Nepean School Flora and Fauna Assessment

MBB Group Pty Ltd

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Abbreviations

Abbreviation	Description
BAM	Biodiversity Assessment Method
BC Act	*Biodiversity Conservation Act 2016*
BC Regulation	*Biodiversity Conservation Regulation 2017*
BDAR	Biodiversity Development Assessment Report
BOS	Biodiversity Offset Scheme
DAWE	Commonwealth Department of Agriculture, Water and Environment
DPIE	NSW Department of Planning, Industry and Environment
ELA	Eco Logical Australia
ELA	Eco Logical Australia
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
FFA	Flora and Fauna Assessment
GIS	Geographic Information System
GPS	Global Positioning System
KFH	Key Fish Habitat
MNES	Matters of National Environmental Significance
NRAR	Natural Resources Access Regulator
PCT	Plant Community Type
SAII	Serious and Irreversible Impact
SEPP	State Environmental Planning Policy

Abbreviation	Description
STIF or TIF	Sydney Turpentine Ironbark Forest
TEC	Threatened Ecological Community

Executive Summary

Eco Logical Australia (ELA) was engaged by MBB Group to address the rejection of a tree removal plan, submitted to Penrith City Council (Council) on 11 November 2020. The removal of trees is required for the proposed construction of a new hall at the Nepean Creative and Performing Arts High School. However, the previous tree removal plan was rejected due to the following reasons:

Insufficient evidence to demonstrate that the trees are of ill health or poor structure
A vegetation permit will generally not be issued to facilitate Complying Development. A Development Application will be required if a complying development proposal does not meet the complying development controls in relation to trees and other vegetation.

As a result of this outcome, Council requested that additional information be provided to determine the viability of the proposed development. This request included addressing the following:

- *The removal of the trees does not impact on biodiversity/habitat.*
- *A thorough fauna survey has been undertaken, in particular a night-time survey and a survey over seasons.*
- *The proposed removal of trees can be sufficiently compensated for through the provision of replacement plantings*;

As such, ELA prepared a Flora and Fauna assessment (FFA), including a field survey and ultrasonic call detection for microchiropteran bat (microbat) species to address these concerns. A desktop and field survey (including nocturnal microbat surveys) was conducted in January 2021 to determine the vegetation community present on site and the presence of threatened fauna and flora. Although several threatened flora, fauna and ecological communities have been recorded in the surrounding area, none have previously been recorded on the subject site and none were observed during the diurnal field surveys. Several threatened microchiropteran species were recorded during the microbat surveys, all with low activity levels which indicated low densities on site.

The site is highly degraded, with mostly planted native vegetation and cleared/exotics. The ground is predominately covered by mulch and gravel. Although several microbat species were recorded on site, due to the degraded nature, low connectivity to surrounding habitat, absence of permanent water bodies and hollow bearing trees, the site provides limited foraging and roosting habitat for these species.

The proposed works will result in the removal of 0.10 ha of planted native vegetation, which provides marginal foraging habitat to the following species, which were recorded as present on site through ultrasonic detection:

- Eastern Coastal Free-tailed Bat (*Micronomus norfolkensis)*
- Large Bent-winged Bat (*Miniopterus orianae oceanensis)*
- Southern Myotis (*Myotis macropus)*

Three (3) other species listed as Vulnerable could potentially be present within the subject site including:

- Greater Broad-nosed Bat (*Scoteanax rueppellii)*
- Eastern Cave Bat (*Vespadelus troughtoni)*
- Grey-Headed Flying Fox (Prteropus *poliocephalus*)

Tests of Significance in accordance with Section 7.3 of the *Biodiversity Conservation Act 2016* (BC Act) were undertaken for the above threatened species, which concluded that the proposed works are unlikely to have a significant impact. Therefore, the preparation of a Species Impact Statement (SIS) or Biodiversity Development Assessment Report (BDAR) is not recommended.

A Significance Assessment in accordance with the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) was also undertaken for the Grey-Headed Flying fox, which also concluded that the proposed development is unlikely to have a significant impact.

1. Introduction

1.1 Purpose of this report

Eco Logical Australia Pty Ltd was engaged by MBB Group Pty Ltd to prepare a Flora and Fauna assessment (FFA) for the proposed construction of a new hall at the Nepean Creative and Performing Arts High School. The development footprint for the hall construction is situated within the current school grounds, consisting of both cleared and vegetated areas. The proposed development will be submitted as a Part 4 Development Application (DA) under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

This report describes the impacts on native vegetation, threatened species, populations and communities listed under the NSW *Biodiversity Conservation Act 2016* (BC Act) and Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The impact assessment within this report is based on information gathered from database searches and field investigation. The report sets out the legislative context, methods used, impacts on the environment and recommendations to mitigate, or reduce these impacts.

1.2 Subject site and subject site

For the purposes of this assessment, the following terms have been defined:

- **Study area** – the area where survey was undertaken
- **Subject site** – The area outside of the subject site that may be indirectly impacted by the proposed activity (a 5km radius from the subject site).

1.3 Proposed work

The proposed work will involve the construction of a new hall in the south west of the school, within the current school boundaries (Figure 1). The construction of the hall will impact on some vegetation within study area. The study area (0.63 ha) contains a total of 0.27 ha of vegetation, the remainder of the study area is cleared consisting of exotic grasses and hard surfaces such as carparks (0.15 ha topped with gravel).

1.4 Impact Assessment

The assessment of impacts of the proposed works on threatened species and communities was undertaken in accordance with the following steps:

- Identification of known or potential habitat for threatened species and communities within the subject site and subject site
- Targeted surveys for microchiropteran bat (microbat) species
- Assessment of the likely impact of the proposed works to any threatened species or communities
- Identification of any additional controls or mitigation measures to reduce impacts

Figure 1: **Study area location and surrounding area**

2. Legislative context

Table 1: Legislative context of the proposed development

Name	Relevance to the project
Commonwealth	
***Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)**	The EPBC Act aims to protect Matters of National Environmental Significance (MNES), including vegetation communities and species listed under the EPBC Act. If a development is likely to have a significant impact on MNES, it is likely to be considered a 'Controlled Action' by the Commonwealth and requires assessment and approval by the Commonwealth in order to proceed. The MNES that have been considered during this assessment are: • Listed threatened species and communities • Listed migratory species
State	
Environmental Planning and Assessment Act 1979 (EP&A Act)	The EP&A Act is the principal planning legislation for NSW. It provides a framework for the overall environmental planning and assessment of development proposals. The proposed works are being assessed under Part 4 of the EP&A Act.
***Biodiversity Conservation Act 2016* (BC Act)**	The overall purpose of the BC Act is to provide the legislative framework to maintain a healthy, productive and resilient environment for the greatest well-being of the community, now and into the future, consistent with the principles of ecologically sustainable development. Among other things, the BC Act outlines the assessment requirements to determine whether a proposed development or activity (Part 4/Part 5 of the EP&A Act) is likely to significantly affect threatened species or ecological communities, or their habitats under section 7.3 of the Act, and whether the Biodiversity Offsets Scheme (BOS) will be triggered. If thresholds for the BOS and application of the Biodiversity Assessment Method (BAM) are triggered, a Biodiversity Development Assessment Report (BDAR) would be required. Triggers for the BOS and BAM are as follows: • Exceeding a native vegetation area clearance threshold relative to minimum lot size; or • Clearing of native vegetation identified on the NSW Government Biodiversity Values (BV) Map; or • A significant impact on a threatened species or ecological community (as assessed by a qualified ecologist). The BC Act also introduces the principle of Serious and Irreversible Impacts (SAII). SAII's are not a threshold trigger for the BOS however they must be addressed if a BDAR is required to be prepared. The BC Act requires a local council to reject a local development (under Part 4 of the EP&A Act) if an action is likely to have a serious and irreversible impact on biodiversity values. This report documents that clearing of native vegetation does not exceed the clearance threshold relative to minimum lot size; the study area is not mapped on the BV Map; it assesses the likelihood of threatened species and concludes that the development is not likely to have a significant impact on threatened species or their habitats; and as a result the BOS is not triggered by the development.
Planning Instruments	
State Environmental Planning Policy (SEPP) (Koala Habitat Protection) 2020	The Penrith City Council local government area (LGA) is not a listed LGA for which the State Environmental Planning Policy (Koala Habitat Protection) 2020 applies.
Local	
Penrith Local Environmental Plan (LEP) 2010	The subject site is not mapped on land that is located on the Terrestrial Biodiversity Layer of the Penrith LEP.

3. Methodology

3.1 Literature review and database search

A review of readily available databases pertaining to the ecology and environmental features of the subject site and study area, including existing vegetation mapping, was conducted to identify records of threatened species, populations and communities and their potential habitat. Databases and vegetation mapping that were reviewed included:

- BioNet (Atlas of NSW Wildlife) database search (5 km) threatened species, populations and ecological communities listed under the BC Act (accessed 22 January 2021).
- EPBC Act Protected Matters Search Tool (5 km) for threatened and migratory species, populations and ecological communities listed under the Commonwealth EPBC Act 1999 (accessed 22 January 2021).
- Remnant Vegetation of the western Cumberland subregion, 2013 Update (OEH, 2013)
- Aerial mapping and vegetation mapping to assess the extent of vegetation including mapped TECs listed under the BC Act and / or EPBC Act.

Aerial photography (Google Maps and SIX Maps) of the subject site and surrounds were also used to investigate the extent of vegetation cover and landscape features. In addition, relevant Geographic Information System (GIS) datasets (soil, geology, drainage) were reviewed.

Species from both the Atlas of NSW Wildlife and Protected Matters Search Tool were combined to produce a list of threatened species, populations and communities that may occur within the subject site (Appendix A).

3.2 Field survey

A field survey was conducted on 26 January 2021 by ELA ecologist Julia Ryeland. The field survey took approximately two hours. Conditions during the survey were calm and sunny (39 °C). The field survey aimed to complete the following:

- Determine best-fit Plant Community Type (PCT), condition and extent.
- Threatened flora and fauna habitat assessment.
- Hollow bearing tree search.
- Opportunistic fauna sightings.

3.2.1 Vegetation communities

Rapid point assessments were used to identify what vegetation communities and species were present within the subject site.

3.2.2 Fauna survey

Any opportunistic fauna sightings were noted during the field survey. Habitat features, such as hollow-bearing trees, culverts and rock outcrops, were marked spatially using a handheld GPS unit. In addition

to this, targeted searches for *Meridolum corneovirens* (Cumberland Plain Land Snail) were conducted under mature native canopy species.

Target surveys for microbats were also conducted via ultrasonic call detectors (Anabat Swift Passive Detectors, Titley Scientific) deployed across the site. Call detection can aid in identifying species and activity levels on site by analysis of high frequency, echolocation calls made by bats. Five Anabat recorders were deployed for four survey nights (25 January to 29 January 2021), automatically programmed to record between dusk and dawn (1800 – 600, giving a total of 20 Anabat survey nights. Detectors were evenly spaced, one in each corner of the site, and one in the centre of the site amongst vegetation. Four Anabats were attached to trees on site, and one to a fence adjacent an existing building. All detectors were placed so as that the microphone faced into the subject site. Microchiropteran calls were analysed in Anabat Insight (Version 1.9.2-0g2fd2328) (Titley Scientific) and Microbat identifications based upon the recorded calls were made by Rodney Armistead from ELA using regional based guides to the echolocation calls of microbats in New South Wales. The full description of methods for microbat surveys is presented in Appendix D.

3.2.3 Survey limitation

No additional targeted surveys for threatened flora and fauna species (other than those specified above) were conducted during the field survey. Instead, a habitat assessment was undertaken to determine the suitability of the subject site to provide habitat. Assessing the habitat features present was considered sufficient to assist in determining whether any threatened species are likely to be present and inform the potential requirements for impact assessments and pre-clearance surveys prior to works commencing.

4. Results

4.1 Literature review and database search

4.1.1 Vegetation communities

A review of the available vegetation mapping (OEH, 2013) returned no previously mapped vegetation within the study area (Figure 2). The nearest mapped native vegetation is approximately 530 m to the south west of the study area and 700 m to the east along the Nepean River. The following vegetation community was mapped in these areas:

- *PCT 835: Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion*

This vegetation community is equivalent to the threatened ecological community (TEC) *River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* listed as an Endangered Ecological Community (EEC) under the BC Act, and Critically Endangered Ecological Community (CEEC) listed under the EPBC Act.

4.1.2 Threatened species

The BioNet Atlas search and EPBC Protect Matters Search Tool returned a total of 57 fauna species, 25 flora species and 23 TECs as occurring, or having the potential to occur, within a 5 km radius of the subject site. No threatened species have been previously recorded within the study area (Figure 3).

Figure 2: Previous vegetation mapping within the locality (OEH, 2013)

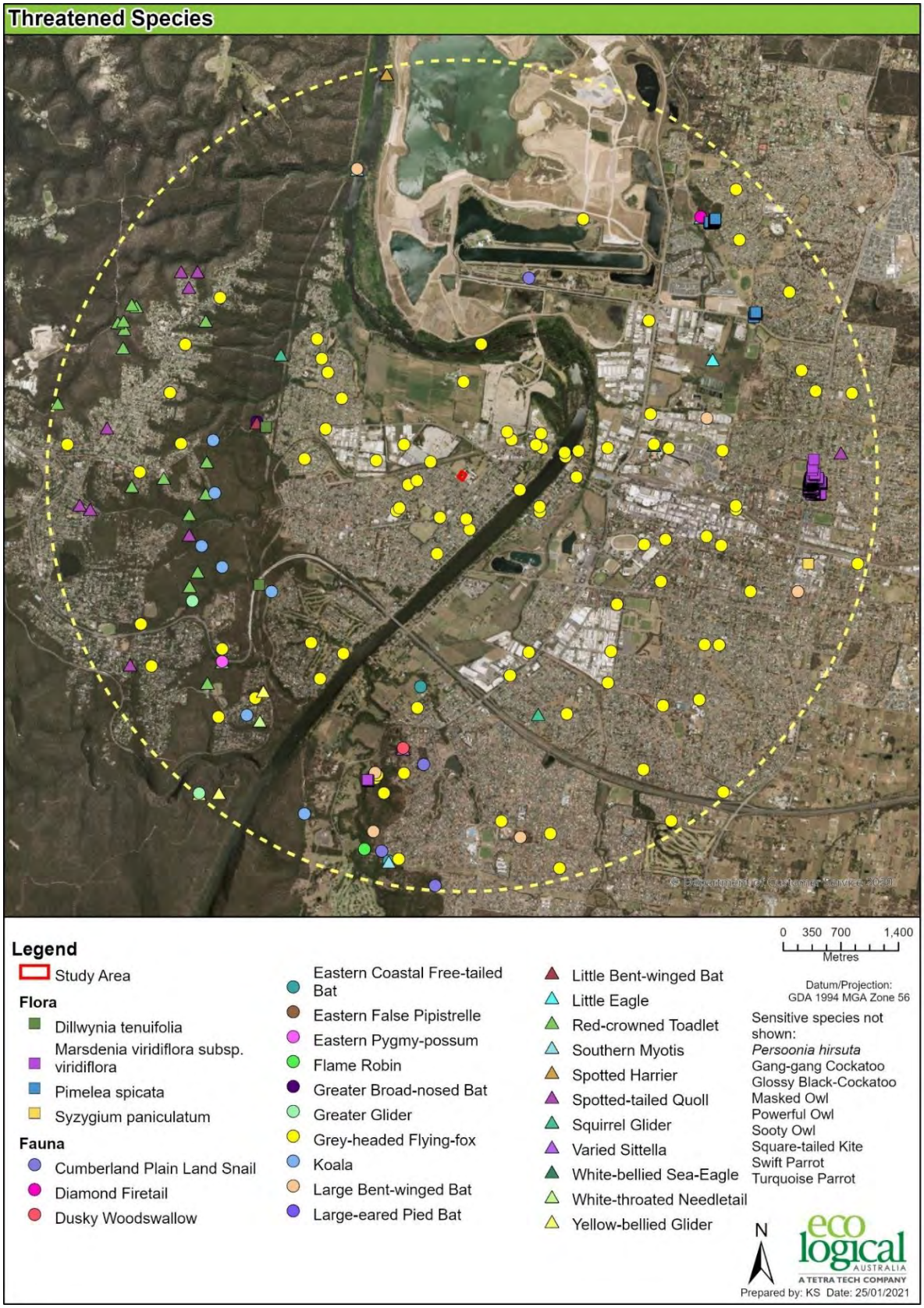

Figure 3: Threatened species previously recorded in the locality (BioNet, 2021)

4.2 Field survey

4.2.1 Vegetation validation

The field survey confirmed the presence of the following vegetation communities (Figure 4):

- **Planted natives** – a variety of planted native species that are not endemic to the area (poor).
- **Exotic/cleared** – cleared areas dominated by exotics or covered in gravel.

Below is a description of the vegetation identified during the field survey. No plant community types were identified, with all native vegetation having been planted. The majority of natives were non-endemic, and clearly planted by their occurrence in rows. Historically, the vegetation on site would have represented Cumberland Plains Woodland, but the site has previously been cleared and replanted with predominately natives.

4.2.1.1 *Planted natives*

This vegetation zone was characterised as follows:

- A patch of *Casuarina glauca* (Swamp Sheoaks) cover the majority of the site, occurring in rows (i.e. previously planted).
- On the southern boundary of the subject site, a single row of Narrow-leaved Bottlebrush (*Callistemon linearis*) occur.
- Several other planted natives occur on site including Silky Oak (*Grevillia robusta*), a single Red Ironbark (*Eucalyptus sideroxylon*), and a single Grey Box (*Eucalyptus moluccana*)

Much of the site with planted natives also had large mulch piles covering the ground layer. As such, little ground cover was able to grow within this area (

Figure 5).

4.2.1.2 Exotic/cleared

All ground cover vegetation and several trees represented exotic/cleared vegetation. Several *Poplar sp.* have been planted on site. The groundcover consisted of predominately managed *Stenotaphrum secundatum* (Buffalo grass) and sections of self-seeded *Solanum lycopersicum* (tomato) and *Tradescantia fluminensis* (Wandering Trad). A substantial section of the site was covered in gravel (

Figure 5).

Figure 4: **Plant natives and exotic cleared vegetation located within the subject site**

Figure 5: Site photos of existing vegetation

4.2.2 Threatened species habitat

The subject site is surrounded predominately by urban settlement, with minimal connectivity to other habitat patches. This would likely decrease the potential for threatened fauna to use the site for foraging, roosting or nesting. The habitat also lacks complexity and diversity with minimal midstory vegetation which would decrease the suitability for many species, particularly given the high abundance of exotic ground cover. No threatened species were observed on site, nor have been observed on site historically. Targeted survey for the Cumberland Plain Land Snail identified no presence of this species within the study area.

Several mature *Eucalyptus sp.* were observed on site, which may provide foraging habitat for highly mobile species such as the *Pteropus poliocephalus* (Grey-headed Flying Fox) and *Phascolarctos cinereus* (Koala), for which there are several records of each within 5 km of the subject site. However, the subject site has poor connectivity, no permanent water sources and is highly degraded. More suitable habitat is available for these species in the nearby Nepean River riparian habitat or the lower Blue Mountains. These alternative sites would provide better quality habitat and are therefore likely preferred by highly mobile species such as these. Given these species are most likely to forage in higher quality habitat located in the study area, the importance of the vegetation identified on the subject site during the field survey for these species is low.

Several Microchiropteran species were been observed on the subject site during nocturnal surveys, including *Miniopterus orianae oceanensis* (Large bent-winged Bat), *Chalinolobus dwyeri* (Large-eared Pied Bat) and *Miniopterus australis* (Little Bent-winged Bat). During the four observation nights, five threatened microbat species were recorded in low densities (indicated by low activity levels). This included:

Three (3) Vulnerable species listed under the BC Act were deemed to have been present within the subject site:

- Eastern Coastal Free-tailed Bat (*Micronomus norfolkensis)*
- Large Bent-winged Bat (*Miniopterus orianae oceanensis)*
- Southern Myotis (*Myotis macropus)*

Two (2) other species listed as Vulnerable could potentially be present within the subject site including:

- Greater Broad-nosed Bat (*Scoteanax rueppellii)*
- Eastern Cave Bat (*Vespadelus troughtoni)*

However, the activity levels of these species were low, and as such it is likely that all species occur in low densities in the surrounding area. The site is highly degraded, with few important habitat features for these species (i.e. connectivity to waterways for foraging for *M. macropus* or hollowing bearing trees for roosting *M. norfolensis* and *S. rueppellii*). These species likely use the site infrequently, potentially only moving through the site, and are unlikely to rely on the site for roosting or foraging. The surrounding areas present higher quality vegetation (i.e. along the Nepean River) and are likely to be preferred over that present on site. The full results of the microbat survey are provided in Appendix D.

The site is used by common fauna species however, such as *Gymnorhina tibicen* (Australian Magpie) and *Manorina melanocephala* (Noisy Miner), observed during the field survey. Several frog species were

also heard in the surrounding area including *Ranoidea caerulea* (Green Tree Frog), *Limnodynastes peronii* (Striped Marsh Frogs) and *Litoria dentata* (Bleating Tree Frog).

No threatened flora species were observed during the diurnal field survey and none are considered likely to occur given the subject site is degraded.

5. Impact assessment

5.1 Summary of impacts

5.1.1 Direct impacts

5.1.1.1 Vegetation communities

A summary of the extent of impacts to vegetation is provided in Table 2 below, and visually represented in Figure 6.

Table 2: Direct impact to vegetation within the subject site

Vegetation community	PCT	Direct Impact (ha)
Planted Native Vegetation	N/A	0.10
Exotic/cleared	N/A	0.07

The vegetation on site was predominately planted natives or exotics that did not make up any PCT. As such, the proposed activity will not impact any of threatened ecological communities and a test of significance under the BC Act is not required. Similarly, because the vegetation is planted natives, it is not recognised under the EPBC Act. As such, the clearance of vegetation on site does not require consideration under the EPBC Act.

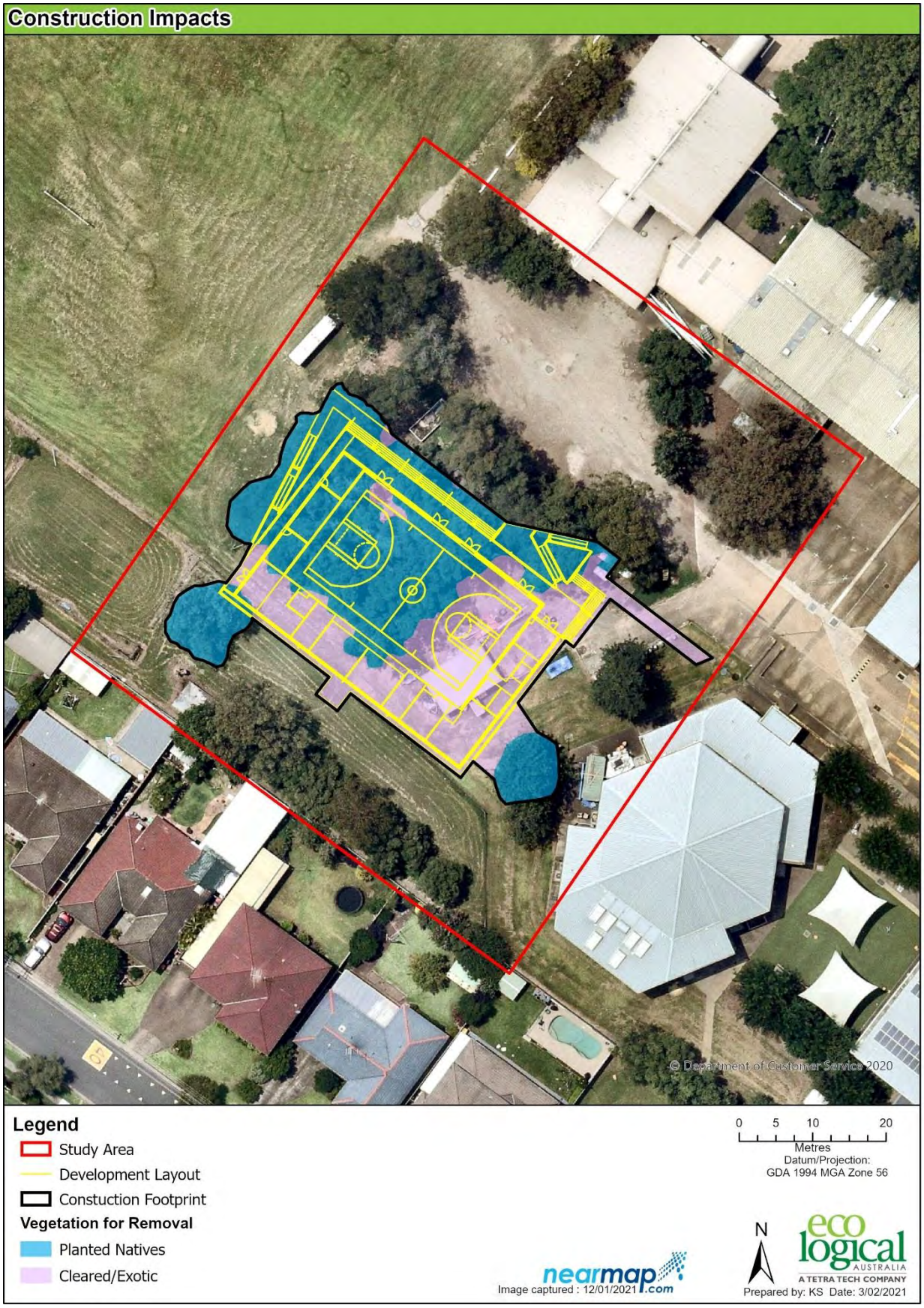

Figure 6: Direct Construction impacts of the proposed works

5.1.1.2 Threatened flora

No threatened flora species occur on site, and the proposed development will not have a direct or indirect impact on any local populations of threatened flora species.

5.1.1.3 Threatened fauna

Due to the degraded nature of the site, as well as the low connectivity to surrounding habitat and waterways, the site is considered to be of low importance to the persistence of any threatened fauna populations in the locality. Although several microbat species were recorded in low densities on the site, the habitat available within the subject area is low quality for these species, with higher quality vegetation available in the surrounding area. No potential roosting habitat in the form of hollow bearing trees will be removed as a result of the development. As such, the removal of vegetation on site is unlikely to have a significant impact on any threatened fauna in the surrounding area.

A single test of Significance in accordance with Section 7.3 of the *Biodiversity Conservation Act 2016* (BC Act) was undertaken for the threatened microbat species which may potentially use the site for foraging. it concluded that the proposed works are unlikely to have a significant impact on these species. Therefore, the preparation of a Species Impact Statement (SIS) or Biodiversity Development Assessment Report (BDAR) is not recommended.

A Test of Significance in accordance with the BC Act, and a Significance Assessment in accordance with the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) was also undertaken for the Grey-Headed Flying fox, which also concluded that the proposed development is unlikely to have a significant impact on this species.

5.1.2 Indirect impacts

Indirect impacts are those that do not directly affect the habitat or species within the subject site but have the potential to interfere through indirect actions. Indirect impacts associated with the proposed activity are:

- Increased spread of exotic species due to increase in access to the subject site and as a result of earthwork.

The overall effect of this potential impact is considered to be negligible for any threatened fauna species which may occur within the study area.

5.2 NSW *Biodiversity Conservation Act 2016* (BC Act)

In November 2016 the NSW parliament passed the BC Act, that replaced the *Threatened Species Conservation Act 1995*, and which took effect on 25 August 2017. Among other things, the BC Act introduces new requirements for biodiversity assessment (Biodiversity Assessment Methodology (BAM)) and requires proponents to offset certain biodiversity impacts through the purchase and retirement of biodiversity credits known as the Biodiversity Offset Scheme (BOS). For a local development under Part 4 of the *Environmental Planning and Assessment Act 1979*, the BOS and the BAM may be triggered by the following means:

- Exceeding the area of clearing threshold associated with the minimum lot size for the property (Table 3)
- The impacts occur on an area mapped on the NSW Government Biodiversity Values Map.

Table 3: Area clearing threshold

Minimum lot size associated with the property	Threshold for clearing native vegetation, 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

5.2.1 Area clearing threshold

The threshold for clearing, above which the BAM and offsets scheme apply, for a property with a minimum lot size in the LEP of less than 1 ha is 0.25 ha or more. The property has a minimum lot size of 550 m^2, and the proposed clearing for the development will remove 0.1 ha of native and exotic plantings; therefore, it does not meet the threshold trigger for the Biodiversity Offset Scheme under s7.3 of the BC Act.

5.2.2 Biodiversity Values Map

The BV Map identifies land considered to have high biodiversity value as defined by the Biodiversity Conservation Regulation 2017. The study area does not contain any areas mapped as high biodiversity value on the BV Map (accessed on 02 February 2021).

5.2.3 Key Threatening Processes

The Key Threatening Processes (KTPs) listed under the BC Act and / or EPBC Act that are likely to be relevant to the proposed development include:

- Clearing of native vegetation (BC Act) / land clearance (EPBC Act)

5.2.4 Test of Significance

Three species of microbat; the *Micronomus norfolkensis* (Eastern Coastal Free-tailed Bat), *Miniopterus orianae oceanensis* (Large Bent-winged Bat) and *Myotis Macropus* (Southern Myotis) utilise foraging resources within the study area, and two additional species of microbat; *Scoteanax rueppellii* (Greater Broad-nosed Bat), *Vespadelus troughtoni* (Eastern Cave Bat), may utilise foraging resources within the study area.

A single test of Significance in accordance with Section 7.3 of the BC Act was undertaken for the above threatened microbat species which may potentially use the site for foraging. it concluded that the proposed works are unlikely to have a significant impact on these species (Appendix B).

A Test of Significance in accordance with the BC Act was also undertaken for the Grey-Headed Flying fox, which also concluded that the proposed development is unlikely to have a significant impact on this species (Appendix B).

5.2.4.1 Endangered Ecological Communities

No endangered ecological communities were present within the study area, hence no further assessment is required under Section 7.3 of the BC Act for endangered ecological communities.

5.2.4.2 Threatened Flora

No threatened flora species were recorded within the study area during the survey. Furthermore, no suitable habitat was considered to be present for any threatened flora species due to the high level of vegetation modification and disturbance. Hence no further assessment is required under Section 7.3 of the BC Act for threatened flora species.

5.2.4.3 Threatened fauna

Due to the degraded nature of the site, as well as the low connectivity to surrounding habitat and waterways, the site is considered to be of low importance to the persistence of any threatened fauna populations in the locality. Although several microbat species were recorded in low densities on the site, the habitat available within the subject area is low quality for these species, with higher quality vegetation available in the surrounding area. No potential roosting habitat in the form of hollow bearing trees will be removed as a result of the development. As such, the removal of 0.1 ha of native vegetation on site is unlikely to have a significant impact on any threatened fauna in the surrounding area. Therefore, no Test of Significance under the BC and EPBC Act was undertaken.

5.3 *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act)

The EPBC Act establishes a process for assessing the environmental impact of activities and developments where MNES may be affected. Under the Act, any action which "has, will have, or is likely to have a significant impact on a MNES" is defined as a controlled action and requires approval from the Commonwealth Department of Agriculture, Water and the Environment (DAWE) which is responsible for administering the EPBC Act.

No threatened ecological communities, flora or fauna species listed under the EPBC Act were recorded during the diurnal field surveys and based on habitat assessments, are unlikely to be adversely impacted by the proposal. One nationally threatened fauna species, *Pteropus poliocephalus* (Grey-headed Flying-fox), may utilise foraging resources within the study area. In accordance with the EPBC Act, Significant Impact Criteria was applied to the Grey-headed Flying-fox which concluded that the activity is unlikely to constitute a significant impact on this species (Appendix C).

6. Mitigation Measures and Recommendations

The following recommendations have been made to reduce, eliminate or mitigate any detrimental effects that the proposed activities could have on, fauna, flora and the surrounding environment.

6.1 Prior to the works beginning

It is recommended that the following measures be in place prior to construction work beginning:

- Tree guard protection should be set up around all trees that are not to be impacted. Ideally, these measures would include physical barriers to prevent any accidental damage to these trees and utilise high visibility colouration to place emphasis on their location

6.2 During construction works

- Ensure tree guard protection remains installed around vegetation outside the impact area
- Ensure adequate sediment and erosion controls are in place to contain soil within the subject site

7. Conclusion

Eco Logical Australia Pty Ltd was engaged by MBB Group to prepare a FFA for the proposed construction of a new hall at the Nepean Creative and Performing Arts High School No threatened ecological communities were identified on site, with the site represented by planted natives and exotic/cleared vegetation. No threatened flora have previously been recorded on site, and were not recorded during the field survey. As a result, no assessment of significance was required for the removal of this vegetation under the BC Act or EPBC Act.

Although several threatened microbat species were recorded during surveys, the subject site is highly degraded, and has no hollow bearing trees or rocky outcrops that would be suitable for roosting for any microbat species. The vegetation on site may provide marginal foraging habitat, but its removal is unlikely to have a significant impact on any microbat species, with higher quality habitat available in the surrounding area (such as the riparian corridor along the Nepean River and lower Blue Mountains). A single test of Significance in accordance with Section 7.3 of the BC Act was undertaken for the above threatened microbat species which may potentially use the site for foraging. it concluded that the proposed works are unlikely to have a significant impact on these species (Appendix B). Additionally, the low level of activity for these species recorded during the targeted surveys indicated low densities of these species within the study area.

Marginal foraging habitat is available for Grey-headed Flying Fox which may utilise the subject site an occasional basis, however, is unlikely to rely on these limited foraging resources for survival. It is unlikely that any additional threatened fauna utilise the subject site, due to the lack of records within the subject site, the degraded nature of the vegetation and the availability of larger high quality patches of vegetation located in the surrounding area. However, a Test of significance In accordance with the BC Act was applied for this species which concluded that the development is unlikely to constitute a significant impact (Appendix B). In accordance with the EPBC Act, Significant Impact Criteria was also applied to the Grey-headed Flying-fox which concluded that the activity is unlikely to constitute a significant impact on this species (Appendix C).

A vegetation species planting list has also been provided in Appendix E. This list has been based off the previous occurrence of native vegetation in the broader study area and can be used as a guide for future vegetation replanting and landscaping works.

8. References

Department of Environment and Energy (DoEE) 2020. *EPBC Act Protected Matters Search Tool*: http://www.environment.gov.au/epbc/pmst/. Accessed 01 February 2021.

Office of Environment and Heritage (OEH) 2019. *Cumberland Plain Woodland in the Sydney Basin Bioregion – Profile* https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10191. Accessed 01 February 2021.

Office of Environment and Heritage (OEH) 2020. *Atlas of NSW Wildlife.* http://www.bionet.nsw.gov.au/ Accessed 01 February 2021.

Appendix A Likelihood of occurrence table

An assessment of likelihood of occurrence was made for threatened and migratory species identified from the database search. Five terms for the likelihood of occurrence of species are used in this report. This assessment was based on database or other records, presence or absence of suitable habitat, features of the proposal site, results of the site inspection and professional judgement. Some Migratory or Marine species identified from the Commonwealth database search have been excluded from the assessment, due to lack of habitat. The terms for likelihood of occurrence are defined below:

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

Information provided in the habitat associations' column has primarily been extracted (and modified) from the Commonwealth Species Profile and Threats Database and the NSW Threatened Species Profiles. Species and communities that have the potential to occur, are likely to occur or are known to occur have been boldened in the below table

Scientific Name	BC Act Status	EPBC Act Status	Distribution and Habitat	Likelihood of Occurrence	Test of significance required
ECOLOGICAL COMMUNITIES					
Castlereagh Scribbly Gum Woodland in the Sydney Basin Bioregion	V / CE	E	Typically a low woodland, with canopy species reaching an average 15 m in height. The canopy is often dominated by one or more of *Angophora bakeri* (narrow leaved apple), *Eucalyptus racemosa* (narrow-leaved scribbly gum) and *E. parramattensis subsp*. *parramattensis* (Parramatta red gum). Melaleuca species including *M. decora* (paperbark) may also be prominent in the canopy and/or mid layer. The understorey has a prominent and diverse mid-layer of sclerophyll shrubs, sometimes dominated by either Banksia or Melaleuca species. It typically has a patchy ground cover of sedges and grasses. The isolation of the alluvial deposits in the Hawkesbury-Nepean river valley and differences in the soil characteristics have led to the development of differences in species composition and abundance across the range of the ecological community. In addition, the Agnes Banks vegetation occurs on aeolian sand and can contain a number of species reminiscent of communities closer to the coast, such as *Dillwynia glaberrima*, *Ricinocarpos pinifolius* (wedding bush) and *Banksia aemula* (wallum).	No - this community was not identified within the subject site during field survey.	No

Scientific Name	BC Act Status	EPBC Act Status	Distribution and Habitat	Likelihood of Occurrence	Test of significance required
Castlereagh Scribbly Gum and Agnes Banks Woodlands of the Sydney Basin Bioregion	E	E	The structure of the community may vary from open forests to low woodlands, scrubs or reedlands with scattered trees. It has a dense to sparse tree layer in which Casuarina glauca (swamp oak) is the dominant species northwards from Bermagui. Other trees including *Acmena smithii* (lilly pilly), *Glochidion spp*. (cheese trees) and Melaleuca spp. (paperbarks) may be present as subordinate species, and are found most frequently in stands of the community northwards from Gosford. *Melaleuca ericifolia* is the only abundant tree in this community south of Bermagui. The understorey is characterised by frequent occurrences of vines, *Parsonsia straminea*, *Geitonoplesium cymosum* and *Stephania japonica var. discolor*, a sparse cover of shrubs, and a continuous groundcover of forbs, sedges, grasses and leaf litter. The composition of the ground stratum varies depending on levels of salinity in the groundwater. Coastal floodplains of NSW. Known from parts of the Local Government Areas of Tweed, Byron, Lismore, Ballina, Richmond Valley, Clarence Valley, Coffs Harbour, Bellingen, Nambucca, Kempsey, Hastings, Greater Taree, Great Lakes, Port Stephens, Maitland, Newcastle, Cessnock, Lake Macquarie, Wyong, Gosford, Pittwater, Warringah, Hawkesbury, Baulkham Hills, Hornsby, Lane Cove, Blacktown, Auburn, Parramatta, Canada Bay, Rockdale, Kogarah, Sutherland, Penrith, Fairfield, Liverpool, Bankstown, Wollondilly, Camden, Campbelltown, Wollongong, Shellharbour, Kiama, Shoalhaven, Eurobodalla and Bega Valley	No - this community was not identified within the subject site during field survey.	No

Scientific Name	BC Act Status	EPBC Act Status	Distribution and Habitat	Likelihood of Occurrence	Test of significance required
Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E	CE	Ranges from open forest to low woodland, with a canopy dominated by *Eucalyptus fibrosa* (Broad-leaved Ironbark) and *Melaleuca decora* (Paperbark). The canopy may also include other eucalypts such as *E. longifolia* (Woolybutt). The dense shrubby understorey consists of *Melaleuca nodosa* (Prickly-leaved Paperbark) and *Lissanthe strigosa* (Peach Heath), with a range of 'pea' flower shrubs, such as *Dillwynia tenuifolia*, *Pultenaea villosa* (Hairy Bush-pea) and *Daviesia ulicifolia* (Gorse Bitter Pea). The sparse ground layer contains a range of grasses and herbs. Occurs in western Sydney, with the most extensive stands occurring in the Castlereagh and Holsworthy areas. Smaller remnants occur in the Kemps Creek area and in the eastern section of the Cumberland Plain.	No - this community was not identified within the subject site during field survey.	No
Cooks River/Castlereagh Ironbark Forest of the Sydney Basin Bioregion	CE	CE	The minimum projected foliage cover of canopy trees is 10% or more and the tree canopy is typically dominated by *Eucalyptus moluccana* (Grey Box*), E. tereticornis* (Forest Red Gum) and/or *E. fibrosa* (Red Ironbark). A sparse lower tree layer may be present, typically with young eucalypts of upper tree canopy species and species of *Acacia*, *Exocarpos* and *Melaleuca*. The understorey typically is dominated by the ground layer, typically comprising a variety of perennial native graminoids and forbs. Endemic to the shale hills and plains of the Sydney Basin Bioregion in NSW, occurring primarily in, but not limited to, the Cumberland Sub-region.	No - this community was not identified within the subject site during field survey.	No

Scientific Name	BC Act Status	EPBC Act Status	Distribution and Habitat	Likelihood of Occurrence	Test of significance required
Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest	E	CE	The structure of the community may vary from tall open forests (>40m) to woodlands. The most widespread and abundant dominant trees include *Eucalyptus tereticornis* (forest red gum), *E. amplifolia* (cabbage gum), *Angophora floribunda* (rough-barked apple) and *A. subvelutina* (broad-leaved apple). *Eucalyptus baueriana* (blue box*), E. botryoides* (bangalay) and *E. elata* (river peppermint) may be common south from Sydney. *E. ovata* (swamp gum) occurs on the far south coast*, E. saligna* (Sydney blue gum) and *E. grandis* (flooded gum) may occur north of Sydney, while *E. benthamii* is restricted to the Hawkesbury floodplain. A layer of small trees may be present, including *Melaleuca decora*, *M. styphelioides* (prickly-leaved teatree), *Backhousia myrtifolia* (grey myrtle), *Melia azadarach* (white cedar), *Casuarina cunninghamiana* (river oak) and *C. glauca* (swamp oak). Scattered shrubs include *Bursaria spinosa*, *Solanum prinophyllum*, *Rubus parvifolius*, *Breynia oblongifolia*, *Ozothamnus diosmifolius*, *Hymenanthera dentata*, *Acacia floribunda* and *Phyllanthus gunnii*. The groundcover is composed of abundant forbs, scramblers and grasses. Found on the river flats of the coastal floodplains. Known from parts of the Local Government Areas of Port Stephens, Maitland, Singleton, Cessnock, Lake Macquarie, Wyong, Gosford, Hawkesbury, Baulkham Hills, Blacktown, Parramatta, Penrith, Blue Mountains, Fairfield, Holroyd, Liverpool, Bankstown, Wollondilly, Camden, Campbelltown, Sutherland, Wollongong, Shellharbour, Kiama, Shoalhaven, Palerang, Eurobodalla and Bega Valley.	No - this community was not identified within the subject site during field survey.	No
River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	CE	CE	The main tree species include *Eucalyptus tereticornis* (Forest Red Gum), *E. punctata* (Grey Gum), stringybarks (*E. globoidea, E. eugenioides*) and ironbarks (*E. fibrosa* and *E. crebra*). Areas of low sandstone influence (more clay-loam soil texture) have an understorey that is closer to Cumberland Plain Woodland. Occurs at the edges of the Cumberland Plain in western Sydney, most now occurs in the Hawkesbury, Baulkham Hills, Liverpool, Parramatta, Penrith, Campbelltown and Wollondilly local government areas.	No - this community was not identified within the subject site during field survey.	No

Scientific Name	BC Act Status	EPBC Act Status	Distribution and Habitat	Likelihood of Occurrence	Test of significance required
Shale Sandstone Transition Forest of the Sydney Basin Bioregion		E	Temporary or permanent swamps with a substrate of peat over sandstone, and vegetation characterised by the presence of sedges, graminoids and forbs, with or without shrubs. The structure of the vegetation varies from open shrubland to closed heath or open heath (dominated by shrub species but with a sedge and graminoid understorey and occasionally with scattered low trees) to sedgeland and closed sedgeland. Components of the community include the Blue Mountains Swamps, Butler's Swamp, Jackson's Bog (Mila Swamp), Newnes Plateau Swamps, Paddy's River Swamps - Hanging Rock, Long, Mundego and Stingray Swamps, Wildes Meadow Swamp and Wingecarribee Swamp.	No - this community was not identified within the subject site during field survey.	No
Temperate Highland Peat Swamps on Sandstone	E	CE	A medium-height open forest with a lower tree layer, an open low shrub layer and a prominent ground layer. Western outliers of the community in wetter habitats may have a tall open forest structure. On the lowlands, the canopy is dominated by *Syncarpia glomulifera* (Turpentine), with *Eucalyptus paniculata* (Grey Ironbark) and *E. eugenioide*s (Thin-leaved Stringybark) occurring less frequently. On the margin of the Cumberland Plain, the vegetation is dominated by *Eucalyptus punctata* (Grey Gum) and *Syncarpia glomulifera*, with species such as *Corymbia gummifera* (Red Bloodwood) and *Eucalyptus globoidea* (White Stringybark) occurring sporadically. The westernmost occurrences of the community are dominated by species such as *Syncarpia glomulifera*, *Eucalyptus globoidea*, *Eucalyptus cypellocarpa* (Monkey Gum), *E. notabilis* (Mountain Mahogany) and *E. paniculata* (Grey Ironbark) in southern areas. *Eucalyptus punctat*a (Grey Gum) and/or *E. piperita* (Sydney Peppermint) are common in areas with sandstone influence. Cumberland Lowlands, with remnants also occurring to the west on shale-capped ridges in the Blue Mountains.	No - this community was not identified within the subject site during field survey.	No

Scientific Name	BC Act Status	EPBC Act Status	Distribution and Habitat	Likelihood of Occurrence	Test of significance required
Turpentine-Ironbark Forest in the Sydney Basin Bioregion		E	Typically occurs as an open to tall open forest with a sparse to dense layer of shrubs and vines, and a diverse understorey of native grasses, forbs, twiners and ferns. Dominant canopy species are most often *Eucalyptus fastigata* (brown barrel*), E. viminalis* (ribbon gum) and *E. radiata subsp.radiata* (narrow-leaved peppermint). *Eucalyptus obliqua* (messmate stringybark), *E. elata* (river peppermint), *E. quadrangulata* (white-topped box) and *E. smithii* (ironbark peppermint) are also common. *Eucalyptus oreades* (Blue Mountains ash) and *E. blaxlandii* (Blaxland‟s stringybark) are prevalent in the Blue Mountains forms. *Eucalyptus cypellocarpa* (mountain grey gum) is widespread in drier sites, while *E. piperita* (Sydney peppermint) and *Eucalyptus ovata* (swamp gum) may also be present. *Acacia melanoxylon*(blackwood) is a common subcanopy tree. Occasional rainforest trees such as *Doryphora sassafras* (sassafras) and *Hedycarya angustifolia* (native mulberry) may also occur. Generally confined to the Sydney Basin bioregion, including the Moss Vale, Ettrema, Burragorang, Sydney Cataract, and Wollemi IBRA sub-regions. However, some patchesmay extend into in the Kanangra and Oberon IBRA sub -regions of the South Eastern Highlands bioregion.	No - this community was not identified within the subject site during field survey.	No

Scientific Name	BC Act Status	EPBC Act Status	Distribution and Habitat	Likelihood of Occurrence	Test of significance required
Upland Basalt Eucalypt Forests of the Sydney Basin Bioregion	E	CE	Typically a low closed forest, slightly more open in the moist woodland form, with emergent trees up to 25 m high and a lower tree layer. In sheltered gullies and on lower slopes the canopy layer is typically dominated by *Melaleuca styphelioides* (prickly-leaved paperbark). Other diagnostic tree species include *Acacia implexa* (hickory wattle), *Alectryon subcinereus* (native quince), *Brachychiton populneus* (kurrajong), *Corymbia maculata* (spotted gum), *Melicope micrococca* (white euodia) and *Streblus pendulinus* (whalebone tree). Generally on upper slopes to undulating terrain, or at more disturbed sites, the ecological community exhibits its moist woodland form with the canopy dominated by E. *moluccana, E. tereticornis, E. crebra* and/or *Corymbia maculata*. Characteristic shrub species include *Breynia oblongifolia* (false coffee bush), *Clerodendrum tomentosum* (hairy clerodendrum) and *Notelaea longifolia f. longifolia* (large mock-olive). Vines and other climber species are typically common. The ground layer is variable and generally sparse with a diverse mix of forbs, ferns and shade-tolerant grasses. Cumberland Plain Sub-region of the Sydney Basin Bioregion.	No - this community was not identified within the subject site during field survey.	No

Scientific Name	BC Act Status	EPBC Act Status	Distribution and Habitat	Likelihood of Occurrence	Test of significance required
Western Sydney Dry Rainforest and Moist Woodland on Shale	V / CE	E	Typically a low woodland, with canopy species reaching an average 15 m in height. The canopy is often dominated by one or more of *Angophora bakeri* (narrow leaved apple), *Eucalyptus racemosa* (narrow-leaved scribbly gum) and *E. parramattensis subsp. parramattensis* (Parramatta red gum). *Melaleuca* species including *M. decora* (paperbark) may also be prominent in the canopy and/or mid layer. The understorey has a prominent and diverse mid-layer of sclerophyll shrubs, sometimes dominated by either *Banksia* or *Melaleuca* species. It typically has a patchy ground cover of sedges and grasses. The isolation of the alluvial deposits in the Hawkesbury-Nepean river valley and differences in the soil characteristics have led to the development of differences in species composition and abundance across the range of the ecological community. In addition, the Agnes Banks vegetation occurs on aeolian sand and can contain a number of species reminiscent of communities closer to the coast, such as *Dillwynia glaberrima*, *Ricinocarpos pinifolius* (wedding bush) and *Banksia aemula* (wallum).	No - this community was not identified within the subject site during field survey.	No
FLORA					
Acacia bynoeana	E1	V	Found in central eastern NSW, from the Hunter District (Morisset) south to the Southern Highlands and west to the Blue Mountains. Heath or dry sclerophyll forest on sandy soils.	Unlikely - suitable habitat not identified within the study area or subject site	No
Allocasuarina glareicola	E1	E	Primarily restricted to the Richmond (NW Cumberland Plain) district, but with an outlier population found at Voyager Point, Liverpool. Castlereagh woodland on lateritic soil. Found in open woodland with Eucalyptus parramattensis, Eucalyptus fibrosa, Angophora bakeri, Eucalyptus sclerophylla and Melaleuca decora.	Unlikely - suitable habitat not identified within the study area or subject site	No

Scientific Name	BC Act Status	EPBC Act Status	Distribution and Habitat	Likelihood of Occurrence	Test of significance required
Cynanchum elegans	E1	E	Restricted to eastern NSW, from Brunswick Heads on the north coast to Gerroa in the Illawarra region, and as far west as Merriwa in the upper Hunter River valley. Dry rainforest; littoral rainforest; Leptospermum laevigatum-Banksia integrifolia subsp. integrifolia (Coastal Tea-tree–Coastal Banksia) coastal scrub; Eucalyptus tereticornis (Forest Red Gum) or Corymbia maculata (Spotted Gum) open forest and woodland; and Melaleuca armillaris (Bracelet Honeymyrtle) scrub.	Unlikely - suitable habitat not identified within the study area or subject site	No
Dillwynia tenuifolia	E2,V		Occurs in the area bounded by Western Road, Elizabeth Drive, Devonshire Road and Cross Street, Kemps Creek in the Liverpool Local Government Area. Transition from Castlereagh Ironbark Forest to Castlereagh Scribbly Gum Woodland.	Unlikely – one record of the species occurring within a 5km was found, but no suitable habitat was identified within the subject site with much of the site cleared or having been topped with gravel or mulch.	No
Dillwynia tenuifolia	E2,V		Near the junction of Wisemans Ferry and Sackville Roads within the Baulkham Hills local government area. Vegetation similar to Cumberland Plain Woodland, on Wianamatta Shale soils.	Unlikely – one record of the species occurring within a 5km was found, but no suitable habitat was identified within the subject site with much of the site cleared or having been topped with gravel or mulch.	No

Scientific Name	BC Act Status	EPBC Act Status	Distribution and Habitat	Likelihood of Occurrence	Test of significance required
Dillwynia tenuifolia	V		Mainly on the Cumberland Plain, but also Bulga Mountains at Yengo in the north, and Kurrajong Heights and Woodford in the Lower Blue Mountains. Scrubby/dry heath areas within Castlereagh Ironbark Forest and Shale Gravel Transition Forest, transitional areas where these communities adjoin Castlereagh Scribbly Gum Woodland, and disturbed escarpment woodland on Narrabeen sandstone.	Unlikely – one record of the species occurring within a 5km was found, but no suitable habitat was identified within the subject site with much of the site cleared or having been topped with gravel or mulch.	No
Eucalyptus aggregata	E2,V	V	Population located in the Wingecarribee local government area, at Berrima, Medway and Sutton Forest. Alluvial soils, on cold, poorly drained flats and hollows adjacent to creeks and small rivers. Usually occurs in open woodland with a grassy groundlayer.	Unlikely - suitable habitat not identified within the study area or subject site	No
Genoplesium baueri	E1	E	Has been recorded from locations between Nowra and Pittwater and may occur as far north as Port Stephens. Dry sclerophyll forest and moss gardens over sandstone.	Unlikely - suitable habitat not identified within the study area or subject site	No
Haloragis exalata subsp. exalata	V	V	Disjunct distribution in the Central Coast, South Coast and North Western Slopes botanical subdivisions of NSW. Protected and shaded damp situations in riparian habitats.	Unlikely - suitable habitat not identified within the study area or subject site	No
Marsdenia viridiflora subsp. viridiflora	E2		Razorback Range, also recorded at Prospect, Bankstown, Smithfield, Cabramatta Creek and St Marys. Vine thickets and open shale woodland.	Unlikely – a cluster of record of the species occurs approximately 4.5km from site, but no suitable habitat was identified within the subject site with much of the site cleared or having been topped with gravel or mulch.	No

Scientific Name	BC Act Status	EPBC Act Status	Distribution and Habitat	Likelihood of Occurrence	Test of significance required
Melaleuca deanei	V	V	Ku-ring-gai/Berowra area, Holsworthy/Wedderburn area, Springwood (in the Blue Mountains), Wollemi National Park, Yalwal (west of Nowra) and Central Coast (Hawkesbury River) areas. Heath on sandstone.	Unlikely - suitable habitat not identified within the study area or subject site	No
Micromyrtus minutiflora	E1	V	Restricted to the general area between Richmond and Penrith, western Sydney. Castlereagh Scribbly Gum Woodland, Ironbark Forest, Shale/Gravel Transition Forest, open forest on tertiary alluvium and consolidated river sediments.	Unlikely - suitable habitat not identified within the study area or subject site	No
Persicaria elatior	V	V	In south-eastern NSW recorded from Mt Dromedary, Moruya State Forest near Turlinjah, the Upper Avon River catchment north of Robertson, Bermagui, and Picton Lakes. In northern NSW known from Raymond Terrace (near Newcastle) and the Grafton area (Cherry Tree and Gibberagee State Forests). Beside streams and lakes, swamp forest or disturbed areas.	Unlikely - suitable habitat not identified within the study area or subject site	No
Persoonia hirsuta	E1,P,3	E	Scattered distribution around Sydney, from Singleton in the north, along the east coast to Bargo in the south and the Blue Mountains to the west. Sandy soils in dry sclerophyll open forest, woodland and heath on sandstone.	Unlikely - suitable habitat not identified within the study area or subject site	No
Persoonia nutans	E1	E	Restricted to the Cumberland Plain in western Sydney, between Richmond in the north and Macquarie Fields in the south. Northern populations: sclerophyll forest and woodland (Agnes Banks Woodland, Castlereagh Scribbly Gum Woodland and Cooks River / Castlereagh Ironbark Forest) on aeolian and alluvial sediments. Southern populations: tertiary alluvium, shale sandstone transition communities and Cooks River / Castlereagh Ironbark Forest.	Unlikely - suitable habitat not identified within the study area or subject site	No

Scientific Name	BC Act Status	EPBC Act Status	Distribution and Habitat	Likelihood of Occurrence	Test of significance required
Pimelea spicata	E1	E	Two disjunct areas; the Cumberland Plain (Marayong and Prospect Reservoir south to Narellan and Douglas Park) and the Illawarra (Landsdowne to Shellharbour to northern Kiama). Well-structured clay soils. Eucalyptus moluccana (Grey Box) communities and in areas of ironbark on the Cumberland Plain. Coast Banksia open woodland or coastal grassland in the Illawarra.	Unlikely – two clusters of record of the species occur approximately 4.8km from site, but no suitable habitat was identified within the subject site with much of the site cleared or having been topped with gravel or mulch.	No
Pomaderris brunnea	E1	V	In NSW, found around the Colo, Nepean and Hawkesbury Rivers, including the Bargo area and near Camden. It also occurs near Walcha on the New England tablelands. Moist woodland or forest on clay and alluvial soils of flood plains and creek lines.	Unlikely - suitable habitat not identified within the study area or subject site	No
Pterostylis saxicola	E1	E	Restricted to western Sydney between Freemans Reach in the north and Picton in the south. Small pockets of shallow soil in depressions on sandstone rock shelves above cliff lines, adjacent to sclerophyll forest or woodland on shale/sandstone transition soils or shale soils.	Unlikely - suitable habitat not identified within the study area or subject site	No
Pultenaea parviflora	E1	V	Endemic to the Cumberland Plain. Mainly from Windsor to Penrith and east to Dean Park, with outlier populations at Kemps Creek and Wilberforce. Dry sclerophyll forest, especially Castlereagh Ironbark Forest, Shale Gravel Transition Forest and transitional areas where these communities adjoin Castlereagh Scribbly Gum Woodland.	Unlikely - suitable habitat not identified within the study area or subject site	No
Rhizanthella slateri	E2,V	E	The population occurs near Bulahdelah (within the Great Lakes LGA). Sclerophyll forest in shallow to deep loams.	Unlikely - suitable habitat not identified within the study area or subject site	No
Rhizanthella slateri	V	E	In NSW, currently known from fewer than 10 locations, including near Bulahdelah, the Watagan Mountains, the Blue Mountains, Wiseman's Ferry area, Agnes Banks and near Nowra. Sclerophyll forest in shallow to deep loams.	Unlikely - suitable habitat not identified within the study area or subject site	No

Scientific Name	BC Act Status	EPBC Act Status	Distribution and Habitat	Likelihood of Occurrence	Test of significance required
Thelymitra kangaloonica	CE		Only known to occur on the southern tablelands of NSW in the Moss Vale / Kangaloon / Fitzroy Falls area at 550-700 m above sea level. Swamps in sedgelands over grey silty grey loam soils.	Unlikely - suitable habitat not identified within the study area or subject site	No
Syzygium paniculatum	E1	V	Only in NSW, in a narrow, linear coastal strip from Upper Lansdowne to Conjola State Forest. Subtropical and littoral rainforest on gravels, sands, silts and clays.	Unlikely – only one record of the species occurs approximately 4.6km from site, but no suitable habitat was identified within the subject site with much of the site cleared or having been topped with gravel or mulch.	No
Thelymitra kangaloonica	E4A	CE	Only known to occur on the southern tablelands of NSW in the Moss Vale / Kangaloon / Fitzroy Falls area at 550-700 m above sea level. Swamps in sedgelands over grey silty grey loam soils.	Unlikely - suitable habitat not identified within the study area or subject site	No
FAUNA					
Anthochaera phrygia	E4A	CE	Inland slopes of south-east Australia, and less frequently in coastal areas. In NSW, most records are from the North-West Plains, North-West and South-West Slopes, Northern Tablelands, Central Tablelands and Southern Tablelands regions; also recorded in the Central Coast and Hunter Valley regions. Eucalypt woodland and open forest, wooded farmland and urban areas with mature eucalypts, and riparian forests of *Casuarina cunninghamiana* (River Oak).	Unlikely – preferred foraging habitat not present.	No

Scientific Name	BC Act Status	EPBC Act Status	Distribution and Habitat	Likelihood of Occurrence	Test of significance required
Artamus cyanopterus cyanopterus	V, P		Widespread in eastern, southern and south western Australia. The species occurs throughout most of New South Wales, but is sparsely scattered in, or largely absent from, much of the upper western region. Most breeding activity occurs on the western slopes of the Great Dividing Range. rimarily inhabit dry, open eucalypt forests and woodlands, including mallee associations, with an open or sparse understorey of eucalypt saplings, acacias and other shrubs, and ground-cover of grasses or sedges and fallen woody debris.	Potential – marginal foraging habitat available, few flowering Eucalypts, minimal species diversity. No fallen timber or ground storey vegetation	No – low quality habitat unlikely to be used on regular basis. Negligible loss of foraging habitat resulting from proposed development
Botaurus poiciloptilus	E1	E	Found over most of NSW except for the far north-west. Permanent freshwater wetlands with tall, dense vegetation, particularly Typha spp. (bullrushes) and Eleocharis spp. (spikerushes).	Unlikely – suitable habitat not present within study area	No
Calidris ferruginea	E1	CE, M	Occurs along the entire coast of NSW, and sometimes in freshwater wetlands in the Murray-Darling Basin. Littoral and estuarine habitats, including intertidal mudflats, non-tidal swamps, lakes and lagoons on the coast and sometimes inland.	Unlikely – suitable habitat not present within study area	No
Callocephalon fimbriatum	V		In NSW, distributed from the south-east coast to the Hunter region, and inland to the Central Tablelands and south-west slopes. Isolated records known from as far north as Coffs Harbour and as far west as Mudgee. Tall mountain forests and woodlands in summer; in winter, may occur at lower altitudes in open eucalypt forests and woodlands, and urban areas.	Unlikely – small patch size, with few feed trees on site. The site is degraded and provides poor foraging habitat	No
Calyptorhynchus lathami	V		In NSW, widespread along coast and inland to the southern tablelands and central western plains, with a small population in the Riverina. Open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur.	Unlikely – small patch size, with few feed trees on site. The site is degraded and provides poor foraging habitat	No
Cercartetus nanus	V		In NSW it extents from the coast inland as far as the Pilliga, Dubbo, Parkes and Wagga Wagga on the western slopes. Rainforest, sclerophyll forest (including Box-Ironbark), woodland and heath.	Unlikely – unsuitable habitat type due to highly degraded vegetation available	No

Scientific Name	BC Act Status	EPBC Act Status	Distribution and Habitat	Likelihood of Occurrence	Test of significance required
Chalinolobus dwyeri	V,P	V	Found mainly in areas with extensive cliffs and caves, from Rockhampton in Queensland south to Bungonia in the NSW Southern Highlands. It is generally rare with a very patchy distribution in NSW. There are scattered records from the New England Tablelands and North West Slopes. Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (*Petrochelidon ariel*), frequenting low to mid-elevation dry open forest and woodland close to these features. Females have been recorded raising young in maternity roosts (c. 20-40 females) from November through to January in roof domes in sandstone caves and overhangs. They remain loyal to the same cave over many years.	Unlikely – no caves or rock structures suitable for roosting within or in proximity to the subject site.	No
Circus assimilis	V		Found throughout the Australian mainland, except in densely forested or wooded habitats, and rarely in Tasmania. Grassy open woodland, inland riparian woodland, grassland, shrub steppe, agricultural land and edges of inland wetlands.	Unlikely – suitable habitat not present	No
Daphoenositta chrysoptera	V		Distribution in NSW is nearly continuous from the coast to the far west. Inhabits eucalypt forests and woodlands, mallee and Acacia woodland.	Unlikely – suitable habitat not present due to highly degraded vegetation and lack of suitable understorey	No
Dasyurus maculatus	V,P	E	Now found in eastern NSW, eastern Victoria, south-east and north-eastern Queensland, and Tasmania. Only in Tasmania is it still considered relatively common. Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Quolls use hollow-bearing trees, fallen logs, other animal burrows, small caves and rock outcrops as den sites.	Unlikely – small, isolated patch with no available den sites (rock outcrops, hollows, fallen logs etc.)	No
Falco hypoleucos	E1		Arid and semi-arid zones. In NSW, found chiefly throughout the Murray-Darling Basin, with the occasional vagrant east of the Great Dividing Range. Shrubland, grassland and wooded watercourses, occasionally in open woodlands near the coast, and near wetlands.	Unlikely – suitable habitat not present	No

Scientific Name	BC Act Status	EPBC Act Status	Distribution and Habitat	Likelihood of Occurrence	Test of significance required
Falsistrellus tasmaniensis	V		South-east coast and ranges of Australia, from southern Qld to Victoria and Tasmania. In NSW, records extend to the western slopes of the Great Dividing Range. Tall (greater than 20m) moist habitats.	Unlikely – Marginal foraging habitat available, however, not recorded during targeted microbat survey	No
Gallinago hardwickii		M	Migrant to east coast of Australia, extending inland west of the Great Dividing Range in NSW. Freshwater, saline or brackish wetlands up to 2000 m above sea-level; usually freshwater swamps, flooded grasslands or heathlands.	Unlikely – suitable habitat not present within study area.	No
Grantiella picta	V	V	Widely distributed in NSW, predominantly on the inland side of the Great Dividing Range but avoiding arid areas. Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests.	Unlikely – marginal foraging habitat, with few flowering Eucalypts	No
Haliaeetus leucogaster	V,P		Distributed around the Australian coastline, as well inland along rivers and wetlands of the Murray Barling Basin. In NSW, it is widespread along the east coast, and along all major inland rivers and waterways.	Unlikely – no foraging habitat available within the study area due to absence of large waterbodies.	No
Heleioporus australiacus	V	V	South eastern NSW and Victoria, in two distinct populations: a northern population in the sandstone geology of the Sydney Basin as far south as Ulladulla, and a southern population occurring from north of Narooma through to Walhalla, Victoria. Heath, woodland and open dry sclerophyll forest on a variety of soil types except those that are clay based.	Unlikely – no permanent freshwater or connectivity to waterways or moist habitats. Degraded site with no suitable vegetation	No

Scientific Name	BC Act Status	EPBC Act Status	Distribution and Habitat	Likelihood of Occurrence	Test of significance required
Hirundapus caudacutus	P		Migratory and usually seen in eastern Australia from October to April. Breeds in forests in south-eastern Siberia, Mongolia, the Korean Penninsula and northern Japan June-August. Most often seen in eastern Australia before storms, low pressure troughs and approaching cold fronts and occasionally bushfire. These conditions are often used by insects to swarm (e.g. termites and ants) or tend to lift insects away from the surface which favours sighting of White-throated Needletails as they feed. More common in coastal areas, less so inland.	Unlikely – suitable habitat not present. May occasionally fly over the site.	No
Hieraaetus morphnoides	V		Throughout the Australian mainland, with the exception of the most densely-forested parts of the Dividing Range escarpment. Open eucalypt forest, woodland or open woodland, including sheoak or Acacia woodlands and riparian woodlands of interior NSW.	Unlikely – marginal foraging habitat, and no suitable breeding habitat (i.e. few large mature trees).	No
Hoplocephalus bungaroides	E1	V	Largely confined to Triassic and Permian sandstones within the coast and ranges in an area within approximately 250 km of Sydney. Dry and wet sclerophyll forests, riverine forests, coastal heath swamps, rocky outcrops, heaths, grassy woodlands.	Unlikely – No shelters available with no rocks or escarpments. Low connectivity to surround areas	No
Lathamus discolor	E1,P,3	CE	Breeds in Tasmania during spring and summer, migrating in the autumn and winter months to south-eastern Australia from Victoria and the eastern parts of South Australia to south-east Queensland. In NSW mostly occurs on the coast and south west slopes. On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations	Unlikely – No suitable breeding habitat and preferred foraging habitat not present.	No
Litoria aurea	E1	V	Since 1990, recorded from ~50 scattered sites within its former range in NSW, from the north coast near Brunswick Heads, south along the coast to Victoria. Records exist west to Bathurst, Tumut and the ACT region. Marshes, dams and stream-sides, particularly those containing Typha spp. (bullrushes) or Eleocharis spp. (spikerushes). Some populations occur in highly disturbed areas.	Unlikely – no permanent freshwater or connectivity to waterways or moist habitats. Degraded site with no suitable vegetation	No

Scientific Name	BC Act Status	EPBC Act Status	Distribution and Habitat	Likelihood of Occurrence	Test of significance required
Lophoictinia isura	V		In NSW, it is a regular resident in the north, north-east and along the major west-flowing river systems. It is a summer breeding migrant to the south-east, including the NSW south coast. Timbered habitats including dry woodlands and open forests, particularly timbered watercourses.	Unlikely – no permanent freshwater or connectivity to waterways or moist habitats. Degraded site with no suitable vegetation	No
Meridolum corneovirens	E1		Areas of the Cumberland Plain west of Sydney, from Richmond and Windsor south to Picton and from Liverpool, west to the Hawkesbury and Nepean Rivers at the base of the Blue Mountains. Primarily inhabits Cumberland Plain Woodland. Also known from Shale Gravel Transition Forests, Castlereagh Swamp Woodlands and the margins of River-flat Eucalypt Forest.	Unlikely – very degraded habitat with mostly cleared, mulched or gravel ground cover. Not recorded during targeted surveys	No
Merops ornatus			Distributed across much of mainland Australia, including NSW. Open forests and woodlands, shrublands, farmland, areas of human habitation, inland and coastal sand dune systems, heathland, sedgeland, vine forest and vine thicket.	Unlikely – very degraded habitat with mostly cleared or planted vegetation. Marginal foraging habitat	No
Micronomus norfolkensis	**V, P**		**Found along the east coast from south Qld to southern NSW. Dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range.**	**Yes – Calls recorded in low numbers during survey. Poor quality foraging habitat it available in the study area. Roosting habitat not present.**	**Yes**
Miniopterus australis	**V, P**		**East coast and ranges south to Wollongong in NSW. Moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub.**	**Yes – Calls recorded in low numbers during survey. Poor quality foraging habitat it available in the study area. Roosting habitat not present.**	**Yes**

Scientific Name	BC Act Status	EPBC Act Status	Distribution and Habitat	Likelihood of Occurrence	Test of significance required
Miniopterus orianae oceanensis	**V, P**		**In NSW it occurs on both sides of the Great Dividing Range, from the coast inland to Moree, Dubbo and Wagga Wagga. Rainforest, wet and dry sclerophyll forest, monsoon forest, open woodland, paperbark forests and open grassland.**	**Yes – Calls recorded in low numbers during survey. Poor quality foraging habitat it available in the study area. Roosting habitat not present.**	**Yes**
Mixophyes balbus	E1	V	Along the east coast of Australia from southern Qld to north-eastern Victoria. Rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range.	Unlikely – suitable habitat not present within study area	No
Monarcha melanopsis		M	In NSW, occurs around the eastern slopes and tablelands of the Great Divide, inland to Coutts Crossing, Armidale, Widden Valley, Wollemi National Park and Wombeyan Caves. It is rarely recorded farther inland. Rainforest, open eucalypt forests, dry sclerophyll forests and woodlands, gullies in mountain areas or coastal foothills, Brigalow scrub, coastal scrub, mangroves, parks and gardens.	Unlikely – very degraded habitat with mostly cleared or planted vegetation. Marginal foraging habitat	No
Monarcha trivirgatus			Coastal eastern Australia south to Port Stephens in NSW. Mountain/lowland rainforest, wooded gullies, riparian vegetation including mangroves.	Unlikely – no permanent freshwater or connectivity to waterways with limited connectivity to surrounding vegetation	No

Scientific Name	BC Act Status	EPBC Act Status	Distribution and Habitat	Likelihood of Occurrence	Test of significance required
Myotis macropus	**V**		**In NSW, found in the coastal band. It is rarely found more than 100 km inland, except along major rivers. Foraging habitat is waterbodies (including streams, or lakes or reservoirs) and fringing areas of vegetation up to 20m.**	**Yes – Calls recorded in low numbers during survey. However, no permanent freshwater or connectivity to waterways occurs on site with limited connectivity to surrounding vegetation. The site represents poor foraging habitat (i.e. no waterbodies), with high quality foraging habitat available nearby (i.e. the Nepean River).**	**Yes**
Neophema pulchella	V		Occurs along the length of NSW from the coastal plains to the western slopes of the Great Dividing Range. Eucalypt and cypress pine open forests and woodlands, ecotones between woodland and grassland, or coastal forest and heath.	Unlikely – very degraded habitat with mostly cleared or planted vegetation. Marginal foraging habitat	No
Ninox strenua	V		In NSW, it is widely distributed throughout the eastern forests from the coast inland to tablelands, with scattered records on the western slopes and plains. Woodland, open sclerophyll forest, tall open wet forest and rainforest.	Unlikely – very degraded habitat with mostly cleared or planted vegetation. Marginal roosting and foraging habitat	No
Pandion haliaetus	V		Common around the northern NSW coast, and uncommon to rare from coast further south. Some records from inland areas. Rocky shorelines, islands, reefs, mouths of large rivers, lagoons and lakes.	Unlikely – no permanent freshwater or connectivity to waterways	No

Scientific Name	BC Act Status	EPBC Act Status	Distribution and Habitat	Likelihood of Occurrence	Test of significance required
Petauroides volans	V	V	Forest dependent and prefer older tree age classes in moist forest types. They are obligate users of hollow-bearing trees for shelter and nesting, with each family group using multiple den trees within its home range	Unlikely – degraded vegetation with no hollow bearing trees on site	No
Petaurus australis	E2,V		The endangered population of the Yellow-bellied Glider occurs on the Bago Plateau; a westward extension of the Kosciuszko highlands in southern NSW. The habitat on the Bago Plateau consists of tall wet sclerophyll forest dominated by *Eucalyptus delegatensis* (Alpine Ash), *E. dalrympleana* (Mountain Gum), *E. radiata* (Narrow-leaved Peppermint), and *E. rubida* (Candlebark).	Unlikely – degraded vegetation with no hollow bearing trees on site	No
Petrogale penicillata	E1	V	In NSW they occur from the Qld border in the north to the Shoalhaven in the south, with the population in the Warrumbungle Ranges being the western limit. Rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges.	Unlikely – degraded vegetation with no rocky escarpment, outcrops or cliffs	No
Petroica phoenicea	V		In NSW, breeds in upland areas, and in winter many birds move to the inland slopes and plains, or occasionally to coastal areas. Likely that there are two separate populations in NSW, one in the Northern Tablelands, and another ranging from the Central to Southern Tablelands. Breeds in upland tall moist eucalypt forests and woodlands. In winter uses dry forests, open woodlands, heathlands, pastures and native grasslands. Occasionally occurs in temperate rainforest, herb fields, heathlands, shrublands and sedgelands at high altitudes.	Unlikely – very degraded habitat with mostly cleared or planted vegetation. Marginal foraging habitat.	No
Phascolarctos cinereus	V, P	V	The Koala has a fragmented distribution throughout eastern Australia from north-east Queensland to the Eyre Peninsula in South Australia. Live in a range of temperate, sub-tropical and tropical forest, woodland and semi-arid communities dominated by eucalypt species	Unlikely – very degraded habitat with mostly cleared or planted vegetation. Limitedl foraging habitat, with few mature Eucalypts. Low connectivity to surrounding habitat.	No

Scientific Name	BC Act Status	EPBC Act Status	Distribution and Habitat	Likelihood of Occurrence	Test of significance required
Pommerhelix duralensis	E		The species is a shale-influenced-habitat specialist, which occurs in low densities along the western and northwest fringes of the Cumberland IBRA subregion on shale-sandstone transitional landscapes.	Unlikely – very degraded habitat with mostly cleared, mulched or gravel ground cover	No
Pseudomys novaehollandiae		V	Fragmented distribution across eastern NSW. Open heathlands, woodlands and forests with a heathland understorey, vegetated sand dunes.	Unlikely – degraded site with little ground storey vegetation	No
Pseudophryne australis	V		Confined to the Sydney Basin, from Pokolbin in the north, the Nowra area to the south, and west to Mt Victoria in the Blue Mountains. Open forests, mostly on Hawkesbury and Narrabeen Sandstones. Inhabits periodically wet drainage lines below sandstone ridges that often have shale lenses or cappings.	Unlikely – no permanent freshwater or connectivity to waterways	No
Pteropus poliocephalus	**V, P**	**V**	**Generally found within 200 km of the eastern coast of Australia, from Rockhampton in Queensland to Adelaide in South Australia. In times of natural resource shortages, they may be found in unusual locations. Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops.**	**Potential – very degraded habitat with mostly cleared or planted vegetation. Marginal foraging habitat, with few mature Eucalypts. Low connectivity to surrounding habitat. Known camp approximately 1.5 km to the north-east.**	**Yes**
Rhipidura rufifrons		M	Coastal and near coastal districts of northern and eastern Australia, including on and east of the Great Divide in NSW. Wet sclerophyll forests, subtropical and temperate rainforests. Sometimes drier sclerophyll forests and woodlands.	Unlikely – suitable habitat not present.	No
Rostratula australis	E1	E	In NSW most records are from the Murray-Darling Basin. Other recent records include wetlands on the Hawkesbury River and the Clarence and lower Hunter Valleys. Swamps, dams and nearby marshy areas.	Unlikely – suitable habitat not present.	No

Scientific Name	BC Act Status	EPBC Act Status	Distribution and Habitat	Likelihood of Occurrence	Test of significance required
Scoteanax rueppellii	**V**		**Both sides of the great divide, from the Atherton Tableland in Qld to north-eastern Victoria, mainly along river systems and gullies. In NSW it is widespread on the New England Tablelands. Woodland, moist and dry eucalypt forest and rainforest.**	**Yes – Calls recorded in low numbers during survey. Poor quality foraging habitat it available in the study area. Roosting habitat not present.**	**Yes**
Stagonopleura guttata	V		Widely distributed in NSW, mainly recorded in the Northern, Central and Southern Tablelands, the Northern, Central and South Western Slopes and the North West Plains and Riverina, and less commonly found in coastal areas and further inland. Grassy eucalypt woodlands, open forest, mallee, Natural Temperate Grassland, secondary derived grassland, riparian areas and lightly wooded farmland.	Unlikely – degraded site with low quality foraging habitat.	No
Tyto novaehollandiae	V		Recorded over approximately 90% of NSW, excluding the most arid north-western corner. Most abundant on the coast but extends to the western plains. Dry eucalypt forests and woodlands from sea level to 1100 m.	Unlikely – very degraded habitat with mostly cleared or planted vegetation. Marginal roosting and foraging habitat	No
Tyto tenebricosa	V		Occupies the easternmost one-eighth of NSW, occurring on the coast, coastal escarpment and eastern tablelands. Dry rainforest, subtropical and warm temperate rainforest, as well as moist eucalypt forests.	Unlikely – very degraded habitat with mostly cleared or planted vegetation. Marginal roosting and foraging habitat	No

Scientific Name	BC Act Status	EPBC Act Status	Distribution and Habitat	Likelihood of Occurrence	Test of significance required
Vespadelus troughtoni	V		The Eastern Cave Bat is found in a broad band on both sides of the Great Dividing Range from Cape York to Kempsey, with records from the New England Tablelands and the upper north coast of NSW. The western limit appears to be the Warrumbungle Range, and there is a single record from southern NSW, east of the ACT. A cave-roosting species that is usually found in dry open forest and woodland, near cliffs or rocky overhangs; has been recorded roosting in disused mine workings, occasionally in colonies of up to 500 individuals	Low – Potential calls recorded in low numbers during survey. Yes –Poor quality foraging habitat it available in the study area. Unlikely to utilise the study area due to absence of nearby caves or cliff lines.	Yes

Appendix B Biodiversity Conservation Act 2016 Tests of Significance

The 'Assessment of significance' (5-part test) is applied to species, populations and ecological communities listed on Schedules 1 and 2 of the BC Act. The assessment sets out five factors, which when considered, allow proponents to undertake a qualitative analysis of the likely impacts of an action and to determine whether a significant impact is likely. All factors must be considered, and an overall conclusion made based on all factors in combination.

B1 Microbats

Due to similar foraging habitat requirements, a single test was undertaken for the following species, which are all listed as vulnerable under the BC Act:

- Eastern Coastal Free-tailed Bat (*Micronomus norfolkensis)*
- Large Bent-winged Bat (*Miniopterus orianae oceanensis)*
- Southern Myotis (*Myotis macropus)*
- Greater Broad-nosed Bat (*Scoteanax rueppellii)*
- Eastern Cave Bat (*Vespadelus troughtoni)*

The description and habitat associations of each of the above-listed threatened species are presented in Appendix A. Potential foraging habitat for these species is available within the 0.1 ha of vegetation proposed to be removed. No hollow bearing trees, which represents potential roosting habitat for these species are proposed for removal. The study area did not contain suitable breeding habitat for any of these threatened microbat species.

BC Act	Question	Response
7.3.1 a)	In the case of a threatened species: whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction	The proposed works will result in the removal 0.10 ha of planted native vegetation. It is considered unlikely that the proposed works will place a viable local population of any of these potentially affected species at risk of extinction given that suitable habitat is available within the tracts of connective vegetation near the Nepean River and lowed Blue Mountains area. Additionally, the species are highly mobile.
7.3.1 b) i	In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity: Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or	Not applicable
7.3.1 b) ii	In the case of an endangered ecological community or critically endangered ecological community: Whether the proposed development or activity is likely to substantially and adversely modify the composition of the ecological	Not applicable

BC Act	Question	Response
	community such that its local occurrence is likely to be placed at risk of extinction.	
7.3.1 c) i	In relation to the habitat of a threatened species or ecological community: The extent to which habitat is likely to be removed or modified as a result of the proposed development or activity	Vegetation removal (0.10 ha) will be minimal. There is similar habitat available immediately adjacent to the study area and the potentially affected species are highly mobile.
7.3.1 c) ii	In relation to the habitat of a threatened species or ecological community: Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity	Habitat for these species is already fragmented by the existing school and residential developments in the surrounding area The construction of the school hall is unlikely to increase fragmentation or isolation of areas of habitat. The highly mobile species will still be able to access similar vegetation located adjacent to the study area.
7.3.1 c) iii	In relation to the habitat of a threatened species or ecological community: The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.	The construction works will impact up to 0.10 ha of potential habitat for threatened microbat species, including one hollow bearing tree. The small area of habitat to be impacted is not considered vital to the long-term survival of these species within the locality.
7.3.1 d)	Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).	The proposed works will not impact any declared area of outstanding biodiversity value.
7.3.1 e)	Whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.	One key threatening processes, the removal of native vegetation is relevant to this proposal. The proposed works are unlikely to contribute significantly to either process given that only 0.10 ha of planted native vegetation is proposed to be removed and suitable habitat is available within the tracts of connective vegetation associated with the Nepean river and lower Blue Mountains area.
Conclusion	Is there likely to be a significant impact?	No. The proposed activity is unlikely to have a significant impact on Eastern Coastal Free-tailed Bat, Large Bent-winged Bat, Southern Myotis, Greater Broad-nosed Bat, or Eastern Cave Bat for the following reasons: • The extent of vegetation to be removed is minimal (0.10 ha) and more suitable habitat for these highly mobile species is available adjacent to the study area. • No hollow bearing trees or habitat features which can be utilised for roosting are to be removed as part of the development.

B2 *Pteropus poliocephalus* (Grey-headed Flying-fox)

The Grey-headed Flying-fox is listed as vulnerable under the BC Act and EPBC Act. This species was not observed during field survey and has not been recording in the study area. The construction of the hall will remove 0.09 ha of native, planted vegetation – little which includes species that are potential foraging habitat for this species. No camps will be affected by the proposed development. The closest Nationally Important Camp is located approximately 21 km northeast of the study area, in Windsor. However, three other Flying-fox camps are located nearby along the Nepean River (approximately two, three and four km to the north).

BC Act	Question	Response
7.3.1 a)	In the case of a threatened species: whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction	The proposed clearance on the subject site would result in removal of 0.09 ha of native, planted vegetation, of which on two trees represent potential foraging habitat for the Grey-headed Flying-fox (one *Grevillia robusta* and *Eucalyptus moluccana*). Most trees to be removed (*Casuarina gluaca*) are not known to be key feed trees of the Grey-headed flying fox (GHFF) (Eby and Law 2008). No breeding habitat will be impacted as part of the proposed works. It is considered unlikely that the proposed works will place a viable population of the species at risk of extinction given that the site has no permanent water bodies, has low connectivity to surrounding habitat and higher quality, similar habitat is available near to the study area. Given that the species is highly mobile, it is likely to move to these higher quality patches if present.
7.3.1 b) i	In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity: Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or	Not applicable
7.3.1 b) ii	In the case of an endangered ecological community or critically endangered ecological community: Whether the proposed development or activity is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.	Not applicable
7.3.1 c) i	In relation to the habitat of a threatened species or ecological community: The extent to which habitat is likely to be removed or modified as a result of the proposed development or activity	The proposed clearance of the subject site will result in the removal of 0.09 ha of native, planted vegetation, most which is not considered key potential foraging habitat for the GHFF (i.e. *Casuarina gluaca*). Similar habitat is available along the nearby Nepean River.
7.3.1 c) ii	In relation to the habitat of a threatened species or ecological community:	Vegetation removal (0.09 ha) will be minimal. The vegetation available closer the known roosts is likely of higher quantity and would therefore be used preferentially by this highly mobile.

BC Act	Question	Response
	Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity	
7.3.1 c) iii	In relation to the habitat of a threatened species or ecological community: The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.	The site is already isolated, with residential housing surrounding the site. Due to the poor connectivity and minimal habitat available on site, the species is unlikely to be using the vegetation that is proposed to be removed. This is supported by the lack of prior records on site.
7.3.1 d)	Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).	There are no areas of outstanding biodiversity within the subject site.
7.3.1 e)	Whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.	One key threatening process, the removal of native vegetation, is relevant to this proposal. The proposed works are unlikely to contribute significantly to this process given that only 0.09 ha of isolated plated natives are proposed to be removed.
Conclusion	**Is there likely to be a significant impact?**	The proposal is unlikely to constitute to a significant impact on the Grey-headed Flying Fox given the following: • The site is in poor quality and constitutes planted natives, mostly which are not known to be significant roost or feed tree species • No camps of state or national significance occur in the local area, with individuals mostly sighted moving over suburban area near the subject site. As such, the clearance of the site will not impact any important populations. • As a result, the proposed development will not trigger the Biodiversity Offset Scheme with respect to impacts to the GHFF.

Appendix C Significant Impact Criteria (EPBC Act)

The EPBC Act establishes a process for assessing the environmental impact of activities and developments where MNES may be affected. Under the Act, any action which "has, will have, or is likely to have a significant impact on MNES" is defined as a "controlled action", and requires approval from the Commonwealth Department of Agriculture, Water and the Environment (DAWE), which is responsible for administering the EPBC Act.

The EPBC Act Significant Impact Criteria was applied to one species, *Pteropus poliocephalus* (Grey-headed Flying-fox), which may occur in the subject site. Grey-headed Flying-fox is listed as vulnerable under the EPBC Act.

C1 Environment Protection and Biodiversity Conservation Act 1999 Assessment of Significance for the Grey-headed Flying Fox

Criterion	Question	Response
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:		
1)	lead to a long-term decrease in the size of an important population of a species *Note: An 'important population' is a population that is necessary for a species' long-term survival and recovery (DoAWE 2013).*	The Grey-headed Flying Fox (GHFF) is considered to be one population that intermixes up and down the east coast, therefore any GHFF population is a meta-population of this one "important population". No roosting habitat (camps) will be affected by the proposed action. The proposed action will impact up to 0.09 ha of native vegetation, of which most species are not considered to be important feed species for GHFF (bar two trees, a *Grevillia robusta* and a *Eucalyptus moluccana*). The site is isolated, with minimal habitat connectivity to nearby camps – none of which are identified on the National Flying-fox Monitoring viewer as of National Importance (DotEE 2021). The Grey-headed Flying-fox is recorded as travelling long distances during foraging (up to 50 km) and as such, are likely to be sighted moving through the area to more suitable habitat along the Nepean River. Given the proximity of more suitable habitat, the removal of this potential habitat would not lead to the long-term decrease in the size of an important population of Grey-headed Flying-fox
2)	reduce the area of occupancy of an important population	No important populations occur within the local area, with the closest camp of National significance being approximately 21km to the north-west. Some individuals have been sighted in the local area, however these numbers are small in comparison to the known numbers at important roosting camps (*i.e.* which include hundreds of thousands of individuals). These individuals have all been sighted travelling across suburban areas, and no roosts have been sighted in any of the local vegetation patches connecting to the site.

Criterion	Question	Response
3)	fragment an existing important population into two or more populations	According to the Draft Recovery Plan for the Grey-headed Flying-fox 2017, "the Grey-headed Flying-fox is considered to be a single, mobile population with individuals distributed across Queensland, New South Wales, Victoria, South Australia, Tasmania and the ACT." The proposed action will not fragment an existing important population into two or more populations. No camps will be affected by the proposed action and other areas of foraging habitat are available for this highly mobile species within the region.
4)	adversely affect habitat critical to the survival of a species *Note: 'Habitat critical to the survival of a species or ecological community' refers to areas that are necessary:* • *for activities such as foraging, breeding, roosting, or dispersal* • *for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators)* • *to maintain genetic diversity and long term evolutionary development, or* • *for the reintroduction of populations or recovery of the species or ecological community.*	The proposed tree removal (0.09 ha), consists of predominately *Casuarina glauca* – not known to be an important feed trees of the GHFF (Eby and Law 2008). No roosting individuals have been recorded within subject site or any connecting vegetation. The species is recorded as travelling long distances (50 km) on feeding forays and similar habitat is available adjacent to the study area. As such, removal of the vegetation on site is unlikely to adversely affect habitat critical to the survival of a species
5)	disrupt the breeding cycle of an important population	The proposed action will not disrupt the breeding cycle of the Grey-headed Flying-fox given that no camps will be affected by the proposed action and suitable foraging habitat is available nearby to the study area.
6)	modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposed action will remove/modify up to 0.09 ha of vegetation, mostly of *Casuarina glauca,* not know was important foraging habitat for the Grey-headed Flying-fox. It is unlikely that the extent of this vegetation removal will cause the species to decline because suitable habitat is available nearby to the study area. Only two potential foraging trees with be removed – one *Grevillia robusta* and one *Eucalyptus moluccana*.
7)	result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	The proposal would not result in invasive species, such as weeds, that would be harmful to GHFF. It is unlikely that the proposed clearance of the subject site will result in a large increase in the number of weeds due to the current disturbed nature of the site, particularly if managed during development
8)	introduce disease that may cause the species to decline, or	Grey-headed Flying-fox are reservoirs for the Australian bat lyssavirus (ABL) and can cause clinical disease and mortality in GHFF. It is estimated that <1% of the entire population is affected by the disease (DotEE, 2017). The proposed action

Criterion	Question	Response
		is unlikely to present a significant ecological stress on any camps or on individuals that may utilise the subject site and therefore the works are unlikely to introduce or exacerbate this virus or any other disease that may cause this species to decline.
9)	interfere substantially with the recovery of the species.	The removal of a small number of foraging tree is unlikely to interfere substantially with the recovery of the species.
Conclusion	**Is there likely to be a significant impact?**	The proposal is unlikely to result in a significant impact on Grey-headed Flying-fox. No camps will be removed by the proposed action. More suitable foraging habitat for this highly mobile species is available nearby to the study area.

Appendix D Ultrasonic Analysis Report

PROJECT BACKGROUND AND SITE DESCRIPTION

Eco Logical Australia Pty Ltd (ELA) was engaged by MBB Group Pty Ltd to conduct an ultrasonic Microchiropteran bat call survey and prepare a MUAR at the Nepean Creative and Performing Arts School (Subject site). The need for this survey and MUAR report came from a request for additional information from Penrith City Council that is in relation to a tree removal application. The information collected during this survey will contribute to the preparation of Flora and Fauna Assessment report.

This MUAR report outlines the methodology used to record the microbat calls, how the recorded calls were analysed and the results of the data analysis.

METHODS

Four (4) Anabat Swift (AS) (Titley Electronics) ultrasonic microbat detectors were set at four (4) locations within the subject site between the 25 January and 29 January 2021. Each detector was set to record a full night of ultrasonic call data (e.g. dusk to dawn) across the four consecutive survey nights.

DATA ANALYSIS

The ultrasonic call data was recorded passively on four Anabat Swift ultrasonic microbat detectors (AS) (Titley Electronics). Microbat calls recorded were recorded as WAV sound files. These WAV files were viewed using the software program Anabat Insight (Version 1.9.2-0g2fd2328) (Titley Scientific) in either zero crossing (ZC) format or full spectrum formats.

Microbat identifications based upon the recorded calls were made by Rodney Armistead from ELA using regional based guides to the echolocation calls of microbats in New South Wales (Pennay et al 2004); and south-east Queensland and north-east New South Wales (Reinhold et al 2001) and the accompanying reference library of over 200 calls from Sydney Basin, NSW (which is available at http://www.forest.nsw.gov.au/research/bats/default.asp). Species identification was guided by considering probability of occurrence based upon the general distribution information that is provided in Churchill (2008); Pennay et al. (2011), Van Dyck and Strahan (2008), Van Dyck et al. (2013) and on the Australian Bat Society web page (Australian Bat Society Inc (viewed January 2021)). A technical review of this report and a sample of the calls was performed by Alicia Scanlon also from ELA. Alicia has over 14 years of experience in the identification of ultrasonic call recordings.

To ensure reliable and accurate results the following protocols (adapted from Lloyd et al. 2006) were applied:

- Search phase calls are used preferentially when analysing the data because they contain more diagnostic features, rather than cruise phase calls or feeding buzzes (McKenzie et al. 2002).
- Recorded calls containing less than three pulses are not analysed as they are often too short to confidently determine the identity of the species making the call (Law et al. 1999). These short sequences were either removed manually or were labelled as unidentifiable.
- For those calls that are able to be used to identify the species making the call, two categories of confidence are used (Mills et al. 1996):

  - Definitely present – the quality and structure of the call profile is such that the identity of the bat species making the calls is not in doubt.
  - Potentially present – the quality and structure of the call profile is such that there is some / low probability of confusion with species that produce similar calls profiles.
- Calls made by bats that cannot be used for identification purposes such as social calls, short and low-quality calls, cruise and approach phase calls were removed from the data.
- Sequences not attributed to microbat echolocation calls (e.g. insect buzzes, wind, train and vehicle movement) were dismissed from the analysis.
- *Nyctophilus* spp. (Long-eared bats) are difficult to identify or separate confidently to species level based upon their recorded calls. Therefore, we have made no attempt to identify any *Nyctophilus* spp. calls recorded during this survey to species level (Pennay et al. 2004). There are two non-threatened species, *Nyctophilus* species that potentially could occur within the subject area. This includes *N. geoffroyi* (Lesser Long-eared Bat) and *N. gouldi* (Gould's Long-eared Bat). Both of these species are relatively common and widely distributed across NSW.
- The Free-tailed Bats (previously referred to as the genus *Mormopterus or Tadarida*) have recently undergone taxonomic revision (Reardon et al. 2014) and now comprise four separate genus; *Austronomus*, *Micronomus, Ozimops* and *Setirostris* (Table 4). This report uses nomenclature for Free-tailed Bat species as referred to in Jackson and Groves (2015). The correlation between nomenclature used in this report and that used in NSW State legislation is presented in Table 2 below.
- Jackson & Groves (2015) list the Eastern Bent-winged Bat (*Miniopterus schreibersii oceanensis*) under the new name of *M. orianae* (Large Bent-winged Bat). However, we follow the NSW Department of Planning, Industry and Environment (DPIE) nomenclature as it applies to the eastern form of the species which occurs in NSW as a distinct sub-species; *M. o. oceanensis* (Large Bent-winged Bat) (see https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10534) (NSW Department of Planning, Industry and Environment (formerly the Office Environment and Heritage).

Table 4: Correlations between current and previous nomenclature for the Free-tailed bats of NSW

Jackson and Groves 2015	Previously known as	Common Name	BC Act
Austronomus australis	*Tadarida australis*	White-striped Free-tailed Bat	
Micronomus norfolkensis	*Mormopterus norfolkensis*	Eastern Coastal Free-tailed Bat	Vulnerable
Ozimops petersi	*Mormopterus* species 3 (small penis)	Inland Free-tailed Bat	
Ozimops planiceps	*Mormopterus* species 4 (long penis eastern form)	Southern Free-tailed Bat	
Ozimops ridei	*Mormopterus* species 2	Ride's Free-tailed Bat	
Setirostris eleryi	*Mormopterus* species 6	Bristle-faced Free-tailed Bat	Endangered

RESULTS

There were 426 call sequences recorded during this survey. Of these, 299 (70.19%) were deemed useful, because the call profile was of sufficient quality and/or length (number of pulses) to enable positive

identification of bat species. The remaining 127 (29.81%) call sequences were either too short (less than three pulses) or of low quality, thus preventing positive identification of a bat species.

There were at least nine (9) and up to fifteen (15) species recorded during this survey (Table 5 and Table 6). During this survey calls attributed to *Chalinolobus gouldii* (Gould's Wattled Bat) and *Ozimops ridei* (Ride's Free-tailed Bat) either as single species or grouped together as Gould's Wattled Bat / Ride's Free-tailed Bat combination because the calls could not be separated, were the most commonly recorded calls during this survey. Calls attributed to these two species (either alone or in combination) accounted for 229 (79.59%) of the 299 identifiable calls recorded during this survey. Definite and potential calls from these two species were recorded at all four locations surveyed.

Threatened species

Up to six (6) species that are listed as Vulnerable under the NSW *Biodiversity Conservation Act 2016* (BC Act) were recorded during this survey (Table 5 and Table 6, Figure 7 - Figure 16). Based on the call profiles, three (3) Vulnerable species listed under the BC Act were deemed to have been definitely present within the Subject site:

- *Micronomus norfolkensis* (Eastern Coastal Free-tailed Bat)
- *Miniopterus orianae oceanensis* (Large Bent-winged Bat)
- *Myotis macropus* (Southern Myotis)

Three (3) other species listed as Vulnerable could potentially be present within the Subject site including:

- *Falsistrellus tasmaniensis* (Eastern False Pipistrelle)
- *Scoteanax rueppellii* (Greater Broad-nosed Bat)
- *Vespadelus troughtoni* (Eastern Cave Bat).

The defining features of the recorded call profiles of Greater Broad-nosed Bat, Eastern False Pipistrelle and Eastern Cave Bat could either:

- have overlapped with one or more of the common and non-threatened species also recorded during this survey or known to occur in this region, or
- be of poor quality and therefore not possible to assign to a single microbat species.

INTERPRETATION OF SURVEY RESULTS

The Eastern Cave Bat, Large Bent-winged Bat (breeding habitat only) and Southern Myotis are categorised as species credits requiring targeted survey under the BC Act. If these species are recorded on site, impact assessment, credit calculations and further survey may be required. The Eastern Coastal Free-tailed Bat, Eastern False Pipistrelle and Greater Broad-nosed Bat are listed as ecosystem credit species that do not require targeted survey. A brief description of the six (6) threatened microbat species that were recorded or potentially recorded within the Subject site, and their habitat requirements is provided below.

Ecosystem credit - Hollow dependant microbat species

Three (3) of the threatened microbat species recorded or potentially recorded during this survey are hollow dependant species. This includes the Eastern Coastal Free-tailed Bat, Eastern False Pipistrelle

and the Greater Broad-nosed Bat. Six potential calls recorded on WOL-04 were attributed to the Eastern False Pipistrelle and Greater Broad-nosed Bat. One definite and one potential Eastern Coastal Free-tailed Bat call were recorded during this survey.

Species credit - Subterranean roosting species

Two (2) threatened microbat species that typically roost in subterranean or cave like environments, including caves, mines, tunnels, bridges, culverts, and buildings, were recorded, or potentially recorded during this survey (Churchill 2008). This includes the Eastern Cave Bat and Large Bent-winged Bat (Churchill 2008).

Potential Eastern Cave Bat calls were recorded during this survey. The Eastern Cave Bat will roost in sandstone caves, overhangs, boulder piles, mines and occasionally in buildings which would generally be within foraging range of sandstone escarpments (Churchill 2008). ELA ecologists have found this species roosting in buildings near suitable natural habitat features that would normally provide foraging and roosting habitat for this species at sites in the Hunter Valley and Sydney Basin in NSW and in Qld during surveys conducted in 2017 and more recently in 2020. The calls of this species overlap with those of other more common Vespadelus species that are also known to occur in the region. ELA understands that the building structures present in the subject site which could be used as roosting habitat by Eastern Cave Bats are not likely to be impacted during the proposed tree removal and the proposed works do not represent a high risk to this species. In order to determine whether this species is present on site harp trapping and positive identification of bats in the hand would be required with the optimal survey period between the months of November to end of January.

Just two calls, (one definite call, see Figure 12 and one potential call) were attributed to the Large Bent-winged Bat during this survey. The Large Bent-winged Bat is a subterranean roosting species that will roost in cement culverts, stormwater drains, bridges, disused mine shafts and caves (Churchill 2008). Breeding occurs over the summer months and bats disperse to other non-breeding winter and hibernation roosts between March and August / September each year (Churchill, 2008). This species only breeds (e.g. gives birth, lactates and provides maternal care) in a small number of caves in the Great Dividing Rang in NSW (Churchill 2008). Caves provide the perfect microclimatic conditions for rearing of young.

Between September / October and February / March each year a large proportion of the Large Bent-winged Bat population that inhabits the Sydney Basin throughout the colder winter months migrates to maternal caves in the Great Dividing Range. There are typically much lower densities of Large Bent-winged Bats recorded in the Sydney Basin between October and February. The low level of Large Bent-winged Bat activity that was recorded during this survey supports this fact. In order to evaluate whether the low activity levels of Large Bent-winged Bats is a true representation of the habitat value of the Subject site and not just an artefact of the lower densities present over summer, the surveys could be repeated during suitable microbat foraging conditions in winter. If similar results are obtained, then it can be inferred that the Subject site does not provide optimal foraging habitat for this species. Breeding habitat for this species does not occur within the Subject site. ELA understands that the building structures present in the subject site which could be used as winter roosts by Large Bent-winged Bats are not likely to be impacted during the proposed tree removal.

Species credit - Southern Myotis

There were five (5) definite and six (6) potential Southern Myotis calls (in combination with the two *Nyctophilus* species) recorded at two locations (WOL-04 and WOL-05) respectively during this survey (Table 5). Southern Myotis are known to use tree hollows as roosting and breeding sites but are more commonly known to roost in subterranean or cave like environments such as beneath bridges, in culverts, tunnels, mines, caves and buildings (Churchill 2008). Southern Myotis are generally closely associated with rivers, creeks, estuaries and permanent waterbodies owing to their unique foraging strategy of trawling for insects, small crustaceans and fish on, and just above the surface of the water (Churchill 2008). Southern Myotis are known from this region of the Sydney basin and mainly roost near to, and are generally more active over water. The Subject site is approximately 400 m from the Nepean River, separated from the river by residential areas and does not contain any waterbodies over which Southern Myotis would forage. It is unlikely that Southern Myotis will roost in trees within the Subject site because it is too far from permanent water and likely that better quality roosting habitat is available in the riparian zone along the Nepean River.

Loss of potential microbat roost habitat

It is our understanding that no Hollow Bearing Trees (HBTs) or underground structures such as culverts and bridges or any buildings are to are to be removed or impacted upon during the proposed development.

Table 5: Microbat species diversity recorded ultrasonically within the Subject site

Scientific Name	Common Name	WOL-01
Austronomus australis	White-Striped Free-tailed Bat	D
Chalinolobus gouldii	Gould's Wattled Bat	D
Chalinolobus morio	Chocolate Wattled Bat	D
*Falsistrellus tasmaniensis**	Eastern False Pipistrelle	P
*Micronomus norfolkensis**	Eastern Coastal Free-tailed Bat	D
*Miniopterus orianae oceanensis**	Large Bent-winged Bat	D
*Myotis macropus**	Southern Myotis	D
Nyctophilus geoffroyi	Lesser Long-eared Bat	P
Nyctophilus gouldi	Gould's Long-eared Bat	P
Ozimops ridei	Ride's Free-tailed Bat	D
*Scoteanax rueppellii**	Greater Broad-nosed Bat	P
Scotorepens orion	Eastern Broad-nosed Bat	P
Vespadelus pumilus	Eastern Forest Bat	P
*Vespadelus troughtoni**	Eastern Cave Bat	P
Vespadelus vulturnus	Little Forest Bat	D

D = Definitely recorded, P = Potentially recorded. *listed as threatened under the BC Act

Table 6: Microbat species diversity recorded ultrasonically at each survey site at the Subject site between the 25 and 29 of January 2021.

Scientific Name	Common Name	WOL-01	WOL-04	WOL-05	WOL-07
Austronomus australis	White-Striped Free-tailed Bat	-	-	D	-
Chalinolobus gouldii	Gould's Wattled Bat	D	D	D	D
Chalinolobus morio	Chocolate Wattled Bat	-	D	D	-
*Falsistrellus tasmaniensis**	Eastern False Pipistrelle		P	-	-
*Micronomus norfolkensis**	Eastern Coastal Free-tailed Bat	P	-	D	-
*Miniopterus orianae oceanensis**	Large Bent-winged Bat	-	D	-	-
*Myotis macropus**	Southern Myotis	P	D	P	-
Nyctophilus geoffroyi	Lesser Long-eared Bat	P	-	P	-
Nyctophilus gouldi	Gould's Long-eared Bat	P	-	P	-
Ozimops ridei	Ride's Free-tailed Bat	D	D	D	P
*Scoteanax rueppellii**	Greater Broad-nosed Bat		P	-	-
Scotorepens orion	Eastern Broad-nosed Bat		P	-	-
Vespadelus pumilus	Eastern Forest Bat		P	-	-
*Vespadelus troughtoni**	Eastern Cave Bat		P	-	-
Vespadelus vulturnus	Little Forest Bat		D	-	-

D = Definitely recorded, P = Potentially recorded. *listed as threatened under the BC Act

SURVEY LIMITATIONS

Calls were only positively identified when the defining characteristics were present and there was no chance of confusion between species with overlapping and/or similar calls. In this survey, there were some call sequences that could not be positively identified to species level. Further, some species recorded in this survey can have call profiles that overlap with other species.

When overlap occurs, species with similar call profiles are assigned to multi species groups of two or three potential species depending on the characteristics displayed in the recorded call sequences. Calls with intermediate characteristics were assigned mixed species labels.

The species recorded in this survey with overlapping call profiles are described below.

Gould's Wattled Bat, Ride's Free-tailed Bat and the threatened Eastern Coastal Free-tailed Bat have calls that overlap in the range 28.5 kHz to 32 kHz. Calls were identified as Ride's Free-tailed Bat if the call shape was flat (initial slope S1 of less than 100 octaves per second) and the frequency was between 28 – 32 kHz. Gould's Wattled Bat was distinguished by a frequency of 27.5 – 32.5 kHz and alternation in call frequency between pulses. Eastern Coastal Free-tailed Bat was identified by flat pulses (initial slope S1 of less than 100 OPS), alternation in call frequency between pulses and a frequency range of 31 kHz to 36 kHz. Calls with intermediate characteristics were assigned mixed species labels.

The calls of Eastern False Pipistrelle, Greater Broad-nosed Bat, and Eastern Broad-nosed Bat can be difficult to separate as their call frequencies and some other call characteristics overlap.

- Greater Broad-nosed Bats can be distinguished by a frequency of 32 – 36 kHz, lack of a tail or short down-sweeping tail, frequency of the knee greater than 37 kHz, and drop of more than 3 kHz from the knee to the characteristic section.
- Eastern False Pipistrelle bat calls have a characteristic frequency between 35 and 39 kHz, display curved, often steep pulses without up-sweeping tails and sometimes with down-sweeping tails. The pre-characteristic section is often long (greater than 3 kHz). This species can only be separated from Eastern Broad-nosed Bat when the characteristic frequency is above 37 kHz.
- Eastern Broad-nosed Bat calls fall between 34 and 37 kHz but can only be separated from Eastern False Pipistrelle when calls are between 34 and 35 kHz, and the frequency of the knee is above 38 kHz.

There were several calls recorded that fell in the range of overlap between these species with characteristics intermediate between all species. In most cases calls could not be assigned to any of the three possible species and were labelled as Eastern False Pipistrelle / Greater Broad-nosed Bat / Eastern Broad-nosed Bat or combinations of two of the three where call frequency was too high or too low for Greater Broad-nosed Bat or Eastern False Pipistrelle.

The calls of *Chalinolobus morio* (Chocolate Wattled Bat) (46.5 – 53 kHz), *Vespadelus pumilus* (Eastern Forest Bat) (50 – 58 kHz), the threatened Eastern Cave Bat (49 – 52 kHz) and *Vespadelus vulturnus* (Little Forest Bat) (48.5 – 53 kHz) overlap in the range 49 kHz to 52 kHz. Chocolate Wattled Bats display a curved call with a down-sweeping tail whereas Eastern Forest Bat, Eastern Cave Bat and Little Forest Bats display curved calls with up-sweeping tails. Call profiles above 54 kHz with upward facing tails can be attributed to the Eastern Forest Bat. Call profiles below 49 kHz with upward facing tails can be attributed to the Little Forest Bat. Eastern Cave Bats cannot be distinguished from Little Forest Bats

where call frequencies overlap. When there are no tails the calls are assigned mixed species labels of Chocolate Wattled Bat / Eastern Forest Bat, Eastern Cave Bat and Little Forest Bat complex.

The calls of Southern Myotis are very similar to all *Nyctophilus* (Long-eared Bat) species and it is often difficult to separate these species on call characteristics alone. Calls can be identified as *Nyctophilus spp*. when the time between calls (TBC) is higher than 95ms and the initial slope S1 is lower than 300 octaves per second (OPS). Calls can be identified as Myotis when the time between calls (TBC) is lower than 75ms and the initial slope S1 is greater than 400 (OPS). Where the TBC is between 75 and 95ms and the OPS is between 300 and 400 calls are assigned a mixed species label of Myotis / Long-eared Bats (Pennay, Law and Reinhold 2004).

Furthermore, calls produced by different bat species differ in fundamental ways related to the foraging mode / activity of each species. Calls of different species and the different types of calls produced by each species (cruise, search, social, approach, attack) are not equally recorded by ultrasonic detectors. Weather and climatic conditions affect the quality and quantity of recorded data as well as the availability of insect prey and therefore the suitability of each site at a given time as foraging habitat. The survey was conducted in January during a period of warm to hot temperatures (minimum of 17.4 degrees to maximum of 40.7 degrees) and 0.8 mm of rainfall.

EXAMPLE CALL PROFILES

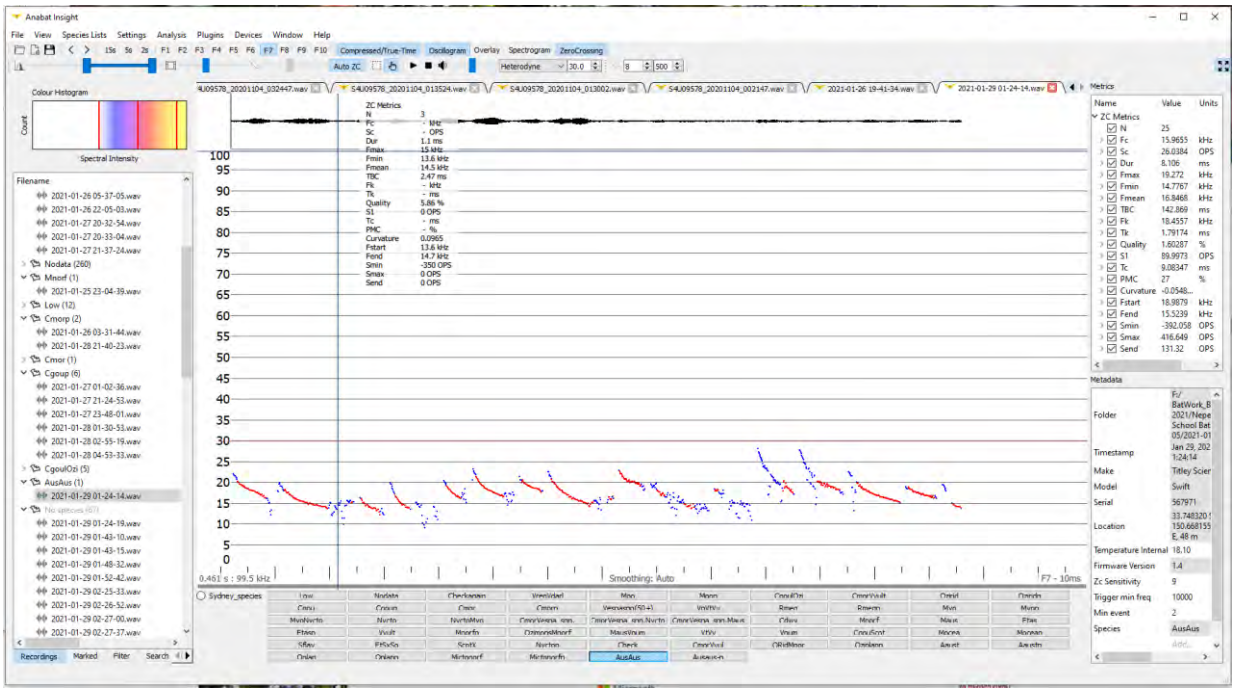

Figure 7. Call profile for *Austronomus australis* (White-striped Free-tailed Bat) recorded on WOL-05 at 0124 (1.24 a.m.) on 29 January 2021.

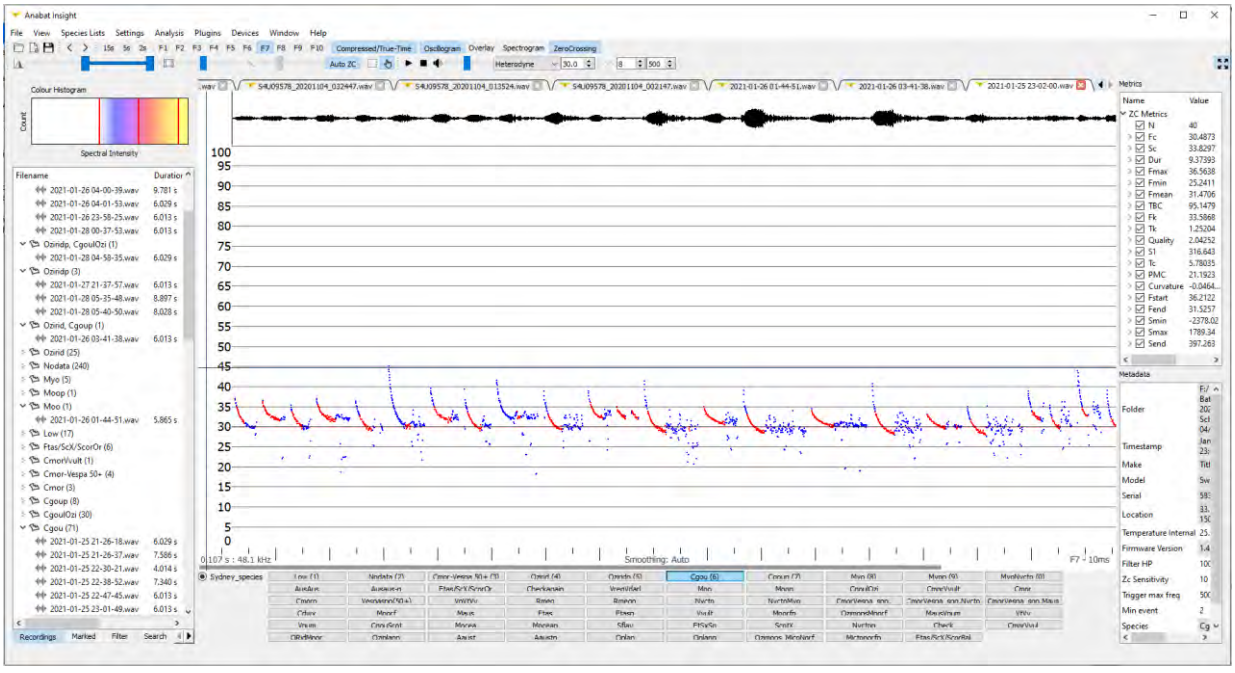

Figure 8. Call profile for *Chalinolobus gouldii* (Gould's Wattled Bat) recorded on WOL-04 at 2302 (11.02 p.m.) on 25 January 2021.

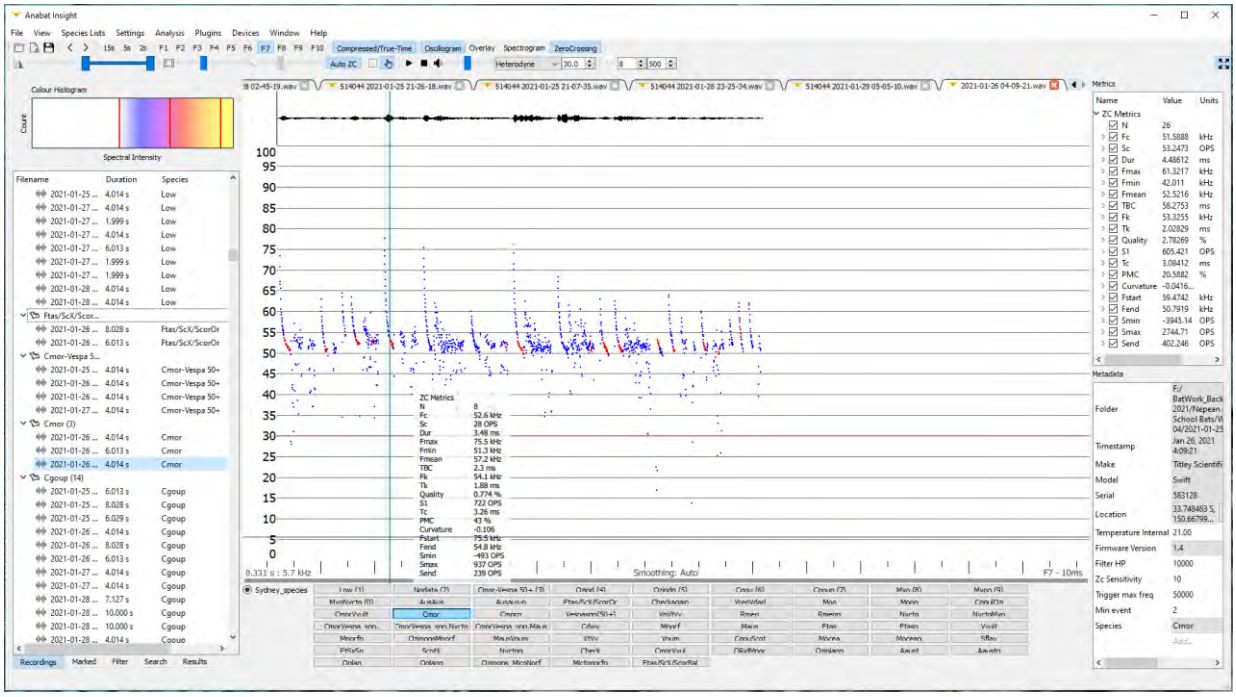

Figure 9. Call profile for *Chalinolobus morio* (Chocolate Wattled Bat) recorded on WOL-04 at 0409 (4.09 a.m.) on 26 January 2021.

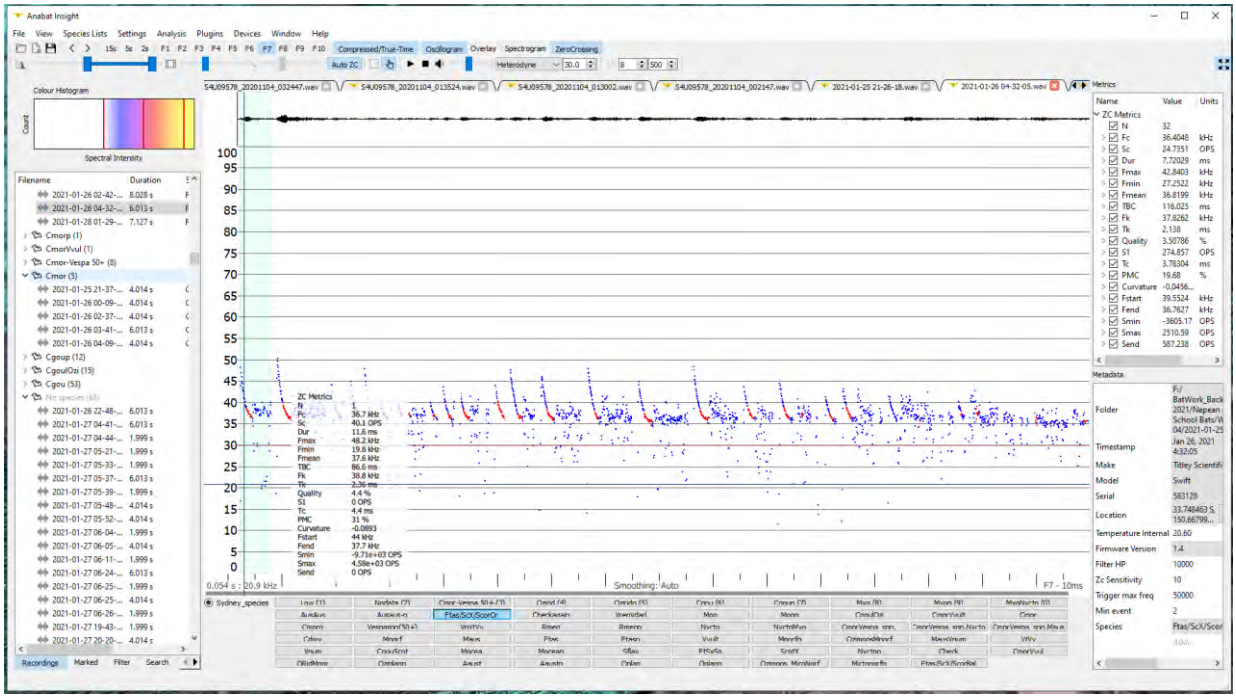

Figure 10. Potential call for profile for *Falsistrellus tasmaniensis* (Eastern False Pipistrelle), *Scoteanax rueppellii* (Greater Broad-nosed Bat), *Scotorepens orion* (Eastern Broad-nosed Bat) recorded on WOL-04 at 0432 (4:32 a.m.) on 26 January 2021.

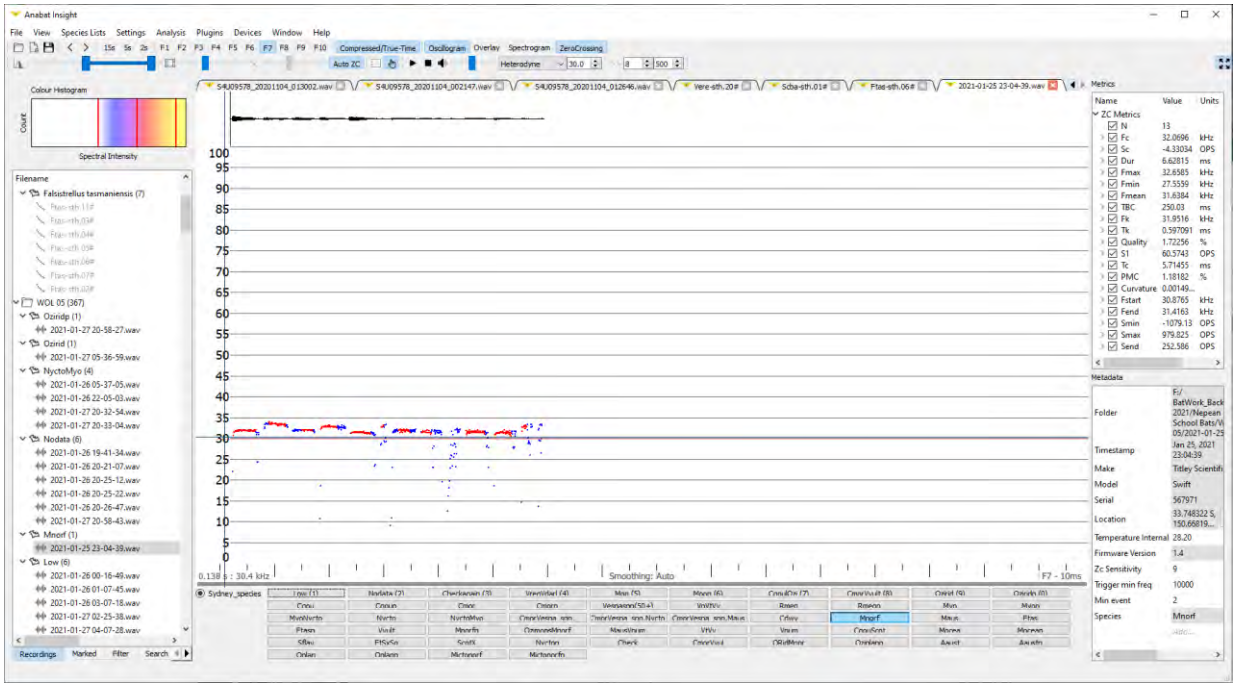

Figure 11. Call profile for *Micronomus norfolkensis* (Eastern Coastal Fee-tailed Bat) recorded on WOL07 at 2304 (11:04 p.m.) on 25 January 2021.

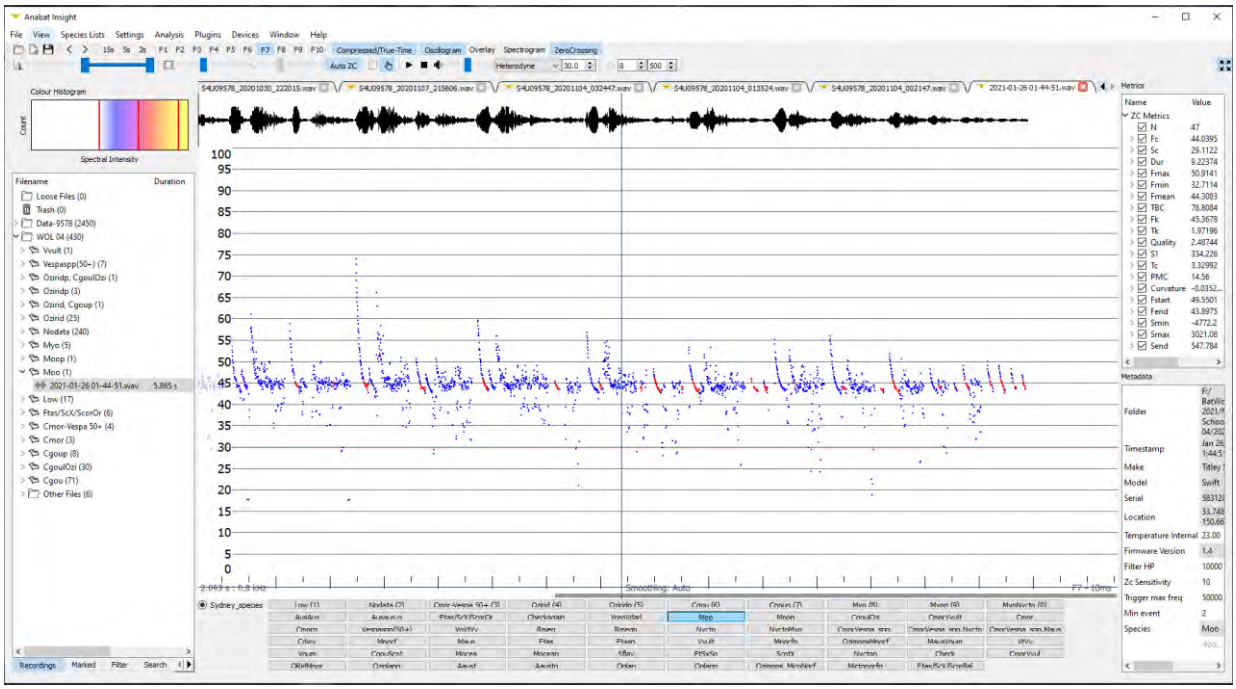

Figure 12. Call profile for *Miniopterus orianae oceanensis* (Large Bent-winged Bat) recorded on WOL-04 at 0144 (1:44 a.m.) on 26 January 2021.

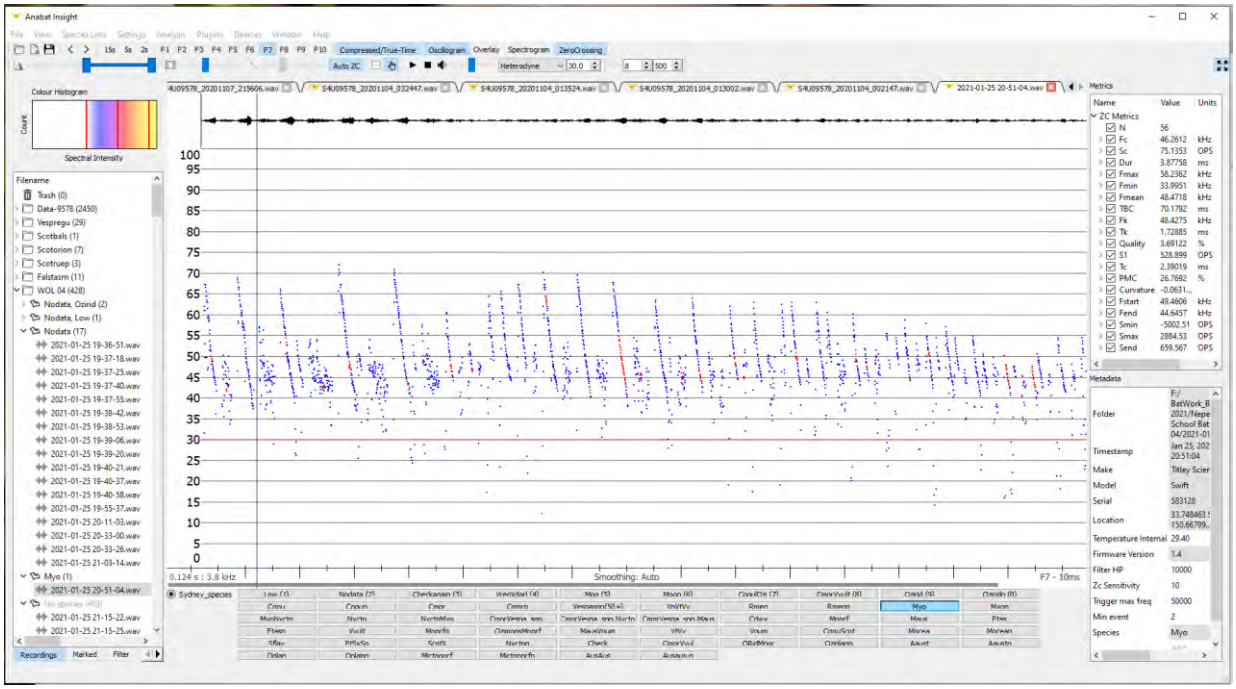

Figure 13. Potential call profile for *Myotis macropus* (Southern Myotis) recorded on WOL-04 at 2051 (8:51 p.m.) on 25 January 2021.

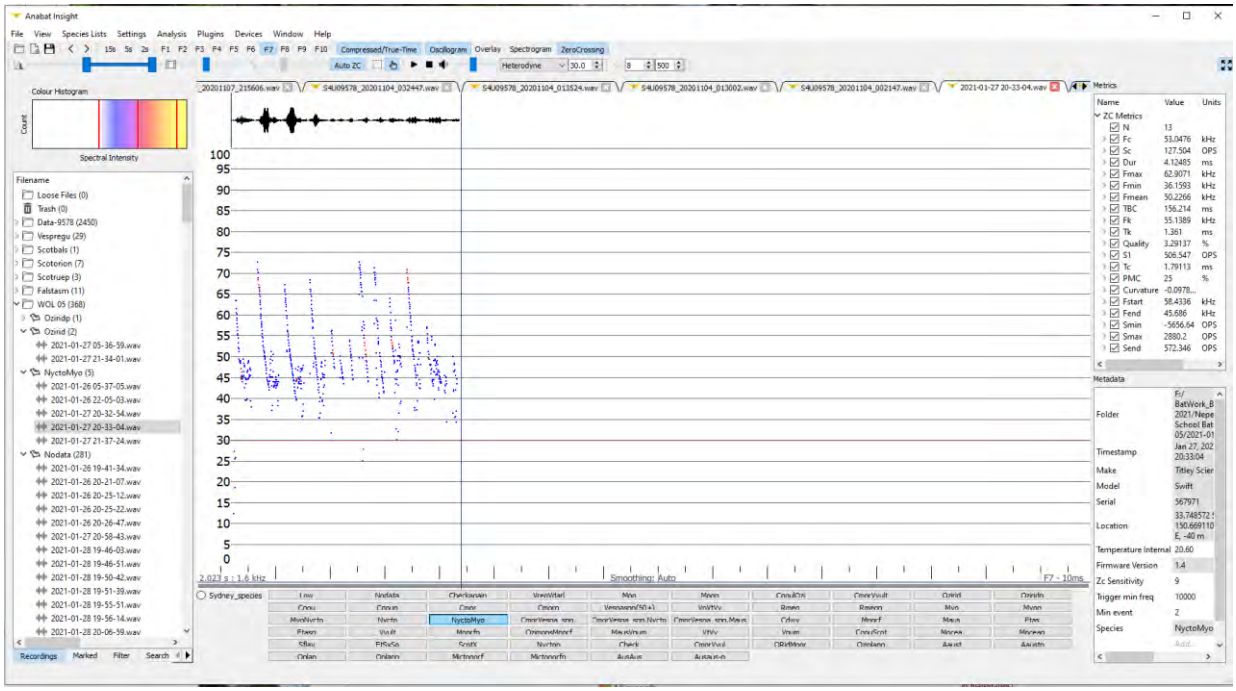

Figure 14. Potential call profile for *Myotis macropus* (Southern Myotis) / *Nyctophilus gouldi* (Gould's Long-eared Bat) / *Nyctophilus geoffroyi* (Lesser Long-eared Bat) recorded on WOL05 at 2033 (8:33 p.m.) on 27 January 2021.

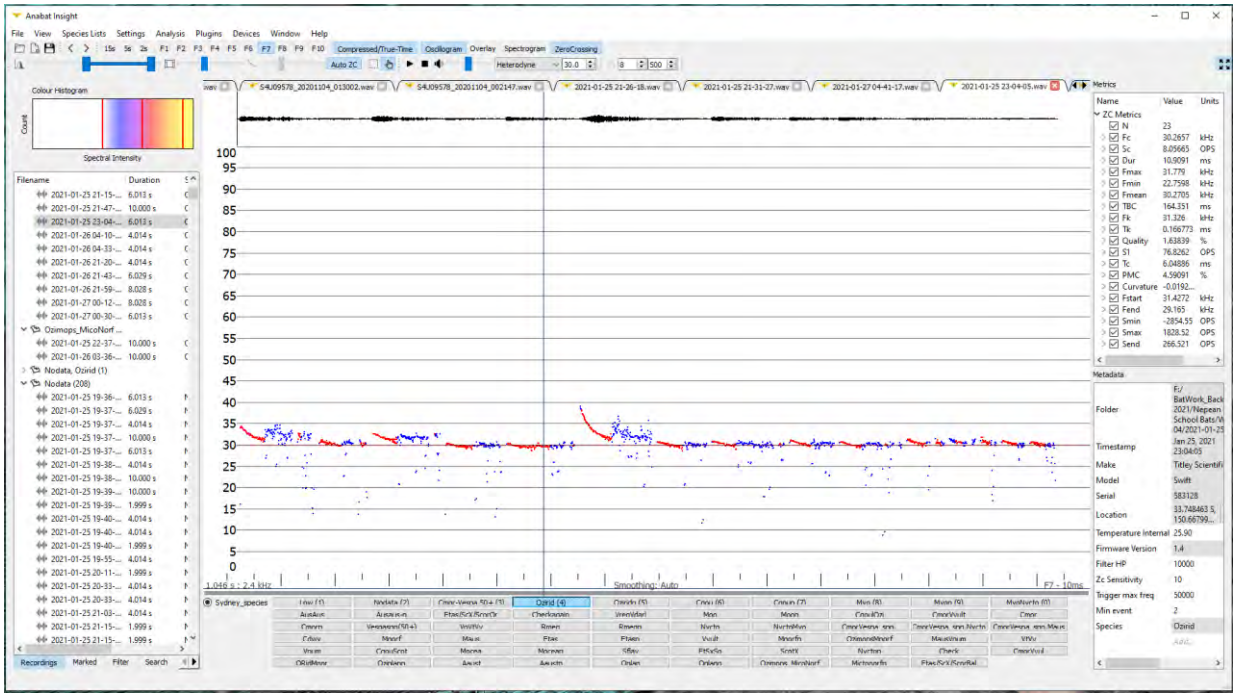

Figure 15. Call profile *Ozimops ridei* (Ride's Free-tailed Bat) recorded on WOL-04 at 2304 (11:04 p.m.) on 25 January 2021.

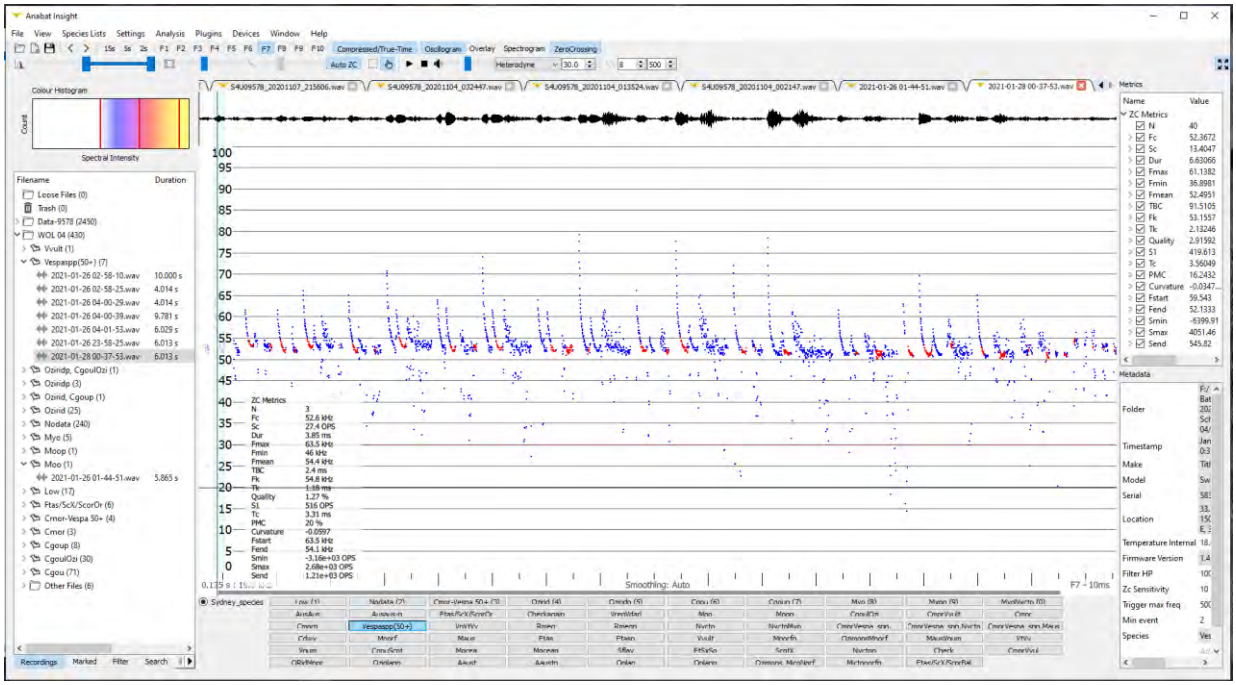

Figure 16. Potential call profile for *Vespadelus pumilus* (Eastern Forest Bat) / *Vespadelus troughtoni* (Eastern Cave Bat) / *Vespadelus vulturnus* (Little Forest Bat) recorded on WOL-04 at 0037 (12:37 a.m.) on 28 January 2021.

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Appendix E Species Planting List

A list of local provenance species has been provided below based on the likelihood that previous vegetation within the area would have consisted of Forest Red Gum – Rough Barked Apple Grassy woodland on alluvial flats of the Cumberland Plan, Sydney Basin bioregion. The following species would be suitable for landscaping works:

Tree Species (>6m)

- *Eucalyptus amplifolia* (Cabbage Gum)
- *Eucalyptus crebra* – (Narrow-leaved Ironbark)
- *Eucalyptus eugenioides* –(Thin-leaved Stringybark)
- *Eucalyptus moluccana* – (Grey Box)
- *Eucalyptus tereticornis* – (Forest Red Gum)
- *Acacia decurrens* – (Sydney Green Wattle)

Small Trees / Shrub Species (1.5 – 6m)

- *Acacia falcata* (Sickle Wattle)
- *Acacia implexa* (Hickory Wattle)
- *Acacia parramattensis* (Parramatta Wattle)
- *Bursaria spinosa* (Blackthorn)
- *Daviesia ulicifolia* (Gorse Bitter Pea)
- *Dillwynia sieberi*
- *Dodonaea viscosa subsp. Cuneate* – (Wedge-leaf Hop-bush)
- *Exocarpos cupressiformis* – (Native Cherry)
- *Indigofera australis* – (Australian Indigo)

Groundcover Species

- *Asperula conferta*
- *Brunoniella australis* – (Blue Trumpet)
- *Centella asiatica* – (Indian Pennywort)
- *Cheilanthes sieberi subsp. sieberi* – (Poison Rock Fern)
- *Clematis glycinoides* – (Old Man's Beard)
- *Commelina cyanea* – (Creeping Christian)
- *Desmodium varians* – (Slender Tick-trefoil)
- *Dianella longifolia* – (Blueberry Lily)
- *Dichondra repens* – (Kidney Weed)
- *Geranium solanderi* – (Native Geranium)
- *Glycine clandestine* – (Twining Glycine)

- *Glycine microphylla* – (Small-leaf Glycine)
- *Glycine tabacina*
- *Hardenbergia violacea* – (Purple Coral Pea)
- *Plectranthus parviflorus* - (Cockspur Flower(
- *Pultenaea microphylla*
- *Solanum prinophyllum* – (Forest Nightshade)

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