

# APPENDIX K BIODIVERSITY DEVELOPMENT ASSESSMENT REPORT WAIVER REQUEST

Jacobs





Powerhouse Parramatta Project  
Biodiversity Development Assessment Report Waiver Request

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Infrastructure NSW  
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## Powerhouse Parramatta Project

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## Executive Summary

This summary provides the detail required in the Biodiversity Development Assessment Report (BDAR) waiver fact sheet. Tables 1 and 2 as provided in the Biodiversity Development Assessment Report (BDAR) waiver fact sheet are included below.

### Fact sheet BDAR waiver compliance tables

Table 1: BDAR waiver request information requirements	
Admin	<ul style="list-style-type: none"> <li>Proponent name and contact details – Infrastructure NSW, contact: Tom Kennedy (Planning Manager)</li> <li>Project ID – SSD-10416</li> <li>Name and ecological qualifications of person completing TABLE 2 – Chris Thomson (BAM Accreditation No. BAAS18058), Graduate Certificate of Natural Resources, Bachelor of Applied Science. A full list of contributor's qualifications is provided in Section 2.1.</li> </ul>
Site details	<ul style="list-style-type: none"> <li>Street address, Lot and DP, local government area – The site is legally described as Lot 1 in DP 128474, Lot 1 in DP 1247122, and Lot 2 in DP 1247122. The site is located within the City of Parramatta Local Government Area.</li> <li>Description of existing development site, i.e., the area of land that is subject to the proposed development application – The site is located at the northern edge of the Parramatta CBD on the southern bank of the Parramatta River. Occupying an area of approximately 2.5 hectares, the site has extensive frontages to Phillip Street, Wilde Avenue and the Parramatta River. A small portion of the site extends along the foreshore of the Parramatta River to the west, close to the Lennox Street Bridge on Church Street. The immediate context of the site comprises a range of land uses including office premises, retail premises, hotel, serviced apartments and residential apartments. To the north is the Parramatta River and open space corridor, beyond which are predominately residential uses. The Riverside Theatre is located to the north-west across the Parramatta River. The site is currently occupied by a number of buildings and structures, including <ul style="list-style-type: none"> <li>Riverbank Car Park – a four-level public car park;</li> <li>Willow Grove – a two-storey villa of Victorian Italianate style constructed in the 1870s, which is a locally-listed heritage item (I737)</li> <li>St George's Terrace – a two-storey terrace of seven houses fronting Phillip Street constructed in the 1880s, which is a locally listed heritage items (I1738)</li> <li>36 Phillip Street – a two-storey building comprising retail and business premises</li> <li>40 Phillip Street – a two-storey building comprising retail and business premises</li> <li>42 Phillips Street – a two-storey building set back from the street comprising retail premises.</li> </ul> </li> <li>Location map showing the development site in the context of surrounding areas and landscape features. Satellite image of site in context of adjoining sites – see Figure 1.1.</li> <li>Site Map (to scale, ideally as a spatial shapefile) – see Figure 1.2. Development footprint shown in Figure 1.3.</li> </ul>
Proposed development	<ul style="list-style-type: none"> <li>Project Description providing enough information to enable an understanding of the nature and scale of the proposed development and any associated activities (including construction etc) – In February 2015, the then NSW Premier and Deputy Premier released the Create in NSW: NSW Arts and Cultural Policy Framework and announced the Government's decision to investigate the creation of the Powerhouse Parramatta. Following that announcement, Create Infrastructure NSW initiated and led the development of the planning framework for the Powerhouse Parramatta. This included site selection assessment which concluded that the Riverbank site in Parramatta was the preferred site for the New Museum. The Government confirmed this decision and announced its choice of the Riverbank site in April 2016. The Riverbank site was acquired by the NSW Government to facilitate the delivery of the project in early-2019.  This application will deliver a new cultural institution for Parramatta in the heart of Sydney's Central City. The SSD DA seeks consent for the delivery of the Powerhouse Parramatta as a single stage, comprising: <ul style="list-style-type: none"> <li>site preparation works, including the termination or relocation of site services and infrastructure, tree removal and the erection of site protection hoardings and fencing;</li> <li>demolition of existing buildings including the existing Riverbank Car Park, 'Willow Grove', 'St George's Terrace' and all other existing structures located on the site;</li> <li>construction of the Powerhouse Parramatta, including: <ul style="list-style-type: none"> <li>front and back-of-house spaces;</li> <li>seven major public presentation spaces;</li> </ul> </li> </ul> </li> </ul>



Table 1: BDAR waiver request information requirements

	<ul style="list-style-type: none"> <li>- studio, co-working and collaboration spaces comprising the 'Powerlab', supported by 40 residences (serviced apartments) for artists, students, researchers and scientists, and 60 dormitory beds for school students;</li> <li>- education and community spaces for staff, researchers and the Powerlab residents, the community, and education and commercial hirers;</li> <li>- commercial kitchen comprising the 'Powerlab Kitchen' used for research and product development, and as a destination, education and event space;</li> <li>- film, photography, and postproduction studio that will connect communities with industry and content that will interpret the Powerhouse Collection;</li> <li>- public facing research library and archive for community, industry, students and researchers to access materials; and</li> <li>- a mix of retail spaces including food and drink tenancies with outdoor dining.</li> </ul> <ul style="list-style-type: none"> <li>▪ operation and use of the Powerhouse Parramatta including for events;</li> <li>▪ maintenance of the existing vehicular access easement via Dirrabarri Lane, the removal of Oyster Lane and termination of George Khattar Lane, and the provision of a new vehicular access point to Wilde Avenue for loading;</li> <li>▪ public domain within the site including new public open space areas, landscaping and tree planting across the site; and</li> <li>▪ building identification signage.</li> </ul> <ul style="list-style-type: none"> <li>▪ Proposed Site Plan – see Figures 1.1, 1.2 and 1.3 for the development footprint.</li> </ul>
Impacts on biodiversity values	Refer to the completed TABLE 2 below on Biodiversity Values.

TABLE 2: Impacts of the proposed development on biodiversity values

Biodiversity value	Meaning	Relevant (✓ or NA)	Explain and document potential impacts including additional impacts prescribed under the BC Regulation Attach additional supporting documentation where appropriate
Vegetation abundance - 1.4(b) BC Regulation	Occurrence and abundance of vegetation at a particular site	NA	There is some native vegetation (according to the definition of native vegetation provided in the LLS Act) that has been planted in the development site and two trees that are potentially remnant (see Figure 4.1). However, the majority of this native vegetation is not naturally occurring and cannot be assigned to a PCT as identified in the DPIE BioNet Vegetation Classification.  Vegetation abundance (as it would apply to a PCT) will not be impacted by the project.  See Section 4.1.
Vegetation integrity 1.5(2)(a) BC Act	Degree to which the composition, structure and function of vegetation at a particular site and the surrounding landscape has been altered from a near natural state	NA	As the native vegetation cannot be assigned to a PCT, it is not possible to assess vegetation integrity by undertaking an assessment of the composition, structure or function of the vegetation according to the field methods outlined in Section 5.3 of the BAM. A vegetation integrity score cannot be determined in accordance with Section 5.4 of the BAM as there are no PCTs that will be impacted.  See Section 4.2.
Habitat suitability 1.5(2)(b) BC Act	Degree to which the habitat needs of threatened species are present at a particular site	✓	The proposed development site contains planted trees, and two possibly remnant trees, that may provide some limited foraging resources for threatened nectarivorous species such as Grey-headed Flying Fox, Swift Parrot and Little Lorikeet. Threatened microbat species may also forage around this vegetation. The buildings to be

TABLE 2: Impacts of the proposed development on biodiversity values

Biodiversity value	Meaning	Relevant (✓ or NA)	Explain and document potential impacts including additional impacts prescribed under the BC Regulation Attach additional supporting documentation where appropriate
			<p>demolished were inspected and do not provide suitable roosting habitat for microbats.</p> <p>These urban trees form a relatively small portion of the available amount of foraging resources in the locality (particularly considering the native vegetation around the Parramatta River and tributaries). Impacts to the local occurrence of the species or their habitats are unlikely to significantly impact these species.</p> <p>As outlined in the Preliminary Arboricultural Report for the Museum of Applied Arts &amp; Sciences (Tree IQ, 2019) 21 trees have been allocated a Retention Value of Consider for Removal and nine trees have been allocated a Retention Value of Priority for Removal. The two potentially remnant trees have been allocated for retention. The removal of these planted trees from the proposed development site is unlikely to significantly impact any of these threatened species.</p> <p>See Section 4.3 and Appendix B and C.</p> <p>No threatened microbats nor evidence of any past daytime roosting by bats was observed within the suite of existing buildings to be demolished as part of Powerhouse Parramatta project. Cave-dwelling bats rely on the presence of specific microclimatic conditions within their roost sites which facilitate the maintenance of a range of metabolic or physiological conditions necessary to their survival and reproduction. While a number of tight spaces were identified including cracks and crevices, holes and joins these were mostly shallow and did not offer suitable microclimate conditions suitable for permanent roosting or maternity roosts. The ceilings and roof cavities were all in good condition with no damage or openings where threatened microbats could enter.</p>
Threatened species abundance 1.4(a) BC Regulation	Occurrence and abundance of threatened species or threatened ecological communities, or their habitat, at a particular site	✓	<p>No high-quality threatened species habitats have been identified on the proposed development site. The species listed above have a moderate chance of foraging in or around the trees on occasion. The proposed development will reduce the potential for impact by minimising the removal of these trees as much as possible and many trees, including the two possibly remnant trees, are identified for retention. Considering the extent of higher quality foraging resources in the locality, the removal of up to 30 planted trees because of the proposed development is unlikely to significantly impact these species. Also, considering there is currently an operating car park and buildings in this location with high levels of human activity, the proposed development is unlikely to increase any impacts on native species in the immediate area. An inspection of the building to be demolished was conducted to search for threatened microbats and these were found not to be occupied.</p> <p>See Section 4.4 and Appendix C and D and Addendum</p>
Habitat connectivity 1.4(c) BC Regulation	Degree to which a particular site connects different areas of habitat of threatened species to facilitate the movement of those species across their range	✓	<p>The development site is located within a highly disturbed landscape where the majority of habitats have been cleared. The habitats that do remain are fragmented and highly isolated. However, planted urban vegetation does provide a role in facilitating the movement of threatened species across the landscape. There is no obvious physical habitat connectivity associated with the development site, but there is</p>



TABLE 2: Impacts of the proposed development on biodiversity values

Biodiversity value	Meaning	Relevant (✓ or NA)	Explain and document potential impacts including additional impacts prescribed under the BC Regulation Attach additional supporting documentation where appropriate
			<p>functional but broken connectivity through the site along the Parramatta River.</p> <p>Functional connectivity exists for flying animals such as birds and bats that use the airspace above the development site to move between habitats and the planted vegetation is likely used as a foraging or perching resource as part of daily movements. In terms of threatened species, a portion of the Grey-headed Flying-fox population will pass over the development site as the animal's head to foraging grounds. The Swift Parrot and Little Lorikeet may move through the area and forage on the planted trees on occasion. Threatened microbat species are likely to move through the area and along the Parramatta River.</p> <p>Given the current condition the project is considered unlikely to have a detrimental effect on habitat connectivity. These threatened species are capable flyers able to cover large distances between habitat patches. The habitats in the development site are not important or unique in the landscape and the project will have a limited effect on the current dispersal and movement of species throughout the locality. No barriers to movement will be introduced and no further fragmentation of habitats will occur.</p> <p>See Section 4.5.</p>
Threatened species movement 1.4(d) BC Regulation	Degree to which a particular site contributes to the movement of threatened species to maintain their lifecycle	✓	<p>Threatened species in the locality including the Grey-headed Flying-fox, Swift Parrot and Little Lorikeet are powerful flyers capable of covering large distances between habitat patches. Threatened microbats are also capable of covering a somewhat smaller distance. The landscape of the locality in its current form is permeable to these species and this landscape permeability will not be affected by the project. The movement patterns of these species are not rigid.</p> <p>No barriers to movement will be introduced and no further fragmentation of habitats will occur. The development site is not part of a recognised movement corridor between breeding grounds, foraging grounds, or other habitats important for the lifecycle of species such as staging points for migration.</p> <p>See Section 4.6.</p>
Flight path integrity 1.4(e) BC Regulation	Degree to which the flight paths of protected animals over a particular site are free from interference	✓	<p>The proposed development is located within a predominately urban landscape. However, it is situated along the Parramatta River, parts of which is known to contain habitat for threatened and migratory birds. It is likely that these migratory bird species will fly over the proposed development site on occasion, however, considering the current development on the site, the proposed development is unlikely to increase the current barrier to flights paths and no new barriers will be introduced.</p> <p>See Section 4.7.</p>
Water sustainability 1.4(f) BC Regulation	Degree to which water quality, water bodies and hydrological processes sustain threatened species and threatened ecological communities at a particular site.	NA	No threatened species or threatened ecological communities have been identified on the proposed development site that are being sustained by water quality, water bodies and hydrological processes.

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## 1. Introduction

This report supports a State Significant Development (SSD) Development Application (DA) for the development of the Powerhouse Parramatta at 34-54 & 30B Phillip Street and 338 Church Street, Parramatta. The Powerhouse Parramatta is a museum (information and education facility) that has a capital investment value in excess of \$30 million and as such the DA is submitted to the Minister for Planning pursuant to Part 4 of the Environmental Planning and Assessment Act 1979 (EP&A Act).

Infrastructure NSW is the proponent of the DA.

### 1.1 Project background

The Powerhouse is Australia's contemporary museum for excellence and innovation in applied arts and sciences. The museum was established in 1879 in the Garden Palace which emerged from a history of 19th Century grand exhibition halls, including the Grand Palais. It currently encompasses the Powerhouse in Ultimo, Sydney Observatory in The Rocks and the Museums Discovery Centre in Castle Hill. The Powerhouse has occupied the Ultimo site since 1988.

Parramatta, in the heart of Western Sydney, is entering a period of rapid growth. It was identified in 2014's A Plan for Growing Sydney as the metropolis' emerging second Central Business District, with the provision of supporting social and cultural infrastructure regarded as integral to its success. The strategic importance of Parramatta as an economic and social capital for Sydney has been subsequently reinforced and further emphasised through its designation as the metropolitan centre of the Central City under the Greater Sydney Region Plan.

Powerhouse Parramatta will be the first State cultural institution to be located in Western Sydney – the geographical heart of Sydney. In December 2019, the Government announced the winning design, by Moreau Kusunoki and Genton, for the Powerhouse Parramatta from an international design competition.

Powerhouse Parramatta will establish a new paradigm for museums through the creation of an institution that is innately flexible. It will become a national and international destination renowned for its distinctive programs driven by original research and inspired by its expansive collections. It will be a place of collaboration, a mirror of its communities forever embedded in the contemporary identity of Greater Sydney and NSW.

### 1.2 Overview of Proposed Development

The Powerhouse was established in 1879, and Powerhouse Parramatta will radically return to its origins through the creation of seven presentation spaces of extraordinary scale that will enable the delivery of an ambitious, dynamic constantly changing program that provides new levels of access to Powerhouse Collection. The Powerhouse will set a new international benchmark in experiential learning through the creation of an immensely scaled 360-degree digital space, unique to Australia.

Powerhouse Parramatta will reflect the communities and cultures of one of Australia's fastest growing regions. It will hold First Nations culture at its core and set a new national benchmark in culturally diverse programming. The Powerhouse will be highly connected through multiple transport links, and integrate into the fine grain of the city.

Powerhouse Parramatta will be an active working precinct and include the Powerlab, which will enable researchers, scientists, artists and students from across regional NSW, Australia and around the world to collaborate and participate in Powerhouse programs. The Powerlab will feature digital studios to support music and screen industries alongside co-working spaces, life-long learning and community spaces. Integrated into the Powerlab will be a research kitchen and library that will support a NSW industry development program including archives and oral histories.

This application will deliver a new cultural institution for Parramatta in the heart of Sydney's Central City. The SSD DA seeks consent for the delivery of the Powerhouse Parramatta as a single stage, comprising:

- site preparation works, including the termination or relocation of site services and infrastructure, tree removal and the erection of site protection hoardings and fencing;
- demolition of existing buildings including the existing Riverbank Car Park, 'Willow Grove', 'St George's Terrace' and all other existing structures located on the site;
- construction of the Powerhouse Parramatta, including:
  - seven major public presentation spaces for the exhibition of Powerhouse Collection;
  - front and back-of-house spaces;
  - studio, co-working and collaboration spaces comprising the 'Powerlab', supported by 40 residences (serviced apartments) for scientists, researchers, students and artists and 60 dormitory beds for school students;
  - education and community spaces for staff, researchers and the Powerlab residents, the community, and education and commercial hirers;
  - commercial kitchen comprising the 'Powerlab Kitchen' used for cultural food programs, research, education and events;
  - film, photography, and postproduction studios that will connect communities with industry and content that will interpret the Powerhouse Collection;
  - public facing research library and archive for community, industry, students and researchers to access materials; and
  - a mix of retail spaces including food and drink tenancies with outdoor dining.
- operation and use of the Powerhouse Parramatta including use of the public domain provided on the site to support programs and functions;
- maintenance of the existing vehicular access easement via Dirrabarri Lane, the removal of Oyster Lane and termination of George Khattar Lane, and the provision of a new vehicular access point to Wilde Avenue for loading;
- public domain within the site including new public open space areas, landscaping and tree planting across the site; and
- building identification signage.

The project does not seek consent for the carrying out of works outside of the site boundary, and in particular does not involve any alterations to the existing edge of the formed concrete edge of the Parramatta River or to the waterway itself.

### 1.3 Legislative context and SEARs

Environmental Impacts Statements (EISs) are prepared to assess the impacts of major projects, including State Significant Development (SSD) projects, under Part 4.1 of the EP&A Act. This biodiversity assessment forms part of the EIS being prepared for the project and assesses the biodiversity impacts of the project.

The Department of Planning, Industry and Environment (DPIE) has issued Secretary's Environmental Assessment Requirements (SEARs) to the applicant for the preparation of an Environmental Impact Statement for the proposed development. This report has been prepared having regard to the relevant SEARs as follows:

The EIS shall include an assessment of the proposal's biodiversity impacts in accordance with section 7.9 of the Biodiversity Conservation Act 2016, including the preparation of a Biodiversity Development Assessment Report where required under the Act except where a waiver for preparation of a BDAR has been granted.



The Biodiversity Conservation Act 2016 (BC Act), together with the Biodiversity Conservation Regulation 2017, outlines the framework for addressing impacts on biodiversity from development and clearing. It establishes a framework to avoid, minimise and offset impacts on biodiversity from development through the Biodiversity Offsets Scheme. The Biodiversity Offsets Scheme applies to state significant infrastructure projects, unless the Department of Planning, Industry and Environment (DPIE) determine that project is unlikely to have a significant impact, as determined by the 'test of significance' outlined in Section 7.3 of the BC Act.

This report is a BDAR Waiver Request, which will be submitted to the DPIE to enable the department to determine whether the project will have a significant impact and hence whether the Biodiversity Offsets Scheme should apply.

## 1.4 Site location

The site is located at the northern edge of the Parramatta CBD on the southern bank of the Parramatta River. It occupies an area of approximately 2.5 hectares and has extensive frontages to Phillip Street, Wilde Avenue and the Parramatta River. A small portion of the site extends along the foreshore of the Parramatta River to the west, close to the Lennox Street Bridge on Church Street. The site boundary is identified in Figures 1.1, 1.2 and 1.3. The site excludes the GE Office Building at 32 Phillip Street.

The site is currently occupied by a number of buildings and structures, including:

- Riverbank Car Park – a four-level public car park
- Willow Grove – a two-storey villa of Victorian Italianate style constructed in the 1870s
- St George's Terrace – a two-storey terrace of seven houses fronting Phillip Street constructed in the 1880s
- 36 Phillip Street – a two-storey building comprising retail and business premises
- 40 Phillip Street – a two-storey building comprising retail and business premises
- 42 Phillips Street – a substation building set back from the street comprising retail premises.

The immediate context of the site comprises a range of land uses including office premises, retail premises, hotel, serviced apartments and residential apartments. To the north is the Parramatta River and open space corridor, beyond which are predominately residential uses. The Riverside Theatre is located to the north-west across the Parramatta River.

The site is legally described as Lot 1 in DP 128474, Lot 1 in DP 1247122, and Lot 2 in DP 1247122. The site is located within the City of Parramatta Local Government Area.



**Figure 1.1: Aerial photograph of the site and its context (Source: Mark Merton Photography)**

The site location and local context is shown in Figure 1.2 and 1.3.

The following areas are discussed throughout the report and are defined as:

- **Development footprint:** this area comprises the limits of the construction footprint and compound site locations. The development footprint includes the construction footprint, compound sites, stockpile sites and any other areas that would be disturbed. Also known as the 'subject land'.
- **Study area:** includes the development footprint and surrounding area that may be used for site access.
- **Locality:** This is defined as the area within a 10-kilometre radius surrounding the proposal footprint.
- **Bioregion:** The study area is located in the Sydney Basin bioregion and within the Cumberland sub-region.

**Figure 1.2: Site location**





Figure 1.3: Site boundary, key existing features, and immediate local context (*source Ethos Urban*)

## 2. Methodology

### 2.1 Personnel

This biodiversity assessment was undertaken and prepared by appropriately qualified and experienced ecologists (refer to Table 2.1).

Name	Role	Qualifications
Chris Thomson	Principal Ecologist – Technical Lead	Graduate Certificate in Natural Resources Bachelor of Applied Science Accredited under Section 6.10 of the Biodiversity Conservation Act 2016 as a Biodiversity Assessment Method Assessor (Accreditation No. BAAS18058)
Lukas Clews	Associate Ecologist – Site assessment and reporting	Master of Scientific Studies Graduate Certificate in Applied Science Bachelor of Science Diploma in Conservation and Land Management Accredited under Section 6.10 of the Biodiversity Conservation Act 2016 as a Biodiversity Assessment Method Assessor (Accreditation No. BAAS17060)
Matt Consterdine	Ecologist	Bachelor of Environmental Science
Julia Bayada	Graduate Ecologist	Bachelor of Environmental Science

### 2.2 Background research

A background review of existing information was undertaken to identify the existing environment of the project within a search area of 10 kilometres by 10 kilometres around the centre of the site. The review focussed on database searches, relevant reports pertaining to the study area, property boundaries, and relevant GIS layers. The review was used to prepare a list of threatened species, populations and communities as well as important habitat for migratory species with a likelihood of occurrence in the study area and locality. The searches were also undertaken to identify if an Areas of Outstanding Biodiversity Value are present.

The following database searches were performed:

- BioNet - the website for the Atlas of NSW Wildlife and DPIE Threatened Species Profile Database.
- NSW Department of Primary Industries (DPI) freshwater threatened species distribution maps.
- The federal Department of Environment's Protected Matters Search Tool.
- OEH BioNet Vegetation Classification database.
- The federal Bureau of Meteorology's Atlas of Groundwater Dependent Ecosystems (GDE).
- Department of Environment's directory of important wetlands.
- Department of Planning and Environment's Coastal wetlands spatial data.

Regional vegetation mapping projects including the Southeast NSW Native Vegetation Classification and Mapping – SCIVI (VIS\_ID 2230), (State Government of NSW and Office of Environment and Heritage 2010), the Native Vegetation of the Sydney Metropolitan Area - Version 3 (VIS\_ID 4489) (State Government of NSW and Office of Environment and Heritage 2016).

Preliminary and provisional determinations to list species and ecological communities as threatened under the BC Act were viewed on the NSW Threatened Species Scientific Committee website. There were no preliminary or provisional listings of relevance to the project.

The annual Final Priority Assessment List of nominated species and ecological communities that have been approved for assessment by the Minister responsible for the EPBC Act was reviewed. None of the nominated species and ecological communities are of relevance to the project.

## 2.3 Field survey

A field survey was undertaken within the study area on the 25<sup>th</sup> of February 2020 to ground-truth the results of the background research and habitat assessment.

### 2.3.1 Vegetation surveys

Due to the characteristics of the development site, a vegetation survey was not able to be completed using the field survey methods in line with Chapter 5 of the Biodiversity Assessment Method (BAM) (Office of Environment and Heritage 2017). A plot-based vegetation survey of the study area was not undertaken as there are no Plant Community Types (PCTs) present in the development site and hence vegetation zones could not be established. A vegetation integrity assessment was not able to be undertaken.

The vegetation survey was limited to identification of trees in the development site. The vegetation was mapped to identify vegetation extent.

### 2.3.2 Habitat assessment

A habitat assessment was undertaken within the study area on the identified list of threatened flora and fauna species known or predicted to occur in the Cumberland IBRA subregion that have been recorded within a 10 km by 10 km area centred on the project site (see Appendix A for the habitat assessment results). This list was identified from databases and literature as well as past surveys. The habitat assessment compared the preferred habitat features for these species with the type and quality of the habitats identified in the study area. This habitat assessment was completed to assess the likelihood of the species being present in the study area (i.e. subject species). The criteria used in the habitat assessment are detailed in Table 2.2. The results of the habitat assessment are provided in Appendix A.

**Table 2.1: Likelihood of occurrence classification and criteria**

Likelihood	Criteria
Recorded	The species was observed in the study area during the current survey
High	It is highly likely that a species inhabits the study area and is dependent on identified suitable habitat (i.e. for breeding or important life cycle periods such as winter flowering resources), has been recorded recently in the locality (10 x 10 km area) and is known or likely to maintain resident populations in the study area. Also includes species known or likely to visit the study area during regular seasonal movements or migration.
Moderate	Potential habitat is present in the study area. Species unlikely to maintain sedentary populations, however may seasonally use resources within the study area opportunistically or during migration. The species is unlikely to be dependent (i.e. for breeding or important life cycle periods such as winter flowering resources) on habitat within the study area, or habitat is in a modified or degraded state. Includes cryptic flowering flora species that were not seasonally targeted by surveys and that have not been recorded.
Low	It is unlikely that the species inhabits the study area and has not been recorded recently in the locality (10km x 10km area). It may be an occasional visitor, but habitat similar to the study area is widely distributed in the local area, meaning that the species is not dependent (i.e. for breeding or important life cycle periods such as winter flowering resources) on available habitat. Specific habitat is not present in the study area or the species are non-cryptic perennial flora species that were specifically targeted by surveys and not recorded.
None	Suitable habitat is absent from the study area.

### 2.3.3 Threatened species surveys

The habitat assessment identified that there is limited habitat in the development site for threatened species. For this reason, targeted surveys were not undertaken for preparation of this report. Where suitable habitat for a threatened species was found to be present, the species was assumed to be present.

### 2.3.4 Threatened microbat survey of buildings

As outlined in the BDAR waiver guideline: How to apply for a biodiversity development assessment report waiver for Major Project Application (DPIE 2019), human-made structures may provide habitat for threatened species, particularly microbats. Therefore, as the proposed development includes demolition of buildings and other human-made structures, an addendum has been prepared to document the methods and results of an inspection of the subject structures.

## 2.4 Limitations

The field survey was able to provide adequate spatial coverage and survey effort for the entire study area. This was achievable in the timeframe given the small size of the study area. Detailed floristic survey of vegetation was not able to be undertaken as no native vegetation that could be assigned to a PCT was present on the development site. The conclusions of this report are based upon available data and limited field survey and are indicative of the environmental condition of the study area at the time of the survey. It should be recognised that site conditions, including the presence of threatened species, can change with time. To address this limitation, the assessment has aimed to identify the presence and suitability of the habitat for threatened species.



### 3. Existing environment

#### 3.1 Landscape context

A summary of landscape context is provided below in Table 3.1.

**Table 3.1: Summary of landscape context**

Landscape feature	Details
IBRA bioregions and IBRA subregions	The study area is located within the Cumberland sub-region of the Sydney Basin Bioregion as defined by Thackway and Cresswell (1995).
Mitchell landscapes	The development site is within the Cumberland Plain Mitchell Landscape as mapped by the NSW National Parks and Wildlife Service (2002) and described by the NSW Department of Environment and Climate Change (2008).
Rivers, streams and estuaries	The Parramatta River is on the northern boundary of the site.
Wetlands	There are no important wetlands (SEPP Coastal Management or Ramsar sites) present in the development footprint.
Connectivity of different areas of habitat	In terms of habitat connectivity, the development site is located within a highly disturbed landscape where most habitats have been cleared. The habitats that do remain are fragmented and highly isolated. However, planted urban vegetation does provide a role in facilitating the movement of threatened species across the landscape. There is no obvious physical habitat connectivity associated with the development site, so a discreet corridor cannot be drawn on a map. However, flying animals such as birds and bats use the airspace to move between habitats and the planted vegetation is likely to be used as a foraging or perching resource as part of daily movements.
Areas of geological significance and soil hazard features	There are no areas of geological significance (e.g. karst, caves, crevices, cliffs) associated with the development site or 1,500-metre buffer.
Areas of outstanding biodiversity value	There are no areas of outstanding biodiversity value as declared by the Minister on the development site or in the 1,500-metre buffer area around the development site.
Native vegetation cover	<p>Under the BAM, native vegetation has the same meaning as in section 1.6 of the BC Act. Under section 1.6 of the BC Act, native vegetation has the same meaning as in Part 5A of the Local Land Services Act 2013 (LLS Act). Part 5A section 60B of the LLS Act outlines the following meaning of "native vegetation":</p> <p>For the purposes of this Part, native vegetation means any of the following types of plants native to New South Wales:</p> <ul style="list-style-type: none"> <li>a) trees (including any sapling or shrub or any scrub),</li> <li>b) understorey plants,</li> <li>c) groundcover (being any type of herbaceous vegetation),</li> <li>d) plants occurring in a wetland.</li> </ul> <p>The development site does contain trees that are native to New South Wales. Therefore, this vegetation is considered native vegetation (but not a PCT) for the purposes of the BAM.</p>
Patch size	<p>Under the BAM a patch size is assigned to each vegetation zone. A vegetation zone means an area of native vegetation on the subject land (development site) that is the same PCT and has a similar broad condition state.</p> <p>The development site does not contain any naturally occurring native vegetation, woody or non-woody, that can be assigned to a PCT (see Section 4). As there are no PCTs on the development site there are no vegetation zones for which a patch size can be determined.</p>

### 3.2 Native vegetation and vegetation integrity

The development site has been comprehensively modified from its original state. The development site is characterised by buildings, roads, pathways, carparks, landscape plantings, and grassed areas. The closest patches of naturally occurring vegetation to the development site are present along the banks of the Parramatta River approximately 200 metres to the west.

There is some native vegetation (according to the definition of native vegetation provided in the LLS Act) that has been planted in the development site. However, this native vegetation cannot be assigned to a PCT as identified in the DPIE BioNet Vegetation Classification. As such, the vegetation cannot be allocated to vegetation zones. The habitat types in the development site and study area are best described as miscellaneous ecosystems as identified by the DPIE, specifically: Highly disturbed areas with no or limited native vegetation.

As the native vegetation cannot be assigned to a PCT, it is not possible to assess vegetation integrity by undertaking an assessment of the composition, structure or function of the vegetation according to the field methods outlined in Section 5.3 of the BAM. A vegetation integrity score cannot be determined in accordance with Section 5.4 of the BAM as there are no PCTs that will be impacted. The project will not result in any alteration to vegetation integrity. There will be no loss of vegetation composition, structure or function (as assessed according to the BAM) because of the project.

As outlined in the Preliminary Arboricultural Report for the Museum of Applied Arts & Sciences (Tree IQ, 2019) there are 58 trees and 'tree groups' from range of native and introduced species. The Arboricultural assessment prepared for the project outlines the location of each species on a Tree Location Plan (see Appendix D).

There are two trees on the development site that may be remnant:

- A single *Eucalyptus saligna* (Sydney Blue Gum) tree on the bank of the Parramatta River adjacent to Lennox Bridge that shows some evidence of hybridisation with *Eucalyptus botryoides*. Vegetation is present in the area of this tree in the 1943 aerial photo so it is possible that this tree may be remnant.
- A single *Casuarina glauca* (Swamp Oak) tree on the bank of the Parramatta River. This tree is present in the 1943 aerial photo so may be remnant.

The remainder of the trees within the development site have been planted and are a mix of native and exotic species including *Jacaranda mimosifolia* (Jacaranda), *Corymbia maculata* (Spotted Gum), *Eucalyptus tereticornis* (Forest Red Gum), *Eucalyptus saligna* (Sydney Blue Gum), *Corymbia citriodora* (Lemon Scented Gum), *Eucalyptus robusta* (Swamp Mahogany), *Livistona australis* (Cabbage Tree Palm), *Populus nigra* (Lombardy Poplar), *Harpulia pendula* (Tulipwood), *Corymbia gummifera* (Red Bloodwood), *Schinus mole* (Peppercorn Tree), *Lophostemon confertus* (Brush Box), *Corymbia ficifolia* (Red Flowering Gum), *Flindersia australis* (Crow's Ash), *Cupressus macrocarpa* (Monterey Cypress), *Cinnamomum camphora* (Camphor Laurel), *Castanospermum australe* (Black Bean), *Elaeocarpus reticulatus* (Blueberry Ash), *Melaleuca quinquenervia* (Broad Leaved Paperbark), *Ailanthus altissima* (Tree of Heaven), *Platanus x acerifolia* (London Plane Tree), *Howea forsteriana* (Kentia Palm), and *Archontophoenix* sp.

The typical vegetation and type of habitats present in the development site are illustrated in Photos 1 to 4.

### 3.3 Threatened ecological communities

There are no threatened ecological communities located in or directly adjacent to the development site.





Photo 1 and 2: The *Eucalyptus saligna* opposite Lennox Bridge (left) and the *Casuarina glauca* on the bank of the Parramatta River (right). These trees are suggested for retention.



Photo 3 and 4: Photos of the typical planted vegetation within the development footprint.

### 3.4 Habitat suitability for threatened species

#### 3.4.1 Ecosystem credit species

Ecosystem credit species are those threatened species where the likelihood of occurrence of a species or elements of the species' habitat can be predicted by vegetation surrogates and landscape features, or for which targeted survey has a low probability of detection. Ecosystem credit threatened species must be assessed in conjunction with information about site context of the development site (Section 4.3 and Subsection 5.3.2 of the BAM), PCTs and vegetation integrity attributes (Chapter 5 of the BAM), and data from the Threatened Biodiversity Data Collection (Section 6.1 of the BAM).

During the assessment of biodiversity values as required by Chapter 5 of the BAM the development site was found to largely contain planted vegetation and two trees that may be remnant. This native vegetation cannot be assigned to a PCT. As a result, if the BAM were applied to the assessment there would be no ecosystem credit species predicted to occur on the development site since there is no suitable habitat that can be used as a habitat surrogate. Ecosystem credit species would not be considered any further as there are no PCTs present on the development site and ecosystem credits could not be created.

There are few ecosystem credit species that may use the planted trees on the development site. Of these, the Swift Parrot and Little Lorikeet may on rare occasion visit the trees to forage or perch. The Grey-headed Flying-fox is however, likely to forage in the planted trees on a more regular basis given that the species is resident in the Sydney area and there are many records of this species from Parramatta given the location of a camp in Parramatta Park. The Large Bent-winged Bat has also been recorded near the development site and may forage along the Parramatta River as may a number of other threatened bat species including Little Bent-winged Bat, Eastern Coastal Freetail Bat, Eastern False Pipistrelle, Yellow-bellied Sheath-tail-bat, and Greater Broad-nosed Bat.

Section 7.3 of the BC Act outlines the 'test of significance' that is to be undertaken to assess the likelihood of a significant impact on threatened species, populations or ecological communities listed under the BC Act. Tests of significance have been undertaken in accordance with the guidelines provided in the Threatened Species Test of Significance Guidelines (Office of Environment and Heritage 2018) which outlines a set of guidelines to help applicants/proponents of a development or activity with interpreting and applying the factors of assessment in the 5-part test. The detailed assessment of significance is provided as Appendix B.

#### 3.4.2 Species credit species

If the BAM was applied to the project, species credit species would be assessed in conjunction with information collected about the site context of the subject land (Section 4.3 of the BAM), on PCTs and vegetation integrity attributes in (Section 5 of the BAM), and data obtained from the Threatened Biodiversity Data Collection (Section 6.1 of the BAM).

The development site was found to contain some native vegetation. However, this native vegetation cannot be assigned to a PCT. The habitat types in the development site and study area are best described as miscellaneous ecosystems as identified by the OEH (2017), specifically referred to as "Highly disturbed areas with no or limited native vegetation". As there are no PCTs on the development site the BAM calculator would not return a list of species credit species for assessment.

However, there are some species credit that can use highly disturbed areas with no or limited native vegetation. The Threatened Biodiversity Data Collection was examined to retrieve a list of species credit species that are known to use the miscellaneous ecosystems present within the study area and have been previously recorded in the locality (10km x 10 km are centred on the development site). The species credit species identified include:

- Gang-gang Cockatoo (breeding habitat)
- Little Eagle (breeding habitat)
- Swift Parrot (breeding habitat)



- Green and Golden Bell Frog
- Large Bent-winged Bat (breeding habitat)
- Southern Myotis
- Grey-headed Flying-fox (breeding habitat).

Threatened plant species are not considered due to the disturbed characteristics of the development footprint. The vegetation is planted and there is no habitat in the development footprint for threatened plant species. No threatened plants were observed in the development footprint during the survey.

The habitat constraints identified in the Threatened Biodiversity Data Collection were used to assess the habitat on the development site for each threatened species predicted for assessment. Some species do not have habitat constraints identified in the Threatened Biodiversity Data Collection, so this step is not applicable, and these species would be automatically referred to as a 'candidate species credit species' that require further assessment (if the BAM was to be applied to the project).

The species credit species with habitat constraints identified in the Threatened Biodiversity Data Collection are:

- Gang-gang Cockatoo – Breeding, Eucalypt tree species with hollows greater than 9 cm diameter.
- Little Eagle – Breeding, nest trees - live (occasionally dead) large old trees within vegetation.
- Swift Parrot – Breeding, as per mapped areas; breeding restricted to Tasmania.
- Green and Golden Bell Frog - Semi-permanent/ephemeral wet areas - within 1km of wet areas; swamps - within 1km of swamps; waterbodies - Within 1km of waterbody.
- Large Bent-winged Bat – Breeding, caves - Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding.
- Southern Myotis - Hollow bearing trees - within 200 m of riparian zone; bridges, caves or artificial structures within 200 m of riparian zone.
- Grey-headed Flying-fox – Breeding camps.

Some species identified from the assessment, including the Gang-gang Cockatoo, Little Eagle, Swift Parrot, Large Bent-winged Bat, and Grey-headed Flying-fox, are dual ecosystem / species credit species. These species are generally regarded as ecosystem credit species unless a project will impact on a specific localised breeding habitat feature, or in the case of the Swift Parrot, mapped important areas. The development site does not contain nest trees suitable as breeding habitat for the Gang-gang Cockatoo or Little Eagle. The development site does not contain mapped important areas for the Swift Parrot. The development site does not contain a cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding by the Large Bent-winged Bat. The development site does not contain a Grey-headed Flying-fox breeding camp. As such, these dual credit species would be excluded from the assessment of species credit species if the BAM were applied to the project. As such, it is unlikely that the project is likely to have a significant impact on these species or their habitats.

The development site is located on the banks of the Parramatta River (i.e. within 1 km of a waterbody). Therefore, if this project were subject to the BAM, the habitat constraints for the Green and Golden Bell Frog would be met and the Green and Golden Bell Frog would be referred to as a 'candidate species credit species'. However, as determined from the site inspection the section of Parramatta River adjacent to the development footprint does not contain any habitat features suitable for the Green and Golden Bell Frog (i.e. this area is a mown grass edge with no natural wetland vegetation nearby) and the habitat is degraded. The planted trees, garden beds and grassed areas amongst concrete, pavement, asphalt and buildings do not provide any suitable habitat for the Green and Golden Bell Frog. The Green and Golden Bell Frog would therefore be excluded from the assessment of species credit species.

A test of significance as outlined in Section 7.3 of the BC Act has been completed for threatened species that have potential habitat in the development footprint (see Appendix B).

### 3.4.3 Roosting microbats

No roosting microbats were identified in any of the buildings searched, either common or threatened species. The buildings in the study area are in good condition and only relatively recently vacated. None of the buildings displayed evidence to suggest that they are currently occupied as a daytime roost, or indeed have potential to be used by microbat species for roosting or breeding in the immediate future prior to demolition.

## 3.5 Matters of National Environmental Significance

### 3.5.1 Threatened ecological communities

There are no threatened ecological communities located in or directly adjacent to the development site.

### 3.5.2 Threatened species

One threatened species listed under the EPBC Act is known to use the habitats in the study area for foraging: The Grey-headed Flying-fox (listed as vulnerable). No roost camps are present in the development site. The planted trees in the development footprint particularly *Corymbia maculata*, *Corymbia citriodora*, and *Eucalyptus robusta* are likely to provide a floral foraging resource. An assessment of significance completed in accordance with the Matters of National Environmental Significance, Significant Impact Guidelines 1.1 (Department of the Environment 2013) is provided for the Grey-headed Flying-fox in Appendix B.

The Swift Parrot is considered moderately likely to occur on the development site due to the presence of foraging resources. The planted trees may be used by this species on rare occasion for foraging or perching. An assessment of significance completed in accordance with the Matters of National Environmental Significance, Significant Impact Guidelines 1.1 (Department of the Environment 2013) is provided for the Swift Parrot in Appendix B.

The Green and Golden Bell Frog is unlikely to use the development site due to a lack of suitable habitat (i.e. there are no wetlands, or any other form of habitat present for this species).

The White-throated Needletail is considered moderately likely to fly over the development site but would not use it as habitat as there are no significant habitat resources for this species.

No threatened plant species listed under the EPBC Act are considered likely to occur in the development site. No EPBC Act listed threatened plants were observed within the development footprint during the field survey. The habitats are highly disturbed and there are no natural habitats present.

### 3.5.3 Migratory species

Fifty-nine listed migratory species were identified in the EPBC Act Protected Matters Search Tool as potentially occurring in the locality based on the distributional range of the species and modelled habitat. These migratory species, along with their preferred habitat requirements and an assessment of their likely presence in the study area are listed in Appendix A (some species such as whales, sharks, fish, wader birds, wetland birds, marine birds were omitted from the assessment due to a lack of marine or wetland habitat in the development footprint). Only the Fork-tailed Swift and White-throated Needletail are considered moderately likely to fly over the development site but would not use it as habitat.

While some migratory species of bird are likely to use the study area and locality, the development site would not be classed as an 'important habitat'. A nationally significant proportion of the population would not be supported by the development site, as the habitats are not large enough or of high enough quality. The project would not substantially modify, destroy or isolate an area of important habitat for any migratory species and it would not seriously disrupt the lifecycle of an ecologically significant proportion of a population of migratory birds.

## 4. Impacts on biodiversity values

A description of the potential impacts on biodiversity values is provided below. A summary of the potential impacts to biodiversity values is provided in the Executive Summary.

### 4.1 Vegetation abundance - 1.4(b) BC Regulation

There is some native vegetation (according to the definition of native vegetation provided in the LLS Act) that has been planted in the development site (see Section 3.2). However, the majority of this native vegetation is not naturally occurring and cannot be assigned to a PCT as identified in the DPIE BioNet Vegetation Classification.

As outlined in the Preliminary Arboricultural Report for the Museum of Applied Arts & Sciences (Tree IQ, 2019) 21 trees have been allocated a Retention Value of Consider for Removal and nine trees have been allocated a Retention Value of Priority for Removal. The two potentially remnant trees are recommended for retention. The plan in Appendix D shows a plan of surveyed trees and identifies three trees that will be retained.

Vegetation abundance (as it would apply to a PCT) will not be impacted by the project.

### 4.2 Vegetation integrity - 1.5(2)(a) BC Act

As the native vegetation cannot be assigned to a PCT, it is not possible to assess vegetation integrity by undertaking an assessment of the composition, structure or function of the vegetation according to the field methods outlined in Section 5.3 of the BAM. A vegetation integrity score cannot be determined in accordance with Section 5.4 of the BAM as there are no PCTs that will be impacted. There will be no loss of vegetation composition, structure or function (as assessed according to the BAM) because of the project.

### 4.3 Habitat suitability - 1.5(2)(b) BC Act

The habitats at the development site consist largely of planted trees amongst pavement, concrete and asphalt carparks and walkways. Habitat for threatened species is limited. Some threatened species are likely to use the habitats in the study area for foraging: The Grey-headed Flying-fox, Swift Parrot, Little Lorikeet, and threatened microbats. No breeding habitat for any of these species is present in the development site. The trees in the development footprint are likely to provide a marginal foraging resource and are not an important local habitat.

The habitat suitability for threatened species at the development site is marginal and not comparable to a high-quality natural habitat.

No threatened microbats nor evidence of any past daytime roosting by bats was observed within the suite of existing buildings to be demolished as part of Powerhouse Parramatta project. Cave-dwelling bats rely on the presence of specific microclimatic conditions within their roost sites which facilitate the maintenance of a range of metabolic or physiological conditions necessary to their survival and reproduction. While a number of tight spaces were identified including cracks and crevices, holes and joins these were mostly shallow and did not offer suitable microclimate conditions suitable for permanent roosting or maternity roosts. The ceilings and roof cavities were all in good condition with no damage or openings where threatened microbats could enter.

### 4.4 Threatened species abundance - 1.4(a) BC Regulation

Habitat for threatened species within the development footprint is limited to trees which may provide a foraging resource for the Grey-headed Flying-fox, Swift Parrot, Little Lorikeet and threatened microbats. The habitats would not provide resources for a significant proportion of the population of any of these species as the habitat is limited. The project is unlikely to have an appreciable impact on threatened species abundance.

An assessment of significance completed in accordance with the Matters of National Environmental Significance, Significant Impact Guidelines 1.1 (Department of the Environment 2013) is provided for threatened species in Appendix B as is a Section 7.3 BC Act 'test of significance' for threatened species listed under the BC Act.

#### 4.5 Habitat connectivity - 1.4(c) BC Regulation

The development site is located within a highly disturbed landscape where most habitats have been cleared. The habitats that do remain are fragmented and highly isolated. However, planted urban vegetation does provide a role in facilitating the movement of threatened species across the landscape. There is no obvious physical habitat connectivity associated with the development site but planted vegetation does provide some functional connectivity along the Parramatta River and through the urban areas.

Functional connectivity exists for flying animals such as birds and bats that use the airspace above the development site to move between habitats and the planted vegetation is likely to be used as a foraging or perching resource as part of daily movements. In terms of threatened species, a portion of the Grey-headed Flying-fox population will pass over the development site as the animals' head to foraging grounds. The Swift Parrot, Little Lorikeet, and threatened microbats may move through the area and forage on and around the planted trees on occasion.

The project is considered unlikely to have a detrimental effect on habitat connectivity. The habitats in the development site are not important or unique in the landscape for these species and the project will have little effect on the current dispersal and movement of species through the locality. No barriers to movement will be introduced and no further fragmentation of habitats will occur.

#### 4.6 Threatened species movement - 1.4(d) BC Regulation

Threatened species in the locality including the Grey-headed Flying-fox, Swift Parrot and Little Lorikeet are powerful flyers capable of covering large distances between habitat patches. The threatened microbats are also capable flyers. The landscape of the locality is permeable to these species and will not be affected by the project. The movement patterns of these species are not rigid and vary according to foraging resource availability.

No barriers to movement will be introduced and no further fragmentation of habitats will occur. The development site is not part of a recognised movement corridor between breeding grounds, foraging grounds, or other habitats important for the lifecycle of species such as staging points for migration.

#### 4.7 Flight path integrity - 1.4(e) BC Regulation

Flight path integrity is the degree to which the flight paths of protected animals over a particular site are free from interference. There will be no appreciable increase in building height in the area that would affect species movement or interfere with the current flight paths of any protected species. The movement of migratory, nomadic or local species is likely to continue unaltered as no new obstacles will be placed in the flight path of any species. Importantly, no important habitats along the flight path of any species will be affected and the project does not impose an increased collision risk to flying species.

The development footprint is located in the East Asia-Australasia Flyway which includes the migratory routes of Arctic breeding birds. Migratory birds arrive in Australia in November and December in the non-breeding season. The landscape within which the development footprint is situated is part of the broader non-breeding area. However, the development footprint does not provide any habitat for migratory birds so there is no impact to habitat in the flyway.

The Swift Parrot that breeds in Tasmania and migrates across Bass Strait to mainland Australia in Autumn. Swift Parrots arrive on the mainland and move across the landscape in search of food. Birds that migrate to the coastal areas of NSW are unlikely to have their flight path interrupted by the project. There would be a small loss of potential foraging habitat, but no barriers will be introduced. Movements of the Little Lorikeet will be similarly unaffected.



The flight paths of the Grey-headed Flying-fox and threatened microbats are unlikely to be affected by the project. The presence of these species in an area is dependent on food availability. These species are able to move freely over and between buildings and the project will not influence the current flight paths of these species.

#### 4.8 Water sustainability - 1.4(f) BC Regulation

Water quality, water bodies and hydrological processes do not sustain threatened species at the development site.

## 5. Conclusions

The development site has been comprehensively modified from its original state. However, there is some native vegetation (according to the definition of native vegetation provided in the LLS Act) that has been planted in the development site and there are two trees that are possibly remnant (see Figure 3.1). This native vegetation cannot be assigned to a PCT as identified in the DPIE BioNet Vegetation Classification. As such, the vegetation cannot be allocated to vegetation zones. The habitat types in the development site and study area are best described as miscellaneous ecosystems, specifically: Highly disturbed areas with no or limited native vegetation. The trees in the development site are situated amongst grassed areas, pavement, asphalt and concrete adjacent to car parks, road sides and along walkways.

Vegetation abundance (as it would apply to a PCT) will not be impacted by the project. As the native vegetation cannot be assigned to a PCT, it is not possible to assess vegetation integrity by undertaking an assessment of the composition, structure or function of the vegetation according to the field methods outlined in Section 5.3 of the BAM. A vegetation integrity score cannot be determined in accordance with Section 5.4 of the BAM as there are no PCTs that will be impacted. There will be no loss of vegetation composition, structure or function (as assessed according to the BAM) because of the project. Consequently, the BAM cannot be applied to the project to assess direct impacts and an offset requirement cannot be calculated.

Habitat suitability for threatened species is generally low. Some threatened species are likely to use the habitats in the study area for foraging. Species including the Grey-headed Flying-fox, Swift Parrot, Little Lorikeet and threatened microbat species. No breeding habitat for any of these species is present in the development site. The trees are likely to provide a marginal foraging resource that may be used occasionally but these trees would not be considered an important local habitat. The habitats would not provide resources for a significant proportion of the population of any of these species as the habitat is limited. The project is unlikely to have an appreciable impact on threatened species abundance in the locality.

The development site is located within a highly disturbed landscape where most habitats have been cleared. The habitats that do remain are fragmented and highly isolated. However, planted urban vegetation does provide a role in facilitating the movement of threatened species across the landscape. There is no obvious physical habitat connectivity associated with the development site, but the vegetation in the development footprint does contribute to functional connectivity along the Parramatta River. The project is considered unlikely to have a detrimental effect on habitat connectivity. The threatened species that may use the development site are capable flyers, able to cover large distances between higher quality habitat patches. The habitats in the development site are not important or unique in the landscape and the project will have little effect on the current dispersal and movement of species through the locality. No barriers to movement will be introduced and no further fragmentation of habitats will occur.

Flight path integrity will not be impacted. The movement of migratory, nomadic or local species is likely to continue unaltered as no new obstacles will be placed in the flight path of any species. Importantly, no important habitats along the flight path of any species will be affected and the project does not impose an increased collision risk to flying species.

Water quality, water bodies and hydrological processes do not sustain threatened species at the development site.

After consideration of the potential impacts on biodiversity values as outlined in the BC Act and the BC regulation, and assessments of significance for impacts to threatened species as outlined in Section 7.3 of the BC Act and the EPBC Act Policy Statement 1.1 Significant Impact Guidelines, the project is unlikely to have a significant impact on threatened species or their habitats.

## 6. References

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## Appendix A. Likelihood of occurrence assessment

State and nationally listed threatened species identified from the literature review and database search were considered in terms of their likelihood to occur in the habitats present within the study area based on identified habitat requirements. The likelihood of occurrence was classified according to the criteria described in Table A.1. With high levels of urbanisation in the locality, the likelihood of threatened terrestrial species or communities occurring in the project area in its current condition is low (see Table A.2).

**Table A.1: Criteria for determining likelihood of occurrence**

Likelihood	Criteria
Recorded	The species was observed in the study area during the current survey
High	It is highly likely that a species inhabits the study area and is dependent on identified suitable habitat (i.e. for breeding or important life cycle periods such as winter flowering resources), has been recorded recently in the locality (10 x 10 km area) and is known or likely to maintain resident populations in the study area. Also includes species known or likely to visit the study area during regular seasonal movements or migration.
Moderate	Potential habitat is present in the study area. Species unlikely to maintain sedentary populations, however may seasonally use resources within the study area opportunistically or during migration. The species is unlikely to be dependent (i.e. for breeding or important life cycle periods such as winter flowering resources) on habitat within the study area, or habitat is in a modified or degraded state. Includes cryptic flowering flora species that were not seasonally targeted by surveys and that have not been recorded.
Low	It is unlikely that the species inhabits the study area and has not been recorded recently in the locality (10km x 10km area). It may be an occasional visitor, but habitat similar to the study area is widely distributed in the local area, meaning that the species is not dependent (i.e. for breeding or important life cycle periods such as winter flowering resources) on available habitat. Specific habitat is not present in the study area or the species are non-cryptic perennial flora species that were specifically targeted by surveys and not recorded.
None	Suitable habitat is absent from the study area.



Table A.2: Likelihood of occurrence assessment for threatened species

Scientific Name	Common Name	Status		Distribution and Habitat	Data Source	Likelihood of Occurrence
		BC Act	EPBC Act			
Birds						
Anthochaera phrygia	Regent Honeyeater	CE	CE	Temperate woodlands and open forests of the inland slopes of south-east Australia. The species inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. Regent Honeyeaters usually nest in horizontal branches or forks in tall mature eucalypts and Sheoaks.	PMST BioNet	Low.  The development footprint does not provide any habitat resources suitable for this species.
Artamus cyanopterus cyanopterus	Dusky Woodswallow	V	-	The Dusky Woodswallow has two separate populations. The eastern population is found from Atherton Tableland, Queensland south to Tasmania and west to Eyre Peninsula, South Australia. The other population is found in south-west Western Australia. The Dusky Woodswallow is found in open forests and woodlands, and may be seen along roadsides, urban parks and golf courses.	BioNet	Low.  The development footprint does not provide any habitat resources suitable for this species.
Botaurus poiciloptilus	Australasian Bittern	E	E	Occurs from south-east Queensland to south-east South Australia, Tasmania and the south-west of Western Australia. The Australasian Bittern’s preferred habitat is comprised of wetlands with tall dense vegetation, where it forages in still, shallow water up to 0.3 m deep, often at the edges of pools or waterways, or from platforms or mats of vegetation over deep water. It favours permanent and seasonal freshwater habitats, particularly those dominated by sedges, rushes and reeds (e.g. Phragmites, Cyperus, Eleocharis, Juncus, Typha, Baumea, Bolboschoenus) or cutting grass (Gahnia) growing over a muddy or peaty substrate	PMST BioNet	Low.  The development footprint does not provide any habitat resources suitable for this species.
Burhinus grallarius	Bush Stone-curlew	E	-	Open forests and woodlands with a sparse grassy ground layer and fallen timber. Largely nocturnal, being especially active on moonlit nights. Feed on insects and small vertebrates, such as frogs, lizards and snakes. Nest on the ground in a scrape or small bare patch.	BioNet	Low.  The development footprint does not provide any habitat resources suitable for this species.

Scientific Name	Common Name	Status		Distribution and Habitat	Data Source	Likelihood of Occurrence
		BC Act	EPBC Act			
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	V	-	In summer, occupies tall montane forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests with an acacia understorey. Also occur in subalpine Snow Gum woodland and occasionally in temperate or regenerating forest. In winter, occurs at lower altitudes in drier, more open eucalypt forests and woodlands, particularly in box ironbark assemblages, or in dry forest in coastal areas, occasionally feeding on exotic plant species on urban fringe areas. Favours old growth forest and woodland attributes for nesting and roosting. Nesting occurs in Spring and Summer with nests located in hollows that are 10 cm in diameter or larger and at least 9 m above the ground in eucalypts.	BioNet	Low.  The development footprint does not provide any habitat resources suitable for this species.
<i>Calyptrorhynchus lathamii</i>	Glossy Black Cockatoo	V	-	The species is uncommon although widespread throughout suitable forest and woodland habitats, from the central Queensland coast to East Gippsland in Victoria, and inland to the southern tablelands and central western plains of NSW, with a small population in the Riverina. An isolated population exists on Kangaroo Island, South Australia. Inhabits open forest and woodlands of the coast and the Great Dividing Range where stands of Sheoak occur. Black Sheoak ( <i>Allocasuarina littoralis</i> ) and Forest Sheoak ( <i>A. torulosa</i> ) are important foods. Inland populations feed on a wide range of Sheoaks, including Drooping Sheoak, <i>Allocasuarina diminuta</i> , and <i>A. gymnanthera</i> . Belah is also utilised and may be a critical food source for some populations. In the Riverina, birds are associated with hills and rocky rises supporting Drooping Sheoak, but also recorded in open woodlands dominated by Belah ( <i>Casuarina cristata</i> ).	BioNet	Low.  The development footprint does not provide any significant habitat resources suitable for this species.
<i>Circus assimilis</i>	Spotted Harrier	V	-	The Spotted Harrier occurs throughout the Australian mainland, except in densely forested or wooded habitats of the coast, escarpment and ranges, and rarely in Tasmania. Individuals disperse widely in NSW and comprise a single population. Occurs in grassy open woodland including Acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe. It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands.	BioNet	Low.  The development footprint does not provide any habitat resources suitable for this species.

Scientific Name	Common Name	Status		Distribution and Habitat	Data Source	Likelihood of Occurrence
		BC Act	EPBC Act			
<i>Daphoenositta chrysoptera</i>	Varied Sittella	V	-	The Varied Sittella is sedentary and inhabits most of mainland Australia except the treeless deserts and open grasslands. Distribution in NSW is nearly continuous from the coast to the far west. Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland. Feeds on arthropods gleaned from crevices in rough or decorticating bark, dead branches, standing dead trees and small branches and twigs in the tree canopy. Nests in an upright tree fork high in the living tree canopy.	BioNet	Low.  The development footprint does not provide any habitat resources suitable for this species.
<i>Dasyornis brachypterus</i>	Eastern Bristlebird	E	E	The distribution of the Eastern Bristlebird has contracted to three disjunct areas of south-eastern Australia. There are three main populations: Northern - southern Queensland/northern NSW, Central - Barren Ground NR, Budderoo NR, Woronora Plateau, Jervis Bay NP, Booderee NP and Beecroft Peninsula and Southern - Nadgee NR and Croajingalong NP in the vicinity of the NSW/Victorian border. Habitat for central and southern populations is characterised by dense, low vegetation including heath and open woodland with a heathy understorey. In northern NSW the habitat occurs in open forest with dense tussocky grass understorey and sparse mid-storey near rainforest ecotone; all of these vegetation types are fire prone.	PMST	Low.  The development footprint does not provide any habitat resources suitable for this species.

Scientific Name	Common Name	Status		Distribution and Habitat	Data Source	Likelihood of Occurrence
		BC Act	EPBC Act			
<i>Epthianura albifrons</i>	White-fronted Chat including the population in the Sydney Metropolitan Catchment Management Area	V, EP	-	The White-fronted Chat is found across the southern half of Australia, from southernmost Queensland to southern Tasmania, and across to Western Australia as far north as Carnarvon. Found mostly in temperate to arid climates and very rarely sub-tropical areas, it occupies foothills and lowlands up to 1000 m above sea level. In NSW, it occurs mostly in the southern half of the state, in damp open habitats along the coast, and near waterways in the western part of the state. Along the coastline, it is found predominantly in saltmarsh vegetation but also in open grasslands and sometimes in low shrubs bordering wetland areas. Two isolated sub-populations of White-fronted Chats are currently known from the Sydney Metropolitan Catchment Management Authority (CMA) area; one at Newington Nature Reserve on the Parramatta River and one at Towra Point Nature Reserve in Botany Bay. These sub-populations are separated from each other by 25 km of urbanised land, across which the Chats are unlikely to fly.	BioNet	Low.  The development footprint does not provide any habitat resources suitable for this species.
<i>Falco subniger</i>	Black Falcon	V	-	Widely, but sparsely, distributed in New South Wales, mostly occurring in inland regions. Some reports of 'Black Falcons' on the tablelands and coast of New South Wales are likely to be referable to the Brown Falcon. In New South Wales there is assumed to be a single population that is continuous with a broader continental population, given that falcons are highly mobile, commonly travelling hundreds of kilometres (Marchant & Higgins 1993). The Black Falcon occurs as solitary individuals, in pairs, or in family groups of parents and offspring.	BioNet	Low.  The development footprint does not provide any habitat resources suitable for this species.
<i>Glossopsitta pusilla</i>	Little Lorikeet	V	-	Forages primarily in the canopy of open Eucalyptus forest and woodland, yet also finds food in apples ( <i>angophora</i> sp.), paperbarks ( <i>melaleuca</i> sp.) and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity. Isolated flowering trees in open country (e.g. paddocks, roadside remnants) and urban trees also help sustain viable populations of the species.	BioNet	Moderate.  The planted trees could potentially provide a foraging resource.



Scientific Name	Common Name	Status		Distribution and Habitat	Data Source	Likelihood of Occurrence
		BC Act	EPBC Act			
<i>Grantiella picta</i>	Painted Honeyeater	V	V	<p>The Painted Honeyeater is nomadic and occurs at low densities throughout its range. The greatest concentrations of the bird and almost all breeding occurs on the inland slopes of the Great Dividing Range in NSW, Victoria and southern Queensland. During the winter it is more likely to be found in the north of its distribution. Inhabits Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests.</p> <p>A specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias. Prefers mistletoes of the genus <i>Amyema</i>.</p>	PMST	<p>Low.</p> <p>The development footprint does not provide any habitat resources suitable for this species.</p>
<i>Haliaeetus leucogaster</i>	White-bellied Sea Eagle	V	M	<p>Distributed along the coastline (including offshore islands) of mainland Australia and Tasmania. Found in coastal habitats (especially those close to the sea-shore) and around terrestrial wetlands in tropical and temperate regions of mainland Australia and its offshore islands. The habitats occupied by the sea-eagle are characterised by the presence of large areas of open water (larger rivers, swamps, lakes, and the sea).</p>	BioNet	<p>Low.</p> <p>The development footprint does not provide any habitat resources suitable for this species.</p>
<i>Hieraaetus morphnoides</i>	Little Eagle	V	-	<p>The Little Eagle is found throughout the Australian mainland excepting the most densely forested parts of the Dividing Range escarpment. It occurs as a single population throughout NSW. Occupies open eucalypt forest, woodland or open woodland. Sheoak or Acacia woodlands and riparian woodlands of interior NSW are also used.</p>	BioNet	<p>Low.</p> <p>The development footprint does not provide any habitat resources suitable for this species.</p>
<i>Hirundapus caudacutus</i>	White-throated Needletail	-	V, M	<p>Widespread in eastern and south-eastern Australia. Almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground. They also commonly occur over heathland but less often over treeless areas, such as grassland or swamps.</p>	PMST	<p>Low.</p> <p>While this species may fly over the development footprint on occasion, the development footprint does not provide any habitat resources suitable for this species.</p>

Scientific Name	Common Name	Status		Distribution and Habitat	Data Source	Likelihood of Occurrence
		BC Act	EPBC Act			
<i>Ixobrychus flavicollis</i>	Black Bittern	V	-	The Black Bittern is found along the coastal plains within NSW, although individuals have rarely being recorded south of Sydney or inland. It inhabits terrestrial and estuarine wetlands such as flooded grasslands, forests, woodlands, rainforests and mangroves with permanent water and dense waterside vegetation. The Black Bittern typically roosts on the ground or in trees during the day and forages at night on frogs, reptiles, fish and invertebrates. The breeding season extends from December to March. Nests are constructed of reeds and sticks in branches overhanging the water.	BioNet	Low.  The development footprint does not provide any habitat resources suitable for this species.
<i>Lathamus discolor</i>	Swift Parrot	E	CE, M	On the mainland they occur in areas where eucalypts are flowering profusely or where there is abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as Swamp Mahogany ( <i>Eucalyptus robusta</i> ), Spotted Gum ( <i>Corymbia maculata</i> ), Red Ironbark ( <i>E. sideroxylon</i> ), and White Box ( <i>E. albens</i> ).	PMST BioNet	Moderate.  The planted trees could potentially provide a foraging resource for the Swift Parrot. There are few records of this species nearby and the development site does not provide a high-quality foraging resource, but the species may still occur.
<i>Lophoictinia isura</i>	Square-tailed Kite	V	-	Typically inhabits coastal forested and wooded lands of tropical and temperate Australia. In NSW it is often associated with ridge and gully forests dominated by <i>Eucalyptus longifolia</i> , <i>Corymbia maculata</i> , <i>E. elata</i> , or <i>E. smithii</i> . Individuals appear to occupy large hunting ranges of more than 100 km <sup>2</sup> . They require large living trees for breeding, particularly near water with surrounding woodland /forest close by for foraging habitat. Nest sites are generally located along or near watercourses, in a tree fork or on large horizontal limbs.	BioNet	Low.  The development footprint does not provide any habitat resources suitable for this species.
<i>Neophema pulchella</i>	Turquoise Parrot	V	-	Range extends from southern Queensland through to northern Victoria, from the coastal plains to the western slopes of the Great Dividing Range. Lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland.	BioNet	Low.  The development footprint does not provide any habitat resources suitable for this species.

Scientific Name	Common Name	Status		Distribution and Habitat	Data Source	Likelihood of Occurrence
		BC Act	EPBC Act			
<i>Ninox connivens</i>	Barking Owl	V	-	Found throughout continental Australia except for the central arid regions. Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. It is flexible in its habitat use, and hunting can extend in to closed forest and more open areas.	BioNet	Low.  The development footprint does not provide any habitat resources suitable for this species.
<i>Ninox strenua</i>	Powerful Owl	V	-	In NSW, it is widely distributed throughout the eastern forests from the coast inland to tablelands, with scattered records on the western slopes and plains suggesting occupancy prior to land clearing. Now at low densities throughout most of its eastern range, rare along the Murray River and former inland populations may never recover. The Powerful Owl inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. The Powerful Owl requires large tracts of forest or woodland habitat but can occur in fragmented landscapes as well. The species breeds and hunts in open or closed sclerophyll forest or woodlands and occasionally hunts in open habitats. It roosts by day in dense vegetation comprising species such as Turpentine <i>Syncarpia glomulifera</i> , Black She-oak <i>Allocasuarina littoralis</i> , Blackwood <i>Acacia melanoxylon</i> , Rough-barked Apple <i>Angophora floribunda</i> , Cherry Ballart <i>Exocarpus cupressiformis</i> and a few eucalypt species.	BioNet	Low.  The development footprint does not provide any habitat resources suitable for this species.
<i>Pandion cristatus</i>	Eastern Osprey	V	M	The Osprey has a global distribution with four subspecies previously recognised throughout its range. Favour coastal areas, especially the mouths of large rivers, lagoons and lakes. Feed on fish over clear, open water.	BioNet	Low.  The development footprint does not provide any habitat resources suitable for this species.
<i>Petroica boodang</i>	Scarlet Robin	V	-	The Scarlet Robin lives in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs. This species lives in both mature and re-growth vegetation. It occasionally occurs in mallee or wet forest communities, or in wetlands and tea-tree swamps.	BioNet	Low.  The development footprint does not provide any habitat resources suitable for this species.

Scientific Name	Common Name	Status		Distribution and Habitat	Data Source	Likelihood of Occurrence
		BC Act	EPBC Act			
<i>Petroica phoenicea</i>	Flame Robin	V	-	The Flame Robin is endemic to south eastern Australia, and ranges from near the Queensland border to south east South Australia and in Tasmania. In NSW, it breeds in upland areas and in winter, many birds move to the inland slopes and plains. It is 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, often on ridges and slopes. Prefers clearings or areas with open understoreys. The groundlayer of the breeding habitat is dominated by native grasses and the shrub layer may be either sparse or dense. Occasionally occurs in temperate rainforest, and in herbfields, heathlands, shrublands and sedgeland at high altitudes.	BioNet	Low.  The development footprint does not provide any habitat resources suitable for this species.
<i>Petroica rodinogaster</i>	Pink Robin	V	-	The Pink Robin is found in Tasmania and the uplands of eastern Victoria and far south-eastern NSW, almost as far north as Bombala. On the mainland, the species disperses north and west and into more open habitats in winter, regularly as far north as the ACT area, and sometimes being found as far north as the central coast of NSW. Inhabits rainforest and tall, open eucalypt forest, particularly in densely vegetated gullies.	BioNet	Low.  The development footprint does not provide any habitat resources suitable for this species.
<i>Ptilinopus superbus</i>	Superb Fruit-Dove	V	-	The Superb Fruit-dove occurs principally from north-eastern in Queensland to north-eastern NSW. Inhabits rainforest and similar closed forests where it forages high in the canopy, eating the fruits of many tree species such as figs and palms. It may also forage in eucalypt or acacia woodland where there are fruit-bearing trees.	BioNet	Low.  The development footprint does not provide any habitat resources suitable for this species.



Scientific Name	Common Name	Status		Distribution and Habitat	Data Source	Likelihood of Occurrence
		BC Act	EPBC Act			
<i>Rostratula australis</i>	Australian Painted Snipe	E	E, M	Most records are from south east Australia, particularly the Murray Darling Basin, with scattered records across northern Australia. They generally inhabit shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. They also use inundated or waterlogged grassland or saltmarsh, dams, rice crops, sewage farms and bore drains. Typical sites include those with rank emergent tussocks of grass, sedges, rushes or reeds, or samphire; often with scattered clumps of lignum Muehlenbeckia or canegrass. Breeding habitat requirements may be quite specific; shallow wetlands with areas of bare wet mud and both low cover and canopy cover nearby; nest records nearly all from or near small islands in freshwater wetlands. Has also been recorded nesting in and near swamps, canegrass swamps, flooded areas including samphire, grazing land, among cumbungi, sedges and grasses; one nest has been found in the centre of a cow-pat in a clump of long grass.	PMST BioNet	Low.  The development footprint does not provide any habitat resources suitable for this species.
<i>Stictonetta naevosa</i>	Freckled Duck	V	-	Prefer permanent freshwater swamps and creeks with heavy growth of Cumbungi, Lignum or Tea-tree. During drier times they move from ephemeral breeding swamps to more permanent waters such as lakes, reservoirs, farm dams and sewage ponds.	BioNet	Low.  The development footprint does not provide any habitat resources suitable for this species.
<i>Tyto longimembris</i>	Eastern Grass Owl	V	-	Eastern Grass Owls have been recorded occasionally in all mainland states of Australia but are most common in northern and north-eastern Australia. In NSW they are more likely to be resident in the north-east. Eastern Grass Owl numbers can fluctuate greatly, increasing especially during rodent plagues. Eastern Grass Owls are found in areas of tall grass, including grass tussocks, in swampy areas, grassy plains, swampy heath, and in cane grass or sedges on flood plains.	BioNet	Low.  The development footprint does not provide any habitat resources suitable for this species.
<i>Tyto novaehollandiae</i>	Masked Owl	V	-	Extends from the coast where it is most abundant to the western plains. Overall records for this species fall within approximately 90% of NSW, excluding the most arid north-western corner. There is no seasonal variation in its distribution. Dry eucalypt forests and woodland typically prefers open forest with low shrub density. Requires old trees for roosting and nesting.	BioNet	Low.  The development footprint does not provide any habitat resources suitable for this species.

Scientific Name	Common Name	Status		Distribution and Habitat	Data Source	Likelihood of Occurrence
		BC Act	EPBC Act			
<i>Tyto tenebricosa</i>	Sooty Owl	V	-	Occupies the easternmost one-eighth of NSW, occurring on the coast, coastal escarpment and eastern tablelands. Territories are occupied permanently. Occurs in rainforest, including dry rainforest, subtropical and warm temperate rainforest, as well as moist eucalypt forests.	BioNet	Low.  The development footprint does not provide any habitat resources suitable for this species.
Mammals						
<i>Cercartetus nanus</i>	Eastern Pygmy-possum	V	-	Found in a broad range of habitats from rainforest through sclerophyll (including Box-Ironbark) forest and woodland to heath, but in most areas woodlands and heath appear to be preferred, except in north-eastern NSW where they are most frequently encountered in rainforest. Feeds largely on nectar and pollen collected from banksias, eucalypts and bottlebrushes; soft fruits are eaten when flowers are unavailable. Shelters in tree hollows, rotten stumps, holes in the ground, abandoned bird-nests, Ringtail Possum dreys or thickets of vegetation, (e.g. grass-tree skirts); nest-building appears to be restricted to breeding females; tree hollows are favoured but spherical nests have been found under the bark of eucalypts and in shredded bark in tree forks. Important habitat requirements include trees with hollows >2cm, loose bark of eucalypts or accumulations of shredded bark in tree forks for nesting; and associated vegetation types and with an understorey containing heath, banksias or myrtaceous shrubs and soft-fruited plants in rainforests.	BioNet	Low.  The development footprint does not provide any habitat resources suitable for this species.
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	V	Forages over a broad range of open forest and woodland habitats, this species is a cave roosting bat which favours sandstone escarpment habitats for roosting, in the form of shallow overhangs, crevices and caves.	PMST BioNet	Low.  The development footprint does not provide any habitat resources suitable for this species.
<i>Dasyurus maculatus maculatus</i> (SE mainland population)	Spotted-tailed Quoll	V	E	Wet and dry sclerophyll forests and rainforests, and adjacent open agricultural areas. Generally associated with large expansive areas of habitat to sustain territory size. Requires hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky-cliff faces as den sites.	PMST BioNet	Low.  The development footprint does not provide any habitat resources suitable for this species.

Scientific Name	Common Name	Status		Distribution and Habitat	Data Source	Likelihood of Occurrence
		BC Act	EPBC Act			
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	V	-	Prefers moist habitats, with trees taller than 20 m. Generally roosts in eucalypt hollows but has also been found under loose bark on trees or in buildings.	BioNet	Low.  The development footprint does not provide any habitat resources suitable for this species.
<i>Isoodon obesulus obesulus</i>	Southern Brown Bandicoot	E	E	This species prefers sandy soils with scrubby vegetation and/or areas with low ground cover that are burn from time to time. A mosaic of post fire vegetation is important for this species.	PMST	Low.  The development footprint does not provide any habitat resources suitable for this species.
<i>Micronomus norfolkensis</i>	Eastern Coastal Free-tailed Bat	V	-	Occur in dry sclerophyll forest and woodland east of the Great Dividing Range. Roosts mainly in tree hollows but will also roost under bark or in human-made structures.	BioNet	Low.  Nearby Haslams Creek may provide foraging habitat for this species but the likelihood of any bats crossing the development footprint is low as foraging or roosting resources are marginal.
<i>Miniopterus australis</i>	Little Bent-winged Bat	V	-	East coast and ranges of Australia from Cape York in Queensland to Wollongong in NSW. Little Bentwing-bats roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats.	BioNet	Low.  Nearby Haslams Creek may provide foraging habitat for this species but the likelihood of any bats crossing the development footprint is low as foraging or roosting resources are marginal.
<i>Miniopterus orianae oceanensis</i>	Large Bent-winged Bat	V	-	Occurs on east and north west coasts of Australia. Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other manmade structures.	BioNet	Low.  Nearby Haslams Creek may provide foraging habitat for this species but the likelihood of any bats crossing the development footprint is low as foraging or roosting resources are marginal.

Scientific Name	Common Name	Status		Distribution and Habitat	Data Source	Likelihood of Occurrence
		BC Act	EPBC Act			
<i>Myotis macropus</i>	Southern Myotis	V	-	Generally roost in groups close to water in caves, mine shafts, hollow-bearing trees, and storm water channels, buildings, under bridges and in dense foliage. Forages over streams and pools catching insects and small fish.	BioNet	Low.  Nearby Haslams Creek may provide habitat for this species but the likelihood of any bats crossing the development footprint is low as foraging or roosting resources are marginal.
<i>Petauroides volans</i>	Greater Glider	-	V	The Greater Glider occurs in eucalypt forests and woodlands along the east coast of Australia from north east Queensland to the Central Highlands of Victoria. This population of Greater Gliders on the south coast of NSW is bounded by the Moruya River to the north, Coila Lake to the south and the Princes Highway and cleared land exceeding 700 m in width to the west. Feeds exclusively on eucalypt leaves, buds, flowers and mistletoe. Shelter during the day in tree hollows and will use up to 18 hollows in their home range. Occupy a relatively small home range with an average size of 1 to 3 ha.	PMST	Low.  The development footprint does not provide any habitat resources suitable for this species.
<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby	E	V	Range extends from south-east Queensland to the Grampians in western Victoria, roughly following the line of the Great Dividing Range. Occupy rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges, often facing north. Browse on vegetation in and adjacent to rocky areas eating grasses and forbs as well as the foliage and fruits of shrubs and trees.	PMST	Low.  The development footprint does not provide any habitat resources suitable for this species.
<i>Phascolarctos cinereus</i>	Koala	V	V	In NSW it mainly occurs on the central and north coasts with some populations in the west of the Great Dividing Range. Inhabit eucalypt woodlands and forests. Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species.	PMST BioNet	Low.  The development footprint does not provide any habitat resources suitable for this species.
<i>Pseudomys novaehollandiae</i>	New Holland Mouse	-	V	Distribution is fragmented across all eastern states of Australia, where it inhabits open heath lands, open woodlands with heath understorey and vegetated sand dunes.	PMST	Low.  The development footprint does not provide any habitat resources suitable for this species.



Scientific Name	Common Name	Status		Distribution and Habitat	Data Source	Likelihood of Occurrence
		BC Act	EPBC Act			
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	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. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. Individual camps may have tens of thousands of animals and are used for mating, and for giving birth and rearing young.	PMST BioNet	Moderate.  The planted trees within the development site may provide a foraging resource for the Grey-headed Flying-fox.
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheathtail-bat	V	-	Wide-ranging species found across northern and eastern Australia. Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows.	BioNet	Low.  The development footprint does not provide any habitat resources suitable for this species.
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	V	-	Utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. Although this species usually roosts in tree hollows, it has also been found in buildings.	BioNet	Low.  The development footprint does not provide any habitat resources suitable for this species.
Frogs						
<i>Heleioporus australiacus</i>	Giant Burrowing Frog	V	V	The Giant Burrowing Frog is distributed in south eastern NSW and Victoria and appears to exist as two distinct populations: a northern population largely confined to the sandstone geology of the Sydney Basin and extending as far south as Ulladulla, and a southern population occurring from north of Narooma through to Walhalla, Victoria. Found in heath, woodland and open dry sclerophyll forest on a variety of soil types except those that are clay based. Spends more than 95% of its time in non-breeding habitat in areas up to 300 m from breeding sites. Whilst in non-breeding habitat it burrows below the soil surface or in the leaf litter. Individual frogs occupy a series of burrow sites, some of which are used repeatedly.	PMST	Low.  The development footprint does not provide any habitat resources suitable for this species.

Scientific Name	Common Name	Status		Distribution and Habitat	Data Source	Likelihood of Occurrence
		BC Act	EPBC Act			
<i>Litoria aurea</i>	Green and Golden Bell Frog	E	V	Since 1990 there have been approximately 50 recorded locations in NSW, most of which are small, coastal, or near coastal populations. These locations occur over the species' former range; however, they are widely separated and isolated. Large populations in NSW are located around the metropolitan areas of Sydney, Shoalhaven and mid north coast (one an island population). There is only one known population on the NSW Southern Tablelands. Ephemeral and permanent freshwater wetlands, ponds, dams with an open aspect and fringed by Typha and other aquatics, free from predatory fish.	PMST Bionet	Low.  While the Green and Golden Bell Frog is known to inhabit Haslams Creek, the development footprint does not provide any habitat for this species and offsite impacts to Haslams Creek will be negligible.
<i>Litoria raniformis</i>	Growling Grass Frog	E	V	The species is currently widespread throughout the Murray River valley and has been recorded from six Catchment Management Areas in NSW: Lower Murray Darling, Murrumbidgee, Murray, Lachlan, Central West and South East. Found mostly amongst emergent vegetation, including Typha sp. (bullrush), Phragmites sp. (reeds) and Eleocharis sp. (sedges), in or at the edges of still or slow-flowing water bodies such as lagoons, swamps, lakes, ponds and farm dams.	PSMT	Low.  The development footprint does not provide any habitat resources suitable for this species.
<i>Mixophyes balbus</i>	Stuttering Frog	E	V	Occur along the east coast of Australia from southern Queensland to north-eastern Victoria. Found in rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range. Outside the breeding season adults live in deep leaf litter and thick understorey vegetation on the forest floor.	PMST	Low.  The development footprint does not provide any habitat resources suitable for this species.
<i>Pseudophryne australis</i>	Red-crowned Toadlet	V	-	It has restricted distribution from Pokolbin to Nowra and west to Mt Victoria. Occurs in open forests and wet drainage lines below sandstone ridges that often have shale lenses or cappings in the Hawkesbury and Narrabeen Sandstones.	BioNet	Low.  The development footprint does not provide any habitat resources suitable for this species.
Insects						

Scientific Name	Common Name	Status		Distribution and Habitat	Data Source	Likelihood of Occurrence
		BC Act	EPBC Act			
<i>Meridolum corneovirens</i>	Cumberland Plain Land Snail	E	-	Primarily inhabits Cumberland Plain Woodland (an endangered ecological community). This community is grassy, open woodland with occasional dense patches of shrubs. Lives under litter of bark, leaves and logs, or shelters in loose soil around grass clumps. Occasionally shelters under rubbish.	BioNet	Low.  The development footprint does not provide any habitat resources suitable for this species.
<i>Pommerhelix duralensis</i>	Dural Land Snail	E	E	The Dural land snail is endemic to New South Wales. The species is a shale-influenced habitat specialist, which occurs in low densities along the northwest fringe of the Cumberland Plain on shale-sandstone transitional landscapes. The species has been observed resting in exposed areas, such as on exposed rock or leaf litter, however it will also shelter beneath leaves, rocks and light woody debris.	PMST BioNet	Low.  The development footprint does not provide any habitat resources suitable for this species.
<i>Synemon plana</i>	Golden Sun Moth	E	CE	The Golden Sun Moth's NSW populations are found in the area between Queanbeyan, Gunning, Young and Tumut. The species' historical distribution extended from Bathurst (central NSW) through the NSW Southern Tablelands, through to central and western Victoria, to Bordertown in eastern South Australia. Occurs in Natural Temperate Grasslands and grassy Box-Gum Woodlands.	PMST	Low.  The development footprint does not provide any habitat resources suitable for this species.
Reptiles						
<i>Hoplocephalus bungaroides</i>	Broad-headed Snake	E	V	Shelters in rock crevices and under flat sandstone rocks on exposed cliff edges during autumn, winter and spring. Moves from the sandstone rocks to shelters in hollows in large trees within 200 m of escarpments in summer.	PMST	Low.  The development footprint does not provide any habitat resources suitable for this species.
Flora						

Scientific Name	Common Name	Status		Distribution and Habitat	Data Source	Likelihood of Occurrence
		BC Act	EPBC Act			
<i>Acacia bynoeana</i>	Bynoe's Wattle	E	V	Found in central eastern NSW, from the Hunter District south to the Southern Highlands and west to the Blue Mountains. It has recently been found in the Colymea and Parma Creek areas west of Nowra. Occurs in heath or dry sclerophyll forest on sandy soils. Seems to prefer open, sometimes slightly disturbed sites such as trail margins, edges of roadside spoil mounds and in recently burnt patches. Associated overstorey species include Red Bloodwood ( <i>Corymbia gummifera</i> ), Scribbly Gum ( <i>Eucalyptus haemastoma</i> ), Drooping Red Gum ( <i>E. parramattensis</i> ), Old Man Banksia ( <i>Banksia serrata</i> ) and Small-leaved Apple ( <i>Angophora bakeri</i> ).	PMST	Low.  The development footprint does not provide any habitat resources suitable for this species.
<i>Acacia clunies-rossiae</i>	Kanangra Wattle	-	V	Kanangra Wattle grows in the Kowmung and Cocks River areas entirely within Kanangra-Boyd and Blue Mountains National Parks. Grows in dry sclerophyll forest on skeletal soils on rocky slopes, or on alluvium along creeks.	BioNet	Low.  The development footprint does not provide any habitat resources suitable for this species.
<i>Acacia pubescens</i>	Downy Wattle	V	V	Concentrated around the Bankstown-Fairfield-Rookwood area and the Pitt Town area, with outliers occurring at Barden Ridge, Oakdale and Mountain Lagoon. Occurs in open woodland and forest, in a variety of plant communities, including Cooks River/ Castlereagh Ironbark Forest, Shale/Gravel Transition Forest and Cumberland Plain Woodland. Occurs on alluviums, shales and at the intergrade between shales and sandstones. The soils are characteristically gravelly soils, often with ironstone.	PMST BioNet	Low.  The development footprint does not provide any habitat resources suitable for this species.
<i>Allocasuarina glareicola</i>	<i>Allocasuarina glareicola</i>	E	E	Primarily restricted to the Richmond (NW Cumberland Plain) district, but with an outlier population found at Voyager Point, Liverpool. Grows in Castlereagh woodland on lateritic soil. Found in open woodland with <i>Eucalyptus parramattensis</i> , <i>Eucalyptus fibrosa</i> , <i>Angophora bakeri</i> , <i>Eucalyptus sclerophylla</i> and <i>Melaleuca decora</i> . Common associated understorey species include <i>Melaleuca nodosa</i> , <i>Hakea dactyloides</i> , <i>Hakea sericea</i> , <i>Dillwynia tenuifolia</i> , <i>Micromyrtus minutiflora</i> , <i>Acacia elongata</i> , <i>Acacia brownei</i> , <i>Themeda triandra</i> and <i>Xanthorrhoea minor</i> .	PMST	Low.  The development footprint does not provide any habitat resources suitable for this species.



Scientific Name	Common Name	Status		Distribution and Habitat	Data Source	Likelihood of Occurrence
		BC Act	EPBC Act			
<i>Asterolasia elegans</i>	<i>Asterolasia elegans</i>	E	E	Occurs north of Sydney, in the Baulkham Hills, Hawkesbury and Hornsby local government areas. Also likely to occur in the western part of Gosford local government area. Known from only seven populations, only one of which is wholly within a conservation reserve. Occurs on Hawkesbury sandstone. Found in sheltered forests on mid- to lower slopes and valleys, e.g. in or adjacent to gullies which support sheltered forest. The canopy at known sites includes Turpentine ( <i>Syncarpia glomulifera</i> subsp. <i>glomulifera</i> ), Smooth-barked Apple ( <i>Angophora costata</i> ), Sydney Peppermint ( <i>Eucalyptus piperita</i> ), Forest Oak ( <i>Allocasuarina torulosa</i> ) and Christmas Bush ( <i>Ceratopetalum gummiferum</i> ).	PMST	Low. The development footprint does not provide any habitat resources suitable for this species.
<i>Caladenia tessellata</i>	Thick-lipped Spider Orchid	E	V	Known from the Sydney area (old records), Wyong, Ulladulla and Braidwood in NSW. Populations in Kiama and Queanbeyan are presumed extinct. Generally found in grassy sclerophyll woodland on clay loam or sandy soils, though the population near Braidwood is in low woodland with stony soil.	PMST	Low. The development footprint does not provide any habitat resources suitable for this species.
<i>Callistemon linearifolius</i>	Netted Bottle Brush	V	-	Recorded from the Georges River to Hawkesbury River in the Sydney area, and north to the Nelson Bay area of NSW. Was more widespread across its distribution in the past. Some populations are reserved in Ku-ring-gai Chase National Park, Lion Island Nature Reserve, and Spectacle Island Nature Reserve. Further north it has been recorded from Yengo National Park and Werakata National Park. Grows in dry sclerophyll forest on the coast and adjacent ranges.	BioNet	Low. The development footprint does not provide any habitat resources suitable for this species.
<i>Cryptostylis hunteriana</i>	Leafless Tongue Orchid	V	V	The Leafless Tongue Orchid has been recorded from as far north as Gibraltar Range National Park south into Victoria around the coast as far as Orbost. The larger populations typically occur in woodland dominated by Scribbly Gum ( <i>Eucalyptus sclerophylla</i> ), Silvertop Ash ( <i>E. sieberi</i> ), Red Bloodwood ( <i>Corymbia gummifera</i> ) and Black Sheoak ( <i>Allocasuarina littoralis</i> ); appears to prefer open areas in the understorey of this community and is often found in association with the Large Tongue Orchid ( <i>C. subulata</i> ) and the Tartan Tongue Orchid ( <i>C. erecta</i> ).	PMST	Low. The development footprint does not provide any habitat resources suitable for this species.

Scientific Name	Common Name	Status		Distribution and Habitat	Data Source	Likelihood of Occurrence
		BC Act	EPBC Act			
<i>Cynanchum elegans</i>	White-flowered Wax Plant	E	E	Occurs from the Gloucester district to the Wollongong area and inland to Mt Dangar. Typically occurs in rainforest gullies, scrub and scree slopes and at the ecotone between dry rainforest vegetation and dry subtropical forest/woodland communities. Other associated vegetation types include littoral rainforest; Coastal Tea-tree ( <i>Leptospermum laevigatum</i> ) – Coastal Banksia ( <i>Banksia integrifolia</i> subsp. <i>integrifolia</i> ) coastal scrub; Forest Red Gum ( <i>Eucalyptus tereticornis</i> ) aligned open forest and woodland; Spotted Gum ( <i>Corymbia maculata</i> ) aligned open forest and woodland; and Bracelet Honey myrtle ( <i>Melaleuca armillaris</i> ) scrub to open scrub.	PMST	Low.  The development footprint does not provide any habitat resources suitable for this species.
<i>Darwinia biflora</i>	-	V	V	Occurs at 129 sites in the northern and north-western suburbs of Sydney, in the Ryde, Baulkham Hills, Hornsby and Ku-Ring-Gai Local Government Areas (LGAs). Occurs on the edges of weathered shale-capped ridges, where these intergrade with Hawkesbury Sandstone. Associated overstorey species include <i>Eucalyptus haemastoma</i> , <i>Corymbia gummifera</i> and/or <i>E. squamosa</i> . The vegetation structure is usually woodland, open forest or scrub-heath.	PMST	Low.  The development footprint does not provide any habitat resources suitable for this species.
<i>Dillwynia tenuifolia</i>	-	V	-	Core distribution is the Cumberland Plain from Windsor to Penrith east to Deans Park. Other populations in Western Sydney are recorded at Voyager Point and Kemps Creek in the Liverpool LGA, Luddenham in the Penrith LGA and South Maroota in the Baulkham Hills Shire. Disjunct localities include the Bulga Mountains at Yengo in the north, and Kurrajong Heights and Woodford in the Lower Blue Mountains. In western Sydney, it may be locally abundant particularly within scrubby/dry heath areas within Castlereagh Ironbark Forest and Shale Gravel Transition Forest on tertiary alluvium or laterised clays. May also be common in transitional areas where these communities adjoin Castlereagh Scribbly Gum Woodland. At Yengo, is reported to occur in disturbed escarpment woodland on Narrabeen sandstone.	BioNet	Low.  The development footprint does not provide any habitat resources suitable for this species.
<i>Epacris purpurascens</i> var. <i>purpurascens</i>	<i>Epacris purpurascens</i> var. <i>purpurascens</i>	V	-	Recorded from Gosford in the north, to Narrabeen in the east, Silverdale in the west and Avon Dam vicinity in the South. Found in a range of habitat types, most of which have a strong shale soil influence.	BioNet	Low.  The development footprint does not provide any habitat resources suitable for this species.

Scientific Name	Common Name	Status		Distribution and Habitat	Data Source	Likelihood of Occurrence
		BC Act	EPBC Act			
<i>Eucalyptus camfieldii</i>	Camfield's Stringybark	V	V	Restricted distribution in a narrow band with the most northerly records in the Raymond Terrace area south to Waterfall. Poor coastal country in shallow sandy soils overlying Hawkesbury sandstone. Coastal heath mostly on exposed sandy ridges. Occurs mostly in small scattered stands near the boundary of tall coastal heaths and low open woodland of the slightly more fertile inland areas. Associated species frequently include stunted specimens of <i>E. oblonga</i> (Narrow-leaved Stringybark), <i>E. capitellata</i> (Brown Stringybark) and <i>E. haemastoma</i> (Scribbly Gum).	PMST	Low. The development footprint does not provide any habitat resources suitable for this species.
<i>Eucalyptus</i> sp. Cattai	-	CE	CE	Occurs in the area between Colo Heights and Castle Hill, northwestern Sydney, with historical records from central Sydney. Occurs as a rare emergent tree in scrub, heath and low woodland on sandy soils, usually as isolated individuals or occasionally in small clustered groups. The sites at which it occurs are generally flat and on ridge tops. Associated soils are laterised clays overlying sandstone. There are no known populations occur in conservation reserves.	PMST	Low. The development footprint does not provide any habitat resources suitable for this species.
<i>Eucalyptus nicholii</i>	Narrow-leaved Black Peppermint	V	V	This species is sparsely distributed but widespread on the New England Tablelands from Nundle to north of Tenterfield, being most common in central portions of its range. Found largely on private property and roadsides, and occasionally conservation reserves. Planted as urban trees, windbreaks and corridors. Typically grows in dry grassy woodland, on shallow soils of slopes and ridges. Found primarily on infertile soils derived from granite or metasedimentary rock.	BioNet	Low. The development footprint does not provide any habitat resources suitable for this species.
<i>Eucalyptus scoparia</i>	Wallangarra White Gum	E	V	In NSW it is known from only three locations near Tenterfield, including Bald Rock National Park. In Queensland it is equally rare, occurring at three sites of which only one has more than a dozen trees. In NSW it is known from only three locations near Tenterfield, including Bald Rock National Park. In Queensland it is equally rare, occurring at three sites of which only one has more than a dozen trees.	BioNet	Low. The development footprint does not provide any habitat resources suitable for this species.

Scientific Name	Common Name	Status		Distribution and Habitat	Data Source	Likelihood of Occurrence
		BC Act	EPBC Act			
<i>Genoplesium baueri</i>	Yellow Gnat Orchid / Bauer's Midge Orchid	E	E	Recorded from locations between Nowra and Pittwater and may occur as far north as Port Stephens. About half the records were made before 1960 with most of the older records being from Sydney suburbs including Asquith, Cowan, Gladesville, Longueville and Wahroonga. No collections have been made from those sites in recent years. The species has been recorded at locations now likely to be within the several conservation reserves including Berowra Valley Regional Park, Royal National Park and Lane Cove National Park. May occur in the Woronora, O'Hares, Metropolitan and Warragamba Catchments. Found in sparse sclerophyll forest and moss gardens over sandstone	PMST	Low. The development footprint does not provide any habitat resources suitable for this species.
<i>Grammitis stenophylla</i>	Narrow-leaf Finger Fern	E	-	Occurs in eastern Queensland and eastern NSW. In NSW it has been found on the south, central and north coasts and as far west as Mount Kaputar National Park near Narrabri. Moist places, usually near streams, on rocks or in trees, in rainforest and moist eucalypt forest.	BioNet	Low. The development footprint does not provide any habitat resources suitable for this species.
<i>Grevillea beadleana</i>	Beadle's Grevillea	E	E	Known from four separate areas, all in north-east NSW: the Torrington area west of Tenterfield, Oxley Wild Rivers National Park, Guy Fawkes River National Park and at Shannon Creek south-west of Grafton. Open eucalypt forest with a shrubby understorey. It is usually found on steep granite slopes at high altitudes, although the population at Shannon Creek is at a lower elevation on sandstone.	BioNet	Low. The development footprint does not provide any habitat resources suitable for this species.
<i>Hibbertia superans</i>	-	E	-	Occurs from Baulkham Hills to South Maroota in the northern outskirts of Sydney and at one locality at Mount Boss inland from Kempsey. Occurs in both open woodland and heathland, and appears to prefer open disturbed areas, such as tracksides.	PMST	Low. The development footprint does not provide any habitat resources suitable for this species.
<i>Leptospermum deanei</i>	Deane's Tee-tree	V	V	Known from the Hornsby, Warringah, Ku-ring-gai and Ryde LGAs. Occurs in woodland on lower hill slopes or near creeks, sandy alluvial soil or sand over sandstone, riparian scrub woodland and open forest.	PMST	Low. The development footprint does not provide any habitat resources suitable for this species.

Scientific Name	Common Name	Status		Distribution and Habitat	Data Source	Likelihood of Occurrence
		BC Act	EPBC Act			
Marsdenia viridiflora subsp. viridiflora (endangered population)	Marsdenia viridiflora R. Br. subsp. viridiflora population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas	EP	-	Endangered population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas. Recent records are from Prospect, Bankstown, Smithfield, Cabramatta Creek and St Marys. Grows in vine thickets and open shale woodland.	BioNet	Low. The development footprint does not provide any habitat resources suitable for this species.
Melaleuca biconvexa	Biconvex Paperbark	V	V	Found only in NSW, with scattered and dispersed populations found in the Jervis Bay area in the south and the Gosford-Wyong area in the north. Generally grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects.	PMST	Low. The development footprint does not provide any habitat resources suitable for this species.
Melaleuca deanei	Deane's Paperbark	V	V	Deane's Paperbark occurs in two distinct areas, in the Ku-ring-gai, Berowra, Holsworthy and Wedderburn areas, and there are also more isolated occurrences at Springwood, Wollemi National Park, Yalwal and the Central Coast areas. The species grows in heath on sandstone	BioNet	Low. The development footprint does not provide any habitat resources suitable for this species.
Persicaria elatior	Tall Knotweed	V	V	Tall Knotweed has been recorded in south-eastern NSW (Mt Dromedary (an old record), Moruya State Forest near Turlinjah, the Upper Avon River catchment north of Robertson, Bermagui, and Picton Lakes. In northern NSW it is known from Raymond Terrace (near Newcastle) and the Grafton area (Cherry Tree and Gibberagee State Forests). This species normally grows in damp places, especially beside streams and lakes. Occasionally in swamp forest or associated with disturbance.	PMST	Low. The development footprint does not provide any habitat resources suitable for this species.
Persoonia hirsuta	Hairy Geebung	E	E	The Hairy Geebung has been recorded in the Sydney coastal area, the Blue Mountains area and the Southern Highlands. Found in sandy soils in dry sclerophyll open forest, woodland and heath on sandstone.	PMST	Low. The development footprint does not provide any habitat resources suitable for this species.



Scientific Name	Common Name	Status		Distribution and Habitat	Data Source	Likelihood of Occurrence
		BC Act	EPBC Act			
<i>Persoonia mollis</i> subsp. <i>maxima</i>		E	E	Highly restricted, known from the Hornsby Heights-Mt Colah area north of Sydney in the Sydney Basin Bioregion. Occurs in sheltered aspects of deep gullies or on the steep upper hillsides of narrow gullies on Hawkesbury Sandstone. These habitats support relatively moist, tall forest vegetation communities, often with warm temperate rainforest influences. Flowers late December – March.	PMST	Low.  The development footprint does not provide any habitat resources suitable for this species.
<i>Persoonia nutans</i>	Nodding Geebung	E	E	Restricted to the Cumberland Plain in western Sydney, between Richmond in the north and Macquarie Fields in the south. Core distribution occurs within the Penrith, and to a lesser extent, Hawkesbury LGAs, with isolated and relatively small populations also occurring in the Liverpool, Campbelltown, Bankstown and Blacktown LGAs. Confined to aeolian and alluvial sediments and occurs in a range of sclerophyll forest and woodland vegetation communities, with the majority of individuals occurring within Agnes Banks Woodland or Castlereagh Scribbly Gum Woodland.	PMST	Low.  The development footprint does not provide any habitat resources suitable for this species.
<i>Pimelea curviflora</i> var. <i>curviflora</i>	<i>Pimelea curviflora</i> var. <i>curviflora</i>	V	V	Confined to the coastal area of Sydney between northern Sydney in the south and Maroota in the north-west. Former range extended south to the Parramatta River and Port Jackson region including Five Dock, Bellevue Hill and Manly. Occurs on shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes amongst woodlands.	PMST	Low.  The development footprint does not provide any habitat resources suitable for this species.
<i>Pimelea spicata</i>	Spiked Rice-flower	E	E	Broad distribution in western Sydney, occurring on the Cumberland Plain (Narellan, Marayong, Prospect Reservoir areas). Another smaller population is recorded in districts (Landsdowne to Shellharbour to northern Kiama) Illawarra. It grows on well-structured clay soils. On the inland Cumberland Plain sites, it is associated with Grey Box and Ironbark. In the coastal Illawarra it occurs commonly in Coastal Banksia open woodland with a more well-developed shrub and grass understorey.	PMST	Low.  The development footprint does not provide any habitat resources suitable for this species.

Scientific Name	Common Name	Status		Distribution and Habitat	Data Source	Likelihood of Occurrence
		BC Act	EPBC Act			
<i>Pomaderris prunifolia</i>	<i>P. prunifolia</i> (in the Parramatta, Auburn, Strathfield and Bankstown Local Government Areas)	EP	-	Endangered population in the Parramatta, Auburn, Strathfield and Bankstown Local Government Areas. Known from only three sites within the listed local government areas, at Rydalmere, within Rookwood Cemetery and at The Crest of Bankstown. At Rydalmere it occurs along a road reserve near a creek, among grass species on sandstone. At Rookwood Cemetery it occurs in a small gully of degraded Cooks River / Castlereagh Ironbark Forest on shale soils.	BioNet	Low. The development footprint does not provide any habitat resources suitable for this species.
<i>Pterostylis gibbosa</i>	Illawarra Greenhood	E	E	Known from a small number of populations in the Hunter region (Milbrodale), the Illawarra region (Albion Park and Yallah) and the Shoalhaven region (near Nowra). It is apparently extinct in western Sydney which is the area where it was first collected (1803). All known populations grow in open forest or woodland, on flat or gently sloping land with poor drainage. In the Hunter region, the species grows in open woodland dominated by Narrow-leaved Ironbark ( <i>Eucalyptus crebra</i> ), Forest Red Gum ( <i>Eucalyptus tereticornis</i> ) and Black Cypress Pine ( <i>Callitris endlicheri</i> ).	PMST	Low. The development footprint does not provide any habitat resources suitable for this species.
<i>Pterostylis saxicola</i>	Sydney Plains Greenhood	E	E	Restricted to western Sydney between Freemans Reach in the north and Picton in the south. There are very few known populations and they are all very small and isolated. Only one population occurs within a conservation reserve at Georges River National Park. Most commonly found growing in small pockets of shallow soil in depressions on sandstone rock shelves above cliff lines. The vegetation communities above the shelves where it occurs are sclerophyll forest or woodland on shale/sandstone transition soils or shale soils.	PMST	Low. The development footprint does not provide any habitat resources suitable for this species.

Scientific Name	Common Name	Status		Distribution and Habitat	Data Source	Likelihood of Occurrence
		BC Act	EPBC Act			
<i>Pultenaea parviflora</i>	Sydney-bush Pea	E	V	Endemic to the Cumberland Plain the core distribution is from Windsor to Penrith and east to Dean Park. Outlier populations are recorded from Kemps Creek and Wilberforce. May be locally abundant, particularly within scrubby/dry heath areas of Castlereagh Ironbark Forest and Shale Gravel Transition Forest on tertiary alluvium or laterised clays. May also be common in transitional areas where these communities adjoin Castlereagh Scribbly Gum Woodland. <i>Eucalyptus fibrosa</i> is usually the dominant canopy species. <i>Eucalyptus globoidea</i> , <i>E. longifolia</i> , <i>E. parramattensis</i> , <i>E. sclerophylla</i> and <i>E. sideroxylon</i> may also be present or co-dominant, with <i>Melaleuca decora</i> frequently forming a secondary canopy layer. Associated species may include <i>Allocasuarina littoralis</i> , <i>Angophora bakeri</i> , <i>Aristida</i> spp., <i>Banksia spinulosa</i> , <i>Cryptandra</i> spp., <i>Daviesia ulicifolia</i> , <i>Entolasia stricta</i> , <i>Hakea sericea</i> , <i>Lissanthe strigosa</i> , <i>Melaleuca nodosa</i> , <i>Ozothamnus diosmifolius</i> and <i>Themeda australis</i> .	BioNet	Low. The development footprint does not provide any habitat resources suitable for this species.
<i>Pultenaea pedunculata</i>	Matted Bush-pea	V	-	Widespread in Victoria, Tasmania, and south-eastern South Australia, However in NSW it is represented by just three disjunct populations on the Cumberland Plains in Sydney, the coast between Tathra and Bermagui and the Windellama area south of Goulburn. NSW populations are generally among woodland vegetation but plants have also been found on road batters and coastal cliffs. It is largely confined to loamy soils in dry gullies in populations in the Windellama area.	BioNet	Low. The development footprint does not provide any habitat resources suitable for this species.
<i>Rhodamnia rubescens</i>	Scrub Turpentine	CE	-	Occurs in coastal districts north from Batemans Bay in New South Wales, approximately 280 km south of Sydney, to areas inland of Bundaberg in Queensland. Populations of <i>R. rubescens</i> typically occur in coastal regions and occasionally extend inland onto escarpments up to 600 m a.s.l. in areas with rainfall of 1,000-1,600 mm. Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils.	BioNet	Low. The development footprint does not provide any habitat resources suitable for this species.

Scientific Name	Common Name	Status		Distribution and Habitat	Data Source	Likelihood of Occurrence
		BC Act	EPBC Act			
<i>Syzygium paniculatum</i>	Magenta Lilly Pilly	E	V	The Magenta Lilly Pilly is found only in NSW, in a narrow, linear coastal strip from Upper Lansdowne to Conjola State Forest. On the south coast the Magenta Lilly Pilly occurs on grey soils over sandstone, restricted mainly to remnant stands of littoral (coastal) rainforest. On the central coast Magenta Lilly Pilly occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities.	PMST BioNet	Unlikely.  This species may be planted in the locality but does not naturally occur.
<i>Tetratheca glandulosa</i>	Tetratheca glandulosa	V	-	Endemic to NSW, with around about 150 populations from Yengo National Park to Lane Cove National Park. Associates in areas with shale cappings over sandstone. Occurs in heath, scrublands to woodlands and open forest. Common woodland tree species include: <i>Corymbia gummifera</i> , <i>C. eximia</i> , <i>Eucalyptus haemastoma</i> , <i>E. punctata</i> , <i>E. racemosa</i> , and/or <i>E. sparsifolia</i> , with an understorey dominated by species from the families Proteaceae, Fabaceae, and Ericaceae.	BioNet	Low.  The development footprint does not provide any habitat resources suitable for this species.
<i>Thesium australe</i>	Austral Toadflax	V	V	Found in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. It is also found in Tasmania and Queensland and in eastern Asia. Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast. Often found in association with Kangaroo Grass ( <i>Themeda triandra</i> ).	PMST	Low.  The development footprint does not provide any habitat resources suitable for this species.
<i>Triplarina imbricata</i>	Creek Triplarina	E	E	Found only in a few locations in the ranges south-west of Glenreagh and near Tabulam in north-east NSW. Along watercourses in low open forest with Water Gum ( <i>Tristania laurina</i> ).	BioNet	Low.  The development footprint does not provide any habitat resources suitable for this species.
<i>Wahlenbergia multicaulis</i>	Tadgell's Bluebell (in the local government areas of Auburn, Bankstown, Baulkham Hills, Canterbury, Hornsby, Parramatta and Strathfield)	EP	-	Endangered population in the in the local government areas of Auburn, Bankstown, Baulkham Hills, Canterbury, Hornsby, Parramatta and Strathfield LGAs. There are 13 known sites, two of which are in northern Sydney (i.e. Thornleigh and Mt Ku-Ring-Gai) with the remainder in western Sydney (e.g. at Rookwood, Chullora, Bass Hill, Bankstown, Georges Hall, Campsie, South Granville and Greenacre).	BioNet	Low.  The development footprint does not provide any habitat resources suitable for this species.

Scientific Name	Common Name	Status		Distribution and Habitat	Data Source	Likelihood of Occurrence
		BC Act	EPBC Act			
<i>Wilsonia backhousei</i>	Narrow-leafed <i>Wilsonia</i>	V	-	Found on the coast between Mimosa Rocks National Park and Wamberal north of Sydney. It grows in all southern states. This is a species of the margins of salt marshes and lakes, both coastal and inland.	BioNet	Low. The development footprint does not provide any habitat resources suitable for this species.
<i>Zannichellia palustris</i>	<i>Zannichellia palustris</i>	E	-	A submerged aquatic plant. In NSW, known from the lower Hunter and in Sydney Olympic Park. Grows in fresh or slightly saline stationary or slowly flowing water. Flowers during warmer months. NSW populations behave as annuals, dying back completely every summer.	BioNet	Low. The development footprint does not provide any habitat resources suitable for this species.

Distribution and habitat requirement information adapted from: Australian Government SPRAT <http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl> and NSW Government database <https://www.environment.nsw.gov.au/threatenedspeciesapp/>

Key:

CE = critically endangered

E = endangered

EP = endangered population

Ex = extinct

V = vulnerable

This assessment does not include any marine or wetland species as these habitats are not present in the development footprint.



**Table A.3: Likelihood of occurrence assessment for listed Migratory terrestrial species**

Scientific Name	Common Name	Status		Distribution and Habitat	Data Source	Likelihood of Occurrence
		BC Act	EPBC Act			
<i>Cuculus optatus</i>	Oriental Cuckoo	-	M	Migrates from Eurasia as far south as Indonesia, New Guinea and North Australia. Some remain through Australia in the winter. Inhabits rainforest margins, monsoon forest, vine scrub and mangroves.	PMST	Low. The development footprint does not provide any habitat resources suitable for this species.
<i>Monarcha melanopsis</i>	Black-faced Monarch	-	M	Widespread in eastern Australia. Mainly occurs in rainforest ecosystems, including semi-deciduous vine-thickets, complex notophyll vine-forest, tropical (mesophyll) rainforest, subtropical (notophyll) rainforest, mesophyll (broadleaf) thicket/shrubland, warm temperate rainforest, dry (monsoon) rainforest and (occasionally) cool temperate rainforest.	PMST	Low. The development footprint does not provide any habitat resources suitable for this species.
<i>Monarcha trivirgatus</i>	Spectacled Monarch	-	M	Occurs along the entire east coast of Australia. Breeds in dense scrub in gullies of coastal ranges.	PMST	Low. The development footprint does not provide any habitat resources suitable for this species.
<i>Motacilla flava</i>	Yellow Wagtail	-	M	Rare but regular visitor around Australian coast, especially in the NW coast Broome to Darwin. Found in open country near swamps, salt marshes, sewage ponds, grassed surrounds to airfields, bare ground; occasionally on drier inland plains.	PMST	Low. The development footprint does not provide any habitat resources suitable for this species.
<i>Myiagra cyanoleuca</i>	Satin Flycatcher	-	M	Widespread in eastern Australia and vagrant to New Zealand. Inhabit heavily vegetated gullies in eucalypt-dominated forests and taller woodlands, and on migration, occur in coastal forests, woodlands, mangroves and drier woodlands and open forests.	PMST	Low. The development footprint does not provide any habitat resources suitable for this species.
<i>Rhipidura rufifrons</i>	Rufous Fantail	-	M	Occurs in coastal and near coastal districts of northern and eastern Australia. In east and south-east Australia, the Rufous Fantail mainly inhabits wet sclerophyll forests, often in gullies dominated by eucalypts such as Tallow-wood ( <i>Eucalyptus microcorys</i> ), Mountain Grey Gum ( <i>E. cypellocarpa</i> ), Narrow-leaved Peppermint ( <i>E. radiata</i> ), Mountain Ash	PMST	Low. The development footprint does not provide any habitat

Scientific Name	Common Name	Status		Distribution and Habitat	Data Source	Likelihood of Occurrence
		BC Act	EPBC Act			
				(E. regnans), Alpine Ash (E. delegatensis), Blackbutt (E. pilularis) or Red Mahogany (E. resinifera); usually with a dense shrubby understorey often including ferns.		resources suitable for this species.
Migratory marine birds, Migratory marine species, Migratory wetlands species and Listed Marine species have not been considered as no habitat for these species is present in the development footprint.						

## Appendix B. BC Act tests of significance

An Assessment of Significance has been conducted for threatened biodiversity that have been positively identified or that have a moderate or high likelihood of occurring and being impacted by the project.

Section 7.3 of the BC Act outlines the 'test of significance' that is to be undertaken to assess the likelihood of significant impact upon threat-listed species, populations or ecological communities listed under the BC Act. These tests of significance have been undertaken in accordance with the guidelines provided in the Threatened Species Test of Significance Guidelines (Office of Environment and Heritage 2018) which outlines a set of guidelines to help applicants/proponents of a development or activity with interpreting and applying the factors of assessment in the 5-part test.

The threatened species that are considered moderately likely to utilise the habitat within the development footprint are the Grey-headed Flying-fox, Swift Parrot, Little Lorikeet and threatened microbats including the Large Bent-winged Bat, Little Bent-winged Bat, Eastern Coastal Freetailed Bat, Eastern False Pipistrelle, Yellow-bellied Sheath-tail-bat, Greater Broad-nosed Bat, and Southern Myotis.

### B.1 Grey-headed Flying-fox, Swift Parrot, Little Lorikeet and threatened microbats

The following is to be taken into account for the purposes of determining whether a proposed development or activity is likely to significantly affect threatened species or ecological communities, or their habitats:

- 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 Grey-headed Flying-fox occurs in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. Annual mating commences in January and conception occurs in April or May; a single young is born in October or November. There are no roost camps located in the development footprint the project would not directly impact on any known breeding / maternity site. As such, the impacts of the project to the Grey-headed Flying-fox would be limited to loss of foraging habitat in the form of planted trees.

The Swift Parrot breeds in Tasmania and as such this important component of the lifecycle of this species will not be impacted by the project. The foraging resource to be impacted is not considered important for this species and the impacts on the life cycle of the Swift Parrot would be negligible.

There is no breeding habitat for the Little Lorikeet present in the development footprint. As for the Swift Parrot, the foraging resource to be impacted is not considered important for this species and the impacts on the life cycle of the Little Lorikeet would be negligible.

The Large Bent-winged Bat and Little Bent-winged Bat breed in caves so breeding habitat for these two species is not present in the development footprint. These two species also prefer to roost in caves or man-made structures such as mines, storm water tunnels, culverts, or under bridges. No roosting habitat would be impacted. The foraging resource to be impacted is not considered important for this species and the impacts on the life cycle of these species would be negligible.

The Eastern Coastal Freetailed Bat, Eastern False Pipistrelle, Yellow-bellied Sheath-tail-bat, Greater Broad-nosed Bat, and Southern Myotis are generally tree roosting species. The trees within the development footprint may be used for temporary roosting but given the exposed position of the trees and lack of surrounding vegetation use of the trees for a maternity roost is considered unlikely. The foraging resource to be impacted is not considered important for this species and the impacts on the life cycle of these species would be negligible.

The affected area of foraging habitat for these species would represent a very small percentage of the total extent of foraging habitat present within the locality. Given the relative widespread nature of similar planted vegetation in the locality, the abundance of higher quality foraging habitat located near the study area, and that breeding habitats will not be impacted, the project is not expected to significantly affect the life cycle of these species such that a viable local population of the species is likely to be placed at risk of extinction.

- b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:
  - i. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or
  - ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Not applicable.

- c) in relation to the habitat of a threatened species or ecological community:
  - i. the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and
  - ii. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and
  - iii. the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality.

The potential habitat within the study area is limited to foraging habitat. The extent of potential foraging habitat would be reduced. However, this amount of habitat removal is small when the amount of available foraging habitat in the locality is considered.

Importantly, the project would not result in fragmentation of habitat. The project will not break apart a habitat into many smaller pieces. These species are highly mobile and will freely fly long distances (50+ km) over open areas including urbanised city centres to move between roost sites and foraging sites. The project would not affect the movement of these species between habitat patches.

Importantly, the project would not affect the most important habitats for these species within the locality. The most important habitats for the local Grey-headed Flying-fox in the locality are camps and large areas of reliable foraging resources. The most important habitats for the Swift Parrot and Little Lorikeet are the coastal forests that support a significant number of trees that provide a foraging resource. The most important habitats for threatened microbats in the locality are roost sites, bushland areas with suitable roost trees and foraging habitat, and vegetated riparian areas. The foraging habitat within the study area is likely to form part of an overall foraging range for these species and would only form a small proportion of available habitat for these species. As such, the foraging habitat within the development footprint is unlikely to be of critical importance for the survival of these species in the locality.

- 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 project will not impact on any declared area of outstanding biodiversity value.**

- 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.

A Key Threatening Process (KTP) is a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, population or ecological community. Key threatening processes are listed under the BC Act and at the present there are currently 38 listed KTPs. Of the 38 listed KTPs under the BC Act, nine are applicable to this assessment. However, hygiene and weed control measures would reduce or avoid the impact of most KTPs except for clearing of native vegetation.

## Conclusion

There would likely be a small reduction in extent of suitable foraging habitat from the project, but no breeding habitat would be affected suggesting the life-cycle of these species would not be impacted. A viable local population of any of these species is unlikely to be placed at risk of extinction. The extent of impact is small. Fragmentation of habitat for these species will not occur. The habitat to be impacted is not considered important to the long-term survival of these species in the locality.

After consideration of the factors above, an overall conclusion has been made that the project is unlikely to result in a significant effect to the Grey-headed Flying-fox, Swift Parrot, Little Lorikeet or threatened microbats.



## Appendix C. EPBC Act assessments of significance

For threatened biodiversity listed under the EPBC Act, significance assessments have been completed in accordance with the EPBC Act Policy Statement 1.1 Significant Impact Guidelines (Department of Environment 2013). Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment that is affected, and upon the intensity, duration, magnitude and geographic extent of the impacts (Department of Environment 2013). Importantly, for a 'significant impact' to be 'likely', it is not necessary for a significant impact to have a greater than 50 per cent chance of happening; it is sufficient if a significant impact on the environment is a real or not remote chance or possibility (Department of Environment 2013). This advice has been considered while undertaking the assessments.

### C.1 Grey-headed Flying-fox

The Grey-headed Flying-fox exists as one interconnected population along the eastern Australian coastal belt from Rockhampton in central Queensland to Melbourne in Victoria. As a result, for this assessment, the impact has been considered in terms of 'important habitat' as opposed the presence of an 'important population'.

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

There are no roost camps in the development footprint and the project would not affect any known permanent roosting, breeding / maternity site. Therefore, it is likely that the impacts of construction and operation of the project would be confined to minor loss of foraging habitat caused by direct clearing or damage to vegetation during the construction phase.

The project would remove up to 30 planted trees but not all of these trees would be used by this species. Given the relatively widespread nature of similar native vegetation and planted vegetation in the locality and abundance of higher quality foraging habitat within the feeding range of local individuals, the project is not expected to significantly affect important habitat or lead to a long-term decrease in the size of an important population.

- 2) reduce the area of occupancy of an important population

The area of occupancy of the Grey-headed Flying-fox is not known but the species exists as one interconnected population along the eastern Australian coastal belt from Rockhampton in central Queensland to Melbourne in Victoria. The area occupied by this species would remain the same after the project. No decrease in the area of occupancy for this species expected as a result of the project.

- 3) fragment an existing important population into two or more populations

Highly mobile species such as bats are expected to be less impacted by fragmentation. The Grey-headed Flying-fox is particularly well adapted to accessing widely spaced habitat resources given its mobility and preference for seasonal fruits and blossom in differing parts of the landscape. The project would not fragment an important population of the Grey-headed Flying-fox. Individuals would still be able to disperse between roosts along the east Australian coast. Genetic exchange within the population and dispersal would not be disrupted by the project.

- 4) adversely affect habitat critical to the survival of a species

This species typically exhibits very large home range and Grey-headed Flying-fox is known to travel distances of at least 50 kilometres from roost sites to access seasonal foraging resources. There are no known roost camps within the development site and the site does not provide typical or likely roosting habitat. However, there are a number of known roost camps with a 50km radius of the project. The draft recovery plan for the Grey-headed Flying-fox identifies critical foraging habitat for this species as:

- Productive during winter and spring, when food bottlenecks have been identified
- Known to support populations of >30,000 individuals, within an area of 50-kilometre radius of a camp site
- Productive during the final weeks of gestation, and during the weeks of birth, lactation and conception (Sept-May)
- Productive during the final stages of fruit development and ripening in commercial crops affected by Grey-headed Flying-foxes
- Known to be continuously occupied as a camp site.

The foraging habitat in the development site is unlikely to constitute critical foraging habitat. Given the extensive nature of high-quality foraging habitats within the range of local bats, the project is not expected to adversely affect foraging habitat critical to the survival of this species in this region.

5) disrupt the breeding cycle of an important population

As stated above there would be a minor impact on foraging habitat, but the project would not directly impact on a known or likely roost camp / breeding or maternity site. Extensive foraging resources are available in the locality that would provide suitable resources during the maternity season. The habitats in the development site are not limiting for this species.

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 impacts to foraging habitat are likely to be negligible. The project is not expected to lead to a decline in the species in this region considering the magnitude of this impact and the expanse of high-quality foraging habitat available to local animals.

7) result in invasive species that are harmful to a vulnerable species becoming established in the Vulnerable species' habitat

The project is unlikely to result in an invasive species harmful to the Grey-headed Flying-fox becoming established in the habitat. The potential for weed invasion with a project of this nature is minimal given the site context.

8) introduce disease that may cause the species to decline, or

There are no known disease issues affecting this species of relevance to the project. The project would be unlikely to increase the potential for significant disease vectors to affect local populations.

9) interfere substantially with the recovery of the species.

The Draft National Recovery Plan for the Grey-headed Flying-fox (*Pteropus poliocephalus*) (Department of Environment Climate Change and Water 2009) outlines the following actions:

- Identify and protect foraging habitat critical to the survival of Grey-headed Flying-foxes across their range
- Enhance winter and spring foraging habitat for Grey-headed Flying-foxes
- Identify, protect and enhance roosting habitat critical to the survival of Grey-headed Flying-foxes
- Significantly reduce levels of deliberate Grey-headed Flying-fox destruction associated with commercial horticulture
- Provide information and advice to managers, community groups and members of the public that are involved with controversial flying-fox camps
- Produce and circulate educational resources to improve public attitudes toward Grey-headed Flying-foxes, promote the recovery program to the wider community and encourage participation in recovery actions
- Monitor population trends for the Grey-headed Flying-fox

- Assess the impacts on Grey-headed Flying-foxes of electrocution on powerlines and entanglement in netting and barbed wire, and implement strategies to reduce these impacts
- Oversee a program of research to improve knowledge of the demographics and population structure of the Grey-headed Flying-fox
- Maintain a National Recovery Team to oversee the implementation of the Grey-headed Flying-fox National Recovery Plan

The recovery actions listed above are largely not applicable to the project and the project is not expected to interfere appreciably with the recovery of the species.

## Conclusion

The Grey-headed Flying-fox would be subject to a small reduction in extent of suitable foraging habitat from the project. No breeding camps or other important habitat would be impacted. The project is unlikely to reduce the population size of the Grey-headed Flying-fox or decrease the reproductive success of this species. The project would not interfere with the recovery of the Grey-headed Flying-fox and would not contribute to the key threats to this species. After consideration of the factors above, an overall conclusion has been made that the project is unlikely to result in a significant impact to the Grey-headed Flying-fox.

## C.2 Swift Parrot

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

- 1) Lead to a long-term decrease in the size of a population

The development footprint contains some potential foraging habitat for the Swift Parrot. While the habitat in the development footprint is marginal, the loss of potential feed trees would directly affect the species opportunity to feed in the area. However, the development footprint is not considered a critical area for the Swift Parrot. The Swift Parrot may utilise trees in the development footprint for foraging intermittently when no other suitable inland (i.e. box ironbark woodlands) or coastal resources (i.e. Spotted Gum and Swamp Mahogany forests) are available.

The Swift Parrot does not breed in the study area and the small amount of habitat present in the study area is of marginal suitability. Thus, the action is unlikely to lead to a long-term decrease in the size of the Australian population.

- 2) Reduce the area of occupancy of the species

As a specialist nectarivore dependent on flowering eucalypts, Swift Parrots are vulnerable to the loss of quantity and quality of key forage tree species. As a large-scale migrant, it has the ability to cover vast areas of its winter range, seeking suitable flowering eucalypt habitat. The species is an occasional visitor to the region and may utilise trees in the study area for foraging intermittently when no other suitable resources are available.

The project would contribute very slightly to the loss of potential foraging habitat and would have a negligible impact on the area of habitat available. The action will not reduce the area of occupancy of this species which is estimated at 4,000 km<sup>2</sup>.

- 3) Fragment an existing population into two or more populations

The action will not result in fragmentation of habitat for the Swift Parrot. This species is highly mobile and as a regular behaviour flies long distances over open areas to move between suitable foraging habitats. The action will not affect the movement of the Swift Parrot between habitat patches or fragment the population

- 4) Adversely affect habitat critical to the survival of a species

Key habitats for this species on the coast and coastal plains of New South Wales include large stands of Spotted Gum (*Corymbia maculata*), Swamp Mahogany (*E. robusta*), Red Bloodwood (*Corymbia gummifera*) and Forest Red Gum (*E. tereticornis*) forests. The study area supports stands of winter flowering eucalypts, which may be suitable habitat for this species. The habitat within the study area is considered to be marginal habitat for the Swift Parrot as this species is not regularly recorded from the area, the habitat is highly modified, and it is not known as critical habitat.

5) Disrupt the breeding cycle of a population

The Swift Parrot is endemic to south-eastern Australia, breeds only in Tasmania, and migrates to mainland Australia in autumn. As such, the project will not impact on breeding habitat for this species. Important winter foraging grounds will not be impacted.

6) Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

As a large-scale migrant, this species can cover vast areas of its winter range, seeking suitable flowering eucalypt habitat. The species is an occasional visitor to the region and may utilise trees in the study area for foraging intermittently when no other suitable resources are available. The project is unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

7) Result in invasive species that are harmful to a Critically Endangered or Endangered species becoming established in the Endangered or Critically Endangered species' habitat

Weed invasion is considered possible with a proposal of this nature and appropriate controls are required during construction and operation to reduce this threat.

8) Introduce disease that may cause the species to decline, or

Beak and feather disease affecting endangered psittacine species is listed as a Key Threatening Process (KTP) potentially affecting this species. There is no mechanism by which the project could introduce or exacerbate this or any other disease potentially affecting the species. The project would be unlikely to increase the potential for significant disease vectors to affect the species.

9) Interfere with the recovery of the species.

The National Recovery Plan for the Swift Parrot (Saunders and Tzaros 2011) identifies the following actions for recovery of this species:

- Identify the extent and quality of habitat.
- Manage and protect Swift Parrot habitat at the landscape scale.
- Monitor and manage the impact of collisions, competition and disease.
- Monitor population and habitat.

The recovery actions listed above to help recover the Swift Parrot are generally not applicable to the project. The project will not interfere appreciably with the recovery of the Swift Parrot.

#### Conclusion

The Swift Parrot will be subject to a small reduction in extent of foraging habitat from the project. The project is unlikely to reduce the population size of the Swift Parrot or decrease the reproductive success of this species. The project will not interfere appreciably with the recovery of the Swift Parrot.

After consideration of the factors above, an overall conclusion has been made that the project is unlikely to result in a significant impact to the Swift Parrot.

## Appendix D. Tree retention plan prepared by Tree IQ







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### Addendum Powerhouse Parramatta Project - BDAR Waiver Request

#### Threatened microbat survey within human-made structures to be demolished

## 1. Introduction

This addendum has been prepared to support the Powerhouse Parramatta Project Biodiversity Development Assessment Report (BDAR waiver request) prepared by Jacobs 31 March 2020.

As outlined in the BDAR waiver guideline: How to apply for a biodiversity development assessment report waiver for Major Project Application (DPIE 2019), human-made structures may provide habitat for threatened species, particularly microbats. Therefore, as the proposed development includes demolition of buildings and other human-made structures, this addendum has been prepared to document the methods and results of an inspection of the subject structures.

## 2. Methods

The first stage of the assessment was to conduct a background review of existing literature to identify the threatened microbat species known from the locality and which may potentially occupy buildings. The review focused on identifying cave-dwelling species and species known to roost in buildings.

Records of threatened species of bats were obtained from the BioNet Atlas for the project locality, (accessed 24 April 2020). Records for threatened species listed pursuant to the EPBC Act that could potentially occur in the project locality were obtained from the Department of Agriculture and Environment Protected Matters Search Tool (accessed 24 April 2020). A list of the cave-dwelling bat species known or expected from the locality based on review of these records is presented in Table 1. These species were targeted in the site survey.

Table 1. List of threatened cave-dwelling microbats expected in the Parramatta locality

Species	EPBC Act	BC Act	BioNet Atlas record within 5 km	Comments
<i>Chalinolobus dwyeri</i>	V	V	-	Records from shallow caves and mines, and buildings, but also thought to be tree-dwelling species
<i>Chalinolobus picatus</i>	-	V	-	Recorded in caves but not an obligate cave-dweller
<i>Falsistrellus tasmaniensis</i>	-	V	Yes	Recorded in caves and mines in NSW. Not an obligate cave-dweller
<i>Miniopterus australis</i>	-	V	Yes	Obligate cave-dweller. Large colonies are known from derelict mines, culverts, man-made tunnels and buildings
<i>Miniopterus schreibersii oceansis</i>	-	V	Yes	Obligate cave-dweller. Large colonies are known from derelict mines, culverts, man-made tunnels and buildings
<i>Myotis macropus</i>	-	V	Yes	Also roosts in vegetation near water, not an obligate cave-dwelling species, however largest

Species	EPBC Act	BC Act	BioNet Atlas record within 5 km	Comments
				colonies are known from tunnels and mine-like structures.
<i>Saccolaimus flaviventris</i>	-	V	Yes	Reported from caves in NSW and may utilise mines and buildings. Not an obligate cave-dwelling species

In Australia there is ample evidence of cave-dwelling microbats roosting in artificial created structures such as culverts, bridges and mines shafts. There is also evidence of roosting in timber and iron roofs (Law and Chidel 2007, Sanderson et al 2010) and steel structures (North West Ecological Services 2012). In all cases where bats were found roosting in artificial structures the site was in proximity to large expanses of natural vegetation.

Existing buildings to be demolished to accommodate the Powerhouse Parramatta project include the Riverbank Car Park, Willow Grove and St George's Terrace (located at 36, 40 and 42 Phillip Street Parramatta). The assessment aimed to:

- Survey for threatened microbat daytime roosts in buildings proposed to be demolished.
- Assess the suitability of the human-made structures to be demolished to provide important microbat roosting habitat.

An inspection of the existing buildings was carried out by two ecologists on 23 April 2020. Each of the existing building's interior and exterior were thoroughly searched using spotlights and torch light to identify roosting microbats or evidence of past use (guano and/or urine staining) in areas such as the roof cavity, as well as crevices, windows, eaves, walls, fireplaces and pipe structures. Additionally, the suitability of the human-made structures was assessed using observation and a camera to photograph the condition of the buildings to determine potential microbat entry points and roosting habitat.

### 3. Results

No roosting microbats were identified in any of the buildings searched, either common or threatened species. The buildings in the study area are in good condition and only relatively recently vacated. None of the buildings displayed evidence to suggest that they are currently occupied as a daytime roost, or indeed have potential to be used by microbat species for roosting or breeding in the immediate future prior to demolition.

#### 3.1 Willow Grove

Willow Grove is a two-storey villa of Victorian Italianate style constructed in the 1870s. The Willow Grove building showed no evidence of entry by microbats and no evidence of current or past daytime roosting by threatened microbats.

Threatened microbat survey within human-made structures to be demolished



Photo 1. Exterior view of Willow Grove.



Photo 2. Willow Grove external ceiling displaying light socket with no light globe. This socket was sealed with no evidence of an entry point for microbats.



Photo 3. Exhaust fan at Willow Grove is completely sealed in window.

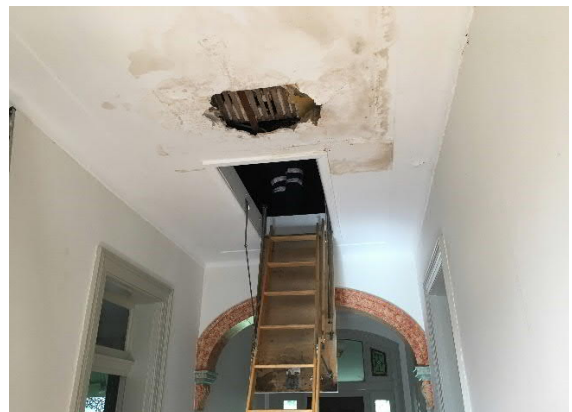


Photo 4. Searches for microbats were undertaken in the roof cavity at Willow Grove.



Photo 5. The fireplace was inspected for microbats by shining a spotlight torch within the chimney.



Photo 6. The roof cavity of the Willow Grove building was searched with a spotlight and demonstrated no openings or damage for microbats to enter.



### 3.2 36 & 40 Phillip Street

The buildings located at 36 & 40 Phillip Street comprise a two-storey building associated with previous retail and business premises. These buildings showed no evidence of entry by microbats and no evidence of current or past daytime roosting by threatened microbats.



Photo 7. 36 & 40 Phillip St internal view.



Photo 8. The roof cavity at 36 & 40 Phillip St was searched with a spotlight and demonstrated no openings or damage for microbats to enter.



Photo 9. The windows were all sealed and closed showing no indication of damage for microbats to enter the building at 36 & 40 Phillip St.

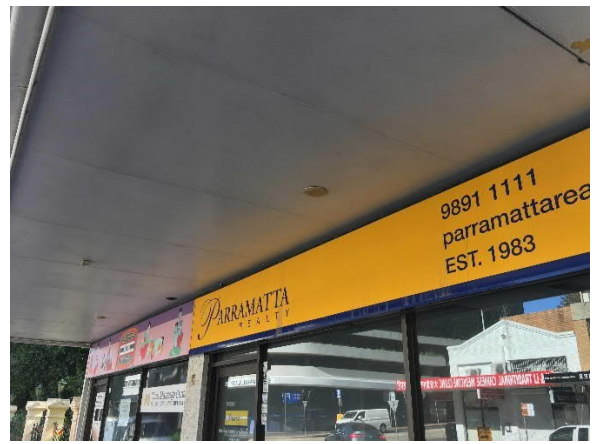


Photo 10. The exterior ceilings and joins were in good condition at 36 & 40 Phillip St and no entry points were found for suitable microbat roosting habitat.

### 3.3 St George's Terrace

The St George's Terrace is a two-storey terrace of seven houses fronting Phillip Street constructed in the 1880s. The terrace was inspected and showed no evidence of entry by microbats and no evidence of current or past daytime roosting by threatened microbats.



Photo 11. The external structure was intact and sealed offering no entry points for microbats at St George's Terrace.



Photo 12. The St George's Terrace demonstrated no suitable roosting habitat or entry points for microbats.

### 3.4 42 Phillip Street

The building located at 42 Phillip Street is a substation building set back from the street comprising retail premises. The substation was inspected and showed no evidence of entry by microbats and no evidence of current or past daytime roosting by threatened microbats.



Photo 13. The windows, ceilings, walls and spaces were searched at 42 Phillip Street, demonstrating no entry points for microbats to enter this building.



Photo 14. The interior of 42 Phillip Street was in good condition and showed no signs of damage or entry points for microbats to enter the building.





Photo 15. The exterior of 42 Phillip Street was inspected in areas with pipes entering the building to check holes and crevices as possible points of entry. No entry points were detected at this building.



Photo 16. The pipes, ceilings and windows of 42 Phillip Street were observed for suitable roosting habitat and entry points for microbats. No suitable habitat or entry points were detected at this building.



Photo 17. A small brick building located on the property of 42 Phillip Street could not be accessed from within. The holes in the wall were inspected, indicating the presence of a person's belongings. No microbats were detected in this structure.



Photo 18. External view of the small brick building on the property of 42 Phillip Street.

### 3.5 Riverbank Car Park

The Riverbank Car Park is a four-level public car park. The carpark was inspected and showed no evidence of entry by microbats and no evidence of current or past daytime roosting by threatened microbats.

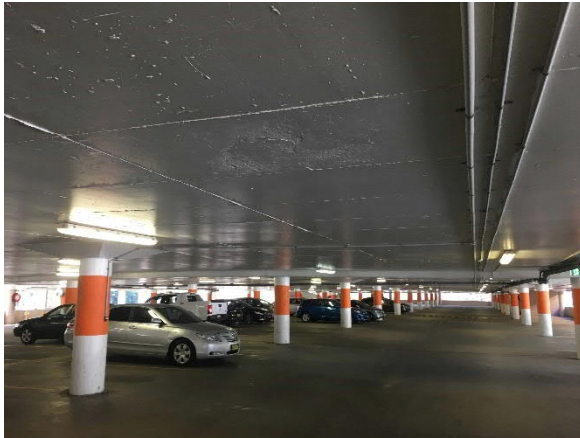


Photo 19. Riverbank Car Park ceilings were predominantly intact with no large holes or deep crevices suitable for microbat roosting habitat.



Photo 20. Ceiling crevices in the Riverbank Car Park were documented, however these crevices were assessed as not suitable microbat roosting habitat as they were too shallow.



Photo 21. West end of the Riverbank Car Park exterior concrete wall with a deep hole extending upward. No microbats detected in this hole.



Photo 22. Exterior of the Riverbank Car Park was searched and demonstrated no potential roosting habitat for microbats.



Photo 23. Riverbank Car Park stair well had no indication of microbat roosting habitat.



Photo 24. Roller door of the Riverbank Car Park demonstrated no sign of microbat roosting habitat.



#### 4. Conclusion and Management Considerations

No threatened microbats nor evidence of any past daytime roosting by bats was observed within the suite of existing buildings to be demolished as part of Powerhouse Parramatta project. Cave-dwelling bats rely on the presence of specific microclimatic conditions within their roost sites which facilitate the maintenance of a range of metabolic or physiological conditions necessary to their survival and reproduction.

While a number of tight spaces were identified including cracks and crevices, holes and joins these were mostly shallow and did not offer suitable microclimate conditions suitable for permanent roosting or maternity roosts. The ceilings and roof cavities were all in good condition with no damage or openings where threatened microbats could enter.

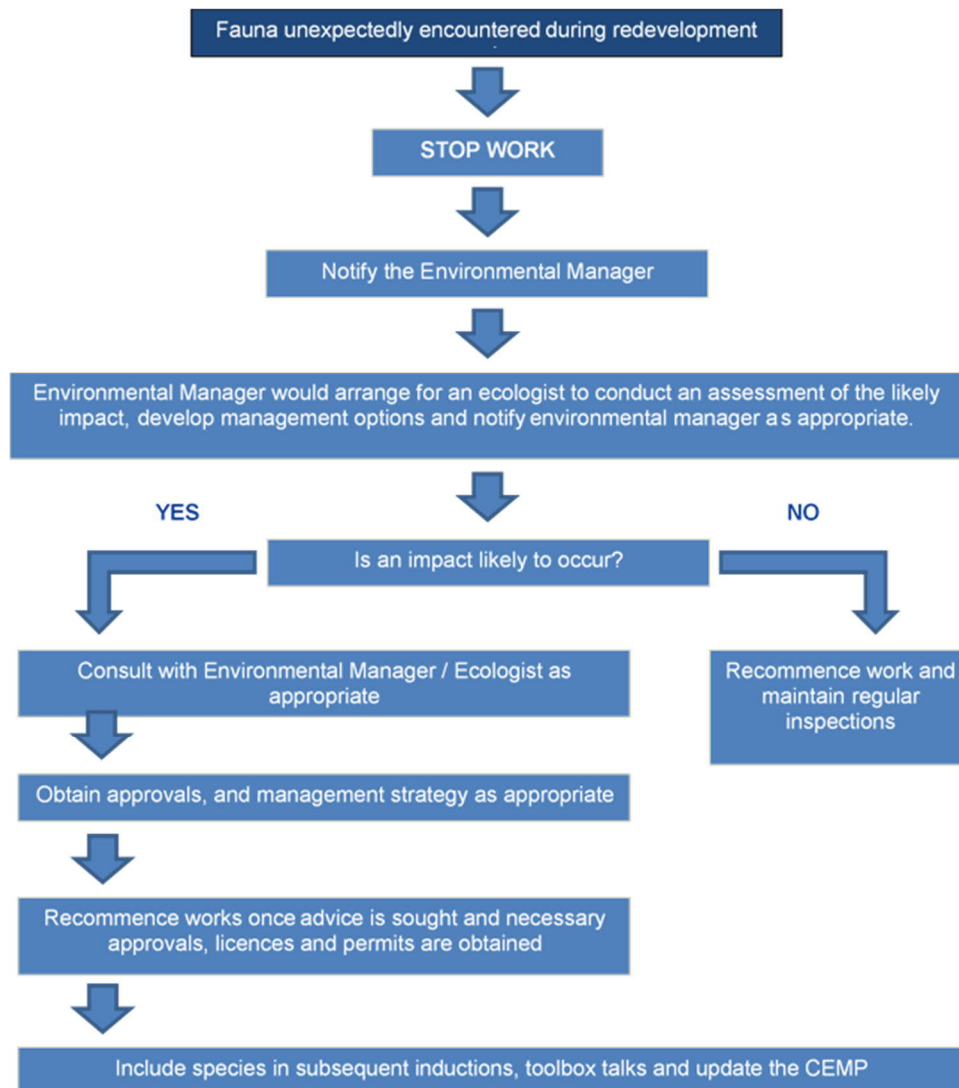
Microclimatic conditions that are selected by bats vary between species and vary seasonally for individual species. For example, it has been established that female Bent-winged Bats select sites in summer with high, domed ceilings which trap heat and humidity, and thus aid in the maintenance of high temperatures for the maternity colony of young bats. This helps the pups to maintain their body temperature when the females are absent at night foraging. It also appears to accelerate the growth rates of the young and help them attain early independence.

The same species is known to select roost sites with low ambient temperatures in winter that facilitate a lowering of body temperature and entry into torpor (brief periods of hibernation). Damp sites, or those with free standing water, will often have quite high humidity and may thus attract species of bats that prefer those conditions.

The vacated buildings were generally found to be unsuitable as roosting habitat for bats due to the open nature of the infrastructure and lack of dark warm havens in the interior. In these areas, air flow made the conditions cool and dry. Where dark recesses were identified, for example in closed roofs, these generally lacked sufficient air flow.

##### 4.1 Unexpected finds procedure

As no roosting microbats have been confirmed, there are no specific management measures required at this stage to avoid potential impacts. As a safeguard it is recommended that future demolition crews on the project are inducted to identify the possibility that roosting microbats could be encountered during the work at any stage of the demolition. In the event that a bat roost is identified during any part of the demolition works then an unexpected finds procedure should apply. The procedure is illustrated below and involves stopping work and consulting with an appropriately experienced bat ecologist to provide advice on work methods and timing to minimise impacts on the bats.



### 5. References

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Mr Tom Kennedy  
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**Attn:** Mr Tom Kennedy  
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2 June 2020

Dear Mr Kennedy

**Biodiversity Development Assessment Report Waiver Request  
Powerhouse Parramatta (SSD 10416)**

I refer to your correspondence received on 1 April 2020 and additional information on 29 April 2020 seeking to waive the requirement to submit a biodiversity development assessment report (BDAR) with the above State significant development application under section 7.9(2) of the Biodiversity Conservation Act 2016 (BC Act):

I have reviewed your request having regard to Sections 1.5 and 7.3 of the BC Act and Clause 1.4 of the Biodiversity Conservation Regulation 2017, and have determined that the proposed development (SSD 10416), as described in your waiver request, is not likely to have any significant impacts on biodiversity values.

The delegated Environment Agency Head in the Energy, Environment and Science Group has also determined that the proposed development is not likely to have any significant impacts on biodiversity values in a letter dated 14 May 2020 and a copy of that letter is attached.

Therefore, a waiver under section 7.9(2) of the BC Act is granted for the proposed development and a BDAR is not required to accompany the SSD application.

If there are any amendments to the proposed development, this BDAR waiver determination will not be valid. You will need to either prepare a BDAR or lodge a new request to have the BDAR requirement waived.

Should you have any further enquiries, please contact Marcus Jennejohn, Key Sites Assessments, at the Department on (02) 8289 6798.

Yours sincerely,



Anthony Witherdin  
**Director**  
**Key Sites Assessments**

As delegate of the Secretary



Our ref: DOC20/268740

Senders ref: SSD 10416

Marcus Jennejohn  
Senior Planning Officer  
Key Sites Assessments  
Planning and Assessment Group  
NSW Department of Planning, Industry and Environment  
4 Parramatta Square,  
12 Darcy Street  
PARRAMATTA NSW 2150

Dear Mr Jennejohn,

**Request for Revised Biodiversity Development Assessment Report Waiver for New Powerhouse (SSD 10416)**

I refer to the request to waive the requirement for a Biodiversity Development Assessment Report (BDAR) to be submitted with the above State Significant Development Application for the New Powerhouse.

I have reviewed the information provided by the applicant in the Revised BDAR waiver application prepared by Jacobs dated 8 May 2020 and determined that the proposed development is not likely to have any significant impact on biodiversity values. The application, therefore, does not need to be accompanied by a BDAR.

The determination is attached for you to provide to the applicant. Please note that if the proposed development is changed so that it is no longer as described in Schedule 1 of the determination, the applicant will need to lodge a new waiver request or prepare a BDAR.

Also attached for your information is the decision report prepared by Environment, Energy and Science Group (EES). The decision report should not be provided to the applicant without EES approval.

If you have any questions about this advice, please do not hesitate to contact Bronwyn Smith, Senior Conservation Planning Officer on 9873 8604 or [Bronwyn.smith@environment.nsw.gov.au](mailto:Bronwyn.smith@environment.nsw.gov.au)

Yours sincerely



14/05/2020

**Daylan Cameron**  
**A/Director Greater Sydney Branch**  
**Climate Change and Sustainability**  
**Environment, Energy and Science**