Waterloo South Renewal Planning Proposal

Flora and Fauna Study

Prepared for NSW Land and Housing Corporation

15 April 2020

DOCUMENT TRACKING

Item	Detail
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Images	Upper left: Courtyard between McEvoy Street and George Street; Upper right: Vegetation adjacent to McEvoy Street, including *Eucalyptus saligna* (Sydney Blue Gum) and *Eucalyptus microcorys* (Tallowwood); Lower left: Fig tree species located along Wellington Street; Lower right: *Eucalyptus saligna* (Sydney Blue Gum) on Kellerick Street.

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ACKNOWLEDGEMENTS

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Abbreviations

Abbreviation	Description
ALA	Atlas of Living Australia
BAM	Biodiversity Assessment Methodology
BC Act	*NSW Biodiversity Conservation Act 2016*
BDAR	Biodiversity Development Assessment Report
BLA	BirdLife Australia
BOS	Biodiversity Offset Scheme
CCB Guide	Connected Corridors Biodiversity Guide
CEEC	Critically Endangered Ecological Community
CEMP	Construction Environmental Management Plan
CoS	City of Sydney
DA	Development Application
DCP	Development Control Plan
DoEE	Commonwealth Department of the Environment and Energy
EEC	Endangered Ecological Community
ELA	Eco Logical Australia Pty Ltd
EP&A Act	*NSW Environmental Planning and Assessment Act 1979*
EPBC Act	*Commonwealth Environment Protection Biodiversity Conservation Act 1999*
FBA	Framework for Biodiversity Assessment
FFA	Flora and Fauna Assessment
FSR	Floor Space Ratio
GFA	Gross Floor Area
GHFF	Grey-headed Flying-fox
GSLLS	Greater Sydney Local Land Services
ISD	Integrated Station Development
LAHC	NSW Land and Housing Corporation
LEP	Local Environmental Plan
LGA	Local Government Area
MNES	Matter of National Environmental Significance
NGIN	National Green Infrastructure Team
OEH	Office of Environment and Heritage

OSD	Over Station Development
SEARS	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
SSROC	Southern Sydney Regional Organisation of Councils
SSP	State Significant Precinct
TEC	Threatened Ecological Community
TSC Act	*NSW Threatened Species Conservation Act 1995*
UESAP	Urban Ecology Strategic Action Plan
Urban Renewal SEPP	State Environmental Planning Policy (Urban Renewal) 2010
WSUD	Water Sensitive Urban Design

Executive Summary

Eco Logical Australia was originally engaged by UrbanGrowth NSW to conduct a Flora and Fauna Assessment for Waterloo 'Estate' (the study area) a portion of Waterloo State Significant Precinct, in relation to an Indicative Concept Proposal. The Flora and Fauna Assessment was intended to support the rezoning of the study area through the State Significant Precinct process, to produce new planning controls that would enable future development applications to be prepared for the renewal of the Estate. A Flora and Fauna Report for the adjacent Waterloo Metro Quarter had previously been completed in September 2018.

The Study Requirements for the Estate issued by the Minister for Planning on 19 May 2017 are still applicable to this planning proposal. This report presents that assessment and responds to the Biodiversity and Urban Ecology requirements of the Study Requirements. These Study Requirements are provided below.

Reference number	Study Requirement	Addressed at
1.5	**Vision, Strategic Context and Justification** Consideration of City of Sydney planning documents, strategies and policies including, but not limited to: • Urban Ecology Strategic Action Plan (UESAP) 2014 *It is noted that 'Urban Ecology Strategic Action Plan' and 'Urban Ecology Strategic Action Plan 2014' are considered the same document.*	**Section 5.1.2**
1.5	• Connected Corridors for Biodiversity: Guide to regulatory tools, financial incentives and other mechanisms for promoting biodiversity conservation on private property (SSROC)	**Section 5.1.3**
1.5	• Greater Sydney LLS – Biodiversity Corridor Mapping https://trade.maps.arcgis.com/apps/webappviewer/index.html?id=3afa804b96ac4d69a74e9b1ed9780328	**Figure 3**
1.5	• Urban Ecology Renewal Investigation Project Report (NGIN 2017)	**Section 5.1.4**
13.1	**Biodiversity** Assess and document biodiversity impacts in accordance with the Framework for Biodiversity Assessment (FBA), unless otherwise agreed by Office of Environment and Heritage (OEH), by a person accredited in accordance with s142B(1)(c) of the TSC Act. Note that this has now been replaced by the BC Act.	**Section 5.4 – see below**
15.1	**Urban Ecology** Prepare an ecological assessment by a suitably qualified ecologist following the guidelines in Southern Sydney Regional Organisation of Councils (SSROC) Connected Corridors for Biodiversity: Guide. Include species and	**Section 5.1.2** **Section 5.1.3**

	communities of local conservation significance, as identified in the City's Urban Ecology Strategic Action Plan (UESAP), as well as, listed threatened species and ecological communities. Include in the assessment the following:	
15.1	• Identify any species that are of particular conservation significance (including threatened species and locally-significant species identified in the City's UESAP.	**Section 5.1.2** **Section 5.1.3**
15.1	• Determine the nature and extent of impacts to the urban vegetation and fauna, particularly those of conservation significance (if present), that are likely to result from each stage of the development.	**Section 8**
15.1	• Outline the mitigation measures that will be employed to avoid or minimise such impacts, including; o clearing and relocating of any onsite indigenous flora and fauna prior to works commencing o protecting of any significant habitat features o restoration / creation of compensatory habitat for any important habitat features removed / disturbed as a result of the development, and	**Section 7.2** **Section 7.3**
15.1	• Provide recommendations and identify opportunities to create habitat features that will benefit urban biodiversity. This report should identify, but not be limited to, what habitat features are to be retained, species to be planted, and other habitat features are to be created.	**Section 7.3**
15.2	To achieve the City's UESAP overall objectives, for this site it is considered appropriate that mid and understorey plantings using locally native indigenous plants comprise of a minimum: • 60% within the public domain; 70 species, and • 40% within private property; 15 species.	**Section 7.3.2**
15.3	Integrate the findings of other urban biodiversity / ecology parts of this study and demonstrate how these have shaped the plan for the site and how they contribute to meeting the City's Urban Ecology requirements and targets.	**Section 7.3**

It should be noted that the study requirements were issued prior to the introduction of the NSW *Biodiversity Conservation Act 2016* (BC Act). At the time, transitional arrangements under the *Biodiversity Conservation (Savings and Transition) Regulation 2017* provided for projects that had been 'substantially commenced' to be finalised using relevant existing assessment and approval pathways. Therefore, in terms of biodiversity impact, this original assessment was undertaken in accordance with the now repealed *Threatened Species Conservation Act 1995* (TSC Act). This report has been updated where applicable to reflect the change in legislation to the BC Act.

The study area contains low biodiversity constraints or conservation opportunities in relation to the NSW BC Act and Commonwealth *Environment Protection Biodiversity Conservation Act 1999* (EPBC Act).

The field survey confirmed that the study area does not contain any native vegetation communities indigenous to the area. Therefore, at the time of the original assessment of impacts, using the Framework for Biodiversity Assessment was not considered appropriate for the proposed planning proposal. Correspondence between Eco Logical Australia Pty Ltd and the Office of Environment and Heritage at that time confirmed that the Framework for Biodiversity Assessment would not be appropriate for this project, and a Flora and Fauna Assessment report would be suitable.

The baseline investigation (**Section 5**) identified a total of 162 flora species, comprising 65 native species and 99 exotic species within the study area. The most common native endemic species was *Melaleuca quinquenervia* (Broad-leaved Paperbark) (74 individuals). The most common native non-endemic species were *Eucalyptus microcorys* (Tallowwood) (75 individuals), *Casuarina cunninghamiana* (River Oak) (68 individuals), and *Ficus microcarpa* var. *hillii* (Hill's Weeping Fig) (64 individuals). The most common introduced non-invasive species was *Platanus* x *acerifolia* (London Planetree) (42 individuals). The most common introduced non-native horticultural planting species was *Robinia pseudoacacia* (Frisia) (58 individuals). The study area contains minimal mid-storey and groundcover species (native and exotic).

No State or Commonwealth listed threatened ecological communities or threatened flora species occur naturally, or are likely to occur within the study area. The Likelihood of Occurrence analysis determined that *Pteropus poliocephalus* (Grey-headed Flying-fox), listed as *Vulnerable* under both the BC Act and EPBC Act, is 'likely' to utilise tree species within the study area for foraging. No roosting sites were recorded. The nectar and pollen of native trees provide potential foraging habitat for Grey-headed Flying-fox, especially species in the families of Myrtaceae (e.g. *Eucalyptus robusta*) and Proteaceae (e.g. *Banksia integrifolia)* (Eby and Law 2008). Species from the families Myrtaceae, Proteaceae, and Moraceae provide potential habitat for Grey-headed Flying-fox. 'Small birds as a general group' (under the Urban Ecology Strategic Action Plan (UESAP)) prepared by the City of Sydney Council in 2016 also have the potential to occur within the study area. Potential marginal foraging and nesting habitat for small birds within native and exotic canopy tree species is also present within the study area.

Potential habitat for other threatened species and species of local conservation significance, such as *Ninox strenua* (Powerful Owl), listed as Vulnerable under the BC Act, *Perameles nasuta* (Long-nosed Bandicoot), microbats (UESAP general group, including some species listed under the BC Act and EPBC Act), reptiles (UESAP general group), and freshwater wetland birds (UESAP general group), was not recorded within the study area. Although microbats are likely to occur in urban areas, the field survey identified no specific urban features (such as culverts or bridges) where microbats are particularly likely to utilise as occurring within the study area. If, during the development application stage any additional information becomes available, and it is considered that any microbat habitat may be impacted, an assessment under the BC Act, which may include targeted surveys and potential offsetting, will be undertaken.

The Indicative Concept Proposal for Waterloo South is detailed in **Section 6**, and would involve the removal of approximately 2.4 ha of planted native and exotic canopy vegetation within the study area The Indicative Concept Proposal requires a substantial contiguous area to construct commercial and residential structures. Draft mitigation measures have been outlined in **Section 8.2**.

Although no significant habitat features (for example, hollow-bearing trees, or sandstone outcrops) were identified within the study area, there are opportunities for the creation of habitat for flora and fauna, including native streetscapes, urban green infrastructure, and nest boxes (**Section 7.3**). The study area is located adjacent to an existing tree network that has been mapped as an urban green corridor by Greater Sydney Local Land Services (GSLLS; Figure 3). It is important to maintain existing connectivity

of green space throughout urban areas to sustain urban biodiversity. The development of this project has the potential to enhance and strengthen this green corridor, assisting native fauna to move freely throughout the area.

An impact assessment was conducted for the clearance of nominated vegetation within Waterloo South (**Section 9**) on the Grey-headed Flying-fox. The Waterloo South works would remove approximately 2.4 ha of potential foraging habitat for Grey-headed Flying-fox. This figure comprises planted native canopy vegetation, including approximately 12 *Ficus* sp.individuals, 121 individuals of *Eucalyptus/Corymbia/Angophora* sp., 27 *Lophostemon confertus* (Brush Box) and 27 *Melaleuca quinquenervia* (Broad-leafed Paperbark) (a significant feed tree species; Eby and Law 2008).

Noting that this report relates to a planning proposal and not the development application, a Test of Significance (AoS) under the BC Act was undertaken to assess the impacts that are likely at the development stage. The assessment determined that the proposed Waterloo South works would not cause a significant impact to Grey-headed Flying-fox (GHFF), (**Appendix C**). A Significance Assessment under the EPBC Act determined that the proposed Waterloo South works would not cause a significant impact to GHFF (**Appendix D**). The Significance Assessment noted that according to the National Flying-fox Monitoring Program, no GHFF camps currently occur or have ever been recorded within the study area (DoEE 2018). Foraging resources for an important populations of GHFF occur within the study area. It is important to note that the staged development approach will ensure a continuous overlap of habitat retention and replacement, thus minimsing disruption to GHFF foraging resources.

The development of Waterloo South would remove 2.4 ha of marginal habitat for small birds as a general group, as identified under the UESAP. Small birds as a general group are not listed under the BC Act or EPBC Act, and therefore assessment using a Test of Significance or Significance Assessment is not required. The loss of the habitat will however have a temporary effect on local bird and reptiles until the landscaping elements are established. The staged development approach will ensure a continuous overlap of habitat retention and replacement, thus minimsing disruption to local birds and reptiles.

It should be noted that any future ecological assessments at the development application stage must be completed in accordance with the *NSW Biodiversity Conservation Act 2016.* It is considered likely that offsetting under the Biodiversity Assessment Methodology may be required at the development application stage due to the presence of planted native vegetation, GHFF habitat, and prescribed impacts (which include planted non-native vegetation). Assessment for microbat habitat may also be required with regards to upgrades to stormwater infrastructure works at the development application stage.

Notwithstanding, with regards to the change in legislation, and requirements for assessment and potential offsetting at the development application stage, it is not considered that the recommendations made in this planning report will be materially changed.

1 Introduction

1.1 Introduction

The Greater Sydney Region Plan and Eastern City District Plan seek to align growth with infrastructure, including transport, social and green infrastructure. With the catalyst of Waterloo Metro Station, there is an opportunity to deliver urban renewal to Waterloo Estate that will create great spaces and places for people to live, work and visit.

The proposed rezoning of Waterloo Estate is to be staged over the next 20 years to enable a coordinated renewal approach that minimises disruption for existing tenants and allows for the up-front delivery of key public domain elements such as public open space. Aligned to this staged approach, Waterloo Estate comprises three separate, but adjoining and inter-related stages:

- Waterloo South;
- Waterloo Central; and
- Waterloo North.

Waterloo South has been identified as the first stage for renewal. The lower number and density social housing dwellings spread over a relatively large area, makes Waterloo South ideal as a first sub-precinct, as new housing can be provided with the least disruption for existing tenants and early delivery of key public domain elements, such as public open space.

A planning proposal for Waterloo South is being led by NSW Land and Housing Corporation (LAHC). This will set out the strategic justification for the proposal and provide an assessment of the relevant strategic plans, state environmental planning policies, ministerial directions and the environmental, social and economic impacts of the proposed amendment. The outcome of this planning proposal will be a revised planning framework that will enable future development applications for the redevelopment of Waterloo South. The proposed planning framework that is subject of this planning proposal, includes:

- **Amendments to the Sydney Local Environmental Plan 2012** – This will include amendments to the zoning and development standards (i.e. maximum building heights and floor space ratio) applied to Waterloo South. Precinct-specific local provisions may also be included.
- **A Development Control Plan (DCP)** – This will be a new part inserted into 'Section 5: Specific Areas' of the Sydney DCP 2012 and include detailed controls to inform future development of Waterloo South.
- **An infrastructure framework** – in depth needs analysis of the infrastructure required to service the needs of the future community including open space, community facilities and servicing infrastructure.

1.2 Waterloo Estate

Waterloo Estate is located approximately 3.3km south-south-west of the Sydney CBD in the suburb of Waterloo (refer to **Figure 1**). It is located entirely within the City of Sydney local government area (LGA). Waterloo Estate is situated approximately 0.6km from Redfern train station and 0.5km from Australia Technology Park. The precinct adjoins the new Waterloo Metro Station, scheduled to open in 2024. The Waterloo Metro Quarter adjoins Waterloo Estate and includes the station and over station development, and was rezoned in 2019. Waterloo Estate comprises land bounded by Cope, Phillip, Pitt and McEvoy Street, including an additional area bounded by Wellington, Gibson, Kellick and Pitt Streets. It has an approximate gross site area of 18.98 hectares (14.4 hectares excluding roads). Waterloo Estate currently comprises 2,012 social housing dwellings owned by LAHC, 125 private dwellings, a small group of shops

and community uses on the corner of Wellington and George Streets, and commercial properties on the south-east corner of Cope and Wellington Streets.

A map of Waterloo Estate and relevant boundaries is illustrated in **Figure 1.**

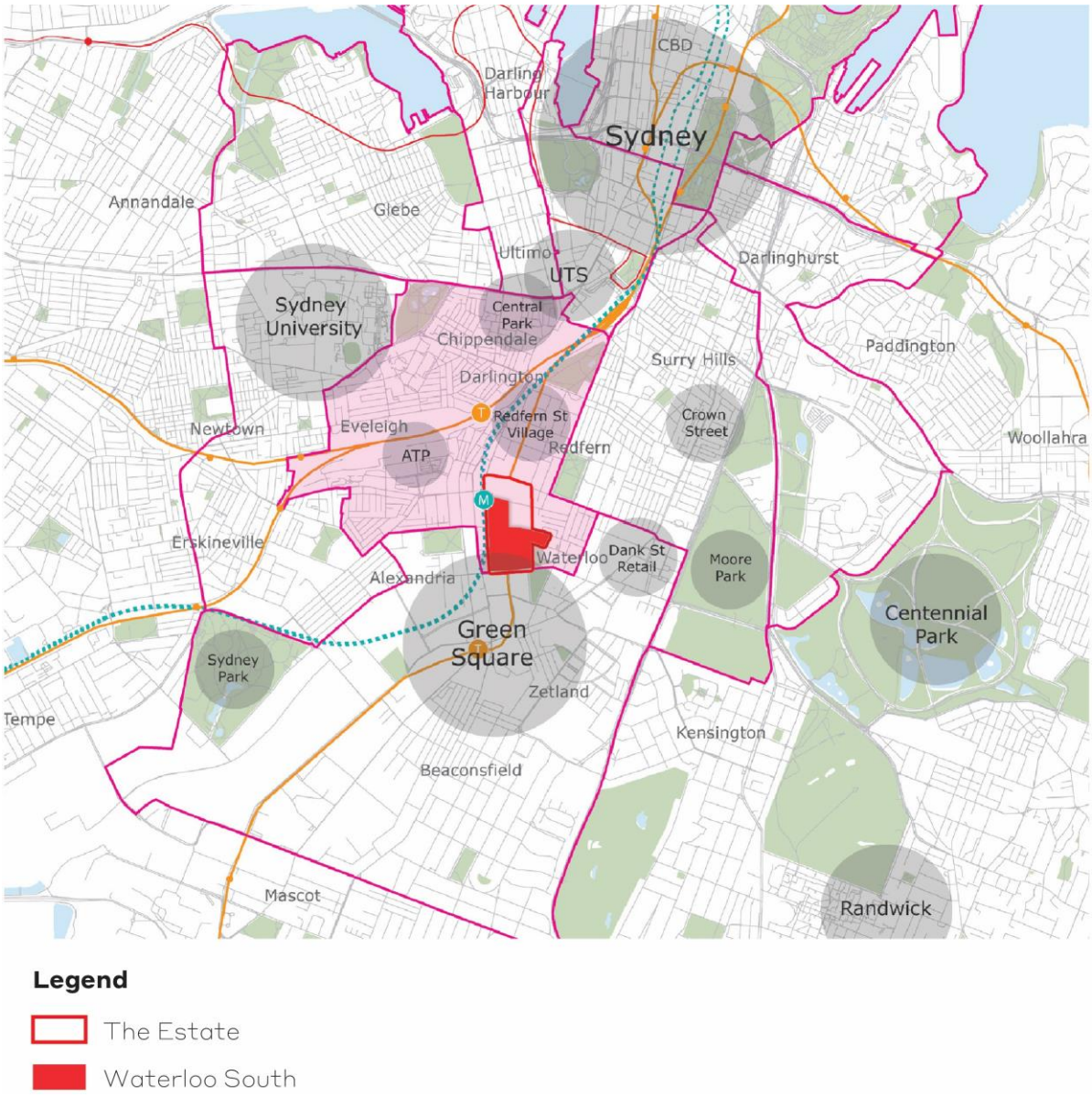


Figure 1: Location plan of Waterloo Estate and Waterloo South

Source: Turner Studio

1.3 Waterloo South

Waterloo South includes land bounded by Cope, Raglan, George, Wellington, Gibson, Kellick, Pitt and McEvoy Streets, and has an approximate gross site area of 12.32 hectares (approximately 65% of the total Estate).

Waterloo South currently comprises 749 social housing dwellings owned by LAHC, 125 private dwellings, and commercial properties on the south-east corner of Cope and Wellington Streets. Existing social

housing within Waterloo South is predominantly walk up flat buildings constructed in the 1950s and '60s, and mid-rise residential flat buildings (Drysdale, Dobell & 76 Wellington Street) constructed in the 1980s. Listed Heritage Items within Waterloo South include the Duke of Wellington Hotel, Electricity Substation 174 on the corner of George and McEvoy Streets, the terrace houses at 229-231 Cope Street and the Former Waterloo Pre-School at 225-227 Cope Street. The State Heritage listed 'Potts Hill to Waterloo Pressure Tunnel and Shafts' passes underneath the precinct.

A map of Waterloo South and relevant boundaries is illustrated in **Figure 2**.

Figure 2: Aerial photograph of the Precinct

(Source: Ethos Urban)

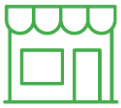
Renewal Vision

This aligns with Future Directions for Social Housing in NSW – the NSW Government's vision for social housing. It also aligns with LAHC's Communities Plus program, which is tasked with achieving three key objectives:

1. Provide more social housing
2. Provide a better social housing experience
3. Provide more opportunities and support for social housing tenants

The following is LAHC's Redevelopment Vision for Waterloo Estate, which was derived from extensive consultation and technical studies:

Source: Let's Talk Waterloo: Waterloo Redevelopment (Elton Consulting, 2019)

	**Culture and Heritage** • Recognise and celebrate the significance of Waterloo's Aboriginal history and heritage across the built and natural environments. • Make Waterloo an affordable place for more Aboriginal people to live and work. • Foster connection to culture by supporting authentic storytelling and recognition of artistic, cultural and sporting achievements.
	**Communal and Open Space** • Create high quality, accessible and safe open spaces that connect people to nature and cater to different needs, purposes and age groups. • Create open spaces that bring people together and contribute to community cohesion and wellbeing.
	**Movement and Connectivity** • Make public transport, walking and cycling the preferred choice with accessible, reliable and safe connections and amenities. • Make Waterloo a desired destination with the new Waterloo Station at the heart of the Precinct's transport network – serving as the gateway to a welcoming, safe and active community.
	**Character of Waterloo** • Strengthen the diversity, inclusiveness and community spirit of Waterloo. • Reflect the current character of Waterloo in the new built environment by mixing old and new.
	**Local Employment Opportunities** • Encourage a broad mix of businesses and social enterprise in the area that provides choice for residents and creates local job opportunities.
	**Community Services, Including Support for Those Who Are Vulnerable** • Ensure that social and human services support an increased population and meet the diverse needs of the community, including the most vulnerable residents. • Provide flexible communal spaces to support cultural events, festivals and activities that strengthen community spirit.
	**Accessible Services** • Deliver improved and affordable services that support the everyday needs of the community, such as health and wellbeing, grocery and retail options.
	**Design Excellence** • Ensure architectural design excellence so that buildings and surrounds reflect community diversity, are environmentally sustainable & people friendly – contributing to lively, attractive and safe neighbourhoods. • Recognise and celebrate Waterloo's history and culture in the built environment through artistic and creative expression. • Create an integrated, inclusive community where existing residents and newcomers feel welcome, through a thoughtfully designed mix of private, and social (affordable rental) housing.

1.4 Purpose of this report

This report relates to the Waterloo South planning proposal. While it provides comprehensive baseline investigations for Waterloo Estate, it only assesses the proposed planning framework amendments and Indicative Concept Proposal for Waterloo South.

The key matters addressed as part of this study, include the relevant Study Requirements detailed below.

2 Study requirements

On 19 May 2017 the Minister issued Study Requirements for the Waterloo Estate. Of relevance to this study are the following requirements:

Table 1: Study requirements

Reference number	Study Requirement	Addressed at
1.5	**Vision, Strategic Context and Justification** Consideration of City of Sydney planning documents, strategies and policies including, but not limited to: • Urban Ecology Strategic Action Plan (UESAP) 2014 *It is noted that 'Urban Ecology Strategic Action Plan' and 'Urban Ecology Strategic Action Plan 2014' are considered the same document.*	**Section 5.1.2**
1.5	• Connected Corridors for Biodiversity: Guide to regulatory tools, financial incentives and other mechanisms for promoting biodiversity conservation on private property (SSROC)	**Section 5.1.3**
1.5	• Greater Sydney LLS – Biodiversity Corridor Mapping https://trade.maps.arcgis.com/apps/webappviewer/index.html?id=3afa804b96ac4d69a74e9b1ed9780328	**Figure 3**
1.5	• Urban Ecology Renewal Investigation Project Report (NGIN 2017)	**Section 5.1.4**
13.1	**Biodiversity** Assess and document biodiversity impacts in accordance with the Framework for Biodiversity Assessment (FBA), unless otherwise agreed by Office of Environment and Heritage (OEH), by a person accredited in accordance with s142B(1)(c) of the TSC Act. Note that this has now been replaced by the BC Act.	**Section 5.4 – see below**
15.1	**Urban Ecology** Prepare an ecological assessment by a suitably qualified ecologist following the guidelines in Southern Sydney Regional Organisation of Councils (SSROC) Connected Corridors for Biodiversity: Guide. Include species and communities of local conservation significance, as identified in the City's Urban Ecology Strategic Action Plan (UESAP), as well as, listed threatened species and ecological communities. Include in the assessment the following:	**Section 5.1.2** **Section 5.1.3**

15.1	• Identify any species that are of particular conservation significance (including threatened species and locally-significant species identified in the City's UESAP.	**Section 5.1.2** **Section 5.1.3**
15.1	• Determine the nature and extent of impacts to the urban vegetation and fauna, particularly those of conservation significance (if present), that are likely to result from each stage of the development.	**Section 8**
15.1	• Outline the mitigation measures that will be employed to avoid or minimise such impacts, including; o clearing and relocating of any onsite indigenous flora and fauna prior to works commencing o protecting of any significant habitat features o restoration / creation of compensatory habitat for any important habitat features removed / disturbed as a result of the development, and	**Section 7.2** **Section 7.3**
15.1	• Provide recommendations and identify opportunities to create habitat features that will benefit urban biodiversity. This report should identify, but not be limited to, what habitat features are to be retained, species to be planted, and other habitat features are to be created.	**Section 7.3**
15.2	To achieve the City's UESAP overall objectives, for this site it is considered appropriate that mid and understorey plantings using locally native indigenous plants comprise of a minimum: • 60% within the public domain; 70 species, and • 40% within private property; 15 species.	**Section 7.3.2**
15.3	Integrate the findings of other urban biodiversity / ecology parts of this study and demonstrate how these have shaped the plan for the site and how they contribute to meeting the City's Urban Ecology requirements and targets.	**Section 7.3**

The field survey confirmed that the study area does not contain any native vegetation communities indigenous to the area. Therefore, the assessment of impacts using the FBA is not considered appropriate for the proposed development. Correspondence between ELA and the Office of Environment and Heritage (OEH) confirmed that the FBA would not be appropriate for this Project, and a Flora and Fauna Assessment report is suitable. This report presents that assessment and responds to the Biodiversity and Urban Ecology requirements of the Study Requirements.

Note the Baseline Investigation (**Section 4**) was undertaken for both the study area (Waterloo Metro Quarter and the Waterloo Estate combined).

3 Statutory Framework

3.1 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is Commonwealth legislation that deals with Matters of National Environmental Significance (MNES). Impacts to MNES are assessed through application of a Significance Assessment. Where a development or activity has the potential to have a significant impact on a MNES, a referral must be made to the Department of the Environment and Energy (DoEE). The Department determines whether the activity can proceed with no further assessment by the Commonwealth, or whether it will be a Controlled Action for which an Environmental Impact Assessment must be supplied.

Rezoning is not considered an 'action' under the EPBC Act, however consideration of the objectives of the EPBC Act is prudent at the rezoning stage.

3.2 Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act 1979* (EP&A Act) is the principal planning legislation for NSW, providing a framework for the overall environmental planning and assessment of development proposals.

3.3 Threatened Species Conservation Act 1995

The repealed *Threatened Species Conservation Act 1995* (TSC Act), aimed to protect and encourage the recovery of threatened species, populations and communities listed under the Act. The interactions between the TSC Act and the EP&A Act required consideration of whether a development (Part 4 of the EP&A Act), or an activity (Part 5 of the EP&A Act), was likely to significantly affect threatened species, populations, ecological communities or their habitats in accordance with Section 5A of the EP&A Act (Assessments of Significance). Whilst a rezoning is not 'development', consideration of the objects of the Act and its relevance to the development stage is prudent.

3.4 Biodiversity Conservation Act 2016

In November 2016 the NSW parliament passed the *Biodiversity Conservation Act 2016* (BC Act). This new legislation replaced the TSC Act and took effect on 25 August 2017. Among other things, the BC Act introduces new requirements for biodiversity assessment and will require proponents to offset significant biodiversity impacts through the purchase and retirement of biodiversity credits at the development application stage.

Study Requirements for the project were issued by the Minister for Planning on 19 May 2017, prior to the establishment of the BC Act. Transitional arrangements under the *Biodiversity Conservation (Savings and Transition) Regulation 2017* provided for projects that have been 'substantially commenced' to be finalised using relevant existing assessment and approval pathways. Therefore, in terms of biodiversity impact, this was originally undertaken in accordance with the now repealed TSC Act (above).

It should be noted that any future ecological assessments at the development application stage must be completed in accordance with the BC Act. It is considered likely that offsetting under the Biodiversity Assessment Methodology may be required at the development application stage due to the presence of planted native vegetation, *Pteropus poliocephalus* (Grey-headed Flying-fox) habitat, and prescribed impacts (which include planted non-native vegetation). Assessment for microbat habitat may also be required with regards to upgrades to stormwater infrastructure works at the development application stage.

3.5 Urban Renewal State Environmental Planning Policy 2010 (Urban Renewal SEPP)

The Waterloo site is listed as one of the Precincts listed under the Urban Renewal SEPP. The main objective of the SEPP is to "integrate land use planning with existing or planned infrastructure to create revitalised local communities, greater access to public transport and a broader range of housing and employment options"

3.6 Sydney Local Environmental Plan 2012 (LEP)

The LEP is an important framework for the local environmental planning provisions for land in the City of Sydney. It encourages the economic growth without compromising the biodiversity. This LEP applies to the Estate (the study area).

3.7 South Sydney Local Environmental Plan 1998 (LEP)

The aim of this plan is to establish the framework for future development within the City of South Sydney and applies to the Estate (the study area).

3.8 Sydney Development Control Plan 2012 (DCP)

Section 3 (Tree Management) of the DCP provides the controls for the protection, pruning or removal of trees within the Sydney LGA. Generally, consent approval from council is required to remove trees greater than 10 m tall.

4 Baseline investigation - Methods

4.1 Literature review

A literature review was undertaken to identify the threatened species, populations, ecological communities, and species and communities of local conservation significance that could potentially occur within the study area. The following documentation and mapping was reviewed:

- BioNet (Atlas of NSW Wildlife) database search (10 km) for threatened species, populations and ecological communities listed under the BC Act (OEH 2017a)
- EPBC Act Protected Matters Search Tool (10 km) for threatened and migratory species, populations and ecological communities listed under the Commonwealth EPBC Act (DoEE 2017a; 2017b)
- OEH Threatened Species Profiles (OEH 2017b)
- Sydney Metropolitan Catchment Management Authority (CMA) vegetation mapping (OEH 2016a)
- species and communities of local conservation significance, including threatened species and endangered ecological communities (EECs), as identified in the SSROC Connected Corridors Biodiversity (CCB) Guide (SSROC 2016)
- key findings of the 'Urban Ecology Renewal Investigation Project' Report (NGIN 2017)
- Greater Sydney Local Land Services (GSLLS) 2017. Biodiversity Corridors Mapping
- species and communities of local conservation significance, including threatened species and endangered ecological communities (EECs), as identified in the City of Sydney's Urban Ecology Strategic Action Plan (UESAP) (CoS 2016)
- aerial mapping and vegetation mapping (OEH 2016a), to assess the extent of vegetation including mapped threatened ecological communities (TECs) listed under the BC Act and / or EPBC Act
- Soil landscape of the study area: eSpade2 Web App: www.environment.nsw.gov.au/eSpade2Webapp (OEH 2017c)
- Eco Logical Australia 2011. *Landscape level assessment of urban trees in Redfern-Waterloo Operational Area.* Prepared for Department of Finance and Services (ELA 2011)
- Eco Logical Australia 2014. *Ecological Constraints Assessment, Waterloo.* Prepared for UrbanGrowth NSW (ELA 2014)
- Arterra 2017 *Waterloo Urban Forest Study (Draft v2).* Prepared for Urban Growth NSW.
- Arterra 2019. *Waterloo Estate Urban Forest Study (Final Draft v3).* Prepared for Urban Growth NSW.

4.2 Likelihood of occurrence

Aerial photography (SIXmaps and Google Earth) of the study area and surrounds were reviewed to identify the extent of vegetation cover and landscape features.

Species from the Atlas of NSW Wildlife, Protected Matters Search Tool, and literature cited above (**Section 4.1**) were combined to produce a list of threatened species and species of local conservation significance that may occur within the study area ("subject species") (**Appendix A**). The likely occurrence of threatened species, endangered populations and communities, and species and communities of local conservation significance in the study area was determined based on the location of database records, the likely presence or absence of suitable habitat on the subject site, and knowledge of the species' ecology. A list of potentially "affected species" was then identified (those that were defined as "yes", "likely" or having "potential" to occur in the study area).

Five terms for the likelihood of occurrence of species are used in this report:

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

Following the site inspection, this list of "affected species" was refined with an understanding of the local environment and available habitat in the study area. The likelihood table in **Appendix A** reflects the final list of species and their likelihood of occurrence.

4.3 Site inspection

A site inspection was conducted on 19 June 2017 by ecologist Mitchell Scott. The site inspection consisted of a rapid visual assessment of the site to verify the presence of native vegetation, threatened ecological communities, threatened species and / or their habitat, and species and communities of local conservation significance.

The survey aimed to:

- validate the extent and quality of native vegetation including any threatened ecological communities (TECs)
- identify the presence of threatened species or populations or their habitat, particularly:
  - hollow-bearing trees, which provide habitat to a range of threatened and locally significant fauna
  - *Perameles nasuta* (Long-nosed Bandicoot), listed as an *Endangered Population* under the BC Act
- identify habitat for species of local conservation significance, including:
  - potential habitat for small birds
  - potential habitat for reptiles and amphibians.

Weather conditions during the survey were overcast, with mild temperature and no precipitation (**Table 2**).

Table 2: Weather conditions during the site inspection

Date	Temperature (°C)		Max wind speed (km/h)	Rainfall (mm)
	Minimum	Maximum		
19 June 2017	11.7	17.4	57 S	0

Weather observations were taken from www.bom.gov.au Sydney Airport (066037) (temperature, wind speed and rainfall)

4.4 Survey limitations

The site inspection was undertaken using hand-held GPS units. It should be noted that these units can have errors in accuracy of approximately 20 m (subject to availability of satellites on the day).

The site inspection consisted of a rapid visual inspection of the study area. Access to private property, or to use aids such as binoculars, was not permitted by UrbanGrowth NSW. Therefore, due to these constraints some more cryptic ecological features within the study area may not have been identified.

5 Baseline investigation - Results

5.1 Literature Review

The literature review identified 131 threatened fauna and migratory species and 45 threatened flora species listed under the BC and/or EPBC Acts, which may have the potential to occur within a 10 km radius of the study area (**Appendix A**).

A total of 289 locally significant fauna species were recorded from the literature review, which includes eight (8) 'Priority Fauna Species /Groups' under the UESAP (**Appendix A**). Priority Fauna Groups consist of non-threatened fauna species which have been recorded within 10 km of the study area. This includes 19 species of amphibian, 164 species of small birds, 57 species of freshwater wetland birds, 9 species of microbat, and 40 species of reptile. Fifteen (15) additional non-threatened bird species which have been recorded within 10 km of the study area and don't conform to the above bird groups were included in the assessment (**Table 14**).

An assessment of the likelihood of occurrence of threatened species and 'Priority Fauna Species/Groups' within the study area is provided in **Appendix A** and was used to guide the field survey methodology. Note, the likelihood of occurrence provided in **Appendix A** represents the assessment following the field survey results. No threatened species have previously been recorded within the boundaries of the study area.

5.1.1 Sydney Metropolitan Catchment Management Authority Vegetation Mapping (OEH 2016)

No threatened ecological communities (TECs) were mapped within the study area by OEH (2016). Further, this mapping identifies that the sites does not contain natural vegetation communities. Vegetation within the study area has been mapped on OEH 2016 as 'urban native and exotic cover.'

5.1.2 City of Sydney's Urban Ecology Strategic Action Plan (UESAP)

The City of Sydney's UESAP identifies species and communities of local conservation significance, along with threatened species and ecological communities (CoS 2016).

Potential remnant and naturally occurring threatened ecological communities of and communities of conservation significance identified in the action plan include:

- Sydney Turpentine Ironbark Forest (listed as a *Critically Endangered Ecological Community* (CEEC) under the BC Act, and *Critically Endangered* under the EPBC Act) – possible remnant trees.
- Coastal saltmarsh in the NSW North Coast, Sydney Basin and South East Corner bioregions *Endangered Ecological Community* (EEC) under the BC Act, and *Vulnerable* under the EPBC Act) – planted and naturally regenerating patches.
- Coastal Alluvium Swamp Forest, a sub-community of Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (EEC under the BC Act) – possible remnant trees.
- Mangrove Forest – planted and naturally regenerating trees.
- Coastal Sandstone Outcrop Complex – possible remnants and other naturally occurring species.
- Freshwater Wetlands – vegetated constructed wetlands/ponds.
- Bushland restoration sites and other plantings comprising indigenous/mostly indigenous species.

The City of Sydney's UESAP recorded 365 flora species, of which 70 are considered to be naturally occurring.

The City of Sydney's UESAP records a total of 99 fauna species in the Sydney LGA, including 87 indigenous species and 12 introduced species.

Eight priority threatened fauna species/groups were identified by the UESAP, which includes threatened species, along with other species generally uncommon in urban areas. These species/groups include:

1. Amphibians, including but not limited to:
- *Litoria aurea* (Green and Golden Bell Frog)^
- *Litoria fallax* (Eastern Dwarf Tree Frog)
- *Litoria peronii* (Peron's Tree Frog).
2. *Pteropus poliocephalus* (Grey-headed Flying-fox)^
3. *Ninox strenua* (Powerful Owl)^
4. *Perameles nasuta* (Long-nosed Bandicoot)^
5. Microbats, including but not limited to:
- *Chalinolobus gouldii* (Gould's Wattled Bat)
- *Mormopterus norfolkensis* (Eastern Freetail-bat)^
- *Vespadelus vulturnus* (Little Forest Bat)
6. Small birds, including but not limited to:
- *Malurus cyaneus* (Superb Fairy-wren)
- *Phylidonyris novaehollandiae* (New Holland Honeyeater)
- *Zosterops lateralis* (Silvereye).
7. Freshwater wetland birds, including but not limited to:
- *Acrocephalus australis* (Australian Reed-warbler)
- *Elseyornis melanops* (Black-fronted Dotterel)
- *Gallirallus philippensis* (Buff-banded Rail)
- *Himantopus himantopus* (Black-winged Stilt)
- *Platalea regia* (Royal Spoonbill).
8. Reptiles, including but not limited to:
- *Eulamprus tenuis* (Bar-sided Skink)
- *Saproscinus spectabilis* (Gully Skink)
- *Tiliqua scincoides scincoides* (Eastern Blue-tongue).

^indicates threatened species (see **Appendix A**)

The City of Sydney's UESAP lists six (6) priority sites with relatively high biodiversity values within the City of Sydney LGA. The study area does not occur within any of these sites.

5.1.3 SSROC Connected Corridors Biodiversity Guide (CCB)

The SSROC CCB identifies threatened species and ecological communities, along with species and communities which continue to persist throughout Sydney (SSROC 2016).

Potential remnant and naturally occurring TECs and communities of conservation significance identified in the CCB Guide include:

- Eastern Suburbs Banksia Scrub in the Sydney Basin Bioregion (EEC under the BC Act, and *Endangered* under the EPBC Act)
- Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion (EEC under the BC Act, and *Critically Endangered* under the EPBC Act)
- Pittwater and Wagstaffe Spotted Gum Forest in the Sydney Basin Bioregion (EEC under the BC Act)

- Blue Gum High Forest in the Sydney Basin Bioregion (*Critically Endangered Ecological Community* (CEEC) under the BC Act, and *Critically Endangered* under the EPBC Act)
- Sydney Turpentine Ironbark Forest (CEEC under the BC Act, and *Critically Endangered* under the EPBC Act)
- Sydney Freshwater Wetlands in the Sydney Basin Bioregion (EEC under the BC Act).

Threatened flora species which the SSROC CCB Guide noted to occur in the Sydney area include:

- *Acacia terminalis* subsp. *terminalis* (Sunshine Wattle)
- *Allocasuarina portuensis* (Nielsen Park She-Oak)
- *Grevillea caleyi* (Caley's Grevillea)

Threatened fauna species which the SSROC CCB Guide noted to occur in the Sydney area include:

Amphibians:

- *Litoria aurea* (Green and Golden Bell Frog)
- *Pseudophryne australis* (Red-crowned Toadlet)

Birds:

- *Artamus cyanopterus* (Dusky Woodswallow)
- *Calidris ferruginea* (Curlew Sandpiper)
- *Calyptorhynchus lathami* (Glossy Black Cockatoo)
- *Ninox strenua* (Powerful Owl)
- *Pandion haliaetus* (Eastern Osprey)

Mammals (excluding bats):

- *Petaurus norfolcensis* (Squirrel Glider)
- *Phascolarctos cinereus* (Koala)

Bats:

- *Miniopterus schreibersii* (Eastern Bent-wing Bat)
- *Pteropus poliocephalus* (Grey-headed Flying-fox)

Snails:

- *Meridolum corneovirens* (Cumberland Plain Land Snail)

SSROC CCB Guide list four (4) species which have declined but still persist. This study includes these species as being of local conservation significance. They are:

Birds:

- *Acanthiza nana* (Yellow Thornbill)
- *Pardalotus punctatus* (Spotted Pardalote)

Reptiles:

- *Amphibolurus muricatus* (Jacky Lizard)
- *Eulamprus tenuis* (Bar-sided Skink)

SSROC CCB reference two (2) charismatic species which can help to build city residents' appreciation of biodiversity. These species include:

- *Malurus cyaneus* (Superb Fairy-wren)
- *Podargus strigoides* (Tawny Frogmouth)

Greater Sydney Local Land Services (GSLLS) produced Biodiversity Corridor Mapping for the Southern Sydney Regional Organisation of Councils' Connected Corridors for Biodiversity (SSROC CCB) project (GSLLS 2017). Most of the study area has been mapped as providing a Biodiversity Corridor as displayed in **Figure 3**. Given the urban context of the study area and the specific type of habitat provided (mostly landscape plantings and street trees), the mapping is taken to refer primarily to corridor habitat for highly mobile species such as birds and bats.

5.1.4 'Urban Ecology Renewal Investigation Project' Report (NGIN 2017)

This report identified nine key findings relevant to urban biodiversity:

1. *urban biodiversity and ecosystems are being lost in our cities*
    - *to reverse this trend, cities need to protect and conserve what already exists.*
2. *strategic planning reform is required to protect existing habitats and create or re-establish habitats and corridors*
3. *cities are heterogeneous in land use, density, form and function, and there is high variability in institutional and community values and practices*
    - *actions to improve urban ecology in cities must consider spatial and temporal scales.*
4. *the natural environment is not considered to contribute to a city's wellbeing or economic outcomes*
5. *performance-based development application and assessment tools are required to support urban ecological outcomes at the lot-to precinct scale*
    - *tools should be spatially specific (e.g. connecting green grids and linking to regional parks), offer flexibility (e.g. in the choice of plantings and setting limits on house-to-land development ratios), and support diverse and appropriate habitat form and function that is relevant to species and community.*
6. *the enforcement of laws and policies needs to be prioritised and embedded within institutional processes and community-change education and awareness programs*
7. *there is a perception that "our cities are green enough"*
    - *this perception has a detrimental effect on urban ecology in our cities.*
8. *public open space is an underused opportunity for enhancing urban ecology in cities*
    - *open space should be considered relative to forecast urban population size and density, and also consider and provide for improved urban ecological outcomes.*
9. *need for full evaluation of environmental services and disservices*
    - *environmental services can provide a range of valuable economic, health and social services as well as increase resilience to extreme weather events and climate change.*

5.1.5 Soil Landscape

The study area consists of the 'Tuggerah' soil landscape unit (OEH 2017c).

This includes Botany, Randwick and South Sydney LGAs. Other examples of this soil landscape unit are found along the coast at Palm Beach, Narrabeen, Collaroy, Rose Bay, Bondi, Coogee, Kyeemagh, Brighton-le-Sands, Monterey, Ramsgate and Dolls Point. The geology of this landscape is Quaternary (Holocene and Pleistocene), comprising wind-blown, fine to medium grained, well sorted marine quartz sand. Shell fragments are absent and the sand appears to be finer than sands found on foredunes and on beaches (OEH 2017c).

The vegetation found within this soil landscape contains generally cleared and modified areas remnant vegetation comprising dry sclerophyll *Eucalypt* and *Angophora* forest and woodland. Small patches of remnant vegetation remain, notably in Scarborough Park at Ramsgate. Dominant tree species may include *Angophora costata* (Smooth-barked Apple), *Eucalyptus piperita* (Sydney peppermint), and *Banksia aemula* (Old Man Banksia). The shrubby understorey may contain many sclerophyllous species such as *Pteridium esculentum* (Common Bracken), *Ceratopetalum gummiferum* (Christmas Bush), *Xylomelum pyriforme* (Woody Pear), and *Acacia ulicifolia* (Prickly Moses) (OEH 2017c).

Figure 3: Study area relative to Biodiversity Corridor Mapping (GSLLS 2017)

5.2 Vegetation

A total of 162 species, comprising 65 native species (including 1 horticultural variety) and 99 exotic species, were identified within and adjacent to the study area from the site inspection, and included canopy tree species data from Arterra 2017 (**Table 12, Appendix B, Figure 4**).

Canopy vegetation

A total of 111 tree species (1084 individual trees), were identified and assessed by Arterra Design Pty Ltd in 2017 as occurring within and adjacent to the study area (**Figure 4** and **Appendix B**) (Arterra 2017 and 2019). There were 940 individual trees identified as being located within the study area (Arterra 2019).

Of the total trees assessed, there was a total of 60 native species (784 individuals), including 17 species endemic to the local area (173 endemic individuals), and 43 species not endemic to the local area (611 individuals; **Table 3**). The most common native endemic species was *Melaleuca quinquenervia* (Broad-leaved Paperbark) (74 individuals). The most common native non-endemic species were *Eucalyptus microcorys* (Tallowwood) (75 individuals), *Casuarina cunninghamiana* (River Oak) (68 individuals), and *Ficus microcarpa* var. *hillii* (Hill's Weeping Fig) (64 individuals).

50 introduced tree species (300 individuals; **Figure 5**, **Appendix B**), including nine invasive species (29 individuals) and 42 non-invasive species (271 individuals; **Table 3**) are located within and adjacent to the study area. The most common introduced non-invasive species was *Platanus x acerifolia* (London Planetree) (42 individuals). The most common introduced invasive species was *Robinia pseudoacacia* (Frisia) (58 individuals). Definition for non- invasive and invasive species are provided within Arterra 2017 and 2019.

Canopy vegetation was scattered throughout the study area, primarily along roadsides and within open spaces. Two areas of open space are located adjacent to Raglan Street, one to the north and one to the south (**Figure 2**). Open space within the study area consisted of scattered trees from native families Moraceae, Casuarinaceae, Myrtaceae, and from the exotic family Platanaceae.

Table 3: Area (ha) and frequency of tree species occurring within and surrounding the study area*^

Origin	Endemic	Non-endemic	Non-invasive	Invasive	Total
Native	1.28 ha 173 (15.6%)	6.32 ha 611 (56.4%)	-	-	7.60 ha 784 (72.3%)
Introduced	-	-	1.29 ha 271 (25%)	0.19 ha 29 (2.7%)	1.48 ha 300 (27.7%)
				Total tree species area and total frequency within the study area and surrounds	**9.08 ha 1084 (100%)**

**Brackets indicate the proportion of tree species relative to the total tree species within study area*
^Note: areas calculated from overlapping canopy

No TECs, communities of conservation significance, or natural occurring vegetation communities were identified within and surrounding the study area during the site inspection (**Table 9, Appendix A**). The assemblage of those present does not meet the determination for any TEC with potential to occur within the study area.

The remainder of the study area consisted of approximately 3.3 ha of urban native and exotic plantings (midstorey and groundcovers) described below (**Figure 4**).

Mid-storey vegetation

Mid-storey vegetation was primarily confined to street plantings, private gardens, and community gardens.

Vegetation on public land adjacent to streets primarily included native species *Lomandra longifolia* (Spiny-headed Mat-rush) and *Dianella* sp., and a horticultural variety of *Lomandra longifolia* (Tanika; Matt Rush). Exotic species included *Westringia fruticosa* (Coastal Rosemary), *Nerium oleander*, *Philodendron* sp., *Liriope* sp., *Viburnum* sp., and *Rhaphiolepis* sp.

Private gardens contained primarily exotic species including *Asparagus aethiopicus* (Asparagus Fern), *Chlorophytum comosum* (Spider Plant), *Colocasia esculenta* (Taro), *Agave americana* (Century Plan), *Cestrum* sp. (Nightshade), *Dracaena* sp. (Dragon Tree), *Hedera helix* (English Ivy), *Phoenix canariensis* (Canary Island Date Palm), *Strelitzia reginae* (Bird of Paradise), *Asplenium nidus* (Birds Nest Fern), and *Clivia* sp. (Native Lily).

Some private gardens contained native species including *Leptospermum petersonii* (Lemon-scented Tea-tree) and *Goodenia* sp.

Banksia integrifolia (Coastal Banksia) and *Banksia serrata* (Old Man Banksia), both native nectar-producing plant species, are located within the open spaces in the north of the study area.

Three Community Gardens are located within the open spaces in the north of the study area. These gardens consisted of exotic horticultural, culinary and ornament species, and thus were not surveyed.

Groundcover vegetation

Ground cover within the two large open spaces (outlined below), and other smaller open spaces such as public and private lawns, were dominated by exotic species *Axonopus* sp. (Carpet Grass), *Cenchrus clandestinus* (Kikuyu Grass), and native species *Daucus glochidiatus* (Native Carrot). Other species present included natives *Microlaena stipoides* (Weeping Grass), *Dichondra repens* (Kidney Weed), *Modiola* sp., and *Oxalis* sp., and exotics *Stellaria media* (Chickweed), *Sonchus* sp. (Sowthistle), *Trifolium repens* (White Clover), *Hypochaeris radicata* (Catsear), and *Conyza* sp.

Figure 4: Vegetation mapped within and adjacent to the study area

5.3 Fauna and fauna habitat

Six fauna species, including three native and three introduced species, were recorded during the site inspection (**Table 13, Appendix A**).

Both native and introduced tree species generally provide habitat for a range of bird and mammal species.

No hollow-bearing trees (HBTs), which may provide habitat for mammals (including microbats) and birds, were identified within the study area during the site inspection. Two hollow-bearing trees were identified nearby but outside of the study area boundary, south-east of the study area (**Figure 4**).

Potential habitat for Amphibians

No streams, riparian areas or wet soaks, which may provide habitat for amphibians, were identified within the study area during the site inspection.

Potential habitat for *Pteropus poliocephalus* (Grey-headed Flying Fox)

Grey-headed Flying Fox (GHFF) is listed as Vulnerable under the BC Act and Vulnerable under the EPBC Act (OEH 2017b).

The nectar and pollen of native trees provide potential foraging and roosting habitat for GHFF, especially species in the families of Myrtaceae (e.g. *Eucalyptus robusta*) and Proteaceae (e.g. *Banksia integrifolia)* (Eby and Law 2008). Species from the families Myrtaceae, Proteaceae, and Moraceae provide potential habitat for GHFF (Table 10**, Figure 5**). Non-mature trees have been included in this mapping due to their potential to provide foraging habitat in the near future.

The blossom diet of GHFF includes multiple species; some species produce a higher amount of nectar than others and are thus a more significant food source (**Table 4**, Eby and Law 2008). Fruit produced by native tree species are also part of the GHFF diet and are primarily from the family Moraceae (e.g. *Ficus rubiginosa*) (**Table 4**).

GHFF foraging habitat is not annually reliable from year to year, and not available consistently throughout the year. There are less nectar and pollen producing species that flower during winter, and thus winter-flower species are critical foraging habitat to the survival of the GHFF (DECCW 2009). Winter-flowering species have been highlighted in **Table 4** (Robinson 2003).

Potential habitat for *Ninox Strenua* (Powerful Owl)

Powerful Owl is listed as *Vulnerable* under the BC Act. No specific foraging habitat or roosting habitat (hollow-bearing trees) were identified within the study area.

Potential habitat for *Perameles nasuta* (Long-nosed Bandicoot)

The Long-nosed Bandicoot (LNB) population in inner western Sydney is listed as *Endangered Population* under the BC Act. No diggings or scats of LNB were identified during the site inspection.

Potential habitat for Microbats

Although microbats are likely to occur in urban areas, the field survey identified no specific urban features (such as culverts or bridges) where microbats are particularly likely to utilise as occurring within the study area. If, during the development application stage any additional information becomes available, and it is considered that any microbat habitat may be impacted, an assessment under the BC Act, which may include targeted surveys and potential offsetting, will be undertaken.

Potential habitat for Small birds

Although the study area lacks areas of dense native mid-storey vegetation, canopy vegetation provides potential habitat for small birds, including *Pardalotus punctatus* (Spotted Pardalote) and *Phylidonyris novaehollandiae* (New Holland Honeyeater), and other small birds recorded within 5 km of the study area (**Table 14, Appendix A**). Approximately 8.6 ha of potential marginal habitat for birds has been mapped in **Figure 6**.

Potential habitat for Freshwater wetland birds

No streams or inundations, which may provide habitat for freshwater and wetland birds, were identified within the study area.

Potential habitat for Reptiles

Seven occurrences of sandstone outcropping were identified within the study area (**Figure 4**). It appears that these sandstone blocks have been introduced to the site for landscaping and do not create any cracks or crevices. Thus they are not likely to provide fauna habitat, including reptiles. No specific potential habitat for reptiles occurs within the study area.

Table 4: Potential foraging / roosting habitat for GHFF that occurs within and adjoining the study area*

Family	Species Name	Common Name	Native / Exotic	Number of individuals within study area	Potential foraging / roosting habitat	Flowering time* (Robinson 2003)	Species flower scores*
Myrtaceae	*Angophora costata*	Smooth-barked Apple	N	1	Foraging	Oct - Jan	0.35
Myrtaceae	*Angophora floribunda*	Rough-barked Apple	N	1	Foraging	Spring and Summer	0.45
Proteaceae	*Banksia integrifolia*	Coastal Banksia	N	6	Foraging	**Mainly Winter (Jan-Jun)**	**0.83**
Proteaceae	*Banksia serrata*	Old Man Banksia)	N	3	Foraging	Dec - Mar	0.45
Myrtaceae	*Corymbia citriodora*	Lemon-scented Gum	N	9	Foraging	**Jun – Nov^**	**0.65**
Myrtaceae	*Corymbia eximia*	Yellow Bloodwood	N	7	Foraging	Spring	0.54
Myrtaceae	*Corymbia maculata*	Spotted Gum	N	36	Foraging	**May-Sep**	**0.65**
Myrtaceae	*Eucalyptus botryoides*	Bangalay	N	40	Foraging	Jan - Mar	0.51
Myrtaceae	*Eucalyptus camaldulensis*	River Red Gum	N	1	Foraging	**Aug – Nov^**	**0.67**
Myrtaceae	*Eucalyptus grandis*	Flooded Gum	N	2	Foraging	Apr – May^	0.56
Myrtaceae	*Eucalyptus pilularis*	Blackbutt	N	4	Foraging	early Summer	0.51-0.67
Proteaceae	*Eucalyptus piperita*	Sydney Peppermint	N	2	Foraging	early Summer	0.55
Proteaceae	*Eucalyptus punctata*	Grey Gum	N	3	Foraging	Dec-Apr	0.56
Myrtaceae	*Eucalyptus robusta*	Swamp Mahogany	N	7	Foraging	**Jun - Nov**	**1**
Myrtaceae	*Eucalyptus saligna*	Sydney Blue Gum	N	12	Foraging	Jan - Mar	0.73
Myrtaceae	*Eucalyptus sideroxylon*	Mugga Ironbark	N	23	Foraging	**Winter^**	**0.54**
Moraceae	*Ficus benjamina*	Weeping Fig	N	5	Foraging / Roosting	-	-

Family	Species Name	Common Name	Native / Exotic	Number of individuals within study area	Potential foraging / roosting habitat	Flowering time* (Robinson 2003)	Species flower scores*
Moraceae	*Ficus macrophylla*	Morton Bay Fig	N	6	Foraging / Roosting	-	-
Moraceae	*Ficus microcarpa* var. *hillii*	Hill's Weeping Fig	N	64	Foraging / Roosting	-	-
Moraceae	*Ficus rubiginosa*	Port Jackson Fig	N	38	Foraging / Roosting	-	-

** Winter-flowering species, and species with a flowering score greater or equal to 0.65, are considered significant food plants for GHFF (Eby and Law 2008), and have been highlighted green. Note ficus species are not included in this flowering study as ficus fruit (figs) and not flowers are a primary food source for GHFF.*

^ Flowering time for these species available: http://www.florabank.org.au/. Accessed July 2017.

Figure 5: Potential foraging habitat for GHFF within the study area

Figure 6: Potential habitat for small birds

5.4 Threatened fauna and fauna of local significance

No threatened fauna listed under the BC Act or EPBC Act were recorded during the site inspection. Nor were any non-threatened fauna species of local significance (UESAP), fauna species in decline (SSROC CCB), or charismatic fauna species (SSROC CCB) recorded during the site inspection.

The likelihood of occurrence analysis identified that *Pteropus poliocephalus* (Grey-headed Flying-fox) was 'likely' to occur within the study area, and *Phylidonyris novaehollandiae* (New Holland Honeyeater (locally significance)) and *Pardalotus punctatus* (Spotted Pardalote (locally significance)) have the 'potential' to occur within the study area (**Table 10, Appendix A**).

5.5 Threatened flora and flora of local significance

No threatened flora listed under the BC Act or EPBC Act, or threatened flora referred to in the UESAP or SSROC CCB, were recorded during the site inspection.

The likelihood of occurrence analysis did not identify any threatened flora species as 'potential' or 'likely' to occur within the study area (**Table 11, Appendix A**).

One *Eucalyptus nicholii (*Narrow-leaved Black Peppermint*)* individual was recorded within the study area. *Eucalyptus nicholii* is listed as *Vulnerable* under the BC Act and *Vulnerable* under the EPBC Act (OEH 2014). This species is sparsely distributed but widespread on the New England Tablelands from Nundle to north of Tenterfield, and thus is not considered a threatened species in the context of the study area given that it is a horticultural planted.

Seven *Eucalyptus scoparia* (Wallangarra White Gum) individuals were recorded within the study area. *Eucalyptus scoparia* is listed as *Endangered* under the BC Act and *Vulnerable* under the EPBC Act (OEH 2002). In NSW this species is only known from only three locations near Tenterfield, including Bald Rock National Park, and does not naturally occur in Sydney (OEH 2002). Thus it is not considered a threatened species in the context of the study area, given the individuals are horticultural plantings.

6 Waterloo South Planning Proposal

The planning proposal will establish new land use planning controls for Waterloo South, including zoning and development standards to be included in Sydney LEP 2012, a new section in Part 5 of DCP 2012, and an infrastructure framework. Turner Studio and Turf has prepared an Urban Design and Public Domain Study which establishes an Indicative Concept Proposal presenting an indicative renewal outcome for Waterloo South. The Urban Design and Public Domain Study provides a comprehensive urban design vision and strategy to guide future development of Waterloo South and has informed the proposed planning framework. The Indicative Concept Proposal has also been used as the basis for testing, understanding and communicating the potential development outcomes of the proposed planning framework.

6.1 Indicative Concept Proposal

The Indicative Concept Proposal comprises:

- Approximately 2.57 hectares of public open space representing 17.8% of the total Estate (Gross Estate area – existing roads) proposed to be dedicated to the City of Sydney Council, comprising:
  - Village Green – a 2.25 hectare park located next to the Waterloo Metro Station; and
  - Waterloo Common and adjacent – 0.32 hectares located in the heart of the Waterloo South precinct.
  - The 2.57 hectares all fall within the Waterloo South Planning Proposal representing 32.3% of public open space (Gross Waterloo South area – proposed roads)
- Retention of 52% of existing high and moderate value trees (including existing fig trees) and the planting of three trees to replace each high and moderate value tree removed.
- Coverage of 30% of Waterloo South by tree canopy.
- Approximately 257,000 sqm of GFA on the LAHC land, comprising:
  - Approximately 239,100 sqm GFA of residential accommodation, providing for approximately 3,048 dwellings (comprising a mix of market and social (affordable rental) housing dwellings);
  - Approximately 11,200 sqm of GFA for commercial premises, including, but not limited to, supermarkets, shops, food & drink premises and health facilities; and
  - Approximately 6,700 sqm of community facilities and early education and child care facilities.

The key features of the Indicative Concept Proposal are:

- It is a design and open space led approach.
- Creation of two large parks of high amenity by ensuring good sunlight access.
- Creation of a pedestrian priority precinct with new open spaces and a network of roads, lanes and pedestrian links.
- Conversion of George Street into a landscaped pedestrian and cycle friendly boulevard and creation of a walkable loop designed to cater to the needs of all ages.
- A new local retail hub located centrally within Waterloo South to serve the needs of the local community.
- A target of 80% of dwellings to have local retail services and open space within 200m of their building entry.
- Achievement of a 6 Star Green Star Communities rating, with minimum 5-star Green Star – Design & As-Built (Design Review certified).
- A range of Water Sensitive Urban Design (WSUD) features.

Table 5 Breakdown of allocation of land within the Waterloo South

Land allocation	Existing	Proposed
Roads	3.12ha / 25.3%	4.38ha / 35.5%
Developed area (Private sites)	0.86ha / 6.98%	0.86ha / 7%
Developed area (LAHC property)	8.28ha / 67.2%	4.26ha / 34.6%
Public open space (proposed to be dedicated to the City of Sydney)	Nil / 0%	2.57ha / 20.9% (32.3% excluding roads)
Other publicly accessible open space (Including former roads and private/LAHC land)	0.06ha / 0.5%	0.25ha / 2%
TOTAL	**12.32ha**	**12.32ha**

The Indicative Concept Proposal for the Waterloo South is illustrated in **Figure 7** below.

Figure 7: Plan of Indicative Concept Proposal

Source: Turner Studio

7 Implementation Plan and Strategy

7.1 Avoidance

The Indicative Concept Proposal requires a substantial contiguous area to construct commercial and residential structures within the study area. The study area contains low biodiversity constraints or conservation opportunities in relation to the BC Act and EPBC Act. Relative to the broader suburb of Waterloo and beyond, the study area has minimal ecological values.

The report considers the proposed works will require clearance of 5.31 ha of vegetation within the study area, primarily comprising canopy trees. Street trees are being retained where possible.

7.2 Mitigation

Draft mitigation measures proposed to minimise impacts at the study area before, during and after the proposed works are outlined in **Table 7**.

These measures will be finalised following provision of the draft Construction Environmental Management Plan (CEMP), and other relevant reports.

Table 6: Proposed mitigation measures

Measure	Risk before mitigation	Risk after mitigation	Action
Displacement of resident fauna	Moderate	Minor	The staged development approach will ensure a continuous overlap of habitat retention and replacement, thus minimsing disruption to local fauna. In lieu of identified habitat trees (e.g. hollow-bearing trees) within the study area, if fauna are located within the study area during the proposed works a qualified ecologist / licensed wildlife handler must be contacted during tree removal in accordance with best practise methods.
Timing works to avoid critical life cycle events such as breeding or nursing	Moderate	Minor	Winter/early spring is breeding / nesting period for birds and fruit bats (including Grey-headed Flying Fox). Observe trees for fauna if works are to be conducted during this period, and if fauna are utilising trees, notify a qualified ecologist/licensed wildlife handler.
Sediment barriers or sedimentation ponds to control the quality of water released from the site into the receiving environment	Minor	Negligible	Appropriate controls will be utilised to manage exposed soil surfaces and stockpiles to prevent sediment discharge into waterways Ensure all works within proximity to the drainage lines have adequate sediment and erosion controls Commence revegetation as soon as practicable to minimise the risks of erosion (Arterra 2019).
Noise barriers or daily/seasonal timing of construction and operational activities to reduce impacts of noise	Minor	Negligible	Winter / early spring is breeding / nesting period for birds and fruit bats (including Grey-headed Flying Fox). Observe trees for fauna if works are to be conducted during this period, and if fauna are utilising trees, notify a qualified ecologist/licensed wildlife handler.
Light shields or daily / seasonal timing of construction and operational activities to reduce impacts of light spill	Minor	Negligible	Consider construction works only to occur during daylight hours, and consider not using night lights If required, lights installed as part of the proposed works should be directional so as to avoid shining into adjacent retained vegetation, adjacent to the boundaries of the study area (Estate)
Adaptive dust monitoring programs to control air quality	Minor	Negligible	Dust suppression measures will be implemented during construction works to limit dust on site Commence revegetation as soon as practicable (if applicable) to minimise areas likely to create dust

7.3 Urban ecology

No significant habitat features (for example, hollow-bearing trees, or sandstone outcrops) were identified within the study area during the site inspection, and thus no specific protection measures for habitat features are required for the proposed works. However, research detailed below on Native Streetscapes, Urban Green Infrastructure, and Nest boxes, may help shape the Preferred Final Plan for the study area.

7.3.1 Native Streetscapes

'Native streetscapes', containing a high proportion of native Australian trees (not necessarily endemic to the region), have been shown to support a higher overall abundance and richness of bird species compared to 'exotic streetscapes' and 'recently developed streetscapes' (White et al. 2005). Thus, it is recommended that a range of native (endemic and non-endemic) canopy tree species be retained where possible and planted throughout the streetscape bordering and within the study area.

The staged development approach will ensure a continuous overlap of habitat retention and replacement, thus minimsing disruption to GHFF foraging habitat. However to enhance the availability of potential foraging habitat for GHFF and compensate for any GHFF foraging habitat to be removed by the proposed works, revegetation plans should consider planting tree species identified in Eby and Law (2008) as high nectar-producing species and/or winter-flowering species. These trees are primarily within the *Eucalyptus, Corymbia, Grevillea,* and *Ficus* genera (Eby and Law 2008). Native high nectar producing species such as *Banksia* and *Grevillea* are also preferred foraging habitat for suburban nectivorous birds (French et al. 2005).

The study area is located within a 'Biodiversity Corridor' (Figure 3), and by integrating native Australian species into the Concept Plan, White et al. (2005) identifies the benefits to native birds within the region as:

- Facilitating the movement of species across the urban landscape
- Providing habitat that favours native bird species over indigenous bird species
- Enhancing remnant vegetation in the region by blending edges between remnant vegetation and the built environment (i.e. the edge of the 'Biodiversity Corridor'), and reducing the degree of isolation between green spaces.

Trees are the predominant elements that will define the public domain character and atmosphere. The tree palette for the Waterloo Estate aims to augment local character and species diversity (both native and exotic), maintaining biodiversity and support local wildlife (Turf 2018).

Species such as *Angophora costata* (Smooth-barked Apple), *Corymbia eximia* (Yellow Bloodwood), *Corymbia maculata* (Spotted Gum), *Melaleuca quinquenervia* (Broad-Leaved Paperbark), *Waterhousea floribunda* (Weeping lilly pilly) and *Lophostemon confertus* (Brushbox) will support local native bee species and foraging wildlife whilst providing canopies that will create shade minimising urban heat island effect and cooling the public domain during summer months (Turf 2018).

To appreciate Waterloo's existing vegetation, species such as *Banksia integrifolia* could be included to help strengthen the threatened plant community Eastern Suburbs Banksia Scrub that was prevalent in the area pre-1788 (**Appendix A;** Turf 2018).

The planting list prepared by the landscape group Turf Design Studio (Turf 2019) is included in **Appendix E**.

7.3.2 Mid-storey and ground covers

In accordance with the City of Sydney's UESAP overall objectives for the study area (Estate) and Waterloo Metro Quarter combined, mid and understorey plantings using locally native indigenous plants comprise of a minimum:

- 60% within the public domain; 70 species; and,
- 40% within private property; 15 species.

Low growing, flood tolerant understorey species may be used to further define the public domain, provide habitat and assist with water-sensitive urban design, avoiding obstruction of sight lines across the site and streets creating a safe and healthy environment (Turf 2018).

Tree and understorey species, such as *Livistona australis* (Cabbage Palm), *Syzygium paniculatum* (Brush Cherry), *Lomandra longifolia* (Spiney-head Mat Rush) and *Dianella caerulea* (Flax Lily) all are of indigenous significance and provide edible elements for cooking with flowers, fruits, roots and seeds all providing a source of food with the public domain (Turf 2018).

The planting list prepared by the landscape group Turf Design Studio (Turf 2019) is included in **Appendix E.**

7.3.3 Habitat features that will benefit urban biodiversity

Opportunities for the creation of habitat features within the study area which have been integrated into projects in Australia and internationally, include Urban Green Infrastructure, nest boxes, and bee hotels.

Urban Green Infrastructure

'Green roofs' and 'green walls' have been integrated in the following projects as examples:

- One Central Park, Sydney Australia (Nouvell et al. 2014)
- Bosco Verticale (name translates to *Vertical Forest*), Italy (Giacomella and Valagussa 2015)
- Barking Riverside, Barking, UK (Cannop et al. 2016)
- Malmö, Sweden (Austin 2013)
- Basel, Switzerland (Brenneisen 2006)
- Skyville at Dawson, Singapore (Semant and Na 2017).

Urban Green Infrastructure can provide potential foraging and roosting habitat for native fauna species, along with additional non-biodiversity benefits recorded from the above projects:

- Reduce cooling energy load, thermal impact, and 'Urban Heat Island Effect'
- Improved air quality
- Absorption of carbon
- Noise reduction
- Aesthetic appeal.

Nest boxes

Species-specific nest boxes have been shown to provide potential roosting habitat for mammals, birds, and micro-bats in natural environments (Lindenmayer et al. 2009; Goldingay et al. 2015; Lindenmayer et al. 2015), but can also be effective in urban environments, specifically for *Trichosurus vulpecula* (Common Brushtail Possum), *Pseudocheirus peregrinus* (Common Ringtail Possum), and local bird species (Harper et al 2005). Roosting habitat may be created by attaching nest boxes to trees and buildings.

8 Impact Assessment

8.1 Introduction

The Indicative Concept Proposal requires a substantial contiguous area to construct commercial and residential structures within the study area, and will be staged over a 10 year period. The staged development approach will ensure a continuous overlap of habitat retention and replacement, thus minimsing disruption to local fauna. The study area contains low biodiversity constraints or conservation opportunities in relation to the BC Act and EPBC Act.

8.2 Vegetation

The proposed works would involve the removal of approximately 2.62 ha of canopy vegetation from within the study area, comprising 2.08 ha of planted native species, over a 10 year staged development period. The study area consists of planted native and exotic vegetation, and no TECs, communities of conservation significance, or natural vegetation communities occur within the study area.

A summary of the likely direct impacts is outlined below in **Table 7.**

Table 7: Direct impacts to vegetation communities within and adjoining the study area over the 20 year staged development period

Origin		Area within study area (ha)	Area removed within Waterloo South (ha)
Native	**Endemic**	1.28	0.47
	Non-endemic	6.32	1.47
Introduced	**Non-invasive**	1.29	0.37
	Invasive	0.19	0.09
	TOTAL	9.08	2.4

8.3 Threatened ecological communities (TECs)

No TECs or communities of conservation significance or natural vegetation communities were identified within the study area during the site inspection, and based on the Likelihood of Occurrence assessment, are unlikely to occur (**Appendix A**).

8.4 Threatened fauna, and fauna of local conservation significance

8.4.1 *Pteropus poliocephalus* (Grey-headed Flying Fox)

Grey-headed Flying Fox (GHFF) is listed as *Vulnerable* under the BC Act and *Vulnerable* under the EPBC Act (OEH 2017b).

The proposed works would remove 2.4 ha of potential foraging habitat for Grey-headed Flying-fox over a 10 year staged development period. This figure comprises planted native canopy vegetation, including approximately 12 *Ficus* sp.individuals, 121 individuals of *Eucalyptus/Corymbia/Angophora* sp., 27 *Lophostemon confertus* (Brush Box) and 27 *Melaleuca quinquenervia* (Broad-leafed Paperbark) (a significant feed tree species; Eby and Law 2008). The staged development approach will ensure a

continuous overlap of habitat retention and replacement, thus minimsing disruption to GHFF foraging resources.

An Assessment of Significance (AoS) under the BC Act determined that the proposed works would not cause a significant impact to GHFF, and thus a Species Impact Statement is not required (**Appendix C**).

The AoS concluded that the proposed works is unlikely to constitute a significant impact on Grey-headed Flying-fox given that:

- The proposed works would remove 2.4 ha of potential foraging habitat for Grey-headed Flying-fox. This figure comprises planted native canopy vegetation, including approximately 12 *Ficus* sp.individuals*,* 121 individuals of *Eucalyptus/Corymbia/Angophora* sp., 27 *Lophostemon confertus* (Brush Box) and 27 *Melaleuca quinquenervia* (Broad-leafed Paperbark). Although *Melaleuca quinquenervia* is a significant food source for GHFF (Eby and Law 2008), potential foraging habitat within the study area is unlikely to be critical habitat for GHFF as it contributes to only approximately 0.1 % of likely potential foraging habitat within 10 km of the study area for this highly mobile species (**Table 8** and **Figure 8**).

- The proposed works are unlikely to isolate any potential foraging habitat for this highly mobile species.

- According to the National Flying-fox Monitoring Program, no GHFF camps currently occur or have ever been recorded within the study area (DoEE 2018). The nearest active GHFF camp occurs approximately 1 km to the east of the study area within Centennial Park, and when reviewed (April 2018), consisted of between 2,500 and 10,000 individuals (DoEE 2018).

- The development approach will ensure a continuous overlap of habitat retention and replacement, thus further minimsing disruption to GHFF foraging resources.

A Significance Assessment under the EPBC Act determined that the proposed staged development works would not cause a significant impact to GHFF, and thus referral to the Minister for Environment is not recommended (**Appendix D**). The Significance Assessment noted that according to the National Flying-fox Monitoring Program, no GHFF camps currently occur or have ever been recorded within the study area (DoEE 2018). No important populations of GHFF are likely to occur within the study area.

To assist in the above assessments, the area of likely potential foraging habitat for GHFF mapped within 10 km of the study area has been detailed in **Table 9** and **Figure 8** below.

Table 8: Area of likely potential foraging habitat for GHFF mapped within 10 km of the study area and Waterloo Estate SSP

Vegetation Community	PCT Code	Area (ha)
Cumberland Dry Sclerophyll Forests	724	0.442
Coastal Dune Dry Sclerophyll Forest	1775	11.725
Sydney Coastal Dry Sclerophyll Forests	1776	41.965
Sydney Coastal Dry Sclerophyll Forests	1778	348.550

Vegetation Community	PCT Code	Area (ha)
Sydney Coastal Dry Sclerophyll Forests	1780	0.213
Sydney Coastal Dry Sclerophyll Forests	1250	7.935
Sydney Coastal Dry Sclerophyll Forests	1782	6.201
Coastal Dune Dry Sclerophyll Forest	1793	0.470
Coastal Swamp Forests	1795	1.820
Coastal Swamp Forests	1232	10.289
Coastal Swamp Forests	1231	2.112
Coastal Swamp Forests	1798	0.516
Coastal Headland Heaths	771	14.260
Wallum Sand Heaths	664	55.898
Wallum Sand Heaths	1061	16.931
Sydney Coastal Heaths	772	25.212
Sydney Coastal Heaths	1822	71.183
Sydney Coastal Heaths	1823	1.218
Sydney Coastal Heaths	1824	5.865
Sydney Coastal Heaths	881	1.459
Coastal Headland Heaths	1810	0.126
Northern Warm Temperate Rainforests	1828	2.900
Littoral Rainforests	1833	7.243
Littoral Rainforests	910	0.000
Mangrove Swamps	920	29.896
North Coast Wet Sclerophyll Forests	1237	5.962
North Coast Wet Sclerophyll Forests	1841	35.103
Northern Hinterland Wet Sclerophyll Forests	1845	0.864
Northern Hinterland Wet Sclerophyll Forests	1847	0.903
Northern Hinterland Wet Sclerophyll Forests	1281	7.130
N/A	N/A	1796.833
Total		**2511.221**

8.4.2 Potential habitat for ‘small birds’

‘Small birds’ (a general group under the UESAP), including *Phylidonyris novaehollandiae* (New Holland Honeyeater) and *Pardalotus punctatus* (Spotted Pardalote) have the potential to occur within the study area.

The proposed works would remove approximately 2.4 ha of marginal habitat over the 10 year staged development period for small birds as a general group, as identified under the UESAP. However it is understood this will be temporary as proposed landscaping and revegetation activities mentioned above will be undertaken. The potential habitat within the study area is marginal as it only includes trees, and lacks ground and midstorey structure important for many small bird species. The amount of potential habitat to be removed is marginal relative to similar potential habitat for small birds in the region. The proposed works are unlikely to fragment the function of the adjacent biodiversity corridor displayed in **Figure 8**. The study area does not contain any specific roosting habitat for birds such as hollow-bearing trees. The loss of the habitat will however have a temporary effect on local bird and reptiles until the landscaping elements are established. The staged development approach will also ensure a continuous overlap of habitat retention and replacement, thus minimsing disruption to local birds and reptiles.

Small birds as a general group are not listed under the BC Act or EPBC Act, and therefore a formal assessment using a Test of Significance (BC Act) or Significance Assessment (EPBC Act) would not be required.

Figure 8: Likely potential foraging habitat for GHFF within 10 km of the study area and Waterloo South

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Appendix A Likelihood of Occurrence

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

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

An assessment of significance was conducted for threatened species or ecological communities that were recorded within the study area or had a higher likelihood of occurring and were not recorded during the site visit. It is noted that some threatened fauna species that are highly mobile, wide ranging and vagrant may use portions of the study area intermittently for foraging. For these fauna species, the habitat present and likely to be impacted is not considered to be important to the threatened species, particularly in relation to the amount of similar habitat remaining in the surrounding landscape. As such, an assessment of significance in reference to State or Commonwealth legislation was not considered necessary.

Information provided in the habitat associations' column has primarily been extracted (and modified) from the Commonwealth Species Profile and Threats Database (DoEE 2017b), the NSW Threatened Species Profiles (OEH. 2017b), the Atlas of Living Australia (ALA 2017), and BirdLife Australia (BLA 2017).

Species considered to be primarily marine species, or marine migratory species were not included in the likelihood table. No habitat for marine species is present.

Table 9: Likelihood of occurrence and requirement of impact assessment for threatened ecological communities and communities of conservation significance

Community Name	BC Act Status	EPBC Act Status	Description	Habitat	Likelihood of occurrence	Impact Assessment Required
Ecological Communities						
Blue Gum High Forest in the Sydney Basin Bioregion	CE	CE	A moist, tall open forest community, with dominant canopy trees of *Eucalyptus saligna* (Sydney Blue Gum) and *E. pilularis* (Blackbutt). *Allocasuarina torulosa* (Forest Oak) and *Angophora costata* (Sydney Red Gum) also occur. Species adapted to moist habitat such as *Acmena smithii* (Lilly Pilly), *Ficus coronata* (Sandpaper Fig), *Calochlaena dubia* (Rainbow Fern) and *Adiantum aethiopicum* (Common Maidenhair) may also occur.	On ridgelines in areas where rainfall is high (above 1100 mm per year) and the soils are relatively fertile and derived from Wianamatta shale. Also occurs on soils associated with localised volcanic intrusions.	Unlikely. The soil landscape (Tuggerah) is not positively associated with this vegetation community.	No. Although some characteristic canopy species are present, the vegetation does not meet the requirements of the Final Determination (OEH 2011b)

Community Name	BC Act Status	EPBC Act Status	Description	Habitat	Likelihood of occurrence	Impact Assessment Required
Coastal Alluvium Swamp Forest, a sub-community of Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E	-	The most widespread and abundant dominant trees include *Eucalyptus robusta* (swamp mahogany), *Melaleuca quinquenervia* (paperbark) and, south from Sydney, *Eucalyptus botryoides* (bangalay) and *Eucalyptus longifolia* (woollybutt). Other trees may be scattered throughout at low abundance or may be locally common at few sites, including *Callistemon salignus* (sweet willow bottlebrush), *Casuarina glauca* (swamp oak) and *Eucalyptus resinifera* subsp. *hemilampra* (red mahogany), *Livistona australis* (cabbage palm) and *Lophostemon suaveolens* (swamp turpentine).	Associated with humic clay loams and sandy loams, on waterlogged or periodically inundated alluvial flats and drainage lines associated with coastal floodplains. Generally occurs below 20 m (though sometimes up to 50 m) elevation. The composition of the community is primarily determined by the frequency and duration of waterlogging and the texture, salinity nutrient and moisture content of the soil, and latitude. The composition and structure of the understorey is influenced by grazing and fire history, changes to hydrology and soil salinity and other disturbance, and may have a substantial component of exotic grasses, vines and forbs.	No. The soil landscape (Tuggerah) is not positively associated with this vegetation community.	No

Community Name	BC Act Status	EPBC Act Status	Description	Habitat	Likelihood of occurrence	Impact Assessment Required
Coastal saltmarsh in the NSW North Coast, Sydney Basin and South East Corner bioregions	E	V	Characteristic species include *Baumea juncea*, *Juncus kraussii* subsp. *australiensis* (Sea Rush), *Sarcocornia quinqueflora* subsp. *quinqueflora* (Samphire), *Sporobolus virginicus* (Marine Couch), *Triglochin striata* (Streaked Arrowgrass), *Ficinia nodosa* (Knobby Club-rush), *Samolus repens* (Creeping Brookweed), *Selliera radicans* (Swamp Weed), *Suaeda australis* (Seablite) and *Zoysia macrantha* (Prickly Couch).	"Typically restricted to the upper intertidal environment; mainly associated with the soft substrate shores of estuaries and embayments (sandy and/or muddy) and on some open, low wave energy coasts)."	No. The soil landscape (Tuggerah) is not positively associated with this vegetation community.	No

Community Name	BC Act Status	EPBC Act Status	Description	Habitat	Likelihood of occurrence	Impact Assessment Required
Cooks River / Castlereagh Ironbark Forest in the Sydney Basin Bioregion	E	CE	"Ranges from open forest to low woodland, with a canopy dominated by *Eucalyptus fibrosa* (Broad-leaved Ironbark) and *Melaleuca decora* (Paperbark). The canopy may also include other eucalypts such as *E. longifolia* (Woolybutt). The dense shrubby understorey consists of *Melaleuca nodosa* (Prickly-leaved Paperbark) and *Lissanthe strigosa* (Peach Heath), with a range of 'pea' flower shrubs, such as *Dillwynia tenuifolia*, *Pultenaea villosa* (Hairy Bush-pea) and *Daviesia ulicifolia* (Gorse Bitter Pea). The sparse ground layer contains a range of grasses and herbs."	Mainly occurs on clay soils derived from the deposits of ancient river systems (alluvium), or on shale soils of the Wianamatta Shales.	Unlikely	No
Eastern Suburbs Banksia Scrub in the Sydney Basin Bioregion	E	E	Predominantly a sclerophyllous heath or scrub community although, depending on site topography and hydrology, some remnants contain small patches of woodland, low forest or limited wetter areas. Common species include *Banksia aemula*, *B. ericifolia, B. serrata, Eriostemon australasius, Lepidosperma laterale*, *Leptospermum laevigatum, Monotoca elliptica* and *Xanthorrhoea resinifera*.	Disjunct patches of nutrient poor aeolian (wind-blown) dune sand.	Unlikely	No. Although some characteristic canopy species are present, the vegetation does not meet the requirements of the Final Determination (OEH 2011b)

Community Name	BC Act Status	EPBC Act Status	Description	Habitat	Likelihood of occurrence	Impact Assessment Required
Kurnell Dune Forest in the Sutherland Shire and City of Rockdale	E	-	A low open sclerophyll forest community with a distinctive moist forest component. Often found in association with areas of sclerophyll heath and scrub. Characteristic sclerophyll tree and shrub species include *Angophora costata*, *Banksia ericifolia, Banksia serrata, Eucalyptus botryoides, Eucalyptus robusta, Leptospermum laevigatum* and *Monotoca elliptica*. The moist component of the flora is characterised by species including *Breynia oblongifolia, Cissus antarctica, Cissus hypoglauca, Clerodendrum tomentosum, Cupaniopsis anacardioides, Elaeocarpus reticulatus, Endiandra sieberi, Glochidion ferdinandi, Maclura cochinchinensis, Notelaea longifolia, Rapanea variabilis* and *Stephania japonica* var. *discolor*.	Coastal dune sand.	No. The soil landscape (Tuggerah) is not positively associated with this vegetation community.	No.

Community Name	BC Act Status	EPBC Act Status	Description	Habitat	Likelihood of occurrence	Impact Assessment Required
Pittwater and Wagstaffe Spotted Gum Forest in the Sydney Basin Bioregion	E	-	General structural form is open-forest but may now exist as woodland or remnant trees. The tree canopy layer is characterised by *Corymbia maculata* (Spotted Gum) and *Eucalyptus paniculata* (Grey Ironbark) and is associated with *Angophora costata* (Smooth-barked Apple), *Corymbia maculata* (Red Bloodwood), *E. umbra* (Broad-leaved White Mahogany*), E. punctata* (Grey Gum), *Syncarpia glomulifera* (Turpentine), *E. botryoides* (Bangalay), and *Angophora floribunda* (Rough-barked Apple).	Occurs in association with shale derived soils with high rainfall on lower hillslopes on the Narrabeen Group - Newport Formations on the Barrenjoey Peninsula and western Pittwater Foreshores.	No. The soil landscape (Tuggerah) is not positively associated with this vegetation community.	No.

Community Name	BC Act Status	EPBC Act Status	Description	Habitat	Likelihood of occurrence	Impact Assessment Required
Sydney Freshwater Wetlands in the Sydney Basin Bioregion	E	-	A complex of vegetation types largely restricted to freshwater swamps in coastal areas. These also vary considerably due to fluctuating water levels and seasonal conditions. Characteristic species include sedges and aquatic plants such as *Baumea* species, *Eleocharis sphacelata, Gahnia* species, *Ludwigia peploides* subsp. *montevidensis* and *Persicaria species*. Areas of open water may occur where drainage conditions have been altered and there may also be patches of emergent trees and shrubs.	Largely restricted to freshwater swamps in swales and depressions on sand dunes and low nutrient sandplains such as those of the Warriewood and Tuggerah soil landscapes.	No. The soil landscape (Tuggerah) is not positively associated with this vegetation community.	No

Community Name	BC Act Status	EPBC Act Status	Description	Habitat	Likelihood of occurrence	Impact Assessment Required
Sydney Turpentine Ironbark Forest	CE	CE	Open forest, with dominant canopy trees including Turpentine *Syncarpia glomulifera*, Grey Gum *Eucalyptus punctata*, Grey Ironbark *E. paniculata* and Thin-leaved Stringybark *E. eugenioides.* In areas of high rainfall (over 1050 mm per annum) Sydney Blue Gum *E. saligna* is more dominant. The shrub stratum is usually sparse and may contain mesic species such as Sweet Pittosporum *Pittosporum undulatum* and Elderberry Panax *Polyscias sambucifolia*.	Occurs close to the shale/sandstone boundary on the more fertile shale influenced soils, in higher rainfall areas on the higher altitude margins of the Cumberland Plain, and on the shale ridge caps of sandstone plateaus. A transitional community, between Cumberland Plain Woodland in drier areas and Blue Gum High Forest on adjacent higher rainfall ridges.	Unlikely. The soil landscape (Tuggerah) is not positively associated with this vegetation community.	No. Although some characteristic canopy species are present, the vegetation does not meet the requirements of the Final Determination (2011c)
Mangrove Forest*	-	-	Low forest 2-8 m tall, either with no groundcover or a sparse cover of forbs. Tree species include *Avicennia marina*, *Aegiceras corniculata*, with *Bruguiera gymnorhiza*, *Rhizophora stylosa* and *Excoecaria agallocha* in the north.	Mudflats in coastal estuaries subject to frequent tidal inundation.	No. Unlikely. The soil landscape (Tuggerah) is not positively associated with this vegetation community.	No

Community Name	BC Act Status	EPBC Act Status	Description	Habitat	Likelihood of occurrence	Impact Assessment Required
Coastal Sandstone Outcrop Complex* (comprises elements of Coastal Sandstone Foreshores Forest, Sandstone Cliff Soak and Coastal Littoral Rainforest)	-	-	The UESAP identifies locations within the LGA as: Domain (Yurong Precinct); Garden Island, Woolloomooloo; Quarry Master Drive, Wentworth Park Light Rail Station and Light Rail Corridor, Pyrmont; Pirrama Road, Pyrmont; The Anchorage, Glebe; Arthur (Paddy) Grey Reserve, Glebe; Arthur McElhone Reserve, Elizabeth Bay; Embarkation Park and McElhone Stairs, Potts Point.	Naturally occurring vegetation associated with sandstone cliffs and outcrops including possible remnants in the Royal Botanic Gardens, Domain and Garden Island, and possible remnant Angophora hispida tree at Arthur McElhone Reserve.	No. The soil landscape (Tuggerah) is not positively associated with this vegetation community.	No. Although some small sandstone boulders are present within the study area (**Figure 4**), they appear to have been places for the purposes of landscaping and do not constitute a naturally occurring sandstone outcrop complex.
Bush Regeneration Sites*	-	-	The UESAP identifies locations within the LGA as: Federal, Bicentennial and Jubilee Parks, The Anchorage and Arthur (Paddy) Grey Reserve, Glebe; Orphan School Creek, Forest Lodge; various sites in Pyrmont.	Locations previously cleared and subject to a regeneration project.	Unlikely	No

*Notes: CE= Critically Endangered, E= Endangered, V=Vulnerable, * = Locally significant*

Table 10: Likelihood of occurrence and requirement of impact assessment for threatened fauna species and species of local conservation significance

Scientific Name	Common Name	BC Act Status	EPBC Status	Habitat	Likelihood of Occurrence	Impact Assessment Required
Amphibians						
Amphibians (As a general group identified by the UESAP. Non-threatened species recorded within 5 km of study area listed in **Table 14**)		-	-	Swamps, marshes, streams, rivers, ponds, inundations, drainage lines and generally moist areas.	Potential	No, there is no specific potential habitat located within the study area
Crinia tinnula	Wallum Froglet	V		Acidic swamps on coastal sand plains (typically in sedgelands and wet heathlands), drainage lines, and swamp sclerophyll forests.	No. No suitable habitat on or near the site	No
Heleioporus australiacus	Giant Burrowing Frog	V	V	Heath, woodland and open dry sclerophyll forest on a variety of soil types except those that are clay based.	No. No suitable habitat on or near the site	No
Litoria aurea	Green and Golden Bell Frog	E	V	Marshes, dams and stream-sides, particularly those containing *Typha* spp. (bullrushes) or *Eleocharis* spp. (spikerushes). Some populations occur in highly disturbed areas.	No. No suitable habitat on or near the site	No
*Litoria fallax**	Eastern Dwarf Tree Frog	-	-	Coastal wetlands, swamps, dams and streams, and can also be found in urban areas.	Potential	No

Scientific Name	Common Name	BC Act Status	EPBC Status	Habitat	Likelihood of Occurrence	Impact Assessment Required
*Litoria peronii**	Peron's Tree Frog	-	-	Most forest habitats, but will also forage open grassland and other open areas.	Potential	No
Mixophyes balbus	Stuttering Frog	E	V	Rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range.	No. No suitable habitat on or near the site	No
Pseudophryne australis	Red-crowned Toadlet	V		Open forests, mostly on Hawkesbury and Narrabeen Sandstones.	No. No suitable habitat on or near the site	No
Birds						
Small birds (As a general group identified by the UESAP. Non-threatened species recorded within 5 km of study area listed in **Table 14**)		-	-	A variety of vegetated habitats, dependant on the species.	Potential	Yes. Marginal potential habitat occurs within the study area.
Freshwater wetland birds (As a general group identified by the UESAP. Non-threatened species recorded within 5 km of study area listed in **Table 14**)		-	-	Coastal and inland wetlands, pond, inundations, dense sedge sand reeds.	No	No
*Acanthiza nana**	Yellow Thornbill	-	-	Found in open forests, woodlands and shrublands which are dominated by Casuarinas, Acacias or paperbarks	Potential	Potential. Dependant on proposed works.

Scientific Name	Common Name	BC Act Status	EPBC Status	Habitat	Likelihood of Occurrence	Impact Assessment Required
				rather than eucalypts. Often seen in parks and gardens, preferring more established areas.		
Actitis hypoleucos	Common Sandpiper		M	Coastal wetlands and some inland wetlands, especially muddy margins or rocky shores. Also estuaries and deltas, lakes, pools, billabongs, reservoirs, dams and claypans, mangroves.	No No suitable habitat on or near the site	No
*Acrocephalus australis**	Australian Reed-warbler	-	-	A freshwater wetland species of local conservation significance. Prefers dense vegetation alongside water, especially thick reed beds, as well as tall crops, bamboo thickets and lantana.	Unlikely	No
Anous stolidus	Common Noddy		M	Marine.	No	No
Anseranas semipalmata	Magpie Goose	V		Shallow wetlands, floodplains, grasslands, pastures, dams and crops.	Unlikely	No
Anthochaera phrygia	Regent Honeyeater	CE	CE	Eucalypt woodland and open forest, wooded farmland and urban areas with mature eucalypts, and riparian forests of *Casuarina cunninghamiana* (River Oak).	Unlikely	No
Apus pacificus	Fork-tailed Swift		M	Riparian woodland, swamps, low scrub, heathland, saltmarsh, grassland, Spinifex sandplains, open farmland and inland and coastal sand-dunes.	Unlikely	No

Scientific Name	Common Name	BC Act Status	EPBC Status	Habitat	Likelihood of Occurrence	Impact Assessment Required
Ardea alba	Great Egret			Swamps and marshes, grasslands, margins of rivers and lakes, salt pans, estuarine mudflats and other wetland habitats.	Unlikely	No
Ardea ibis	Cattle Egret		M	Grasslands, wooded lands and terrestrial wetlands.	Unlikely	No
Ardenna carneipes	Flesh-footed Shearwater	V	M	Marine.	No	No
Ardenna pacificus	Wedge-tailed Shearwater		M	Islands, offshore.	No	No
Ardenna tenuirostris	Short-tailed Shearwater		M	Islands, offshore.	No	No
Arenaria interpres	Ruddy Turnstone		M	Tidal reefs and pools; pebbly, shelly and sandy shores; mudflats; inland shallow waters; sewage ponds, saltfields; ploughed ground.	No	No
Botaurus poiciloptilus	Australasian Bittern	E	E	Permanent freshwater wetlands with tall, dense vegetation, particularly Typha spp. (bullrushes) and Eleocharis spp. (spikerushes).	No	No
Burhinus grallarius	Bush Stone-curlew	E		In NSW, it occurs in lowland grassy woodland and open forest.	No	No
Calidris acuminata	Sharp-tailed Sandpiper		M	Shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation.	No	No

Scientific Name	Common Name	BC Act Status	EPBC Status	Habitat	Likelihood of Occurrence	Impact Assessment Required
Calidris alba	Sanderling	V	M	Coastal areas on low beaches of firm sand, near reefs and inlets, along tidal mudflats and lagoons; rarely recorded in near-coastal wetlands.	No	No
Calidris bairdii	Baird's Sandpiper		M	Sandy beaches, mudflats, saltponds, sewage ponds and shores of lakes and lagoons.	No	No
Calidris canutus	Red Knot		E, M	Intertidal mudflats, sandflats sheltered sandy beaches, estuaries, bays, inlets, lagoons, harbours, sandy ocean beaches, rock platforms, coral reefs, terrestrial saline wetlands near the coast, sewage ponds and saltworks. Rarely inland lakes or swamps.	No	No
Calidris ferruginea	Curlew Sandpiper	E	CE, M	"Littoral and estuarine habitats, including intertidal mudflats, non-tidal swamps, lakes and lagoons on the coast and sometimes inland."	No	No
Calidris melanotos	Pectoral Sandpiper		M	Shallow fresh to saline wetlands, including coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands.	No	No
Calidris ruficollis	Red-necked Stint		M	Tidal mudflats, saltmarshes, sandy and shelly beaches, saline and freshwater wetlands, saltfields, sewage ponds.	No	No
Calidris subminuta	Long-toed Stint		M	Coastal and inland shallow wetlands, sewage ponds, tidelines, tidal mudflats.	No	No

Scientific Name	Common Name	BC Act Status	EPBC Status	Habitat	Likelihood of Occurrence	Impact Assessment Required
Calidris tenuirostris	Great Knot	V	CE, M	Intertidal mudflats or sandflats, including inlets, bays, harbours, estuaries and lagoons.	No	No
Calonectris leucomelas	Streaked Shearwater		M	Marine.	No	No
Calyptorhynchus lathami	Glossy Black-Cockatoo, Riverina population	EP, V		Largely restricted to hills and low ridges where suitable stands of its food plant *Allocasuarina verticillata* (Drooping Sheoak) remain.	No	No
Calyptorhynchus lathami	Glossy Black-Cockatoo	V		Open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur.	Unlikely	No
Charadrius leschenaultii	Greater Sand-plover	V	V, M	Almost entirely restricted to coastal areas in NSW, mainly on sheltered sandy, shelly or muddy beaches or estuaries with large intertidal mudflats or sandbanks.	Unlikely	No
Charadrius mongolus	Lesser Sand-plover	V	E, M	Almost entirely coastal in NSW, using sheltered bays, harbours and estuaries with large intertidal sandflats or mudflats, sandy beaches, coral reefs and rock platforms.	No	No
Charadrius veredus	Oriental Plover		M	Open plains, ploughed land, inland swamps, tidal mudflats, claypans, coastal marshes, grassy airfields, playing fields, lawns.	No	No
Chlidonias leucopterus	White-winged Black Tern		M	Large coastal and inland wetlands, saltfields, tidal estuaries, lagoons, grassy swamps, and sewage ponds.	No	No

Scientific Name	Common Name	BC Act Status	EPBC Status	Habitat	Likelihood of Occurrence	Impact Assessment Required
Daphoenositta chrysoptera	Varied Sittella	V		Inhabits eucalypt forests and woodlands, mallee and Acacia woodland.	Unlikely	No
Dasyornis brachypterus	Eastern Bristlebird	E	E	Central and southern populations inhabit heath and open woodland with a heathy understorey. In northern NSW, habitat comprises open forest with dense tussocky grass understorey.	No	No
Diomedea antipodensis	Antipodean Albatross	V	V	Marine.	No	No
Diomedea antipodensis gibsoni	Antipodean Albatross	V	V	Marine.	No	No
Diomedea exulans	Wandering Albatross	E	V, M	Marine.	No	No
Diomedea gibsoni	Gibson's Albatross	V	V	Marine.	No	No
Egretta sacra	Eastern Reef Egret			Beaches, rocky shores, tidal rivers and inlets, mangroves, and exposed coral reefs.	No	No
*Elseyornis melanops**	Black-fronted Dotterel	-	-	A freshwater wetland species of local conservation significance. Found in the shallow margins of wetlands, lakes, rivers, sewage farms, storm drains and marshes. It is normally always near freshwater and is not often seen on the coast.	No	No

Scientific Name	Common Name	BC Act Status	EPBC Status	Habitat	Likelihood of Occurrence	Impact Assessment Required
Epthianura albifrons	White-fronted Chat population in the Sydney Metropolitan Catchment Management Area	E		"Saltmarsh of Newington Nature Reserve and in grassland on the northern bank of the Parramatta River. Saltmarsh and on the sandy shoreline of a small island of Towra Point Nature Reserve."	Unlikely	No
Epthianura albifrons	White-fronted Chat	V		Saltmarsh vegetation, open grasslands and sometimes low shrubs bordering wetland areas.	Unlikely	No
Erythrotriorchis radiatus	Red Goshawk	CE	V	Open woodland and forest, often along or near watercourses or wetlands. In NSW, preferred habitats include mixed subtropical rainforest, Melaleuca swamp forest and coastal riparian Eucalyptus forest.	Unlikely	No
Fregata ariel	Lesser Frigatebird		M	Marine.	No	No
Fregata minor	Great Frigatebird		M	Marine.	No	No
Fregetta grallaria	White-bellied Storm-Petrel	V	V	Marine.	No	No
Gallinago hardwickii	Latham's Snipe		M	Freshwater, saline or brackish wetlands up to 2000 m above sea-level; usually freshwater swamps, flooded grasslands or heathlands.	No	No
*Gallirallus philippensis**	Buff-banded Rail	-	-	A freshwater wetland species of local conservation significance. Seen singly or in pairs in dense reeds and vegetation bordering many types of wetlands or crops. It	No	No

Scientific Name	Common Name	BC Act Status	EPBC Status	Habitat	Likelihood of Occurrence	Impact Assessment Required
				makes widespread use of artificial wetlands like sewage ponds and drainage channels.		
Glossopsitta pusilla	Little Lorikeet	V		Dry, open eucalypt forests and woodlands, including remnant woodland patches and roadside vegetation.	Unlikely	No
Grantiella picta	Painted Honeyeater	V	V	Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests.	No	No
Haematopus fuliginosus	Sooty Oystercatcher	V		Rocky headlands, rocky shelves, exposed reefs with rock pools, beaches and muddy estuaries.	No	No
Haematopus longirostris	Pied Oystercatcher	E		Intertidal flats of inlets and bays, open beaches and sandbanks.	No	No
Haliaeetus leucogaster	White-bellied Sea-Eagle	V		Freshwater swamps, rivers, lakes, reservoirs, billabongs, saltmarsh and sewage ponds and coastal waters. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, forest and urban areas.	No	No
Hieraaetus morphnoides	Little Eagle	V		Open eucalypt forest, woodland or open woodland, including sheoak or *Acacia* woodlands and riparian woodlands of interior NSW.	Unlikely	No
*Himantopus himantopus**	Black-winged Stilt	-	-	A freshwater wetland species of local conservation significance. A social species, and is usually found in small groups. Black-winged Stilts prefer freshwater and saltwater	No	No

Scientific Name	Common Name	BC Act Status	EPBC Status	Habitat	Likelihood of Occurrence	Impact Assessment Required
				marshes, mudflats, and the shallow edges of lakes and rivers.		
Hirundapus caudacutus	White-throated Needletail		M	Occur most often over open forest and rainforest, as well as heathland, and remnant vegetation in farmland.	No	No
Hydroprogne caspia	Caspian Tern		M	Coastal offshore waters, beaches, mudflats, estuaries, rivers, lakes.	No	No
Ixobrychus flavicollis	Black Bittern	V		Terrestrial and estuarine wetlands. Also flooded grassland, forest, woodland, rainforest and mangroves where permanent water is present.	No	No
Lathamus discolor	Swift Parrot	E	CE	Box-ironbark forests and woodlands.	Unlikely	No
Limicola falcinellus	Broad-billed Sandpiper	V	M	Sheltered parts of the coast such as estuarine sandflats and mudflats, harbours, embayments, lagoons, saltmarshes and reefs.	No	No
Limosa lapponica	Bar-tailed Godwit		M	Intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons, bays, seagrass beds, saltmarsh, sewage farms and saltworks, saltlakes and brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-flats. Rarely inland wetlands, paddocks and airstrips.	No	No

Scientific Name	Common Name	BC Act Status	EPBC Status	Habitat	Likelihood of Occurrence	Impact Assessment Required
Limosa limosa	Black-tailed Godwit	V	M	"Usually sheltered bays, estuaries and lagoons with large intertidal mudflats and/or sandflats. Further inland, it can also be found around muddy lakes and swamps."	No	No
Lophoictinia isura	Square-tailed Kite	V		Timbered habitats including dry woodlands and open forests, particularly timbered watercourses.	No	No
Macronectes giganteus	Southern Giant Petrel	E	E, M	Marine.	No	No
Macronectes halli	Northern Giant-Petrel	V	V, M	Marine.	No	No
*Malurus cyaneus**	Superb Fairy-wren	-	-	A species of local conservation significance. Seen in most habitat types where suitable dense cover and low shrubs occur. They are common in urban parks and gardens, and can be seen in small social groups. These groups normally consist of one male and several females and young birds.	Potential	No
Monarcha melanopsis	Black-faced Monarch		M	Rainforest, open eucalypt forests, dry sclerophyll forests and woodlands, gullies in mountain areas or coastal foothills, Brigalow scrub, coastal scrub, mangroves, parks and gardens.	No	No
Monarcha trivirgatus	Spectacled Monarch			Mountain/lowland rainforest, wooded gullies, riparian vegetation including mangroves.	No	No

Scientific Name	Common Name	BC Act Status	EPBC Status	Habitat	Likelihood of Occurrence	Impact Assessment Required
Motacilla flava	Yellow Wagtail		M	Swamp margins, sewage ponds, saltmarshes, playing fields, airfields, ploughed land, lawns.	No	No
Myiagra cyanoleuca	Satin Flycatcher		M	Eucalypt-dominated forests, especially near wetlands, watercourses, and heavily-vegetated gullies.	No	No
Neophema chrysogaster	Orange-bellied Parrot	CE	CE	Winter habitat is mostly within 3 km of the coast in sheltered bays, lagoons, estuaries, coastal dunes and saltmarshes. Also small islands and peninsulas, saltworks, golf courses, low samphire herbland and taller coastal shrubland.	No	No
Neophema pulchella	Turquoise Parrot	V		Eucalypt and cypress pine open forests and woodlands, ecotones between woodland and grassland, or coastal forest and heath.	No	No
Ninox connivens	Barking Owl	V		Woodland and open forest, including fragmented remnants and partly cleared farmland, wetland and riverine forest.	No	No
Ninox strenua	Powerful Owl	V		Woodland, open sclerophyll forest, tall open wet forest and rainforest.	Unlikely	No
Numenius madagascariensis	Eastern Curlew		CE, M	Estuaries, bays, harbours, inlets and coastal lagoons, intertidal mudflats or sandflats, ocean beaches, coral reefs, rock platforms, saltmarsh, mangroves, freshwater/brackish lakes, saltworks and sewage farms.	No	No

Scientific Name	Common Name	BC Act Status	EPBC Status	Habitat	Likelihood of Occurrence	Impact Assessment Required
Numenius minutus	Little Curlew		M	Dry grasslands, open woodlands, floodplains, margins of drying swamps, tidal mudflats, airfields, playing fields, crops, saltfields, sewage ponds.	No	No
Numenius phaeopus	Whimbrel		M	Estuaries, mangroves, tidal flats, coral cays, exposed reefs, flooded paddocks, sewage ponds, grasslands, sports fields, lawns.	No	No
Onychoprion fuscata	Sooty Tern	V		Marine.	No	No
Pandion cristatus	Eastern Osprey	V		Rocky shorelines, islands, reefs, mouths of large rivers, lagoons and lakes.	No	No
*Pardalotus punctatus**	Spotted Pardalote	-	-	A species of local conservation significance. The Spotted Pardalote is mostly found in eucalypt forests and woodlands but occurs in parks and gardens with well-established eucalypt canopy.	Potential	Yes. Potential habitat occurs within the study area.
Petroica boodang	Scarlet Robin	V		Dry eucalypt forests and woodlands, and occasionally in mallee, wet forest, wetlands and tea-tree swamps.	Unlikely	No
Petroica phoenicea	Flame Robin	V		Breeds in upland tall moist eucalypt forests and woodlands. In winter uses dry forests, open woodlands, heathlands, pastures and native grasslands. Occasionally occurs in temperate rainforest, herbfields, heathlands, shrublands and sedgelands at high altitudes.	Unlikely	No

Scientific Name	Common Name	BC Act Status	EPBC Status	Habitat	Likelihood of Occurrence	Impact Assessment Required
Pezoporus wallicus wallicus	Eastern Ground Parrot	V		Coastal or subcoastal low heathland and sedgeland.	No	No
Phaethon lepturus	White-tailed Tropicbird		M	Marine.	No	No
Philomachus pugnax	Ruff		M	Terrestrial wetlands including lakes, swamps, pools, lagoons, tidal rivers, swampy fields and floodlands. Occasionally harbours, estuaries, seashores, sewage farms and saltworks.	No	No
*Phylidonyris novaehollandiae**	New Holland Honeyeater	-	-	A species of local conservation significance. Common in heath, forests, woodland and gardens, mainly where grevilleas and banksias are found. It is inquisitive and approaches humans. It also mixes with other types of honeyeaters.	Potential	Yes. Potential habitat occurs within the study area.
Phoebetria fusca	Sooty Albatross	V	V, M	Marine.	No	No
*Platalea regia**	Royal Spoonbill	-	-	A freshwater wetland species of local conservation significance. Found in shallow freshwater and saltwater wetlands, intertidal mud flats and wet grasslands. Both permanent and temporary inland waters are used when available in the arid zone. Will also use artificial wetlands such as sewage lagoons, saltfields, dams and reservoirs.	No	No

Scientific Name	Common Name	BC Act Status	EPBC Status	Habitat	Likelihood of Occurrence	Impact Assessment Required
Pluvialis fulva	Pacific Golden Plover		M	Estuaries, mudflats, saltmarshes, mangroves, rocky reefs, inland swamps, ocean shores, paddocks, sewage ponds, ploughed land, airfields, playing fields.	No	No
Pluvialis squatarola	Grey Plover		M	Mudflats, saltmarsh, tidal reefs and estuaries.	No	No
Pterodroma leucoptera leucoptera	Gould's Petrel	V	E	"Marine. Nesting habitat is located within steeply sloping rock scree gullies with a canopy of Cabbage Tree Palms."	No	No
Pterodroma neglecta neglecta	Kermadec Petrel (west Pacific subspecies)	V	V	Marine.	No	No
Ptilinopus superbus	Superb Fruit-Dove	V		Rainforest and closed forests. May also forage in eucalypt or acacia woodland where there are fruit-bearing trees.	No	No
Rhipidura rufifrons	Rufous Fantail		M	Wet sclerophyll forests, subtropical and temperate rainforests. Sometimes drier sclerophyll forests and woodlands.	Unlikely	No
Rostratula australis	Australian Painted Snipe	E	E	Swamps, dams and nearby marshy areas.	No	No
Stagonopleura guttata	Diamond Firetail	V		"Grassy eucalypt woodlands, open forest, mallee, Natural Temperate Grassland, secondary derived grassland, riparian areas and lightly wooded farmland."	No	No

Scientific Name	Common Name	BC Act Status	EPBC Status	Habitat	Likelihood of Occurrence	Impact Assessment Required
Stercorarius longicaudus	Long-tailed Jaeger		M	Marine.	No	No
Stercorarius parasiticus	Arctic Jaeger		M	Marine.	No	No
Stercorarius pomarinus	Pomarine Jaeger		M	Marine.	No	No
Sterna hirundo	Common Tern		M	Offshore waters, ocean beaches, estuaries, large lakes. Less commonly freshwater swamps, floodwaters, sewage farms and brackish and saline lakes.	No	No
Sternula albifrons	Little Tern	E	M	Sheltered coastal environments, harbours, inlets and rivers.	No	No
Stictonetta naevosa	Freckled Duck	V		Freshwater swamps and creeks, lakes, reservoirs, farm dams and sewage ponds.	No	No
Thalassarche cauta	Shy Albatross	V	V	Marine.	No	No
Thalassarche cauta cauta	Shy Albatross	V	V	Marine.	No	No
Thalassarche chrysostoma	Grey-headed Albatross		E	Marine.	No	No
Thalassarche melanophris	Black-browed Albatross	V	V	Marine.	No	No

Scientific Name	Common Name	BC Act Status	EPBC Status	Habitat	Likelihood of Occurrence	Impact Assessment Required
Thalassarche salvini	Salvin's Albatross	V		Marine.	No	No
Tringa brevipes	Grey-tailed Tattler		M	"Sheltered coasts with reefs and rock platforms or intertidal mudflats; intertidal rocky, coral or stony reefs; shores of rock, shingle, gravel or shells; embayments, estuaries and coastal lagoons; lagoons and lakes; and ponds in sewage farms and saltworks.	No	No
Tringa glareola	Wood Sandpiper		M	Well-vegetated, shallow, freshwater wetlands, such as swamps, billabongs, lakes, pools and waterholes; inundated grasslands; floodplains; irrigated crops; sewage ponds; reservoirs; large farm dams; bore drains; rarely brackish wetlands and saltmarsh.	No	No
Tringa incana	Wandering Tattler		M	Rocky coasts with reefs and platforms, offshore islands, shingle beaches or beds; occasionally coral reefs or beaches.	No	No
Tringa nebularia	Common Greenshank		M	Terrestrial wetlands (swamps, lakes, dams, rivers, creeks, billabongs, waterholes and inundated floodplains, claypans, saltflats, sewage farms and saltworks dams, inundated rice crops and bores) and sheltered coastal habitats (mudflats, saltmarsh, mangroves, embayments, harbours, river estuaries, deltas, lagoons, tidal pools, rock-flats and rock platforms).	No	No
Tringa stagnatilis	Marsh Sandpiper		M	Swamps, lagoons, billabongs, saltpans, saltmarshes, estuaries, pools on inundated floodplains, intertidal	No	No

Scientific Name	Common Name	BC Act Status	EPBC Status	Habitat	Likelihood of Occurrence	Impact Assessment Required
				mudflats, sewage farms and saltworks, reservoirs, waterholes, soaks, bore-drain swamps and flooded inland lakes.		
Tryngites subruficollis	Buff-breasted Sandpiper	-	M	Short grasslands, freshwater or saline wetlands, tidal mudflats.	No	No
Tyto novaehollandiae	Masked Owl	V		Dry eucalypt forests and woodlands from sea level to 1100 m.	No	No
Tyto tenebricosa	Sooty Owl	V		Dry rainforest, subtropical and warm temperate rainforest, as well as moist eucalypt forests.	No	No
Xenus cinereus	Terek Sandpiper	V	M	Mudbanks and sandbanks near mangroves, rocky pools and reefs, and occasionally up to 10 km inland around brackish pools.	No	No
*Zosterops lateralis**	Silvereye	-	-	A species of local conservation significance. Coastal heath, shrublands, forests, farms, and urban areas.	Unlikely	No
Mammals (excluding bats)						
Aepyprymnus rufescens	Rufous Bettong	V		From tall wet sclerophyll forests on the coast to the dry forests and open woodlands west of the Great Dividing Range.	No	No
Cercartetus nanus	Eastern Pygmy-possum	V		Rainforest, sclerophyll forest (including Box-Ironbark), woodland and heath.	No	No

Scientific Name	Common Name	BC Act Status	EPBC Status	Habitat	Likelihood of Occurrence	Impact Assessment Required
Dasyurus maculatus	Spotted-tailed Quoll	V	E	Rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline.	No	No
Dasyurus maculatus maculatus (SE mainland population)	Spotted-tailed Quoll	V	E	Rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline.	No	No
Dasyurus viverrinus	Eastern Quoll	E	E	Dry sclerophyll forest, scrub, heathland and cultivated land.	No	No
Dugong dugon	Dugong	E	M	Wide shallow protected bays, wide shallow mangrove channels and in the lee of large inshore islands. Will also occupy deeper waters.	No	No
Isoodon obesulus obesulus	Southern Brown Bandicoot (eastern)	E	E	Heath or open forest with a heathy understorey on sandy or friable soils.	No	No
Perameles nasuta	Long-nosed Bandicoot, North Head	EP		Occupies a variety of habitats on North Head.	No	No
Perameles nasuta	Long-nosed Bandicoot population in inner western Sydney	EP		Backyards, parkland.	No	No
Petauroides volans	Greater Glider population in the	EP	V	Eucalypt forests and woodlands.	No	No

Scientific Name	Common Name	BC Act Status	EPBC Status	Habitat	Likelihood of Occurrence	Impact Assessment Required
	Eurobodalla local government area					
Petrogale penicillata	Brush-tailed Rock-wallaby	E	V	Rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges.	No	No
Phascolarctos cinereus	Koala, Hawks Nest and Tea Gardens population	EP,V	V	Eucalypt forest and woodland communities, including coastal forests, rainforest, riparian areas, swamp sclerophyll forests, heathland and shrubland.	No	No
Phascolarctos cinereus	Koala in the Pittwater Local Government Area	EP,V	V	Eucalypt forests and woodlands. Key likely habitats within Pittwater Council are: Swamp Mahogany Forest, ecotone between Spotted Gum Forest & Hawkesbury Sandstone Open-Forest, Northern form of Coastal Sandstone Woodland at Whale Beach, Red Bloodwood - Scribbly Gum Woodland, Bilgola Plateau Forest and the Grey Ironbark - Grey Gum form of the Newport Bangalay Woodland.	No	No
Phascolarctos cinereus	Koala	V	V	Eucalypt woodlands and forests.	No	No
Pseudomys novaehollandiae	New Holland Mouse		V	Open heathlands, woodlands and forests with a heathland understorey, vegetated sand dunes.	No	No
Microbats and Fruit Bats						

Scientific Name	Common Name	BC Act Status	EPBC Status	Habitat	Likelihood of Occurrence	Impact Assessment Required
Microbats (As a general group identified by the UESAP. Non-threatened species recorded within 5 km of study area listed in **Table 14**)		-	-	Occur in a variety of habitat from forested areas, particularly containing hollows, to caves and cliff lines, along with urban features such as culverts and bridges.	Likely	Although microbats are likely to occur in urban areas, the field survey identified no specific urban features (such as culverts or bridges) where microbats are particularly likely to utilise as occurring within the study area. If, during the development application stage any additional information becomes available, and it is considered that any microbat habitat may be impacted, an

Scientific Name	Common Name	BC Act Status	EPBC Status	Habitat	Likelihood of Occurrence	Impact Assessment Required
						assessment under the BC Act, which may include targeted surveys and potential offsetting, will be undertaken.
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	Wet and dry sclerophyll forests, Cyprus Pine dominated forest, woodland, sub-alpine woodland, edges of rainforests and sandstone outcrop country.	Unlikely	No. No potential habitat was identified in the study area
*Chalinolobus gouldii**	Gould's Wattled Bat	-	-	A priority fauna species under EUSAP. Utilises a wide variety of habitats including rainforests, eucalypt forest and woodlands, grasslands, desert, and urban areas. Roosts commonly in tree hollows, but may also utilise buildings.	Potential	No. There was no specific roosting habitat identified for this generalist widespread species.
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V		Tall (greater than 20m) moist habitats.	No	No. No potential habitat was identified in the study area

Scientific Name	Common Name	BC Act Status	EPBC Status	Habitat	Likelihood of Occurrence	Impact Assessment Required
Miniopterus australis	Little Bentwing-bat	V		Moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub.	Unlikely	No. No potential habitat was identified in the study area
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V		Rainforest, wet and dry sclerophyll forest, monsoon forest, open woodland, paperbark forests and open grassland.	Unlikely	No. No potential habitat was identified in the study area
Mormopterus norfolkensis	Eastern Freetail-bat	V		Dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range.	Unlikely	No. No potential habitat was identified in the study area
Myotis macropus	Southern Myotis	V		Foraging habitat is waterbodies (including streams, or lakes or reservoirs) and fringing areas of vegetation up to 20m.	Unlikely	No. No potential habitat was identified in the study area
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	Subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops.	Likely	Yes, potential habitat occurs within the study area
*Vespadelus vulturnus**	Little Forest Bat	-	-	A priority fauna species under EUSAP. Wet and dry sclerophyll forests and woodland, often in riverine habitats. Roosts in tree hollows.	Unlikely	No. No potential habitat was identified in the study area

Scientific Name	Common Name	BC Act Status	EPBC Status	Habitat	Likelihood of Occurrence	Impact Assessment Required
Reptiles						
Reptiles (As a general group identified by the UESAP. Non-threatened species recorded within 5 km of study area listed in **Table 14**)		-	-	A wide variety of urban and rural habitats which contain shelters such as cracks, crevices, hollows, and dappled to full exposure of sunlight.	Unlikely	No, the study area does not contained any specific potential habitat for this general group
Amphibolurus muricatus*	Jacky Lizard	-	-	A species of local conservation significance. Sclerophyll forests, coastal woodlands, usually in areas with some native vegetation.	Unlikely	No
*Eulamprus tenuis**	Bar-sided Skink	-	-	A species of local conservation significance. Forest and woodland areas.	Unlikely	No
Hoplocephalus bungaroides	Broad-headed Snake	E	V	Dry and wet sclerophyll forests, riverine forests, coastal heath swamps, rocky outcrops, heaths, grassy woodlands.	No – no suitable habitat on or near the site	No
*Saproscinus spectabilis**	Gully Skink	-	-	A species of local conservation significance. Cool shaded gullies with rocky outcrops, ground cover, and rocky cracks.	Unlikely	No
*Tiliqua scincoides scincoides**	Eastern Blue-tongue	-	-	A species of local conservation significance. This species inhabits semi-desert, mixed woodland, and scrubland areas of Australia, New Guinea, and Tasmania.	Unlikely	No

Notes: BC Act: E = Endangered, EP = Endangered Population, E4 = Extinct, CE = Critically Endangered, V = Vulnerable; EPBC Act: Bonn = Listed migratory species under Bonn Convention, CD = Conservation Dependent, CE = Critically Endangered, E = Endangered, V = Vulnerable, X = Extinct; FM Act: E = Endangered, EP = Endangered

*Population, E4 = Extinct, CE = Critically Endangered, V = Vulnerable, * = locally significant species or priority fauna species. Some marine and migratory species have been excluded from this Likelihood of Occurrence analysis.*

Table 11: Likelihood of occurrence and requirement of impact assessment for threatened flora species

Scientific Name	Common Name	BC Status	EPBC Status	Habitat	Likelihood of Occurrence	Impact Assessment Required
Acacia bynoeana	Bynoe's Wattle	E	V	Heath or dry sclerophyll forest on sandy soils.	No	No
Acacia gordonii		E	E	Sclerophyll forest and heathlands amongst or within rock platforms on sandstone outcrops.	No	No
Acacia pubescens	Downy Wattle	V	V	Open woodland and forest, including Cooks River/Castlereagh Ironbark Forest, Shale/Gravel Transition Forest and Cumberland Plain Woodland. Occurs on alluviums, shales and at the intergrade between shales and sandstones.	No	No
Allocasuarina glareicola		E	E	Castlereagh woodland on lateritic soil. Found in open woodland with Eucalyptus parramattensis, Eucalyptus fibrosa, Angophora bakeri, Eucalyptus sclerophylla and Melaleuca decora.	No	No
Allocasuarina portuensis	Nielsen Park She-oak	E	E	The original habitat is tall closed woodland, above a sandstone shelf approximately 20 m above the harbour. Soils are shallow and sandy; plantings have occurred on similar soils.	No	No
Amperea xiphoclada var. *pedicellata*		E4	X	Heath, woodland and forest in low-fertility, sandy soils.	No	No
Asterolasia buxifolia		E		Restricted to dense riparian scrub along rocky watercourses with a granitic substrate.	No	No

Scientific Name	Common Name	BC Status	EPBC Status	Habitat	Likelihood of Occurrence	Impact Assessment Required
Asterolasia elegans		E	E	"Hawkesbury sandstone. Found in sheltered forests on mid- to lower slopes and valleys."	No	No
Caladenia tessellata	Thick Lip Spider Orchid	E	V	Grassy sclerophyll woodland on clay loam or sandy soils, or low woodland with stony soil.	No	No
Callistemon linearifolius	Netted Bottle Brush	V		Dry sclerophyll forest.	No	No
Cryptostylis hunteriana	Leafless Tongue Orchid	V	V	"Coastal heathlands, margins of coastal swamps and sedgelands, coastal forest, dry woodland, and lowland forest."	No	No
Darwinia biflora		V	V	Woodland, open forest or scrub-heath on the edges of weathered shale-capped ridges, where these intergrade with Hawkesbury Sandstone.	No	No
Dichanthium setosum	Bluegrass	V	V	Cleared woodland, grassy roadside remnants and highly disturbed pasture, on heavy basaltic black soils and red-brown loams with clay subsoil.	No	No
Diuris arenaria	Sand Doubletail	E		"Coastal heath and dry grassy eucalypt forest.	No	No
Epacris purpurascens var. *purpurascens*		V		Sclerophyll forest, scrubs and swamps. Most habitats have a strong shale soil influence.	No	No

Scientific Name	Common Name	BC Status	EPBC Status	Habitat	Likelihood of Occurrence	Impact Assessment Required
Eucalyptus camfieldii	Camfield's Stringybark	V	V	"Coastal heath on shallow sandy soils overlying Hawkesbury sandstone, mostly on exposed sandy ridges."	No	No
Eucalyptus fracta	Broken Back Ironbark	V		Dry eucalypt woodland in shallow soils along the upper escarpment of a steep sandstone range.	No	No
Eucalyptus nicholii	Narrow-leaved Black Peppermint	V	V	Dry grassy woodland, on shallow soils of slopes and ridges.	Yes	N/A – planted individuals not naturally occurring
Eucalyptus pulverulenta	Silver-leafed Gum	V	V	Open forest typically dominated by *Eucalyptus mannifera* (Brittle Gum), *E. macrorhynca* (Red Stringybark), *E. dives* (Broad-leafed Peppermint), *E. sieberi* (Silvertop Ash) and *E. bridgesiana* (Apple Box), on shallow soils.	No	No
Eucalyptus scoparia	Wallangarra White Gum	E	V	"Open eucalypt forest, woodland and heaths on well-drained granite/rhyolite hilltops, slopes and rocky outcrops, typically at high altitudes.	Yes	N/A – planted individuals not naturally occurring
Genoplesium baueri	Bauer's Midge Orchid	E	E	Dry sclerophyll forest and moss gardens over sandstone.	No	No
Grammitis stenophylla	Narrow-leaf Finger Fern	E		Rainforest and moist eucalypt forest, usually near streams, on rocks or in trees.	No	No
Grevillea caleyi	Caley's Grevillea	CE	CE	Open forest, generally dominated by Eucalyptus sieberi and E. gummifera on a ridgetop, in association with laterite soils.	No	No

Scientific Name	Common Name	BC Status	EPBC Status	Habitat	Likelihood of Occurrence	Impact Assessment Required
Hibbertia puberula		E		Low heath, dry sclerophyll woodland, upland swamps, on sandy soils or clay.	No	No
Leptospermum deanei		V	V	Woodland, riparian scrub and open forest on lower hill slopes or near creeks, on sand or sandy alluvial soil.	No	No
Melaleuca biconvexa	Biconvex Paperbark	V	V	Damp places, often near streams or low-lying areas on alluvial soils.	No	No
Melaleuca deanei	Deane's Paperbark	V	V	Heath on sandstone.	No	No
Pelargonium sp. *Striatellum (G.W.Carr 10345)*	Omeo Storksbill	E	E	Irregularly inundated or ephemeral lakes, in the transition zone between surrounding grasslands or pasture and wetland or aquatic communities.	No	No
Persoonia hirsuta	Hairy Geebung	E	E	Sandy soils in dry sclerophyll open forest, woodland and heath on sandstone.	No	No
Melaleuca biconvexa	Biconvex Paperbark	V	V	Damp places, often near streams or low-lying areas on alluvial soils.	No	No
Persoonia nutans	Nodding Geebung	E	E	Northern populations: sclerophyll forest and woodland (Agnes Banks Woodland, Castlereagh Scribbly Gum Woodland and Cooks River / Castlereagh Ironbark Forest) on aeolian and alluvial sediments. Southern populations: tertiary alluvium, shale sandstone transition communities and Cooks River / Castlereagh Ironbark Forest.	No	No

Scientific Name	Common Name	BC Status	EPBC Status	Habitat	Likelihood of Occurrence	Impact Assessment Required
Pimelea curviflora var. *curviflora*		V	V	Woodland, mostly on shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes.	No	No
Pimelea spicata	Spiked Rice-flower	E	E	"Well-structured clay soils. Eucalyptus moluccana (Grey Box) communities and in areas of ironbark on the Cumberland Plain. Coast Banksia open woodland or coastal grassland in the Illawarra."	No	No
Prasophyllum fuscum	Slaty Leek Orchid	CE	V	Moist heath, often along seepage lines	No	No
Pterostylis saxicola	Sydney Plains Greenhood	E	E	Small pockets of shallow soil in depressions on sandstone rock shelves above cliff lines, adjacent to sclerophyll forest or woodland on shale/sandstone transition soils or shale soils.	No	No
Pultenaea parviflora		E	V	"Dry sclerophyll forest, especially Castlereagh Ironbark Forest, Shale Gravel Transition Forest and transitional areas where these communities adjoin Castlereagh Scribbly Gum Woodland."	No	No
Senecio spathulatus	Coast Groundsel	E		Frontal dunes in coastal areas.	No	No
Syzygium paniculatum	Magenta Lilly Pilly	E	V	"Subtropical and littoral rainforest on gravels, sands, silts and clays.	No	No

Scientific Name	Common Name	BC Status	EPBC Status	Habitat	Likelihood of Occurrence	Impact Assessment Required
Tetratheca glandulosa		V		"Heath, scrub, woodlands and open forest on upper-slopes and mid-slope sandstone benches. Soils generally shallow, consisting of a yellow, clayey/sandy loam.	No	No
Tetratheca juncea	Black-eyed Susan	V	V	Low open forest/woodland, heathland and moist forest, mainly on low nutrient soils associated with the Awaba Soil Landscape.	No	No
Thesium australe	Austral Toadflax	V	V	Grassland on coastal headlands or grassland and grassy woodland away from the coast.	No	No
Triplarina imbricata	Creek Triplarina	E	E	Along watercourses in low open forest with Tristaniopsis laurina (Water Gum).	No	No
Wilsonia backhousei	Narrow-leafed Wilsonia	V		Margins of salt marshes and lakes.	No	No

**BC Act: E1 = Endangered, E2 = Endangered Population, E4 = Extinct, E4A = Critically Endangered, V = Vulnerable; EPBC Act: M = Migratory; Mar = Marine, Bonn = Listed migratory species under Bonn Convention, CD = Conservation Dependent, CE = Critically Endangered, E = Endangered, V = Vulnerable, X = Extinct*

Appendix B Flora and fauna species list

Table 12: Flora species list recording within the study area during the site inspection by ELA, and from Arterra 2017

Family	Species Name	Common Name	Species origin
Adoxaceae	*Viburnum sp.*	-	Exotic
Agavaceae	*Agave americana*	Century Plant	Exotic
Amaryllidaceae	*Clivia sp.*	Natal Lily	Exotic
Anacardiaceae	*Harpephyllum caffrum*	Kaffir Plum	Invasive
Anacardiaceae	*Mangifera indica*	Mango	Exotic
Anacardiaceae	*Pistacia chinensis*	Chinese Pistachio	Exotic
Anacardiaceae	*Schinus areira*	Peppercorn Tree	Exotic
Apiaceae	*Daucus glochidiatus*	Native Carrot	Exotic
Apocynaceae	*Hoya sp.*	Dogbane	Exotic
Apocynaceae	*Nerium oleander*	-	Exotic
Apocynaceae	*Plumeria rubra*	Frangipani	Exotic
Araceae	*Colocasia esculenta*	Taro	Exotic
Araceae	*Philodendron sp.*	-	Exotic
Araliaceae	*Hedera helix*	English Ivy	Exotic
Araliaceae	*Schefflera actinophylla*	Umbrella Tree	Invasive
Araucariaceae	*Araucaria columnaris*	Cook Pine	Exotic
Araucariaceae	*Araucaria heterophylla*	Norfolk Island Pine	Exotic
Arecaceae	*Archontophoenix cunninghamiana*	Bangalow Palm	Native
Arecaceae	*Howea forsteriana*	Kentia Palm	Exotic
Arecaceae	*Livistona sp.*	Palm	Exotic
Arecaceae	*Phoenix canariensis*	Canary Island Date Palm	Exotic
Arecaceae	*Phoenix canariensis*	Canary Island Date Palm	Exotic
Arecaceae	*Syagrus romanzoffiana*	Queen Palm	Exotic
Arecaceae	*Washingtonia robusta*	Washington Palm	Exotic
Asparagaceae	*Asparagus aethiopicus*	Asparagus fern	Exotic
Asparagaceae	*Beaucarnea recurvata*	Ponytail Palm	Exotic
Asparagaceae	*Chlorophytum comosum*	Spider Plant	Exotic
Asparagaceae	*Cordyline australis*	Cabbage Tree	Exotic
Asparagaceae	*Dracaena* sp.	Dragon Tree	Exotic
Asparagaceae	*Liriope sp.*	Lilyturfs	Exotic
Asphodelaceae	*Aloe vera*	-	Exotic
Aspleniaceae	*Asplenium nidus*	Birds Nest Fern	Exotic
Asteraceae	*Conyza* sp.	-	Exotic
Asteraceae	*Hypochaeris radicata*	Catsear	Exotic
Asteraceae	*Sonchus* sp.	Sowthistle	Exotic

Berberidaceae	*Nandina domestica*	Sacred bamboo	Exotic
Bignoniaceae	*Jacaranda mimosifolia*	Jacaranda	Exotic
Bignoniaceae	*Radermachera sinica*	China Doll Tree	Exotic
Bromeliaceae	*Aechmea* sp.	Bromeliad	Exotic
Cactaceae	*Cereus* sp.	Cactus	Exotic
Caryophyllaceae	*Stellaria media*	Common Chickweed	Exotic
Casuarinaceae	*Casuarina cunninghamiana*	River She-Oak	Native
Casuarinaceae	*Casuarina glauca*	Swamp She-Oak	Endemic
Convolvulaceae	*Dichondra repens*	Kidney Weed	Exotic
Crassulaceae	*Crassula ovata*	Jade Plant	Exotic
Cupressaceae	*Callitris rhomboidea*	Port Jackson Cypress	Native
Cupressaceae	*Cupressus torulosa*	Bhutan Cypress	Exotic
Elaeocarpaceae	*Elaeocarpus reticulatus*	Blueberry Ash	Native
Euphorbiaceae	*Glochidion ferdinandi*	Cheese Tree	Native
Euphorbiaceae	*Hevea brasiliensis*	Rubber Tree	Exotic
Fabaceae	*Acacia floribunda*	Gossamer Wattle	Endemic
Fabaceae	*Acacia saligna*	WA Golden Wattle	Invasive
Fabaceae	*Bauhinia variegata*	Orchid Tree	Exotic
Fabaceae	*Erythrina x sykesii*	Coral Tree	Exotic
Fabaceae	*Gleditsia triacanthos*	Honey Locust	Exotic
Fabaceae	*Robinia pseudoacacia*	Black Locust	Exotic
Fabaceae	*Robinia pseudoacacia 'Frisia'*	Black Locust	Exotic
Fabaceae subf. Faboideae	*Trifolium repens*	White Clover	Exotic
Fagaceae	*Castanospermum australe*	Blackbean	Native
Geraniaceae	*Geranium sp.*	Geranium	Native
Geraniaceae	*Pelargonium* sp.	Geranium	Exotic
Hamamelidaceae	*Liquidambar styraciflua*	Liquidambar	Exotic
Lamiaceae	*Westringia fruticosa*	Coastal Rosemary	Exotic
Lauraceae	*Cinnamomum camphora*	Camphor Laurel	Invasive
Lauraceae	*Persea gratissima*	Avocado	Exotic
Lomandraceae	*Lomandra longifolia*	Spiny-headed Mat-rush	Native
Lomandraceae	*Lomandra longifolia*	Matt Rush	Tanika
Lomariopsidaceae	*Nephrolepis cordifoli*	Fishbone Fern	Native
Lythraceae	*Lagerstroemia indica*	Crepe Myrtle	Exotic
Magnoliaceae	*Magnolia grandiflora*	American Bull Bay Magnolia	Exotic
Malvaceae	*Brachychiton acerifolius*	Illawarra Flame Tree	Native
Malvaceae	*Lagunaria patersonia*	Norfolk Island Hibiscus	Exotic
Malvaceae	*Modiola sp.*	-	Exotic

Meliaceae	*Melia azedarach*	White Cedar	Native
Moraceae	*Ficus benjamina*	Weeping Fig	Exotic
Moraceae	*Ficus elastica*	Variegated Rubber Plant	Exotic
Moraceae	*Ficus macrophylla*	Moreton Bay Fig	Native
Moraceae	*Ficus microcarpa* var. *hillii*	Hills Weeping Fig	Native
Moraceae	*Ficus rubiginosa*	Port Jackson Fig	Native
Moraceae	*Morus nigra*	Mulberry	Exotic
Musaceae	*Musa* sp.	Banana	Exotic
Myrtaceae	*Acmena smithii* var. *minor*	Small Leaf Lilly Pilly	Endemic
Myrtaceae	*Agonis flexuosa*	Willow Myrtle	Native
Myrtaceae	*Angophora costata*	Smooth-barked Apple	Endemic
Myrtaceae	*Angophora floribunda*	Rough-barked Apple	Endemic
Myrtaceae	*Callistemon salignus* cv.	Willow Bottlebrush	Native
Myrtaceae	*Callistemon viminalis* cv.	Weeping Bottlebrush	Native
Myrtaceae	*Callistemon viminalis* cv.	Weeping Bottlebrush	Native
Myrtaceae	*Corymbia citriodora*	Lemon Scented Gum	Native
Myrtaceae	*Corymbia eximia*	Yellow Bloodwood	Native
Myrtaceae	*Corymbia maculata*	Spotted Gum	Native
Myrtaceae	*Eucalyptus bicostata*	Southern Blue Gum	Native
Myrtaceae	*Eucalyptus botryoides*	Bangalay	Endemic
Myrtaceae	*Eucalyptus camaldulensis*	River Red Gum	Native
Myrtaceae	*Eucalyptus elata*	River Peppermint	Native
Myrtaceae	*Eucalyptus grandis*	Flooded Gum	Native
Myrtaceae	*Eucalyptus haemastoma*	Scribbly Gum	Endemic
Myrtaceae	*Eucalyptus mannifera*	Brittle Gum	Native
Myrtaceae	*Eucalyptus microcorys*	Tallowood	Native
Myrtaceae	*Eucalyptus nicholii*	Narrow-leaved Black Peppermint	Native
Myrtaceae	*Eucalyptus pilularis*	Blackbutt	Endemic
Myrtaceae	*Eucalyptus piperita*	Sydney Peppermint	Endemic
Myrtaceae	*Eucalyptus pseudoglobulous*	Gippsland Blue Gum	Native
Myrtaceae	*Eucalyptus punctata*	Grey Gum	Endemic
Myrtaceae	*Eucalyptus robusta*	Swamp Mahogany	Endemic
Myrtaceae	*Eucalyptus saligna*	Sydney Blue Gum	Native
Myrtaceae	*Eucalyptus scoparia*	Wallangarra White Gum	Native
Myrtaceae	*Eucalyptus sideroxylon*	Mugga Ironbark	Native
Myrtaceae	*Eucalyptus* sp. *(caleyi hybrid)*	Caley's Ironbark	Native
Myrtaceae	*Leptospermum petersonii*	Lemon Scented Tea Tree	Native
Myrtaceae	*Lophostemon confertus*	Brush Box	Native
Myrtaceae	*Melaleuca armillaris*	Bracelet Honey-myrtle	Endemic
Myrtaceae	*Melaleuca bracteata*	Black Tea-Tree	Native

Myrtaceae	*Melaleuca linariifolia*	Flax Leaved Paperbark	Endemic
Myrtaceae	*Melaleuca quinquenervia*	Broad Leafed Paperbark	Endemic
Myrtaceae	*Melaleuca styphelioides*	Prickly Paperbark	Endemic
Myrtaceae	*Metrosideros excelsa*	New Zealand Christmas Tree	Exotic
Myrtaceae	*Syzygium paniculatum*	Magenta Cherry	Native
Myrtaceae	*Tristaniopsis laurina*	Water Gum	Native
Myrtaceae	*Waterhousea floribunda*	Weeping Lilly Pilly	Native
Ochnaceae	*Ochna serrulata*	Bird's eye Bush	Exotic
Oleaceae	*Fraxinus griffithii*	Griffith's Ash	Exotic
Oleaceae	*Olea europaea* subsp. *africana*	African Olive	Invasive
Oleaceae	*Olea europaea* subsp. *europea*	European Olive	Invasive
Oxalidaceae	*Oxalis sp.*	-	Exotic
Phormiaceae	*Dianella sp.*	-	Native
Phyllanthaceae	*Glochidion ferdinandi*	Cheese Tree	Exotic
Pittosporaceae	*Pittosporum tenuifolium* cv.	New Zealand Pittosporum Cultivar	Exotic
Pittosporaceae	*Pittosporum undulatum*	Sweet Pittosporum	Native
Platanaceae	*Platanus orientalis*	Oriental Plane Tree	Exotic
Platanaceae	*Platanus x acerifolia*	London Plane	Exotic
Poaceae	*Axonopus* sp.	Carpet Grass	Exotic
Poaceae	*Cenchrus clandestinus*	Kikuyu Grass	Exotic
Poaceae	*Microlaena stipoides*	Weeping Grass	Exotic
Poaceae	*Pennisetum* sp.	-	Exotic
Poaceae subf. Bambusoideae	*Bambuseae* sp.	Bamboo	Exotic
Podocarpaceae	*Afrocarpus falcatus*	Outeniqua Yellow-wood	Exotic
Podocarpaceae	*Podocarpus elatus*	Plum Pine	Native
Proteaceae	*Banksia integrifolia*	Coastal Banksia	Endemic
Proteaceae	*Banksia serrata*	Old Man Banksia	Endemic
Proteaceae	*Buckinghamia celsissima*	Ivory Curl Tree	Native
Proteaceae	*Grevillea robusta*	Silky Oak	Invasive
Proteaceae	*Macadamia integrifolia*	Macadamia	Native
Rosaceae	*Cotoneaster glaucophyllus*	Large Leaf Cotoneaster	Invasive
Rosaceae	*Eriobotrya japonica*	Loquat	Exotic
Rosaceae	*Prunus sp.*	Plum	Exotic
Rosaceae	*Rhaphiolepis sp.*	-	Exotic
Rutaceae	*Citrus limon* cv.	Lemon	Exotic
Rutaceae	*Flindersia australis*	Crows Ash	Native
Rutaceae	*Murraya paniculata*	Murraya	Exotic
Salicaceae	*Populus nigra 'Italica'*	Lombardy Poplar	Exotic

Sapindaceae	*Alectryon coriaceus*	Beach Bird's Eye	Native
Sapindaceae	*Cupaniopsis anacardioides*	Tuckeroo	Native
Sapindaceae	*Sapium sebiferum*	Chinese Tallow Tree	Exotic
Solanaceae	*Cestrum* sp.	Nightshade	Exotic
Strelitziaceae	*Strelitzia reginae*	Bird of Paradise	Exotic
Theaceae	*Camellia sasanqua*	Sasanqua camellia	Exotic
Ulmacaeae	*Celtis australis*	Southern Hackberry	Exotic
Ulmacaeae	*Celtis sinensis*	Chinese Hackberry	Invasive
Ulmacaeae	*Ulmus parvifolia*	Chinese Elm	Exotic
Ulmacaeae	*Ulmus procera*	English Elm	Exotic
Zingiberaceae	*Zingiber* sp.	(ginger)	Exotic

**denotes introduced species*

Table 13: Fauna species list recording within the study area during the site inspection by ELA

Family	Species Name	Common Name
Sturnidae	*Acridotheres tristis**	Common Myna
Columbidae	*Columba livia**	Rock Dove
Artamidae	*Cracticus tibicen*	Australian Magpie
Felidae	*Felis catus**	Cat
Threskiornithidae	*Threskiornis moluccus*	Australian White Ibis
Psittaculidae	*Trichoglossus moluccanus*	Rainbow Lorikeet

**denotes introduced species*

Table 14: Non-threatened native species records from within 5 km of the study area, relevant to 'Priority Fauna Groups' as identified in the UESAP

Family	Species Name	Common Name
Amphibians - As a general group identified by the UESAP		
Hylidae	*Litoria caerulea*	Green Tree Frog
Hylidae	*Litoria dentata*	Bleating Tree Frog
Hylidae	*Litoria fallax*	Eastern Dwarf Tree Frog
Hylidae	*Litoria jervisiensis*	Jervis Bay Tree Frog
Hylidae	*Litoria latopalmata*	Broad-palmed Frog
Hylidae	*Litoria nasuta*	Rocket Frog
Hylidae	*Litoria peronii*	Peron's Tree Frog
Hylidae	*Litoria phyllochroa*	Leaf-green Tree Frog
Hylidae	*Litoria tyleri*	Tyler's Tree Frog
Hylidae	*Litoria verreauxii*	Verreaux's Frog
Molossidae	*Mormopterus ridei*	Eastern Free-tailed Bat

Molossidae	*Tadarida australis australis* (previously *Austronomus australis*)	White-striped Freetail-bat
Myobatrachidae	*Adelotus brevis*	Tusked Frog
Myobatrachidae	*Crinia signifera*	Common Eastern Froglet
Myobatrachidae	*Limnodynastes dumerilii*	Eastern Banjo Frog
Myobatrachidae	*Limnodynastes peronii*	Brown-striped Frog
Myobatrachidae	*Limnodynastes tasmaniensis*	Spotted Grass Frog
Myobatrachidae	*Pseudophryne bibronii*	Bibron's Toadlet
Myobatrachidae	*Uperoleia laevigata*	Smooth Toadlet
Small birds - As a general group identified by the UESAP		
Acanthizidae	*Acanthiza chrysorrhoa leighi*	Yellow-rumped Thornbill
Acanthizidae	*Acanthiza lineata*	Striated Thornbill
Acanthizidae	*Acanthiza nana*	Yellow Thornbill
Acanthizidae	*Acanthiza pusilla*	Brown Thornbill
Acanthizidae	*Gerygone mouki*	Brown Gerygone
Acanthizidae	*Gerygone olivacea*	White-throated Gerygone
Acanthizidae	*Origma solitaria*	Rockwarbler
Acanthizidae	*Sericornis citreogularis*	Yellow-throated Scrubwren
Acanthizidae	*Sericornis frontalis*	White-browed Scrubwren
Acanthizidae	*Smicrornis brevirostris*	Weebill
Acrocephalidae	*Acrocephalus australis*	Australian Reed-Warbler
Alcedinidae	*Ceyx azureus*	Azure Kingfisher
Alcedinidae	*Dacelo novaeguineae*	Laughing Kookaburra
Alcedinidae	*Todiramphus macleayii*	Forest Kingfisher
Alcedinidae	*Todiramphus sanctus*	Sacred Kingfisher
Acrocephalidae	*Acrocephalus australis*	Australian Reed-Warbler
Alcedinidae	*Ceyx azureus*	Azure Kingfisher
Artamidae	*Artamus cyanopterus cyanopterus*	Dusky Woodswallow
Artamidae	*Artamus leucorynchus*	White-breasted Woodswallow
Artamidae	*Artamus personatus*	Masked Woodswallow
Artamidae	*Cracticus nigrogularis*	Pied Butcherbird
Artamidae	*Cracticus sp.*	Unidentified Butcherbird
Artamidae	*Cracticus tibicen*	Australian Magpie
Artamidae	*Cracticus torquatus*	Grey Butcherbird
Artamidae	*Strepera graculina*	Pied Currawong
Cacatuidae	*Cacatua galerita*	Sulphur-crested Cockatoo
Cacatuidae	*Cacatua sanguinea*	Little Corella
Cacatuidae	*Cacatua tenuirostris*	Long-billed Corella

Cacatuidae	*Calyptorhynchus funereus*	Yellow-tailed Black-Cockatoo
Cacatuidae	*Eolophus roseicapillus*	Galah
Cacatuidae	*Nymphicus hollandicus*	Cockatiel
Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike
Campephagidae	*Lalage sueurii*	White-winged Triller
Caprimulgidae	*Eurostopodus mystacalis*	White-throated Nightjar
Centropodidae	*Centropus phasianinus*	Pheasant Coucal
Charadriidae	*Charadrius bicinctus*	Double-banded Plover
Charadriidae	*Charadrius ruficapillus*	Red-capped Plover
Charadriidae	*Elseyornis melanops*	Black-fronted Dotterel
Charadriidae	*Erythrogonys cinctus*	Red-kneed Dotterel
Charadriidae	*Vanellus miles*	Masked Lapwing
Charadriidae	*Vanellus miles novaehollandiae*	[Spur-winged Plover]
Charadriidae	*Vanellus tricolor*	Banded Lapwing
Cisticolidae	*Cisticola exilis*	Golden-headed Cisticola
Climacteridae	*Cormobates leucophaea*	White-throated Treecreeper
Columbidae	*Chalcophaps indica*	Emerald Dove
Columbidae	*Columba leucomela*	White-headed Pigeon
Columbidae	*Geopelia humeralis*	Bar-shouldered Dove
Columbidae	*Geopelia striata*	Peaceful Dove
Columbidae	*Leucosarcia melanoleuca*	Wonga Pigeon
Columbidae	*Lopholaimus antarcticus*	Topknot Pigeon
Columbidae	*Macropygia amboinensis*	Brown Cuckoo-Dove
Columbidae	*Ocyphaps lophotes*	Crested Pigeon
Columbidae	*Phaps elegans*	Brush Bronzewing
Coraciidae	*Eurystomus orientalis*	Dollarbird
Corvidae	*Corvus coronoides*	Australian Raven
Cuculidae	*Cacomantis flabelliformis*	Fan-tailed Cuckoo
Cuculidae	*Cacomantis pallidus*	Pallid Cuckoo
Cuculidae	*Cacomantis variolosus*	Brush Cuckoo
Cuculidae	*Chalcites basalis*	Horsfield's Bronze-Cuckoo
Cuculidae	*Chalcites lucidus*	Shining Bronze-Cuckoo
Cuculidae	*Chalcites osculans*	Black-eared Cuckoo
Cuculidae	*Eudynamys orientalis*	Eastern Koel
Cuculidae	*Scythrops novaehollandiae*	Channel-billed Cuckoo
Dicruridae	*Dicrurus bracteatus*	Spangled Drongo
Diomedeidae	*Thalassarche chrysostoma*	Grey-headed Albatross

Estrildidae	*Lonchura castaneothorax*	Chestnut-breasted Mannikin
Estrildidae	*Neochmia phaeton*	Crimson Finch
Estrildidae	*Neochmia temporalis*	Red-browed Finch
Estrildidae	*Taeniopygia bichenovii*	Double-barred Finch
Estrildidae	*Taeniopygia guttata*	Zebra Finch
Fregatidae	*Fregata ariel*	Lesser Frigatebird
Hirundinidae	*Hirundo neoxena*	Welcome Swallow
Hirundinidae	*Petrochelidon ariel*	Fairy Martin
Hirundinidae	*Petrochelidon nigricans*	Tree Martin
Maluridae	*Malurus cyaneus*	Superb Fairy-wren
Maluridae	*Malurus lamberti*	Variegated Fairy-wren
Maluridae	*Malurus sp.*	Unidentified Fairy-wren
Maluridae	*Stipiturus malachurus*	Southern Emu-wren
Megaluridae	*Megalurus gramineus*	Little Grassbird
Megaluridae	*Megalurus timoriensis*	Tawny Grassbird
Megapodiidae	*Alectura lathami*	Australian Brush-turkey
Meliphagidae	*Acanthagenys rufogularis*	Spiny-cheeked Honeyeater
Meliphagidae	*Acanthorhynchus tenuirostris*	Eastern Spinebill
Meliphagidae	*Anthochaera carunculata*	Red Wattlebird
Meliphagidae	*Anthochaera chrysoptera*	Little Wattlebird
Meliphagidae	*Caligavis chrysops*	Yellow-faced Honeyeater
Meliphagidae	*Lichenostomus melanops*	Yellow-tufted Honeyeater
Meliphagidae	*Manorina melanocephala*	Noisy Miner
Meliphagidae	*Manorina melanophrys*	Bell Miner
Meliphagidae	*Meliphaga lewinii*	Lewin's Honeyeater
Meliphagidae	*Melithreptus lunatus*	White-naped Honeyeater
Meliphagidae	*Myzomela sanguinolenta*	Scarlet Honeyeater
Meliphagidae	*Philemon citreogularis*	Little Friarbird
Meliphagidae	*Philemon corniculatus*	Noisy Friarbird
Meliphagidae	*Phylidonyris niger*	White-cheeked Honeyeater
Meliphagidae	*Phylidonyris novaehollandiae*	New Holland Honeyeater
Meliphagidae	*Ptilotula fuscus*	Fuscous Honeyeater
Meliphagidae	*Ptilotula penicillatus*	White-plumed Honeyeater
Menuridae	*Menura novaehollandiae*	Superb Lyrebird
Meropidae	*Merops ornatus*	Rainbow Bee-eater
Monarchidae	*Grallina cyanoleuca*	Magpie-lark
Monarchidae	*Monarcha melanopsis*	Black-faced Monarch

Monarchidae	*Myiagra cyanoleuca*	Satin Flycatcher
Monarchidae	*Myiagra inquieta*	Restless Flycatcher
Monarchidae	*Myiagra rubecula*	Leaden Flycatcher
Monarchidae	*Symposiachrus trivirgatus*	Spectacled Monarch
Motacillidae	*Anthus novaeseelandiae*	Australian Pipit
Nectariniidae	*Dicaeum hirundinaceum*	Mistletoebird
Oceanitidae	*Pelagodroma marina*	White-faced Storm-Petrel
Oriolidae	*Oriolus sagittatus*	Olive-backed Oriole
Oriolidae	*Sphecotheres vieilloti*	Australasian Figbird
Pachycephalidae	*Colluricincla harmonica*	Grey Shrike-thrush
Pachycephalidae	*Falcunculus frontatus frontatus*	Eastern Shrike-tit
Pachycephalidae	*Pachycephala pectoralis*	Golden Whistler
Pachycephalidae	*Pachycephala rufiventris*	Rufous Whistler
Pardalotidae	*Pardalotus punctatus*	Spotted Pardalote
Pardalotidae	*Pardalotus striatus*	Striated Pardalote
Petroicidae	*Eopsaltria australis*	Eastern Yellow Robin
Petroicidae	*Microeca fascinans*	Jacky Winter
Petroicidae	*Petroica rosea*	Rose Robin
Phasianidae	*Coturnix pectoralis*	Stubble Quail
Phasianidae	*Coturnix sp.*	Unidentified Quail
Phasianidae	*Coturnix ypsilophora*	Brown Quail
Phasianidae	*Excalfactoria chinensis*	King Quail
Pittidae	*Pitta versicolor*	Noisy Pitta
Podargidae	*Podargus strigoides*	Tawny Frogmouth
Psittacidae	*Alisterus scapularis*	Australian King-Parrot
Psittacidae	*Aprosmictus erythropterus*	Red-winged Parrot
Psittacidae	*Barnardius zonarius*	Australian Ringneck
Psittacidae	*Glossopsitta concinna*	Musk Lorikeet
Psittacidae	*Melopsittacus undulatus*	Budgerigar
Psittacidae	*Platycercus adscitus*	Pale-headed Rosella
Psittacidae	*Platycercus elegans*	Crimson Rosella
Psittacidae	*Platycercus eximius*	Eastern Rosella
Psittacidae	*Platycercus icterotis*	Western Rosella
Psittacidae	*Psephotus haematonotus*	Red-rumped Parrot
Psittacidae	*Trichoglossus chlorolepidotus*	Scaly-breasted Lorikeet
Psittacidae	*Trichoglossus haematodus*	Rainbow Lorikeet
Psophodidae	*Psophodes olivaceus*	Eastern Whipbird

Ptilonorhynchidae	*Ptilonorhynchus violaceus*	Satin Bowerbird
Rhipiduridae	*Rhipidura albiscapa*	Grey Fantail
Rhipiduridae	*Rhipidura leucophrys*	Willie Wagtail
Rhipiduridae	*Rhipidura rufifrons*	Rufous Fantail
Psittacidae	*Platycercus adscitus*	Pale-headed Rosella
Psittacidae	*Platycercus elegans*	Crimson Rosella
Psittacidae	*Platycercus elegans adelaidae*	[Adelaide Rosella]
Psittacidae	*Platycercus eximius*	Eastern Rosella
Psittacidae	*Platycercus icterotis*	Western Rosella
Psittacidae	*Psephotus haematonotus*	Red-rumped Parrot
Psittacidae	*Trichoglossus chlorolepidotus*	Scaly-breasted Lorikeet
Psittacidae	*Trichoglossus haematodus*	Rainbow Lorikeet
Psophodidae	*Psophodes olivaceus*	Eastern Whipbird
Ptilonorhynchidae	*Ptilonorhynchus violaceus*	Satin Bowerbird
Rhipiduridae	*Rhipidura albiscapa*	Grey Fantail
Rhipiduridae	*Rhipidura leucophrys*	Willie Wagtail
Strigidae	*Ninox novaeseelandiae*	Southern Boobook
Threskiornithidae	*Threskiornis molucca*	Australian White Ibis
Threskiornithidae	*Threskiornis spinicollis*	Straw-necked Ibis
Timaliidae	*Zosterops lateralis*	Silvereye
Turdidae	*Zoothera heinei*	Russet-tailed Thrush
Turnicidae	*Turnix pyrrhothorax*	Red-chested Button-quail
Turnicidae	*Turnix varius*	Painted Button-quail
Turnicidae	*Turnix velox*	Little Button-quail
Tytonidae	*Tyto javanica*	Eastern Barn Owl
Freshwater wetland birds - As a general group identified by the UESAP		
Anatidae	*Anas castanea*	Chestnut Teal
Anatidae	*Anas gracilis*	Grey Teal
Anatidae	*Anas superciliosa*	Pacific Black Duck
Anatidae	*Aythya australis*	Hardhead
Anatidae	*Biziura lobata*	Musk Duck
Anatidae	*Chenonetta jubata*	Australian Wood Duck
Anatidae	*Cygnus atratus*	Black Swan
Anatidae	*Dendrocygna arcuata*	Wandering Whistling-Duck
Anatidae	*Malacorhynchus membranaceus*	Pink-eared Duck
Anhingidae	*Anhinga novaehollandiae*	Australasian Darter
Ardeidae	*Ardea intermedia*	Intermediate Egret

Ardeidae	*Ardea modesta*	Eastern Great Egret
Ardeidae	*Ardea pacifica*	White-necked Heron
Ardeidae	*Botaurus poiciloptilus*	Australasian Bittern
Ardeidae	*Butorides striatus*	Striated Heron
Ardeidae	*Egretta garzetta*	Little Egret
Ardeidae	*Egretta novaehollandiae*	White-faced Heron
Ardeidae	*Egretta sacra*	Eastern Reef Egret
Ardeidae	*Ixobrychus dubius*	Australian Little Bittern
Ardeidae	*Nycticorax caledonicus*	Nankeen Night Heron
Laridae	*Chlidonias hybrida*	Whiskered Tern
Laridae	*Chlidonias leucopterus*	White-winged Black Tern
Laridae	*Chroicocephalus novaehollandiae*	Silver Gull
Laridae	*Hydroprogne caspia*	Caspian Tern
Laridae	*Sterna hirundo*	Common Tern
Laridae	*Sterna striata*	White-fronted Tern
Laridae	*Sternula nereis*	Fairy Tern
Laridae	*Thalasseus bergii*	Crested Tern
Laridae	*Larus dominicanus*	Kelp Gull
Laridae	*Larus pacificus*	Pacific Gull
Laridae	*Leucophaeus pipixcan*	Franklin's Gull
Pelecanidae	*Pelecanus conspicillatus*	Australian Pelican
Phaethontidae	*Phaethon lepturus*	White-tailed Tropicbird
Phalacrocoracidae	*Microcarbo melanoleucos*	Little Pied Cormorant
Phalacrocoracidae	*Phalacrocorax carbo*	Great Cormorant
Phalacrocoracidae	*Phalacrocorax sulcirostris*	Little Black Cormorant
Phalacrocoracidae	*Phalacrocorax varius*	Pied Cormorant
Podicipedidae	*Podiceps cristatus*	Great Crested Grebe
Podicipedidae	*Poliocephalus poliocephalus*	Hoary-headed Grebe
Podicipedidae	*Tachybaptus novaehollandiae*	Australasian Grebe
Procellariidae	*Pelecanoides urinatrix*	Common Diving-Petrel
Procellariidae	*Pterodroma macroptera*	Great-winged Petrel
Procellariidae	*Pterodroma mollis*	Soft-plumaged Petrel
Procellariidae	*Puffinus gavia*	Fluttering Shearwater
Rallidae	*Fulica atra*	Eurasian Coot
Rallidae	*Gallinula tenebrosa*	Dusky Moorhen
Rallidae	*Gallirallus philippensis*	Buff-banded Rail
Rallidae	*Lewinia pectoralis*	Lewin's Rail

Rallidae	*Porphyrio porphyrio*	Purple Swamphen
Rallidae	*Porzana fluminea*	Australian Spotted Crake
Rallidae	*Porzana pusilla*	Baillon's Crake
Rallidae	*Porzana tabuensis*	Spotless Crake
Recurvirostridae	*Himantopus himantopus*	Black-winged Stilt
Recurvirostridae	*Recurvirostra novaehollandiae*	Red-necked Avocet
Scolopacidae	*Bartramia longicauda*	Upland Sandpiper
Threskiornithidae	*Platalea flavipes*	Yellow-billed Spoonbill
Threskiornithidae	*Platalea regia*	Royal Spoonbill
Other bird species records		
Accipitridae	*Accipiter cirrocephalus*	Collared Sparrowhawk
Accipitridae	*Accipiter fasciatus*	Brown Goshawk
Accipitridae	*Accipiter novaehollandiae*	Grey Goshawk
Accipitridae	*Aquila audax*	Wedge-tailed Eagle
Accipitridae	*Aviceda subcristata*	Pacific Baza
Accipitridae	*Circus approximans*	Swamp Harrier
Accipitridae	*Elanus axillaris*	Black-shouldered Kite
Accipitridae	*Haliastur sphenurus*	Whistling Kite
Falconidae	Falco berigora	Brown Falcon
Falconidae	Falco cenchroides	Nankeen Kestrel
Falconidae	Falco longipennis	Australian Hobby
Falconidae	Falco peregrinus	Peregrine Falcon
Spheniscidae	Eudyptula minor	Little Penguin
Stercorcariidae	Catharacta skua	Great Skua
Sulidae	Morus serrator	Australasian Gannet
Microbats - As a general group identified by the UESAP		
Vespertilionidae	*Chalinolobus gouldii*	Gould's Wattled Bat
Vespertilionidae	*Chalinolobus morio*	Chocolate Wattled Bat
Vespertilionidae	*Nyctophilus geoffroyi*	Lesser Long-eared Bat
Vespertilionidae	*Nyctophilus gouldi*	Gould's Long-eared Bat
Vespertilionidae	*Scotorepens orion*	Eastern Broad-nosed Bat
Vespertilionidae	*Vespadelus darlingtoni*	Large Forest Bat
Vespertilionidae	*Vespadelus pumilus*	Eastern Forest Bat
Vespertilionidae	*Vespadelus regulus*	Southern Forest Bat
Vespertilionidae	*Vespadelus vulturnus*	Little Forest Bat
Reptiles - As a general group identified by the UESAP		
Agamidae	*Amphibolurus muricatus*	Jacky Lizard

Agamidae	*Intellagama lesueurii*	Eastern Water Dragon
Colubridae	*Boiga irregularis*	Brown Tree Snake
Colubridae	*Dendrelaphis punctulatus*	Common Tree Snake
Elapidae	*Cacophis squamulosus*	Golden-crowned Snake
Elapidae	*Cryptophis nigrescens*	Eastern Small-eyed Snake
Elapidae	*Demansia psammophis*	Yellow-faced Whip Snake
Elapidae	*Furina diadema*	Red-naped Snake
Elapidae	*Hemiaspis signata*	Black-bellied Swamp Snake
Elapidae	*Hydrophis elegans*	Elegant Seasnake
Elapidae	*Notechis scutatus*	Tiger Snake
Elapidae	*Parasuta dwyeri*	Dwyer's Snake
Elapidae	*Pseudechis porphyriacus*	Red-bellied Black Snake
Elapidae	*Pseudonaja textilis*	Eastern Brown Snake
Elapidae	*Vermicella annulata*	Bandy-bandy
Gekkonidae	*Amalosia lesueurii*	Lesueur's Velvet Gecko
Gekkonidae	*Diplodactylus vittatus*	Wood Gecko
Gekkonidae	*Phyllurus platurus*	Broad-tailed Gecko
Gekkonidae	*Saltuarius swaini*	Southern Leaf-tailed Gecko
Gekkonidae	*Underwoodisaurus milii*	Thick-tailed Gecko
Pygopodidae	*Lialis burtonis*	Burton's Snake-lizard
Pygopodidae	*Pygopus lepidopodus*	Common Scaly-foot
Pythonidae	*Morelia spilota*	Carpet & Diamond Pythons
Pythonidae	*Morelia spilota spilota*	Diamond Python
Scincidae	*Cryptoblepharus virgatus*	Cream-striped Shinning-skink
Scincidae	*Ctenotus robustus*	Robust Ctenotus
Scincidae	*Ctenotus taeniolatus*	Copper-tailed Skink
Scincidae	*Cyclodomorphus michaeli*	Mainland She-oak Skink
Scincidae	*Eulamprus quoyii*	Eastern Water-skink
Scincidae	*Eulamprus tenuis*	Barred-sided Skink
Scincidae	*Lampropholis delicata*	Dark-flecked Garden Sunskink
Scincidae	*Lampropholis guichenoti*	Pale-flecked Garden Sunskink
Scincidae	*Liopholis whitii*	White's Skink
Scincidae	*Saiphos equalis*	Three-toed Skink
Scincidae	*Saproscincus mustelinus*	Weasel Skink
Scincidae	*Tiliqua rugosa*	Shingle-back
Scincidae	*Tiliqua scincoides*	Eastern Blue-tongue
Typhlopidae	*Anilios bituberculatus*	Prong-snouted Blind Snake

Typhlopidae	*Anilios proximus*	Proximus Blind Snake
Varanidae	*Varanus varius*	Lace Monitor

Appendix C Test of Significance under the BC Act

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

The Grey-headed Flying-fox is listed as a *Vulnerable* species under the BC Act.

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

Grey-headed Flying-fox (GHFF) was not recorded within the study area during the site inspection, but is a highly mobile species known to occur within the region (OEH 2017b).

The nectar and pollen of native trees provide potential foraging and roosting habitat for GHFF, especially species in the family of Myrtaceae (e.g. *Melaleuca quinquenervia*) (Eby and Law 2008). Species from the families Myrtaceae, Proteaceae, and Moraceae provide potential foraging habitat for GHFF (**Figure 5**) were recorded within the study area and the adjacent Waterloo Estate SSP. Non-mature trees have been included in this mapping due to their potential to provide foraging habitat in the near future.

According to the National Flying-fox Monitoring Program, no GHFF camps currently occur or have ever been recorded within the study area (DoEE 2020). The nearest active GHFF camp occurs approximately 1 km to the east of the study area within Centennial Park, and at last count consists of between 2,500 and 10,000 individuals (DoEE 2020).

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.

Threats to GHFF include loss of foraging habitat, disturbance of roosting sites, unregulated shooting, and electrocution on powerlines. The proposed works would remove 2.4 ha of potential foraging habitat for GHFF over a 10 year staged development period. The 10 staged development approach will ensure a continuous overlap of habitat retention and replacement, thus minimsing disruption to GHFF foraging resources.

This figure comprises planted native canopy vegetation, including approximately 12 *Ficus* individuals, 121 individuals of *Eucalyptus/Corymbia/Angophora*., 27 *Lophostemon confertus* (Brush Box) and 27 *Melaleuca quinquenervia* (Broad-leafed Paperbark) (a significant feed tree species; Eby and Law 2008)). It is considered likely that this species would use the planted native vegetation within the study area for foraging purposes.

According to the National Flying-fox Monitoring Program, no GHFF camps currently occur or have ever been recorded within the study area (DoEE 2020). The nearest active GHFF camp occurs approximately 1 km to the east of the study area within Centennial Park, and at last count consists of between 2,500 and 10,000 individuals (DoEE 2020).

Although the highly mobile GHFF may use the potential foraging habitat within the study area from time to time, the removal of this planted native vegetation is unlikely to place a viable population at risk of extinction due to the extent of surrounding foraging habitat outside the study area.

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

N/A this is not an endangered ecological community or critically endangered ecological community.

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

The proposed works would remove 2.4 ha of potential foraging habitat for GHFF over a 10 year staged development period. This figure comprises planted native canopy vegetation, including approximately 45 *Ficus* individuals, 160 individuals of *Eucalyptus/Corymbia/Angophora*., 40 *Lophostemon confertus* (Brush Box) and 60 *Melaleuca quinquenervia* (Broad-leafed Paperbark. *Melaleuca quinquenervia* is a significant food source for GHFF (Eby and Law 2008). It is considered likely that this species would use the planted native vegetation within the study area for foraging purposes.

(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

GHFF is a highly mobile species and can travel up to 50 km during nightly feeding forays and can migrate up to 750 km during winter migrations (Churchill 1998). Given the high mobility of this species it is unlikely that areas of habitat will be fragmented or isolated.

(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 proposed works would remove 2.4 ha of potential foraging habitat for GHFF over a 10 year staged development period. This figure comprises planted native canopy vegetation, including approximately 12 *Ficus* individuals, 121 individuals of *Eucalyptus/Corymbia/Angophora*., 27 *Lophostemon confertus* (Brush Box) and 27 *Melaleuca quinquenervia* (Broad-leafed Paperbark)). *Melaleuca quinquenervia* is a significant food source for GHFF (Eby and Law 2008). It is considered likely that this species would use the planted native vegetation within the study area for foraging purposes.

Furthermore, approximately 1.40 ha of planted vegetation is proposed be retained in the study area, thus not entirely removing all foraging resources in the study area. It is considered GHFF is likely to continue to forage within and adjacent to the study area and across the broader locality.

There is presently 2511.221 ha of mapped native vegetation (OEH 2016) within 10 km of the study area (excluding Waterloo Estate SSP), and many vegetation communities are likely to contain fruiting or flowering species that are potential habitat for GHFF (**Figure 11**). Some vegetation types were also included because they are listed in the OEH species profile for GHFF as being associated with this species.

Therefore within 10 km of the study area, there is approximately 2511.221 ha of forest and other vegetation that GHFF may forage within, being a highly mobile species (Churchhill 1998). The proposed works would remove 2.4 ha of potential foraging habitat (0.1% of occurrence within 10 km). The removal of such a small portion potential foraging habitat is unlikely to have a significant impact on the GHFF. The small portion of potential foraging habitat within the study area is unlikely to be important to the long-term survival of the species.

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)

No declared areas of outstanding biodiversity value for this species have been identified within the study area. According to the National Flying-fox Monitoring Program, no GHFF camps currently occur or have ever been recorded within the study area (DoEE 2020). The nearest active GHFF camp occurs approximately 1 km to the east of the study area within Centennial Park, and when reviewed (February 2020), consisted of between 2,500 and 10,000 individuals (DoEE 2020).

proposed works are unlikely to impact these recovery objectives contained within the National Recovery Plan for the Grey-headed Flying-fox GHFF.

e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.

One key threatening processes are relevant to this proposal with respect to the Grey-headed Flying-fox:

- Clearing of native vegetation.

Due to the relatively small portion of planted native vegetation to be removed (0.1 % of native vegetation within 10 km, and the staged development approach ensuring a continuous overlap of habitat retention and replacement, it is considered the proposed works are unlikely to exacerbate this key threatening process in regards to GHFF.

Conclusions

The proposed works are unlikely to constitute a significant impact on Grey-headed Flying-fox given that:

- The proposed works would remove 2.4 ha of potential foraging habitat for GHFF. This figure comprises planted native canopy vegetation, including approximately 12 *Ficus* individuals, 121 individuals of *Eucalyptus/Corymbia/Angophora*., 27 *Lophostemon confertus* (Brush Box) and 27 *Melaleuca quinquenervia* (Broad-leafed Paperbark). Although *Melaleuca quinquenervia* is a significant food source for GHFF (Eby and Law 2008), potential foraging habitat within the study area is unlikely to be critical habitat for GHFF as it attributes only approximately 0.1% of likely potential foraging habitat within 10 km of the study area, for this highly mobile species (**Table 8** and **Figure 8**).

- The proposed works are unlikely to isolate any potential resources for this highly mobile species.

- According to the National Flying-fox Monitoring Program, no GHFF camps currently occur or have ever been recorded within the study area (DoEE 2020). The nearest active GHFF camp occurs approximately 1 km to the east of the study area within Centennial Park, and when reviewed (April 2018), consisted of between 2,500 and 10,000 individuals (DoEE 2020).

- The development approach will ensure a continuous overlap of habitat retention and replacement, thus further minimsing disruption to GHFF foraging resources.

Appendix D Significance Assessment under the EPBC Act

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

The Grey-headed Flying-fox (GHFF) is listed as a *Vulnerable* species under the EPBC Act.

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

GHFF was not recorded within the study area during the site inspection, but is a highly mobile species known to occur within the region (OEH 2017b).

The nectar and pollen of native trees provide potential foraging and roosting habitat for GHFF, especially species in the family of Myrtaceae (e.g. *Melaleuca quinquenervia*) (Eby and Law 2008). Species from the families Myrtaceae, Proteaceae, and Moraceae provide potential foraging habitat for GHFF (**Figure 5**), were recorded within the study area and the adjacent Waterloo Estate SSP. Non-mature trees have been included in this mapping due to their potential to provide foraging habitat in the near future.

The proposed works would remove 2.4 ha of potential foraging habitat for GHFF over a 10 year staged development period. This figure comprises planted native canopy vegetation, including approximately 12 *Ficus* individuals, 121 individuals of *Eucalyptus/Corymbia/Angophora*., 27 *Lophostemon confertus* (Brush Box) and 27 *Melaleuca quinquenervia* (Broad-leafed Paperbark) *Melaleuca quinquenervia* is a significant food source for GHFF (Eby and Law 2008). It is considered likely that this species would use the planted native vegetation within the study area for foraging purposes.

In this assessment, an 'important population' of GHFF is identified as a current GHFF camp that has been recorded by the National Flying-fox Monitoring Program. According to the National Flying-fox Monitoring Program, no GHFF camps currently occur or have ever been recorded within the study area (DoEE 2020). The nearest active GHFF camp occurs approximately 1 km to the east of the study area within Centennial Park, and when reviewed (February 2020), consisted of between 2,500 and 10,000 individuals (DoEE 2020).

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

No camps have been recorded within the study area. According to the National Flying-fox Monitoring Program, no GHFF camps currently occur or have ever been recorded within the study area (DoEE 2020). The nearest active GHFF camp occurs approximately 1 km to the east of the study area within Centennial Park, and when reviewed (February 2020), consisted of between 2,500 and 10,000 individuals (DoEE 2020). Therefore the study area does comprise foraging resources for an important population. However considering to small amount of foraging material to be removed in the context of the region, it is considered that the development will not lead to a long-term decrease in the size of an important population.

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

No important populations have been recorded within the study area. Therefore the proposed works would not reduce the area of occupancy of an important population.

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

The potential foraging habitat to be removed is marginal relative to the region. Potential foraging habitat will persist within and adjacent to the study area in Alexandra Park to the south-west, and Waterloo Oval to the south-east.

Whilst the potential foraging habitat may contribute as a 'stepping-stone' for this highly mobile species to other more substantial foraging habitat sites, this function is unlikely to be significantly inhibited by the proposed works.

Furthermore, approximately 1.4 ha of planted vegetation is proposed be retained in the study area, thus not entirely removing all foraging resources in the study area. It is considered GHFF is likely to continue to forage within and adjacent to the study area and across the broader locality.

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

These individual trees represent a negligible amount of potential foraging resources in the region. Potential foraging habitat will persist within and adjacent to the study area in Alexandra Park to the south-west, and Waterloo Oval to the south-east. Approximately 1.4 ha of planted vegetation is proposed to be retained within the study area, thus not entirely removing all GHFF resources in the study area. It is considered GHFF is likely to continue to utilise resources within the study area and across the broader locality. GHFF is a highly mobile species and it therefore is considered unlikely that the works would adversely affect habitat critical to the survival of this species.

Criterion e: disrupt the breeding cycle of an important population

According to the National Flying-fox Monitoring Program, no GHFF camps currently occur or have ever been recorded within the study area (DoEE 2020). The nearest active GHFF camp occurs approximately 1 km to the east of the study area within Centennial Park, and when reviewed (February 2020), consisted of between 2,500 and 10,000 individuals (DoEE 2020). Thus, no important population of GHFF occurs within the study area, and the proposed works is unlikely to disrupt the breeding cycle of an important population.

Criterion f: Adversely affect habitat critical to the survival of a species; modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

Approximately 2.4 ha of potential foraging and periodic roosting habitat will be removed from within the study area, including Myrtaceae species *Eucalyptus/Corymbia (121 individuals), Lophostemon confertus* (Brush Box; 27 individuals) and *Melaleuca quinquenervia* (Broad-leafed Paperbark; 27 individuals). *Melaleuca quinquenervia* is a significant food source for GHFF (Eby and Law 2008). Approximately 1.4 ha of planted vegetation will be retained, thus not entirely removing all foraging resources in the study area. Foraging and occasional roosting resources are also present adjacent to the study area; Alexandra Park to the south-west, and Waterloo Oval to the south-east. GHFF is a highly mobile species and it is considered unlikely that the potential habitat to be removed is critical to the survival of the species.

Furthermore, according to the National Flying-fox Monitoring Program, no GHFF camps currently occur or have ever been recorded within the development site (DoEE 2020). The nearest active GHFF camp occurs approximately 1 km to the east of the study area within Centennial Park, and when reviewed

(February 2020), consisted of between 2,500 and 10,000 individuals (DoEE 2020). Therefore, although the study area does contain foraging and roosting resources for GHFF, it is considered that the development will not adversely affect habitat critical to the survival of the species such that the speices is likely to decline.

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

The proposed works are unlikely to result in the establishment of an invasive species that is harmful to GHFF.

Criterion h: Introduce disease that may cause the species to decline

The proposed works are unlikely to result in the introduction of a disease that is harmful to the GHFF.

Criterion i: Interfere substantially with the recovery of the species

Considering the above factors, the proposed works are unlikely to interfere substantially with the recovery of the species.

Conclusion

In consideration of the above, the proposed works are not considered likely to have a significant impact on the Grey-headed Flying-fox, and therefore, an EPBC Act referral is not required.

Appendix E Planting List for the Estate

Waterloo Estate Planting Palette

TREES	
Botanical Name	**Common Name**
Street Trees	
Afrocarpus falcatus	Yellowwood
Argyrodendron actinophyllum	Black Booyong
Backhousia citriodora	Lemon Scented Myrtle
Banksia integrifolia	Coastal Banksia
Corymbia eximia	Yellow Bloodwood
Corymbia maculata	Spotted Gum
Diploglottis australis	Native Tamarind
Eucalyptus haemastoma	Scribbly Gum
Eucalyptus microcorys	Tallowwood
Eucalyptus pilularis	Blackbutt
Eucalyptus saligna	Sydney Blue Gum
Flindersia australis	Crow's Ash
Fraxinus oxycarpa 'Raywood'	Claret Ash
Fraxinus pennsylvanica	Green Ash
Koelreuteria paniculata	Goldenrain tree
Liriodendron tulipifera	Tulip Tree
Lophostemon confertus	Brush Box
Melaleuca quinquenervia	Broad-leaved paperbark
Syzygium paniculatum	Magenta Lilly Pilly
Public Spaces, social corners and setbacks	
CIVIC	
Ficus macrophylla	Moreton Bay fig
Ficus rubiginosa	Port Jackson fig
Corymbia maculata	Spotted Gum
Jacaranda mimosifolia	Jacaranda
Livistona australis	Cabbage Tree Palm
Lophostemon confertus	Brush Box
LARGE	
Angophora costata	Smooth-barked apple
Backhousia citriodora	Lemon Scented Myrtle
Eucalyptus microcorys	Tallowwood
Eucalyptus pilularis	Blackbutt
Eucalyptus grandis	Flooded Gum
Syncarpia glomulifera	Turpentine
MEDIUM	
Acmena Smithii	Lilly Pilly
Corymbia exima	Yellow Bloodwood
Melaleuca quinquenervia	Broad-leaved paperbark
Pyrus ussuriensis	Manchurian pear
Robinia pseudoacacia 'Frisia'	Golden Robinia
Syzygium paniculatum	Magenta Lilly Pilly
Waterhousia floribunda 'Green Avenue'	Weeping Lilly Pilly
SMALL	
Banksia integrifolia	Coastal Banksia
Citrus lemon x reticulata	Lemonade tree
Citrus x meyeri	Lemon tree
Citrus reticulata	Mandarin
Citrus sinensis	Orange tree
Cupaniopsis anacardiodes	Tuckeroo

Elaeocarpus eumundii	Quandong
Laurus nobilis	Bay Tree
Prunus domestica	Plum Tree
Prunus persica	Peach Tree
Prunus persica var. Nectarine	Nectarine
Pyrus calleryana 'Chanticleer'	Flowering Ornamental Pear
Tristaniopsis laurina 'Luscious'	Water Gum
Ulmus parvifolia 'Todd'	Chinese Elm
UNDERSTOREY	
Botanical Name	**Common Name**
Shrubs	
Anigozanthos manglesii	kangaroo paw
Asplenium australasicum	Bird's Nest Fern
Aspidistra elatior	Cast Iron Plant
Banksia ericifolia	Heath Banksia
Banksia integrifolia prostrate	Coastal banksia
Banksia spinulosa	Birthday Candles
Baumea articulata	Jointed Twig Rush
Callistemon viminalis 'Little John'	weeping bottlebrush
Callistemon 'White Anzac'	Bottlebrush
Elettaria cardamomum	Cardamom
Carpobrotus glaucescens	Native Pig Face
Cymbopogon citratus	Lemon Grass
Cymbopogon obtectus	Silky-heads
Dianella caerulea	Blue Flax Lily
Dietes robinsoniana	Lord howe wedding lily
Eleocharis sphacelata	Tall Spike Rush
Farfugium japonicum 'Giganteum'	farfugium
Goodenia ovata	Hop Goodenia
Hebe inspiration	Purple Inspiration
Lavender angustifolia 'Munstead'	Munstead lavender
Lomandra longifolia	Spiny-headed mat-rush
Loropetalum chinense	Chinese Fringe Flower
Philodendron 'Xanadu'	Xanadu
Raphiolepis indica 'Oriental Pearl'	Indian Hawthorn
Rosemarinus officinalis 'Blue Lagoon'	Blue Rosemary
Thyme vulgaris	Thyme
Salvia officinalis	Common Sage
Viola hederacea	Native Violet
Westringia fruticosa	Coastal Rosemary
Xanthorrhoea spp	Grass Tree
Ground Covers	
Liriope muscari	Evergreen Giant
Hardenbergia violacea	Native Sasparilla
Hibbertia scandens	Climbing Guinea Flower
Melaleuca hypericifolia 'Ulladulla Beacon'	Honey Myrtle
Scaevola aemula	Fairy Fan-flower
Grasses	
Poa spp.	Tussock Grass
Themeda triandra	Kangaroo Grass
WSUD	
Juncus usitatus	Common Rush
Carex appressa	Carex
Carex fascicularis	tassel sedge
Ficinia nodosa	knotted club-rush

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