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Environment and Heritage

1 - 2 Murray Rose Avenue, Sydney Olympic Park

Biodiversity Development Assessment Report (Small Area Development)

Prepared for Austino Property Group

22 October 2018

Document control

Project no.:	4465
Project client:	Austino Property Group
Project office:	Parramatta
Document description:	Biodiversity Development Assessment Report for 1 – 2 Murray Rose Avenue, Sydney Olympic Park
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Internal review:	Sian Griffiths (Accredited Assessor)
Document status:	Final R0
Document address:	P:\Projects\4000s\4400s\4465 Olympic Park Ecology Assessments\Report
Local Government Area:	City of Parramatta

Document revision status

Author	Revision number	Internal review	Date issued
Evelyn Craigie	Draft 1	Sian Griffiths	22/10/18
Evelyn Craigie	Final R0		22/10/2018

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Cover photograph: Vegetation of the Site

Executive summary

Context

Austino Property Group is proposing to undertake residential development (the Project) at Sydney Olympic Park, within the Parramatta Local Government Area.

The project site (the Site) is approximately 0.65 hectares in size and comprises two separate properties, of which one is unoccupied and the other has demountable buildings providing offices and amenities for a neighbouring construction site. The Site is highly disturbed and has previously been cleared and filled and therefore, does not represent a natural landscape or vegetation assemblage. The Site includes areas of bare earth, planted native trees and cleared areas dominated by weeds.

The entire Site, including approximately 0.08 hectares of native vegetation, is part of the proposed residential apartment development.

Aims

Niche Environment and Heritage Pty Ltd (Niche) was commissioned by Austino Property Group to address the biodiversity components of the Secretary's Environmental Assessment Requirements (SEARs) for the preparation of an Environmental Impact Statement for the Project. Niche have specifically been requested to address items 19 and 20 of the SEARs:

> ***19. Biodiversity***
>
> *The EIS shall assess biodiversity impacts related to the proposed development in accordance with Section 7.9 of the Biodiversity Conservation Act 2016.*
>
> ***20. Ecology and impact on adjoining wetlands***
>
> *The EIS shall:*
>
> - *Assess the impact of overshadowing on the significant vegetation, including Grey Mangroves and aquatic* Zannichellia palustris*, in Bennelong Pond, and how these impacts will be minimised.*
> - *Assess the impact of light spill from the development on significant wildlife habitats in Bennelong pond, and how these impacts will be minimised.*

In accordance with the requirements of the SEARs, a Biodiversity Development Assessment Report (BDAR) will be required to support the development application for the proposed residential subdivision. The Project has been assessed in accordance with the BAM 'streamlined assessment module' for small area development that requires consent.

Survey overview

An ecological survey in accordance with the BAM was undertaken for the Project, and consisted of:

- Biodiversity Assessment on the 28th of September 2018 which included BAM plot/transect collection, and threatened flora survey.
- Habitat assessment on the 28th of September 2018 to determine the potential for indirect impacts to the important habitats in the vicinity of the Site.

Native vegetation assessment

Native vegetation at the Site is limited to small stands of planted native trees and some juvenile native regrowth. The remaining vegetation at the Site comprises weeds and exotic species. Due to the altered condition of the Site, determining an appropriate Plant Community Type (PCT) is difficult. The best-fit PCT was selected based on the species present, the landscape position of the Site and its geographic location.

One PCT was recorded within the Site: PCT1231: Swamp Mahogany swamp sclerophyll forest on coastal lowlands of the Sydney Basin Bioregion and South East Corner Bioregion. PCT1231 occurs in three small patches at the Site.

In total, 0.08 hectares of PCT1231 would be cleared for the Project. PCT1231 does not align to any Threatened Ecological Community (TEC) listed under the BC Act.

Impacts

The impacts of the Project on ecological values are summarised as follows:

- Clearing of native vegetation communities, estimated at 0.08 ha
- Facilitation of weed spread via construction activities
- Indirect impacts including migration of sediments to sensitive environments, light spill onto and overshadowing of Bennelong Pond.

Avoid, minimise and mitigate impacts

Measures to reduce the impact of the Project on local flora and fauna include:

- Identification of stormwater, erosion and sedimentation controls in a Stormwater Management Plan
- Inclusion of endemic tree and shrub species in landscaping
- Restriction of external lighting to the pathways and communal areas on the lower levels, with all external lighting to be inward facing.

Credit calculations

The vegetation at the Site has a vegetation integrity score of less than 20 and therefore, biodiversity offsets are not required for the Project.

Glossary

Term	Definition
Development envelope	The location of the Project and all associated infrastructure. Direct impacts occur wholly within this area.
Locality	The Site and surrounds, nominally a 10 km radius from the Site.
Project site (Site)	Means the lots encompassing the development envelope (refer figures).
Study area	Area of direct and indirect impact.

Abbreviations

Acronym	Term/Definition
BAM	Biodiversity Assessment Methodology
BDAR	Biodiversity Development Assessment Report
BAM Calculator	Biodiversity Assessment Method Credit Calculator
BC Act	*Biodiversity Conservation Act 2016* (NSW)
BC Reg	*Biodiversity Conservation Regulation 2017* (NSW)
BMP	Biodiversity Management Plan
BOS	*NSW Biodiversity Offsets Scheme*
CEEC	Critically Endangered Ecological Community
DA	Development Application
DoEE	Commonwealth Department of the Environment and Energy
DP&E	NSW Department of Planning and Environment
EEC	Endangered Ecological Community
EIS	Environmental Impact Statement
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
FFA	Flora and Fauna Assessment Report
FM Act	*Fisheries Management Act 1994* (NSW)
ha	Hectare/s
IBRA	Interim Biogeographic Regionalisation for Australia
LGA	Local Government Area
MNES	Matters of National Environmental Significance (from the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*).
OEH	Office of Environment and Heritage (formerly DECCW, DECC, DEC)
PEA	Preliminary Environmental Assessment
PCT	Plant Community Type
SAII	Serious and Irreversible Impacts
SEARs	Secretary's Environmental Assessment Requirements
TEC	Threatened Ecological Community

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1. Biodiversity Assessment

1.1 Introduction

Austino Property Group is proposing to construct residential apartments (the Project) at Sydney Olympic Park, within the Parramatta Local Government Area (**Error! Reference source not found.** and **Error! Reference source not found.**).

Niche Environment and Heritage Pty Ltd (Niche) was commissioned by Austino Property Group to address the biodiversity components of the Secretary's Environmental Assessment Requirements (SEARs) for the preparation of an Environmental Impact Statement (EIS) for the Project. Niche have specifically been requested to address items 19 and 20 of the SEARs:

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In accordance with the requirements of the SEARs, a Biodiversity Development Assessment Report (BDAR) will be required to support the development application for the proposed residential subdivision. The Project has been assessed in accordance with the BAM 'streamlined assessment module' for small area development that requires consent.

1.2 The Project

1.2.1 General description of project site

The project site (Site) is located at 1 and 2 Murray Rose Avenue, Sydney Olympic Park, within the City of Parramatta Local Government Area (**Error! Reference source not found.** and **Error! Reference source not found.**). The Site is approximately 0.65 hectares in size on land previously cleared, cut and filled. The Site is highly disturbed and includes areas of bare earth, planted native trees and areas dominated by weeds. Small stands of planted native vegetation occur on the Site and a narrow corridor of native vegetation occurs offsite, adjacent to the eastern boundary of both properties. Bennelong Parkway and Bennelong Pond are also to the east of both properties. A former industrial site, known as the Brickpit, occurs to the north of 1 Murray Rose Avenue. Land to the south and west of the Site comprises office buildings and carparks.

1.2.2 Construction and operational footprint

The construction and operational footprint of the Project encompasses the entire Site (Figure 76). A number of mitigation measures would be implemented, and the Project would be designed to ensure that all indirect impacts are contained within the Site.

In accordance with the SEARs, the potential for impacts to vegetation and wildlife habitats in Bennelong Pond must also be considered. The study area (area of direct and indirect impacts) therefore encompasses the entire Site and the portion of Bennelong Pond to the east of the Site that may be affected by the Project.

1.3 State approval and assessment process

1.3.1 Application of the BAM

The BAM is a new framework for assessment of biodiversity impacts and determination of offsetting requirements under the NSW Biodiversity Offsets Scheme (BOS). Implementation of the BAM is required when certain thresholds are triggered, as prescribed in the *Biodiversity Conservation Regulation 2017* (BC Reg), or for certain types of development. The Project comprises State significant development and therefore, a BDAR is required in accordance with Section 7.9 of the BC Act.

1.3.2 Streamlined assessment module

The Project has been assessed in accordance with the BAM 'streamlined assessment module for small area development that requires consent'. The module uses a specific version of the BAM Calculator and has different survey and reporting requirements to a regular BDAR. The Project is eligible to be assessed in accordance with the streamlined assessment module as:

- The Site does not occur in the shaded area of the Biodiversity Values Map.
- The proposed area of vegetation clearing (0.08 ha) does not exceed the maximum area limit for application of the small area development module (≤ 1 ha).

1.3.3 Indirect impacts

In accordance with item 20 of the SEARs, the impacts of overshadowing and light spill on the vegetation and wildlife habitats in Bennelong Pond have been assessed.

1.4 Commonwealth approval and assessment process

Matters of National Environmental Significance (MNES) are protected under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The BAM requires proponents to identify and assess the impacts on all nationally listed threatened species and threatened ecological communities that may be present on or near the Site. Therefore, the BAM has partly been used to perform assessment of impacts under the EPBC Act.

1.5 Assessment resources and assessor qualifications

This BDAR has been prepared by the following accredited assessors:

- Evelyn Craigie – Senior Ecologist/Accredited Biodiversity Assessor: field survey, data management, data entry, credit calculations, report preparation.

Other specialist staff involved in preparing the assessment include:

- Sian Griffiths - Senior Ecologist/Accredited Biodiversity Assessor: report review, quality assurance.
- Matthew Harris - mapping.

1.6 Landscape assessment

1.6.1 Methods

As detailed in Section 4 of the BAM (OEH 2017), a landscape assessment for the Site is required, which was conducted within the BAM Calculator. Landscape value is an assessment of a number of factors including:

- Native vegetation cover
- Rivers, streams and estuaries
- Areas of geological significance
- Habitat connectivity.

For each factor the current state of the landscape is assessed then compared with the state of the landscape if the Project were to proceed.

1.6.2 Landscape features and site context

Table 1 below provides details of the landscape settings and scored landscape features for the Project.

Table 1: Landscape features and scoring under the NSW BAM

Landscape features	Description	Figure reference
IBRA bioregion/subregion	The majority of the Site is located in the Cumberland subregion of the Sydney Basin Interim Biogeographic Regionalisation for Australia (IBRA) bioregion. A section of 1 Murray Rose Avenue occurs in the Pittwater subregion, however, only the Cumberland subregion has been used in the BAM Calculator as the majority of the Site occurs in this subregion and the BAM Calculator only allows one subregion to be entered.	**Error! Reference source not found.** **Error! Reference source not found.**
Native vegetation cover	A 1,500m buffer was applied to the Site resulting in an overall buffer area of 767.37 ha. Existing vegetation mapping (OEH, 2016) identified very limited areas of vegetation within the buffer area. *Woody vegetation cover* The native vegetation extent and cover of woody vegetation was determined via aerial photography interpretation based on canopy cover. For woody vegetation, 14.5% of the buffer area was determined to support native woody vegetation with benchmark cover. *Non-woody vegetation cover* For non-woody vegetation, experience of the study area was drawn upon in addition to aerial photography interpretation and vegetation mapping to estimate cover of native grassland vegetation. The buffer area only supports a small proportion of non-woody vegetation cover and it is assumed this is not native as it is subject to high levels of disturbance and is not included in vegetation mapping for the area. *Total native vegetation cover* Combining the estimated woody and non-woody vegetation cover resulted in 14.5% of the buffer area supporting native vegetation. This falls into the >10 - 30% category within the BAM Calculator.	**Error! Reference source not found.**
Patch size	Patch size refers to areas of intact native vegetation within which each vegetation zone occurs, including offsite vegetation. Areas of vegetation that have gaps of less than 100 m from the next area of native vegetation are included in the patch. A patch size of 91 ha was assigned to the vegetation zone.	-
Mitchell Landscapes	The Mitchell Landscape within the Site is: Ashfield Plains (majority of Site) and Port Jackson Basin (part of 1 Murray Rose Avenue).	**Error! Reference source not found.** **Error! Reference source not found.**

Landscape features	Description	Figure reference
Connectivity features	Extant vegetation within the Site is connected to/within 100m of native vegetation along Bennelong Parkway and within Bennelong Pond.	**Error! Reference source not found.Error! Reference source not found.**

1.7 Native vegetation and vegetation integrity

1.7.1 Methods – data review

NSW Bionet Atlas Database

A review of spatial records of threatened flora within a 10 km radius of the study area was undertaken using data obtained from the NSW Bionet Atlas (Figure 4). Records were obtained prior to field survey. Results were considered during field survey and likelihood of occurrence analysis.

EPBC Act Protected Matters Search

A Protected Matters Search (EPBC Act) was carried out for a 10 km area around the Site. Results were considered during field survey and likelihood of occurrence analysis.

1.7.2 Methods – field survey

An ecological survey in accordance with the BAM was undertaken for the Project, and consisted of:

- Biodiversity Assessment on the 28th of September 2018 which included BAM plot/transect collection, and threatened flora survey.
- Habitat assessment on the 28th of September 2018 to determine the potential for indirect impacts to the important habitats in the vicinity of the Site.

One plot/transect survey was conducted in an area incorporating native vegetation at the Site. Plant Community Types (PCT) were recorded and mapped using BAM vegetation quadrats/ transects and walking meanders. Habitat assessments were undertaken in the vegetation to the east of the Site.

The BAM plot requirements were determined using the BAM (OEH 2017). The number of plots conducted and and required for each PCT and zone is provided in

Table 3 and the location of the completed plot is illustrated in **Error! Reference source not found.**.

Walking meanders were carried out at habitat observation points and around plot locations. Given the relatively small size of the Site, a random meander was able to thoroughly cover the entire area. Habitat assessments were undertaken in the vegetation to the east of the Site. Bennelong Pond could not be accessed, however, the areas of potential impact were observed through the fence.

1.7.3 Plant community delineation and mapping

The majority of the Site does not align to any native vegetation community as it comprises cleared areas dominated by weeds and areas of bare earth (Plate 1). Small stands of native canopy species occur at the Site comprising *Corymbia eximia* (Yellow Bloodwood) and *Eucalyptus robusta* (Swamp Mahogany). As the

trees at 1 Murray Rose Avenue are located along a disused driveway and the Site has previously been cleared and filled, it is likely the trees were planted.

The stand of trees at 2 Murray Rose Avenue are currently surrounded by demountable buildings and hardstand areas, with a number of native shrubs that are unlikely to naturally occur in the area and thus, it is likely this vegetation was also planted. Canopy species include Yellow Bloodwood, *Elaeocarpus reticulatus* (Blueberry Ash) with a garden variety Grevillea in the understorey (likely Grevillea 'Honey Gem'). A number of juvenile *Casuarina glauca* (Swamp Oak) occur near the eastern boundary of the Site and are likely to have colonised from the Swamp Oak adjacent to Bennelong Pond.

Introduced species include: *Ulmus parviflora* (Chinese Elm), *Jacaranda mimosifolia* (Jacaranda), *Olea europaea* subsp*. cuspidata* (African Olive), *Lantana camara* (Lantana), *Sida rhombifolia* (Paddy's Lucerne), *Ligustrum sinense* (Small-leaved Privet), *Verbena bonariensis* (Purpletop) and *Chrysanthemoides monilifera* (Bitou Bush).

1.7.4 Plant Community Type

It is difficult to determine an appropriate PCT for the Site due to the altered condition of the vegetation and landscape. The issues associated with selecting a PCT in such cases were discussed with OEH and they advised that, where there is native vegetation on the Site that does not conform to a PCT, the vegetation should be assessed against the best-fit PCT. The best-fit PCT was identified based on the species present, the landscape position of the Site and its geographic location. On this basis, one PCT was identified on the Site:

- PCT1231: Swamp Mahogany swamp sclerophyll forest on coastal lowlands of the Sydney Basin Bioregion and South East Corner Bioregion.

This PCT was selected due to the presence of Swamp Mahogany in the canopy, its location in a low lying area near the Parramatta River foreshore and the known occurrence of this PCT in the Parramatta LGA. The geotechnical report for the Site (JK Geotechnics, 2017a and 2017b) identified the soil at the Site as sandy and clayey fill over residual silty clay. The landscape position of PCT1231 is described as drainage lines and depressions on sandy alluvium and sand flats in low altitude coastal areas.

A second PCT was also considered: PCT1234 Swamp Oak swamp forest fringing estuaries, Sydney Basin Bioregion and South East Corner Bioregion. While this PCT also aligns to the landscape position and geographic location of the Site, the native vegetation at the Site is not representative of this PCT and the Site is considered to be too elevated from the nearby estuaries to fit this PCT.

Only one condition class was given to the PCT given similar structure and quality occurred across the Site (Table 2 and

Table 3).

Table 2: Vegetation mapping and alignment for vegetation types within the development envelope

Plant Community Type Name (OEH BAM Calculator)	Vegetation Type Abbreviation for this Assessment (Niche)	TEC Status (NSW/ Commonwealth)	Vegetation Formation (Keith 2004)	Vegetation Class (Keith 2004)	PCT % cleared
PCT1231: Swamp Mahogany swamp sclerophyll forest on coastal lowlands of the Sydney Basin Bioregion and South East Corner Bioregion	PCT1231	According to the BioNet Vegetation Classification, PCT 1231 does not align with the Swamp Sclerophyll TEC in the Sydney metropolitan area and adjacent areas because it occurs on sand.	Forested Wetlands	Coastal Swamp Forests	50

Table 3: Proposed development envelope per vegetation zone and associated plot/transect survey requirement

Zone number	PCT – best fit	Condition	Proposed development envelope (ha)	Plots required (BAM)	Plots completed
1	PCT1231: Swamp Mahogany swamp sclerophyll forest on coastal lowlands of the Sydney Basin Bioregion and South East Corner Bioregion	Low	0.08	1	1
Total			**0.08**	**1**	**1**

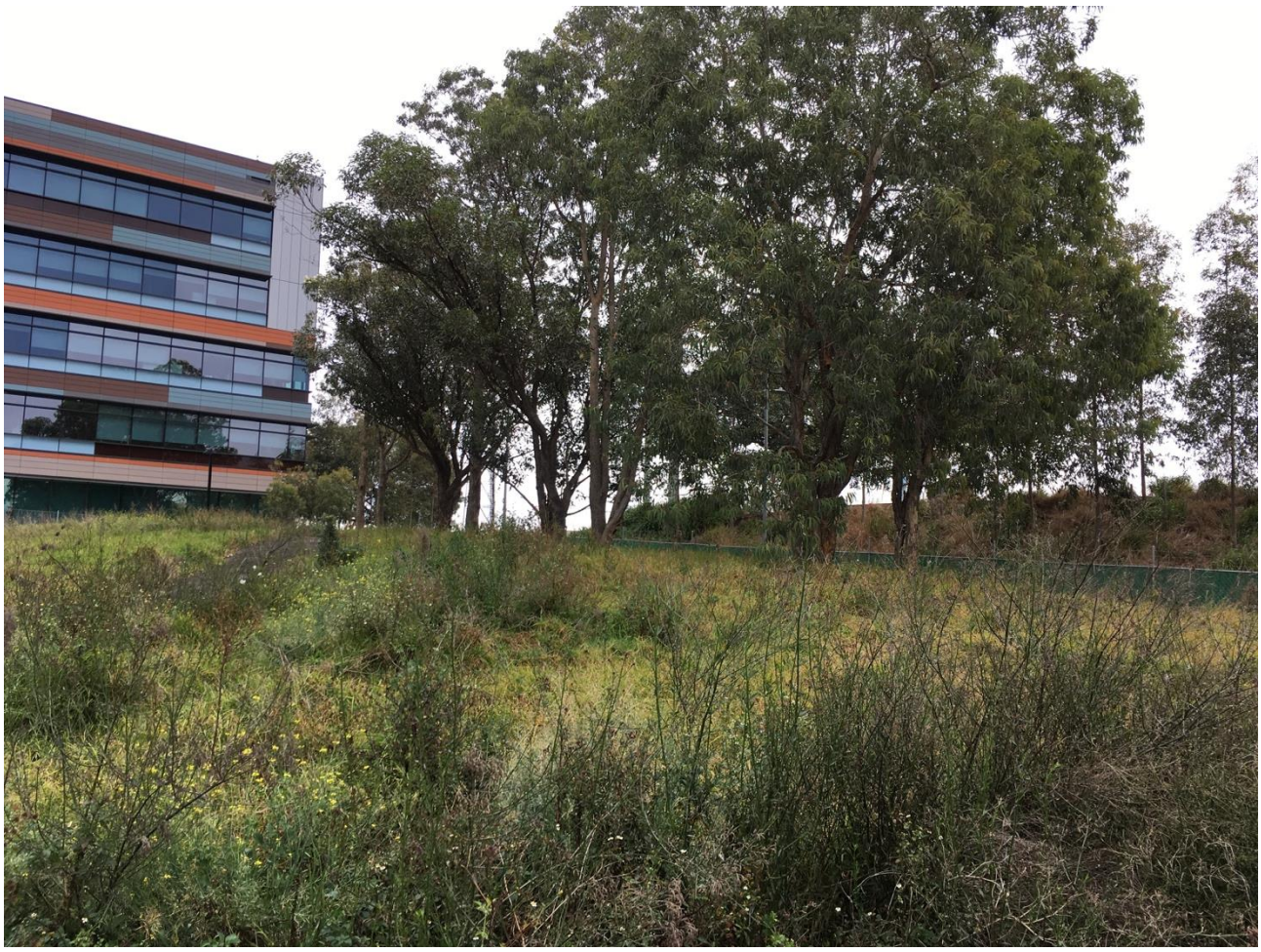

Plate 1. PCT1231 at the Site

1.7.5 Site values

Flora

Floristic data recorded from the BAM plot is included within Appendix 1 and Appendix 3. Sixteen species were recorded, comprising three native species and 13 exotic species. The juvenile Swamp Oak did not occur within the BAM plot.

Plot and transect values

The results of the plot data and species lists obtained during the field assessment is provided in **Error! Reference source not found.**.

Vegetation integrity score

The vegetation integrity score was determined by entering plot data into the BAM Calculator (Table 4). The data provides quantitative measures of composition, structure and function for each vegetation zone (Appendix 2). The BAM Calculator compares the values recorded with the benchmark for the vegetation class to provide the vegetation integrity score. This score represents the overall condition of the vegetation compared against the benchmark (out of 100).

Table 4: Vegetation zones and current and future vegetation integrity scores

Vegetation zone	Zone number	Area	Patch size	Current vegetation integrity score	Future vegetation integrity score
PCT1231: Swamp Mahogany swamp sclerophyll forest on coastal lowlands of the Sydney Basin Bioregion and South East Corner Bioregion	1	0.08	91	14.9	0

The score from these inputs, coupled with data in the following section of this report, would be used to determine the number of ecosystem credits that are required to offset the impacts of the Project. However, as the score is less than 20 in this case, further assessment of native vegetation and threatened species habitat in accordance with the BAM is not required. Biodiversity offsetting is also not required for the Project.

1.7.6 High threat weeds

During the field surveys, four high threat weeds were recorded, as listed the High Threat Weeds list associated with the BAM Calculator. The high threat weed species occur throughout the Site with a dense infestation of Lantana near the eastern boundary of 1 Murray Rose Avenue. High threat weeds recorded at the Site are provided in Appendix 1.

1.7.7 Threatened ecological communities

PCT1231 does not align to any Threatened Ecological Community (TEC) listed under the BC Act. Whilst it aligns with some criteria associated with Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions, the Bionet Vegetation Classification states PCT1231 does not align with the Swamp Sclerophyll TEC in the Sydney metropolitan area and adjacent areas because it occurs on sand (OEH 2018b).

1.7.8 Threatened flora

No threatened flora were detected during field survey and are considered unlikely to occur due to the low overall native species richness and cover at the Site. A likelihood of occurrence assessment was undertaken for predicted and candidate species generated via the BAM Calculator and is provided in Appendix 4. All are assumed to be absent from the Site based on non-detection of the species during targeted searches conducted during the survey.

1.8 Fauna assessment

1.8.1 Methods – data review

NSW Bionet Atlas Database

A review of spatial records of threatened fauna within a 10 km radius of the Site was undertaken using data obtained from the NSW Bionet Atlas (Figure 5). Records were obtained prior to field survey. Results were considered during field survey and likelihood of occurrence analysis.

EPBC Act Protected Matters Search

A Protected Matters Search (EPBC Act) was carried out for a minimum 10 km radius around the Site by inputting the Site centroid coordinates into the EPBC Act Protected Matters Search Tool and applying a 10 km buffer. Results were considered during field survey and likelihood of occurrence analysis.

1.8.2 Methods – field survey

Habitat assessments were undertaken at the Site and adjoining areas including the vegetation to the east of the Site and Bennelong Pond. Bennelong Pond is fenced and could not be accessed so observations were made through the fence. Targeted fauna survey was not undertaken for this assessment.

1.8.3 Assessment of threatened species and populations

As noted above, the low vegetation integrity score negates the requirement to further assess threatened species habitat in accordance with the BAM. Nonetheless, a description of fauna habitat at the Site is provided in section 1.8.4 and a likelihood of occurrence assessment was undertaken for predicted and candidate species generated via the BAM Calculator (Appendix 4). The results indicate that no threatened fauna species are likely to utilise the Site, however, a number of species may use the aquatic habitats to the east of the Site.

An assessment of potential indirect impacts to threatened species is provided to address Item 20 of the SEARs (section 2.1.1 and 2.1.2).

1.8.4 Fauna habitats

Habitat condition within the Site has been influenced by previous clearing of vegetation, grading, filling and construction of a driveway. The native vegetation at the Site provides limited foraging habitat for mobile species as it is within an urban environment with no key features such as hollows, native understorey vegetation, fallen logs or aquatic habitats. No evidence of breeding was observed. The vegetation at the Site retains limited connectivity to the nearest area of remnant native vegetation (Bennelong Pond and its surrounding vegetation), with Bennelong Parkway presenting a barrier to less mobile species.

The eastern boundary of both properties comprises a landscaped area of planted native species including *Corymbia maculata* (Spotted Gum) and a sparse understorey of *Gahnia* sp. Swamp Oaks also occur and may have naturally colonised from the remnant vegetation surrounding Bennelong Pond. This area also lacks features such as hollows, logs and aquatic habitat. One bird nest was observed in a Swamp Oak.

A narrow strip of remnant Swamp Oaks occurs between Bennelong Parkway and Bennelong Pond. This is adjacent to a section of Bennelong Pond in which aquatic vegetation was not observed, with mangroves occurring 20 – 40m from the western bank.

1.8.5 Fauna recorded from field surveys

A total of two bird species were recorded during field surveys: *Cracticus tibicen* (Australian Magpie) and *Manorina melanocephala* (Noisy Miner).

2. Impact Assessment

As the assessment of biodiversity values resulted in a vegetation integrity score of less than 20, the Stage 2 impact assessment of the BAM is not required to be undertaken. Therefore, this impact assessment addresses Item 20 of the SEARs only:

- *Assess the impact of overshadowing on the significant vegetation, including Grey Mangroves and aquatic* Zannichellia palustris*, in Bennelong Pond, and how these impacts will be minimised.*
- *Assess the impact of light spill from the development on significant wildlife habitats in Bennelong pond, and how these impacts will be minimised.*

2.1 Overshadowing

A Shadow Diagram for the proposed buildings was provided by Austino Property Group, with modelled shadowing shown between 9am and 3pm during June. An overlay of this on aerial photography indicates a small component of Bennelong Pond would be in the building shadow from 2pm (Figure 7). The shade does not affect areas containing mangroves until 3pm and at this time, only a small portion of the western edge of the mangrove area is in shade.

It is noted the western sections of Bennelong Pond are also subject to shade from the native trees along both sides of Bennelong Parkway. At approximately 1:30pm during the site visit (28 September 2018), shade from these trees was observed to approximately 12m east from the western bank of Bennelong Pond, with only small areas of light filtering through.

The mangroves and aquatic habitats (including habitat for *Zannichellia palustris*) to the east of the Project extend over an area of greater than 30 hectares. The section of Bennelong Pond subject to shading from the development at 3pm during winter is approximately 0.7 hectares, i.e. 2.3%. The remaining area of mangroves and habitat for *Zannichellia palustris* would remain unaffected.

Given the effects of shade from the Project will only occur over a small area from 3pm (in the winter months), in an area which is already partly subject to shading from trees, the shadow from the Project is not considered likely to adversely affect aquatic species in Bennelong Pond.

2.2 Light Spill

The buildings on both properties will be set back a minimum of 35 metres from the western edge of Bennelong Pond and are designed so the setback increases as the building height increases. External lighting will be restricted to pathways and common areas on the lower levels and will comprise inward facing lights only. Light from the lower levels will be largely blocked by the vegetation along both sides of Bennelong Parkway and, internal light from higher levels is not expected to spill onto the wildlife habitats due to the distance provided by height and increased setbacks. Therefore, light spill from the Project is likely to be minimal. Bennelong Pond is already subject to light spill from street lighting, traffic and other buildings along Bennelong Parkway and the Project is unlikely to add significantly to this.

3. Mitigation Measures

3.1 Mitigation measures (pre-construction, construction and post construction)

Management and mitigation measures will be further developed and implemented during the construction and operation phases of the Project, as detailed in Table 5.

Table 5: Mitigation measures

Mitigation measure	Responsibility
Pre-construction	
Ensuring that the Project does not impose on the drip lines of trees on neighbouring properties.	Project manager
Construction	
Implementation of erosion and sediment controls for the duration of construction works. Regular maintenance of erosion and sediment controls during construction and until excavated areas are vegetated. This will be detailed in a Stormwater Management Plan.	Project manager
Post construction	
Landscape planting focusing on naturally occurring endemic tree and shrub species to compensate for loss of foraging habitat due to the removal of trees.	Project manager/ Project ecologist
Management and removal of all waste from the Site	Project manager
External lighting to be restricted to pathways and communal areas on the lower levels. External lighting to be inward facing.	Project manager

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Figures

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Niche PM: Evelyn Craigie
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Client: Austino Property Group

Site Map
1 – 2 Murray Rose Avenue

Figure 1

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0 500 m

GDA 1994 MGA Zone 56

Niche PM: Evelyn Craigie
Niche Proj. #: 4465
Client: Austino Property Group

Location Map

1 – 2 Murray Rose Avenue

Figure 2

v2.0

Subject Area

BAM Plot

PCT1231, Swamp Mahogany swamp sclerophyll forest on coastal lowlands of the Sydney Basin Bioregion and South East Corner Bioregion

Waterbody

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0 20

m

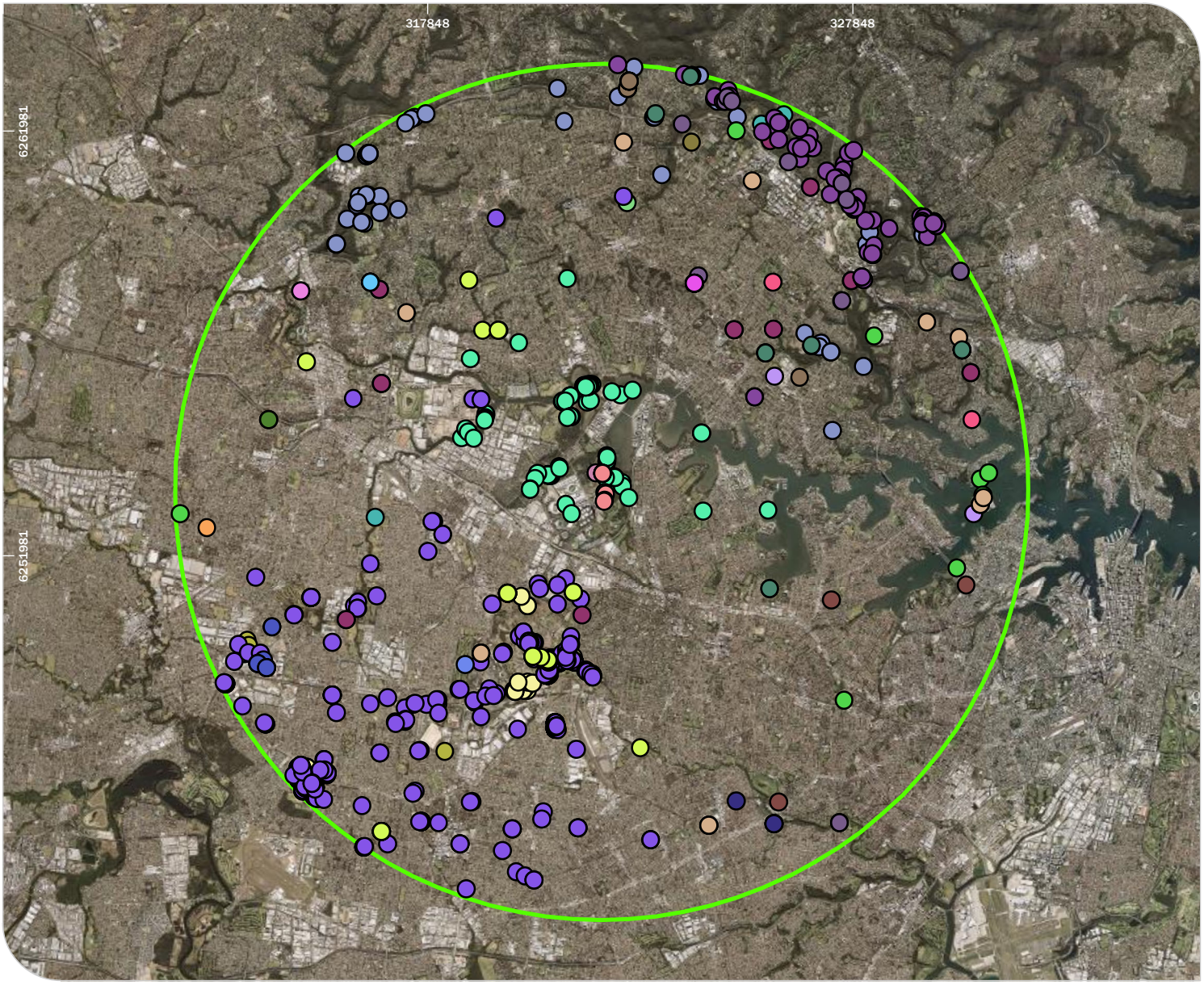
GDA 1994 MGA Zone 56

Vegetation zones and plot locations

1 – 2 Murray Rose Avenue

Niche PM: Evelyn Craigie
Niche Proj. #: 4465
Client: Austino Property Group

Figure 3



10km Search Area

Subject Area

- *Acacia bynoeana*
- *Acacia clunies-rossiae*
- *Acacia pubescens*
- *Acacia terminalis subsp. terminalis*
- *Callistemon linearifolius*
- *Darwinia biflora*
- *Dillwynia tenuifolia*
- *Epacris purpurascens var. purpurascens*
- *Eucalyptus nicholii*
- *Eucalyptus scoparia*
- *Genoplesium baueri*
- *Grammitis stenophylla*
- *Grevillea beadleana*
- *Hibbertia spanantha*
- *Isotoma fluviatilis subsp. fluviatilis*
- *Leptospermum deanei*
- *Marsdenia viridiflora subsp. viridiflora*
- *Melaleuca deanei*
- *Persoonia hirsuta*
- *Persoonia nutans*
- *Pimelea curviflora var. curviflora*
- *Pimelea spicata*
- *Pomaderris prunifolia*
- *Prostanthera marifolia*
- *Pterostylis saxicola*
- *Pultenaea parviflora*
- *Pultenaea pedunculata*
- *Syzygium paniculatum*
- *Tetratheca glandulosa*
- *Tetratheca juncea*
- *Triplarina imbricata*
- *Wahlenbergia multicaulis*
- *Wilsonia backhousei*
- *Zannichellia palustris*

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N

0 3

km

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NSW Bionet Atlas Threatened Species 10km Search - Flora

1 – 2 Murray Rose Avenue

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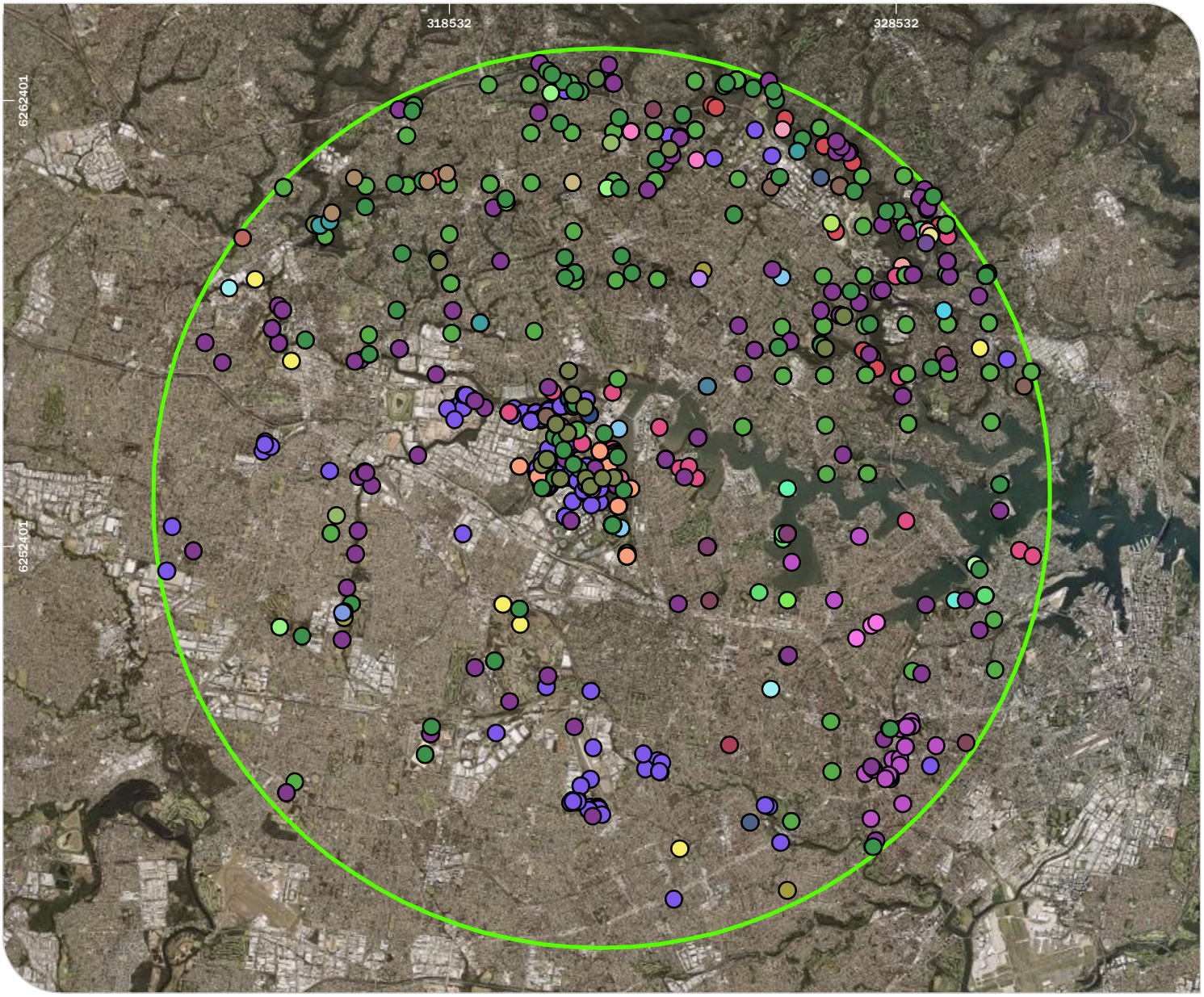
Client: Austino Property Group

Figure 4



- 10km Search Area
- Subject Area
- <all other values>
- Australasian Bittern
- Australian Painted Snipe
- Barking Owl
- Black Bittern
- Black Falcon
- Black-necked Stork
- Black-tailed Godwit
- Broad-billed Sandpiper
- Bush Stone-curlew
- Cotton Pygmy-Goose
- Cumberland Plain Land Snail
- Curlew Sandpiper
- Dural Woodland Snail
- Dusky Woodswallow
- Eastern Bentwing-bat
- Eastern Curlew
- Eastern False Pipistrelle
- Eastern Freetail-bat
- Eastern Grass Owl
- Eastern Osprey
- Eastern Pygmy-possum
- Flame Robin
- Freckled Duck
- Gang-gang Cockatoo
- Gang-gang Cockatoo pop. Hornsby/Ku-ring-gai LGAs
- Glossy Black-Cockatoo
- Great Knot
- Greater Broad-nosed Bat
- Greater Glider
- Greater Sand-plover
- Green and Golden Bell Frog
- Grey-headed Flying-fox
- Little Bentwing-bat
- Little Eagle
- Little Lorikeet
- Little Tern
- Long-nosed Bandicoot pop. inner western Sydney
- Masked Owl
- Pied Oystercatcher
- Powerful Owl
- Red Knot
- Red-crowned Toadlet
- Regent Honeyeater
- Scarlet Robin
- Sooty Owl
- Southern Myotis
- Spotted Harrier
- Spotted-tailed Quoll
- Superb Fruit-Dove
- Swift Parrot
- Terek Sandpiper
- Turquoise Parrot
- Varied Sittella
- White-bellied Sea-Eagle
- White-fronted Chat
- White-fronted Chat pop. Syd Metro. Catch. Mgmt Area
- Yellow-bellied Glider
- Yellow-bellied Sheathtail-bat

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N

0 3

km

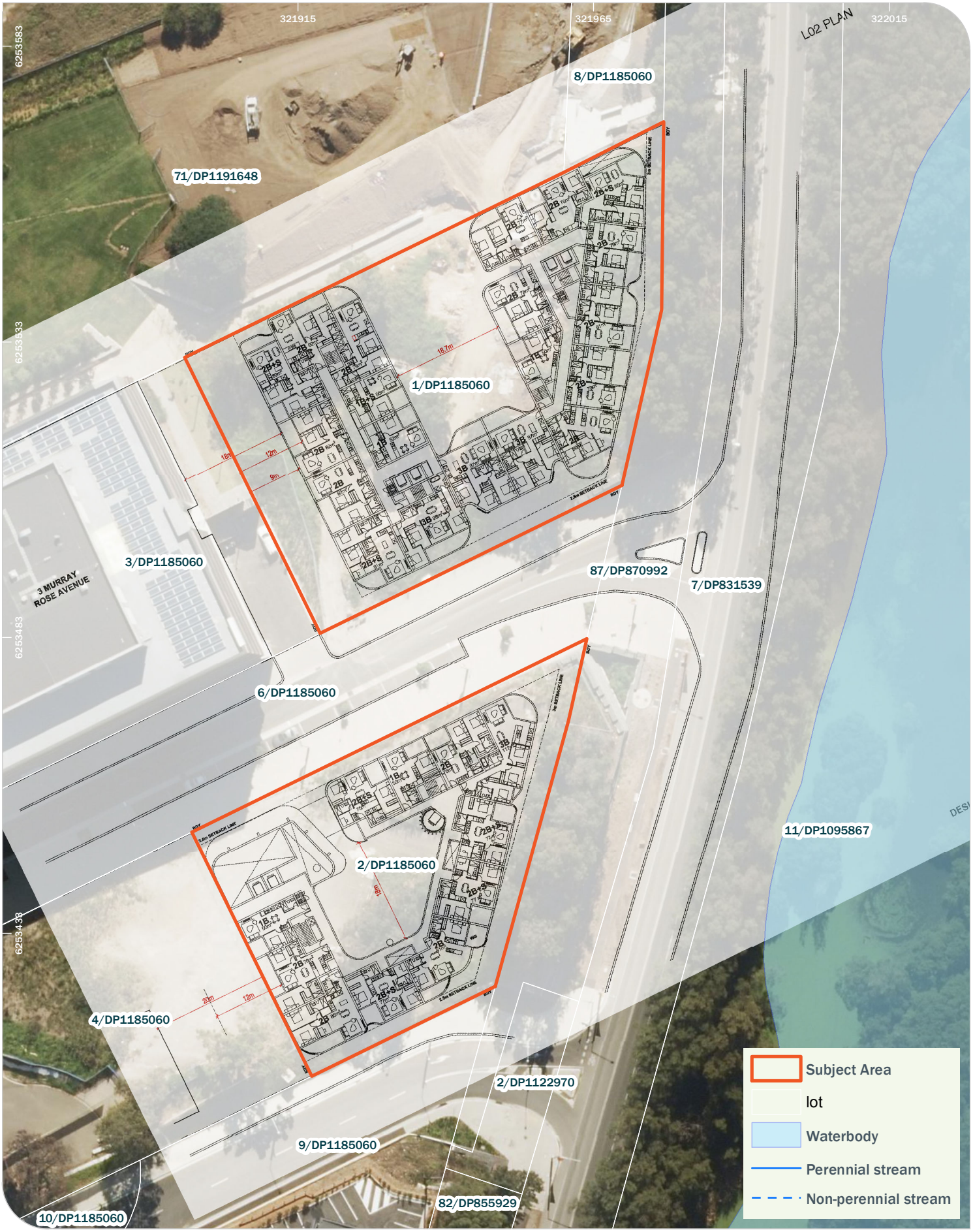
GDA 1994 MGA Zone 56

NSW Bionet Atlas Threatened Species 10km Search - Fauna

1 – 2 Murray Rose Avenue

Niche PM: Evelyn Craigie
Niche Proj. #: 4465
Client: Austino Property Group

Figure 5



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0 20
m
GDA 1994 MGA Zone 56

Niche PM: Evelyn Craigie
Niche Proj. #: 4465
Client: Austino Property Group

Proposed development footprint
1 – 2 Murray Rose Avenue

Figure 6

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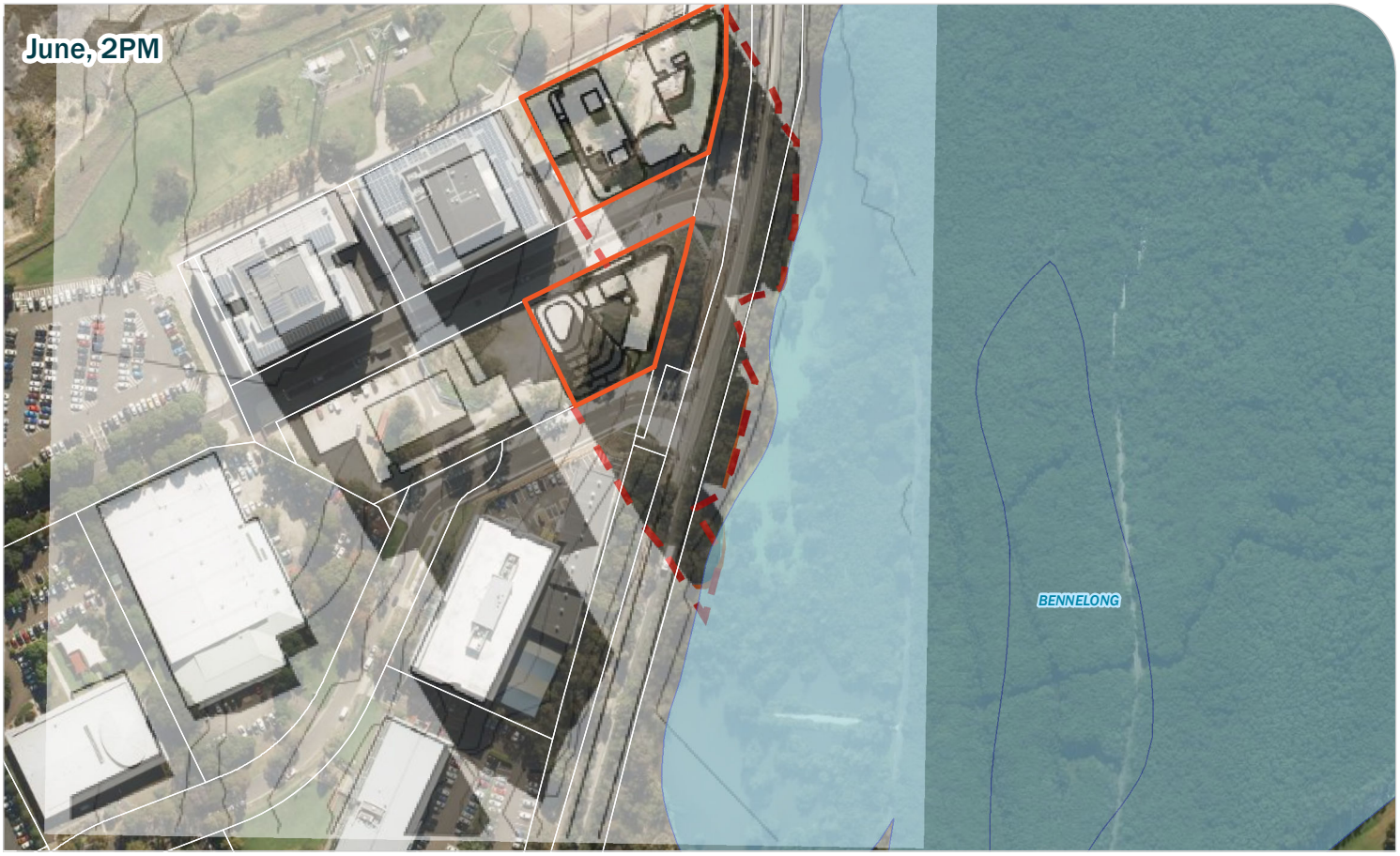

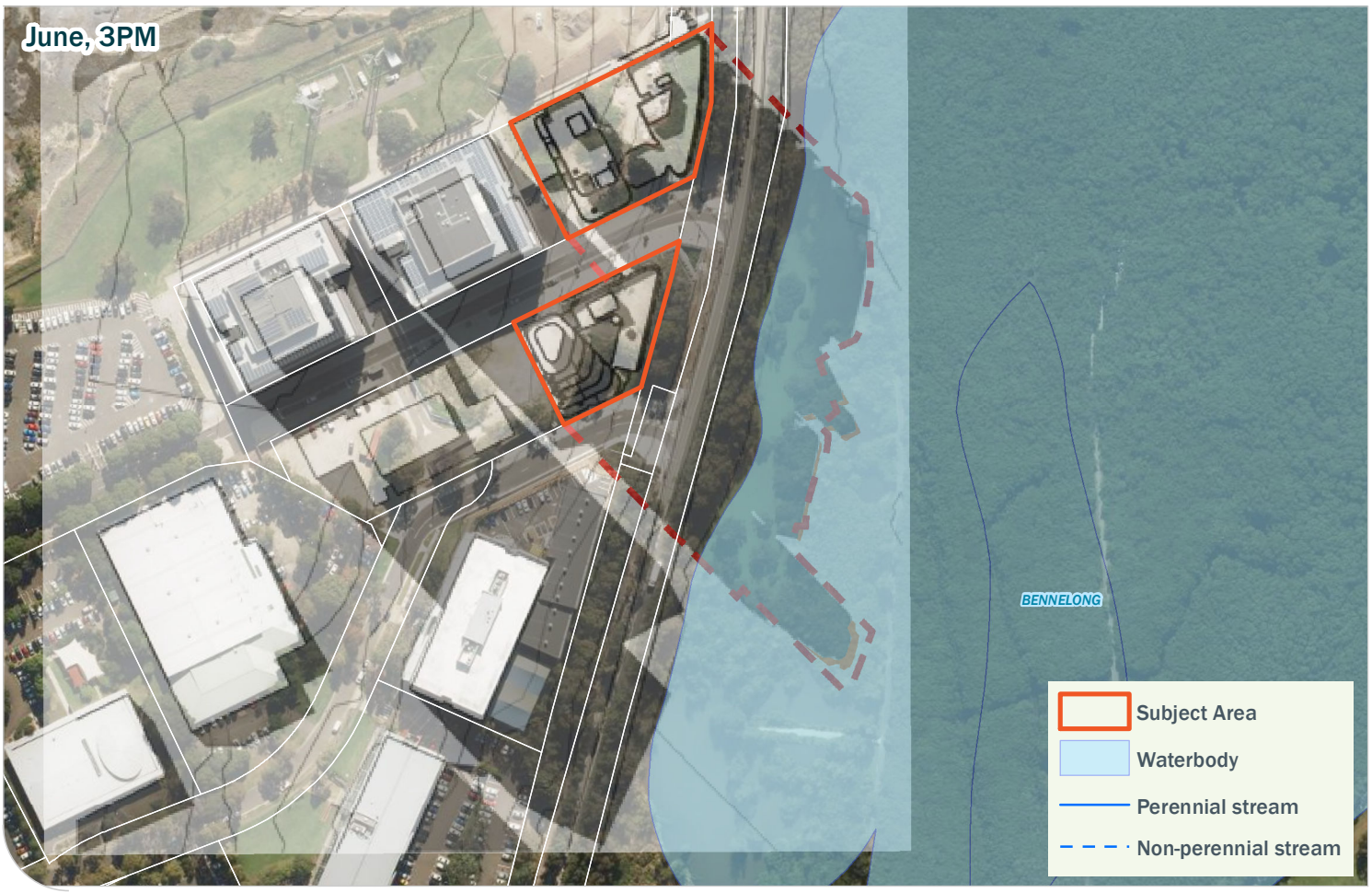

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0 50
m
GDA 1994 MGA Zone 56

Niche PM: Evelyn Craigie
Niche Proj. #: 4465
Client: Austino Property Group

Shadow Diagram
1 – 2 Murray Rose Avenue

Figure 7

Appendix 1. Floristic plot data

Family	Species	Common Name	Introduced	4465_EC_1 Cover	4465_EC_1 Abundance	Growth Form
Fabaceae	*Acacia longifolia*			0.1	1	Shrub
Asteraceae	*Bidens pilosa*	Cobblers Pegs	HTW	5		N/A
Brassicaceae	*Brassica juncea*	Mustard Weed	✓	0.2	5	N/A
Poaceae	*Cenchrus clandestinus*	Kikuyu Grass	✓	80		N/A
Asteraceae	*Chrysanthemoides monilifera*	Bitou Bush	HTW	0.5		N/A
Myrtaceae	*Corymbia eximia*	Yellow Bloodwood		20		Tree
Myrtaceae	*Eucalyptus robusta*	Swamp Mahogany		25		T
Verbenaceae	*Lantana camara*	Lantana	HTW	2		N/A
Oleaceae	*Ligustrum sinense*	Small-leaved Privet	HTW	0.5		N/A
Asteraceae	*Onopordum acanthium*	Scotch Thistle	✓	0.5		N/A
Plantaginaceae	*Plantago lanceolata*	Plantain	✓	3		N/A
Malvaceae	*Sida rhombifolia*	Paddy's Lucerne	✓	2		N/A
Solanaceae	*Solanum nigrum*	Black-berry Nightshade	✓	0.5		N/A
Solanaceae	*Solanum sisymbriifolium*		✓	5		N/A
Verbenaceae	*Verbena bonariensis*	Purpletop	✓	5		N/A

HTW: High Threat Weed (as listed in the High Threat Weed list associated with the BAM Calculator)

Appendix 2. Plot transect scores

Plot no.	PCT abbreviated name and condition	Species richness						Cover (%)						
		Tree species	Shrub species	Grass species	Forb species	Fern species	Other species	Tree	Shrub	Grass	Forb	Fern	Other	High threat weed
4465_EC_1	Swamp Mahogany swamp sclerophyll forest on coastal lowlands of the Sydney Basin Bioregion and South East Corner Bioregion	2	1	0	0	0	0	45	0.1	0	0	0	0	8

Plot no.	Tree regeneration	Large trees (count)	Trees with hollows (count)	Litter cover (%)	Fallen logs (m)	Tree composition (stem classes)				
						Stems 5 to 9 cm	Stems 10 to 19cm	Stems 20 to 29 cm	Stems 30 to 49 cm	Stems 50 to 79 cm
4465_EC_1	Absent	0	0	46	0	Absent	Absent	Present	Present	Absent

Appendix 3. Flora species list

Species	Common Name
Acacia longifolia	
*Bidens pilosa**	Cobblers Pegs
*Brassica juncea**	Mustard Weed
Casuarina glauca	Swamp Oak
*Cenchrus clandestinus**	Kikuyu Grass
*Chrysanthemoides monilifera**	Bitou Bush
Corymbia eximia	Yellow Bloodwood
Dianella caerulea	Blue Flax-lily
Elaeocarpus reticulatus	Blueberry Ash
Eucalyptus robusta	Swamp Mahogany
Gahnia sp.	Saw-sedge
Grevillea sp.	Grevillea 'Honey Gem'
*Lantana camara**	Lantana
*Ligustrum sinense**	Small-leaved Privet
*Olea europaea**	African Olive
*Onopordum acanthium**	Scotch Thistle
*Plantago lanceolata**	Plantain
*Sida rhombifolia**	Paddy's Lucerne
*Solanum nigrum**	Black-berry Nightshade
*Solanum sisymbriifolium**	
*Verbena bonariensis**	Purpletop

*Exotic species

Appendix 4. Threatened species matrix, status and likelihood of occurrence

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of Occurrence	Potential Impact
Amphibians						
Heleioporus australiacus	Giant Burrowing Frog	V	V	The Giant Burrowing Frog has been recorded breeding in a range of water bodies associated with sandy environments of the coast and adjacent ranges from the Sydney Basin south the eastern Victoria. It breeds in hanging swamps, perennial non-flooding creeks and occasionally permanent pools, but permanent water must be present to allow its large tadpoles time to reach metamorphosis.	None	None
Litoria aurea	Green and Golden Bell Frog	E	V	Inhabits a very wide range of water bodies including marshes, dams and streams, particularly those containing emergent vegetation such as bullrushes or spikerushes. It also inhabits numerous types of man-made water bodies including quarries and sand extraction sites. Optimum habitat includes water-bodies that are un-shaded, free of predatory fish such as Plague Minnow, have a grassy area nearby and diurnal sheltering sites available.	None onsite. Occurs in suitable habitat in vicinity of the Site.	Unlikely. No direct impacts and offsite areas that are subject to overshadowing and light spill do not comprise optimal habitat.
Litoria raniformis	Southern Bell Frog	E	V	A highly adaptable and wide-ranging large frog found in a very wide range of habitats to the west of the Great Dividing Range in lignum-typha swamps and river red gum swamps or billabongs along floodplains and river valleys as well as irrigated rice crops and farm dams in agricultural environments. They prefer areas with emergent aquatic vegetation that they can use for shelter and for basking sites. Individuals can be found sheltering and overwintering under debris or in vegetation immediately adjacent to the breeding sites.	None	None
Mixophyes balbus	Stuttering Frog	E	V	Associated with streams in dry sclerophyll and wet sclerophyll forests and rainforests of more upland areas of the Great Dividing Range of NSW and down into Victoria. Breeding occurs along forest streams with permanent water where eggs are deposited within nests excavated in riffle zones by the females and the tadpoles swim free into the stream when large enough	None	None

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of Occurrence	Potential Impact
				to do so. Outside of breeding, individuals range widely across the forest floor and can be found hundreds of metres from water.		
Birds						
Anthochaera phrygia	Regent Honeyeater	CE	CE	The Regent Honeyeater mainly inhabits temperate woodlands and open forests of the inland slopes of south-east Australia. Birds are also found in drier coastal woodlands and forests in some years. There are only three known key breeding regions remaining: north-east Victoria (Chiltern-Albury), and in NSW at Capertee Valley and the Bundarra-Barraba region. In NSW the distribution is very patchy and mainly confined to the two main breeding areas and surrounding fragmented woodlands. In some years flocks converge on flowering coastal woodlands and forests.	Low. Suitable habitat does not occur	Unlikely
Artamus cyanopterus cyanopterus	Dusky Woodswallow	V	-	Often reported in woodlands and dry open sclerophyll forests, usually dominated by eucalypts, including mallee associations. It has also been recorded in shrublands and heathlands and various modified habitats, including regenerating forests; very occasionally in moist forests or rainforests.	Low. Suitable habitat does not occur	Unlikely
Botaurus poiciloptilus	Australasian Bittern	E	E	The Australasian Bittern is widespread but uncommon over south-eastern Australia. In NSW they may be found over most of the state except for the far north-west. Favours permanent freshwater wetlands with tall, dense vegetation, particularly spikerushes.	Low. Suitable habitat does not occur	Unlikely
Calidris canutus	Red Knot	-	E, M	Usually found foraging in soft substrate near the edge of the water on intertidal mudflats. Also have been recorded at nearby lakes, sewage ponds and floodwaters. Roosts on sandy beaches spits and islands. Northern hemisphere breeding.	Low. Suitable habitat does not occur	Unlikely
Calidris ferruginea	Curlew Sandpiper	E	CE, M	It occurs along the entire coast of NSW, particularly in the Hunter Estuary, and sometimes in freshwater wetlands in the Murray-Darling Basin. It generally occupies littoral and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats of sheltered coasts. It also occurs in non-	None onsite. Potential habitat in vicinity of the Site.	Unlikely. Potential indirect impacts to a small area of habitat only.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of Occurrence	Potential Impact
				tidal swamps, lakes and lagoons on the coast and sometimes the inland. Northern hemisphere breeding.		
Calidris tenuirostris	Great Knot	V	CE, M	In NSW this species has been recorded at scattered sites along the coast to about Narooma. It has also been observed inland at Tullakool, Armidale, Gilgandra and Griffith. Occurs within sheltered coastal habitats containing large intertidal mudflats or sand flats including inlets, bays, harbours, estuaries and lagoons. Often recorded on sandy beaches with mudflats nearby sandy spits and islets and sometimes on exposed reefs or rock platforms. Northern hemisphere breeding.	None onsite. Potential habitat in vicinity of the Site.	Unlikely. Potential indirect impacts to a small area of habitat only.
Callocephalon fimbriatum	Gang-gang Cockatoo	V	-	In summer, occupies tall montane forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. Also occur in subalpine snow gum woodland and occasionally in temperate or regenerating forest. In winter, occurs at lower altitudes in drier, more open eucalypt forests and woodlands, particularly in box-ironbark assemblages, or in dry forest in coastal areas. It requires tree hollows in which to breed.	None	None
Calyptorhynchus lathami	Glossy Black-Cockatoo	V	-	Inhabits forest with low nutrients, characteristically with key Allocasuarina spp. Tends to prefer drier forest types with a middle stratum of Allocasuarina below Eucalyptus or Angophora. Often confined to remnant patches in hills and gullies. Breed in hollows stumps or limbs, either living or dead. Endangered population in the Riverina.	None	None
Charadrius leschenaultii	Greater Sand Plover	V	M	Occur on sheltered sandy, shelly or muddy beaches with large intertidal mudflats or sandbanks as well as sandy estuarine lagoons. Non-breeding in Australia.	None onsite. Potential habitat in vicinity of the Site.	Unlikely. Potential indirect impacts to a small area of habitat only.
Charadrius mongolus	Lesser Sand Plover	V	M	Inhabits large intertidal sand flats or mudflats in sheltered bays, harbours and estuaries and occasionally sandy ocean beaches, coral reefs, wave-cut rock platforms and rocky outcrops. Non-breeding in Australia.	None onsite. Potential habitat in vicinity of the Site.	Unlikely. Potential indirect impacts to a small area of habitat only.
Circus assimilis	Spotted Harrier	V	-	The Spotted Harrier occurs throughout the Australian mainland except in densely forested or wooded habitats of the coast escarpment and ranges and rarely in Tasmania. Individuals	Low. Suitable habitat does not occur	Unlikely

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of Occurrence	Potential Impact
				disperse widely in NSW and comprise a single population. Occurs in grassy open woodland including acacia and mallee remnants inland riparian woodland grassland and shrub steppe. It is found most commonly in native grassland but also occurs in agricultural land foraging over open habitats including edges of inland wetlands.		
Daphoenositta chrysoptera	Varied Sittella	V	-	Inhabits wide variety of dry eucalypt forests and woodlands, usually with either shrubby under storey or grassy ground cover or both, in all climatic zones of Australia. Usually in areas with rough-barked trees, such as stringybarks or ironbarks, but also in paperbarks or mature eucalypts with hollows.	Low. Suitable habitat does not occur	Unlikely
Dasyornis brachypterus	Eastern Bristlebird	E	E	Found in coastal woodlands, dense scrub and heathlands, particularly where it borders taller woodlands.	None	None
Epthianura albifrons	White-fronted Chat	V	-	Low vegetation in salty coastal and inland areas and crops. Runs along ground and is found in local flocks in Winter	Low. Suitable habitat does not occur	Unlikely
Epthianura albifrons	White-fronted Chat population in the Sydney Metropolitan Catchment Management Area	EP	-	Two isolated sub-populations of White-fronted Chats are currently known from the Sydney Metropolitan Catchment Management Authority area; one at Newington Nature Reserve on the Parramatta River and one at Towra Point Nature Reserve in Botany Bay. These sub-populations are separated from each other by 25 km of urbanised land across which White-fronted Chats are unlikely to fly.	Low. Suitable habitat does not occur	Unlikely
Falco subniger	Black Falcon	V	-	Widely but sparsely distributed in NSW mostly occurring in inland regions. In NSW there is assumed to be a single population that is continuous with a broader continental population given that falcons are highly mobile commonly travelling hundreds of kilometres. The Black Falcon inhabits woodland shrubland and grassland in the arid and semi-arid zones especially wooded watercourses and agricultural land with scattered remnant trees.	Low. Suitable habitat does not occur	Unlikely
Glossopsitta pusilla	Little Lorikeet	V	-	Distributed in forests and woodlands from the coast to the western slopes of the Great Dividing Range in NSW, extending westwards to the vicinity of Albury, Parkes, Dubbo and	Low. Suitable habitat does not occur	Unlikely

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of Occurrence	Potential Impact
				Narrabri. Mostly occur in dry, open eucalypt forests and woodlands. They feed primarily on nectar and pollen in the tree canopy. Nest hollows are located at heights of between 2 m and 15 m, mostly in living, smooth-barked eucalypts. Most breeding records come from the western slopes.		
Grantiella picta	Painted Honeyeater	V	V	The Painted Honeyeater is nomadic and occurs at low densities throughout its range. The greatest concentrations of the bird and almost all breeding occurs on the inland slopes of the Great Dividing Range in NSW, Victoria and southern Queensland. During the winter it is more likely to be found in the north of its distribution. Inhabits boree, brigalow and box-gum woodlands and box-ironbark forests.	Low. Suitable habitat does not occur	Unlikely
Haliaeetus leucogaster	White-bellied Sea-Eagle	V	MA	Inhabits coastal and near coastal areas, building large stick nests, and feeding mostly on marine and estuarine fish and aquatic fauna.	Low. Suitable habitat does not occur	Unlikely
Hieraeetus morphnoides	Little Eagle	V	-	Most abundant in lightly timbered areas with open areas nearby. Often recorded foraging in grasslands, crops, treeless dune fields and recently logged areas. May nest in farmland, woodland and forest in tall trees individuals may be recorded in sewage farms or within shallow freshwater lagoons. Broad-billed Sandpipers roost on banks on sheltered sand	Low. Suitable habitat does not occur	Unlikely
Ixobrychus flavicollis	Black Bittern	V	-	Usually found on coastal plains below 200 m. Often found along timbered watercourses, in wetlands with fringing trees and shrub vegetation. The sites where they occur are characterized by dense waterside vegetation.	Low. Suitable habitat does not occur	Unlikely
Lathamus discolor	Swift Parrot	E	CE	The Swift Parrot occurs in woodlands and forests of NSW from May to August, where it feeds on eucalypt nectar, pollen and associated insects. The Swift Parrot is dependent on flowering resources across a wide range of habitats in its wintering grounds in NSW. This species is migratory, breeding in Tasmania and also nomadic, moving about in response to changing food availability.	None	None

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of Occurrence	Potential Impact
Limicola falcinellus	Broad-billed Sandpiper	V	M	Favours sheltered parts of the coast such as estuarine sand flats and mudflats, harbours, embayments, lagoons, saltmarshes and reefs as feeding and roosting habitat. Occasionally shell or shingle beaches. Breeds in the northern hemisphere.	None onsite. Potential habitat in vicinity of the Site.	Unlikely. Potential indirect impacts to a small area of habitat only.
Limosa lapponica baueri	Bar-tailed Godwit	-	M, V	Bar-tailed Godwit (spp 35auera) is the eastern Australian / New Zealand sub species. Mainly found in coastal habitats such as intertidal sand flats, mudflats, estuaries, inlets, coastal lagoons and bays. Often found around beds of seagrass and saltmarsh. Northern hemisphere breeding.	None onsite. Potential habitat in vicinity of the Site.	Unlikely. Potential indirect impacts to a small area of habitat only.
Limosa lapponica menzbieri	Bar-tailed godwit	-	M, CE	Bar-tailed Godwit (spp menzbieri) is the western Australian sub species. Mainly found in coastal habitats such as intertidal sand flats, mudflats, estuaries, inlets, coastal lagoons and bays. Often found around beds of seagrass and saltmarsh. Northern hemisphere breeding.	None onsite. Potential habitat in vicinity of the Site.	Unlikely. Potential indirect impacts to a small area of habitat only.
Limosa limosa	Black-tailed Godwit	V	M	Primarily a coastal species. Usually found in sheltered bays estuaries and lagoons with large intertidal mudflats and/or sand flats. Further inland it can also be found on mudflats and in water less than 10 cm deep around muddy lakes and swamps. Northern hemisphere breeding.	None onsite. Potential habitat in vicinity of the Site.	Unlikely. Potential indirect impacts to a small area of habitat only.
Lophoictinia isura	Square-tailed Kite	V	-	Typically inhabits coastal forested and wooded lands of tropical and temperate Australia. In NSW it is often associated with ridge and gully forests dominated by Woollybutt, Spotted Gum, River Peppermint or Gully Gum. Individuals appear to occupy large hunting ranges of more than 100km². They require large living trees for breeding, particularly near water with surrounding woodland-forest close by for foraging habitat. Nest sites are generally located along or near watercourses, in a tree fork or on large horizontal limbs.	Low. Suitable habitat does not occur	Unlikely
Neophema chrysogaster	Orange-bellied Parrot	CE	CE	The Orange-bellied Parrot breeds in the south-west of Tasmania and migrates in autumn to spend the winter on the mainland coast of south-eastern South Australia and southern Victoria. There are occasional reports from NSW with the most recent records from Shellharbour and Maroubra in May 2003.	None onsite. Potential habitat in vicinity of the Site.	Unlikely. Potential indirect impacts to a small area of habitat only.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of Occurrence	Potential Impact
				Typical winter habitat is saltmarsh and strandline-foredune vegetation communities either on coastlines or coastal lagoons. Spits and islands are favoured but they will turn up anywhere within these coastal regions. The species can be found foraging in weedy areas associated with these coastal habitats or even in totally modified landscapes such as pastures seed crops and golf course.		
Ninox connivens	Barking Owl	V	-	Generally found in open forests, woodlands, swamp woodlands and dense scrub. Can also be found in the foothills and timber along watercourses in otherwise open country.	Low. Suitable habitat does not occur	Unlikely
Ninox strenua	Powerful Owl	V	-	Occupies wet and dry eucalypt forests and rainforests. Can occupy both un-logged and lightly logged forests as well as undisturbed forests where it usually roosts on the limbs of dense trees in gully areas. It is most commonly recorded within turpentine tall open forests and black she-oak within open forests. Large mature trees with hollows at least 0.5 m deep are required for nesting. Tree hollows are particularly important for the Powerful Owl because a large proportion of the diet is made up of hollow-dependent arboreal marsupials. Nest trees for this species are usually emergent with a diameter at breast height of at least 100 cm.	Low. Suitable habitat does not occur	Unlikely
Numenius madagascariensis	Eastern Curlew	-	CE, MA, M	A primarily coastal distribution. Found in all states, particularly the north, east, and south-east regions including Tasmania. Rarely recorded inland. Mainly forages on soft sheltered intertidal sand flats or mudflats, open and without vegetation or cover. Breeds in the northern hemisphere.	None onsite. Potential habitat in vicinity of the Site.	Unlikely. Potential indirect impacts to a small area of habitat only.
Pandion cristatus, Pandion haliaetus	Eastern Osprey	V	M, MA	Ospreys are found right around the Australian coast line, except for Victoria and Tasmania. They are common around the northern coast, especially on rocky shorelines, islands and reefs. The species is uncommon to rare or absent from closely settled parts of south-eastern Australia. Favour coastal areas, especially the mouths of large rivers, lagoons and lakes. Feed on fish over clear, open water.	None	None

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of Occurrence	Potential Impact
Petroica boodang	Scarlet Robin	V	-	The Scarlet Robin is found from SE Queensland to SE South Australia and also in Tasmania and SW Western Australia. In NSW it occurs from the coast to the inland slopes. The Scarlet Robin lives in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs.	Low. Suitable habitat does not occur	Unlikely
Petroica phoenicea	Flame Robin	V	-	Flame Robins are found in a broad coastal band from southern Queensland to just west of the South Australian border. The species is also found in Tasmania. The preferred habitat in summer includes eucalypt forest and woodland whilst in winter prefers open woodlands and farmlands. It is considered migratory. The Flame Robin breeds from about August to January.	Low. Suitable habitat does not occur	Unlikely
Ptilinopus superbus	Superb Fruit-dove	V	-	The Superb Fruit-dove occurs principally from north-eastern in Queensland to north-eastern NSW. It is much less common further south where it is largely confined to pockets of suitable habitat as far south as Moruya. There are records of vagrants as far south as eastern Victoria and Tasmania. Inhabits rainforest and similar closed forests where it forages high in the canopy eating the fruits of many tree species such as figs and palms. It may also forage in eucalypt or acacia woodland where there are fruit-bearing trees.	None	None
Rostratula australis	Australian Painted Snipe	E	E, MA	In NSW, this species has been recorded at the Paroo wetlands, Lake Cowell, Macquarie Marshes and Hexham Swamp. Most common in the Murray-Darling Basin. Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. Nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds.	None onsite. Potential habitat in vicinity of the Site.	Unlikely. Potential indirect impacts to a small area of habitat only.
Stictonetta naevosa	Freckled Duck	V	-	Breeds in permanent fresh swamps that are heavily vegetated. Found in fresh or salty permanent open lakes especially during drought. Often seen in groups on fallen trees and sand spits.	None	None

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of Occurrence	Potential Impact
Tyto longimembris	Eastern Grass Owl	V	-	Ground-dwelling bird found in areas of tall grass including grass tussocks in swampy areas, grassy plains, swampy heath, and in cane grass or sedges on flood plains.	None	None
Tyto novaehollandiae	Masked Owl	V	-	Inhabits a diverse range of wooded habitat that provide tall or dense mature trees with hollows suitable for nesting and roosting. Mostly recorded in open forest and woodlands adjacent to cleared lands. Nest in hollows, in trunks and in near vertical spouts or large trees, usually living but sometimes dead. Nest hollows are usually located within dense forests or woodlands. Masked Owls prey upon hollow-dependent arboreal marsupials, but terrestrial mammals make up the largest proportion of the diet.	Low. Suitable habitat does not occur	Unlikely
Xenus cinereus	Terek Sandpiper	V	M	The Terek Sandpiper mostly forages in the open on soft wet intertidal mudflats or in sheltered estuaries, embayments, harbours or lagoons. Northern hemisphere breeding.	None onsite. Potential habitat in vicinity of the Site.	Unlikely. Potential indirect impacts to a small area of habitat only.
Invertebrates						
Pommerhelix duralensis	Dural Woodland Snail	E	E	The species is a shale-influenced habitat specialist, which occurs in low densities along the northwest fringes of the Cumberland Plain on shale-sandstone transitional landscapes.	None	None
Mammals						
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	Located in a variety of drier habitats, including the dry sclerophyll forests and woodlands to the east and west of the Great Dividing Range. Can also be found on the edges of rainforests and in wet sclerophyll forests. This species roosts in caves and mines in groups of between 3 and 37 individuals.	None	None
Cercartetus nanus	Eastern Pygmy-possum	V	V	Inhabits rainforest through to sclerophyll forest and tree heath. Banksias and myrtaceous shrubs and trees are a favoured food source. Will often nest in tree hollows but can also construct its own nest. Because of its small size it is able to utilise a range of hollow sizes including very small hollows. Individuals will use a number of different hollows and an individual has been recorded using up to 9 nest sites within a 0.5 ha area over a 5 month period.	None	None

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of Occurrence	Potential Impact
Dasyurus maculatus maculatus	Spotted-tailed Quoll	V	E	Spotted-tailed Quoll are found on the east coast of NSW, Tasmania, eastern Victoria and north-eastern Queensland. Only in Tasmania is it still considered common. Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline.	None	None
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	-	Inhabit sclerophyll forests, preferring wet habitats where trees are more than 20 m high. Two observations have been made of roosts in stem holes of living eucalypts. There is debate about whether or not this species moves to lower altitudes during winter, or whether they remain sedentary but enter torpor. This species also appears to be highly mobile and records showing movements of up to 12 km between roosting and foraging sites.	Low. Suitable habitat does not occur	Unlikely
Isoodon obesulus obesulus	Southern Brown Bandicoot (eastern)	E	E	Prefers sandy soils with scrubby vegetation and-or areas with low ground cover that are burn from time to time. A mosaic of post fire vegetation is important for this species.	None	None
Miniopterus australis	Little Bentwing-bat	V	-	Coastal north-eastern NSW and eastern Queensland. The Little Bentwing-bat is an insectivorous bat that roost in caves, in old mines, in tunnels, under bridges, or in similar structures. They breed in large aggregations in a small number of known caves and may travel hundreds of kilometres from feeding home ranges to breeding sites. They have a preference for moist eucalypt forest, rainforest or dense coastal banksia scrub where it forages below the canopy for insects.	Low. Suitable habitat does not occur	Unlikely
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V	-	Eastern Bentwing-bats occur along the east and north-west coasts of Australia. Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. Form discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young.	Low. Suitable habitat does not occur	Unlikely
Mormopterus norfolkensis	Eastern Freetail-bat	V	-	Most records are from dry eucalypt forests and woodlands to the east of the Great Dividing Range. Appears to roost in trees, but little is known of this species' habits.	Low. Suitable habitat does not occur	Unlikely

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of Occurrence	Potential Impact
Myotis macropus	Southern Myotis	V	-	The Southern Myotis is found in the coastal band from the north-west of Australia, across the top-end and south to western Victoria. Generally roost in groups of 10 – 15 close to water in caves, mine shafts, hollow-bearing trees, stormwater channels, buildings, under bridges and in dense foliage.	Low. Suitable habitat does not occur	Unlikely
Petauroides volans	Greater Glider	-	V	The Greater Glider is restricted to eastern Australia, occurring from the Windsor Tableland in north Queensland through to central Victoria. It is typically found in highest abundance in taller, montane, moist eucalypt forests with relatively old trees and abundant hollows.	None	None
Petaurus norfolcensis	Squirrel Glider	V	-	Generally occurs in dry sclerophyll forests and woodlands but is absent from dense coastal ranges in the southern part of its range. Requires abundant hollow bearing trees and a mix of eucalypts, banksias and acacias. There is only limited information available on den tree use by Squirrel gliders, but it has been observed using both living and dead trees as well as hollow stumps. Within a suitable vegetation community at least one species should flower heavily in winter and one species of eucalypt should be smooth barked. Endangered population in the Wagga Wagga LGA.	None	None
Petrogale penicillata	Brush-tailed Rock-wallaby	E	V	Found in rocky areas in a wide variety of habitats including rainforest gullies, wet and dry sclerophyll forest, open woodland and rocky outcrops in semi-arid country. Commonly sites have a northerly aspect with numerous ledges, caves and crevices.	None	None
Phascolarctos cinereus	Koala	V	V	Inhabits eucalypt forests and woodlands. The suitability of these forests for habitation depends on the size and species of trees present, soil nutrients, climate and rainfall.	None	None
Pseudomys novaehollandiae	New Holland Mouse	-	V	The New Holland Mouse currently has a disjunct, fragmented distribution across Tasmania, Victoria, New South Wales and Queensland. Across the species' range the New Holland Mouse is known to inhabit open heathlands, open woodlands with a heathland understorey, and vegetated sand dunes.	None	None

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of Occurrence	Potential Impact
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	This species is a canopy-feeding frugivore and nectarivore of rainforests, open forests, woodlands, melaleuca swamps and banksia woodlands. Bats commute daily to foraging areas, usually within 15 km of the day roost although some individuals may travel up to 70 km.	Low. Suitable habitat does not occur	Unlikely
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V	-	Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows. When foraging for insects, flies high and fast over the forest canopy, but lower in more open country. Forages in most habitats across its very wide range, with and without trees; appears to defend an aerial territory.	Low. Suitable habitat does not occur	Unlikely
Scoteanax rueppellii	Greater Broad-nosed Bat	V	-	Prefer moist gullies in mature coastal forests and rainforests, between the Great Dividing Range and the coast. They are only found at low altitudes below 500 m. In dense environments they utilise natural and human-made opening in the forest for flight paths. Creeks and small rivers are favoured foraging habitat. This species roosts in hollow tree trunks and branches.	Low. Suitable habitat does not occur	Unlikely
Reptiles						
Hoplocephalus bungaroides	Broad-headed Snake	E	V	Occurs almost exclusively in association with communities occurring on Triassic sandstone within the Sydney Basin. Typically found among exposed sandstone outcrops with vegetation types ranging from woodland to heath. Within these habitats they spend most of the year sheltering in and under rock crevices and exfoliating rock. However, some individuals will migrate to tree hollows to find shelter during hotter parts of summer.	None	None
Varanus rosenbergi	Rosenberg's Goanna	V	-	Rosenberg's Goanna occurs on the Sydney Sandstone in Wollemi National Park to the north-west of Sydney in the Goulburn and ACT regions and near Cooma in the south. Found in heath open forest and woodland associated with termites the mounds of which this species nests in; termite mounds are a critical habitat component. Individuals require large areas of habitat and feeds on carrion, birds, eggs, reptiles and small mammals. They shelter in hollow logs rock crevices and in	None	None

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of Occurrence	Potential Impact
				burrows which they may dig for themselves or they may use other species' burrows such as rabbit warrens.		
Flora						
Acacia bynoeana	Bynoe's Wattle	E	V	Grows mainly in heath and dry sclerophyll forest in sandy soils. Mainly south of Dora Creek-Morisset area to Berrima and the Illawarra region, west to the Blue Mountains, also recorded from near Kurri Kurri in the Hunter Valley and from Morton National Park.	Low. Not recorded and suitable habitat does not occur at the Site	None
Acacia pubescens	Downy Wattle	V	V	Concentrated around the Bankstown-Fairfield-Rookwood area and the Pitt Town area, with outliers occurring at Barden Ridge, Oakdale and Mountain Lagoon. Occurs on alluviums, shales and at the intergrade between shales and sandstones. The soils are characteristically gravely soils, often with ironstone. Grows in open woodland and forest, in a variety of plant communities, including Cooks River-Castlereagh Ironbark forest, Shale-Gravel Transition forest and Cumberland Plain woodland.	Low. Not recorded and suitable habitat does not occur at the Site	None
Acacia terminalis subsp. *Terminalis*	Sunshine Wattle	E	E	Very limited distribution mainly in near-coastal areas from the northern shores of Sydney Harbour south to Botany Bay with most records from the Port Jackson area and the eastern suburbs of Sydney. Coastal scrub and dry sclerophyll woodland on sandy soils. Habitat is generally sparse and scattered.	Low. Not recorded and suitable habitat does not occur at the Site	None
Allocasuarina glareicola		E	E	Primarily restricted to the Richmond (NW Cumberland Plain) district, but with an outlier population found at Voyager Point, Liverpool. Grows in Castlereagh woodland on lateritic soil. Found in open woodland with Parramatta Red Gum, Broad-leaved Ironbark, Narrow-leaved Apple, Scribbly Gum and Paperbarks.	Low. Not recorded and suitable habitat does not occur at the Site	None
Asterolasia elegans		E	E	Occurs north of Sydney, in the Baulkham Hills, Hawkesbury and Hornsby local government areas. Also likely to occur in the western part of Gosford local government area. Known from only seven populations, only one of which is wholly within a conservation reserve. Occurs on Hawkesbury sandstone in	Low. Not recorded and suitable habitat does not occur at the Site	None

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of Occurrence	Potential Impact
				sheltered forests on mid- to lower slopes and valleys, e.g. in or adjacent to gullies which support sheltered forest.		
Caladenia tessellata	Thick-lip Spider Orchid	E	V	The Tessellated Spider Orchid is found in grassy sclerophyll woodland on clay loam or sandy soils, though the population near Braidwood is in low woodland with stony soil. Known from the Sydney area (old records), Wyong, Ulladulla and Braidwood in NSW. Populations in Kiama and Queanbeyan are presumed extinct.	Low. Not recorded and suitable habitat does not occur at the Site	None
Callistemon linearifolius	Netted Bottle Brush	V	-	Recorded from the Georges River to Hawkesbury River in the Sydney area, and north to the Nelson Bay area of NSW. Recorded in 2000 at Coalcliff in the northern Illawarra. For the Sydney area, recent records are limited to the Hornsby Plateau area near the Hawkesbury River. Grows in dry sclerophyll forest on the coast and adjacent ranges.	Low. Not recorded and suitable habitat does not occur at the Site	None
Cryptostylis hunteriana	Leafless Tongue-orchid	V	V	Does not appear to have well defined habitat preferences and is known from a range of communities, including swamp-heath and woodland. The larger populations typically occur in woodland dominated by Scribbly Gum, Silvertop Ash, Red Bloodwood and Black She-oak and appears to prefer open areas in the understorey of this community.	Low. Not recorded and suitable habitat does not occur at the Site	None
Darwinia biflora		V	V	Recorded in Ku-ring-gai, Hornsby, Baulkham Hills and Ryde local government areas. The northern, southern, eastern and western limits of the range are at Maroota, North Ryde, Cowan and Kellyville, respectively. Occurs on the edges of weathered shale-capped ridges, where these intergrade with Hawkesbury Sandstone. The vegetation structure is usually woodland, open forest or scrub-heath.	Low. Not recorded and suitable habitat does not occur at the Site	None
Deyeuxia appressa		E	E	A highly restricted NSW endemic known only from two pre-1942 records in the Sydney area (Herne Bay Saltpan Creek off the Georges River south of Bankstown and Killara near Hornsby). Almost nothing is known about the species' habitat and ecology. Flowers spring to summer and is mesophilic (grows in moist conditions).	Low. Not recorded and suitable habitat does not occur at the Site	None

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of Occurrence	Potential Impact
Dillwynia tenuifolia		V	-	The core distribution is the Cumberland Plain from Windsor to Penrith east to Deans Park. In western Sydney may be locally abundant particularly within scrubby-dry heath areas within Castlereagh Ironbark forest and Shale Gravel Transition forest on tertiary alluvium or laterised clays. May also be common in transitional areas where these communities adjoin Castlereagh Scribbly Gum woodland. At Yengo is reported to occur in disturbed escarpment woodland on Narrabeen sandstone.	Low. Not recorded and suitable habitat does not occur at the Site	None
Epacris purpurascens var. purpurascens		V	-	Recorded from Gosford in the north, to Narrabeen in the east, Silverdale in the west and Avon Dam vicinity in the South. Found in a range of habitat types, most of which have a strong shale soil influence.	Low. Not recorded and suitable habitat does not occur at the Site	None
Eucalyptus nicholii	Narrow-leaved Black Peppermint	V	V	Typically grows in dry grassy woodland, on shallow soils of slopes and ridges. Found primarily on infertile soils derived from granite or metasedimentary rock. Seedling recruitment is common, even in disturbed soils, if protected from grazing and fire.	Low. Not recorded and suitable habitat does not occur at the Site	None
Eucalyptus scoparia	Wallangarra White Gum	E	V	In NSW it is known from only three locations near Tenterfield. Found in open eucalypt forest and woodland on well-drained granite hilltops, slopes and rocky outcrops, typically at high altitudes. At lower elevations can occur in less rocky soils in damp situations.	Low. Not recorded and suitable habitat does not occur at the Site	None
Genoplesium baueri	Bauer's Midge Orchid	E	E	Grows in dry sclerophyll forest and moss gardens over sandstone. Flowers February to March. Has been recorded between Ulladulla and Port Stephens. Currently the species is known from just over 200 plants across 13 sites. The species has been recorded in Berowra Valley Regional Park, Royal National Park and Lane Cove National Park and may also occur in the Woronora, O'Hares, Metropolitan and Warragamba Catchments.	Low. Not recorded and suitable habitat does not occur at the Site	None
Grevillea beadleana	Beadle's Gevillea	E	E	Open eucalypt forest with a shrubby understorey. It is usually found on steep granite slopes at high altitudes although the population at Shannon Creek is at a lower elevation on sandstone.	Low. Not recorded and suitable habitat does not occur at the Site	None

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of Occurrence	Potential Impact
Isotoma fluviatilis subsp. Fluviatilis		-	Extinct	Currently known from only two adjacent sites on a single private property at Erskine Park in the Penrith LGA. Previous sightings are all from western Sydney, at Homebush and at Agnes Banks. Known to grow in damp places, on the Cumberland Plain, including freshwater wetland, grassland/alluvial woodland and an alluvial woodland/shale plains woodland (Cumberland Plain Woodland) ecotone.	Low. Not recorded and suitable habitat does not occur at the Site	None
Leptospermum deanei	Deane's Tea-tree	V	V	Woodland on lower hill slopes or near creeks. Sandy alluvial soil or sand over sandstone. Occurs in riparian scrub, woodland and open forest.	Low. Not recorded and suitable habitat does not occur at the Site	None
Melaleuca biconvexa	Biconvex Paperbark	V	V	Grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects. Scattered and dispersed populations found in the Jervis Bay area in the south and the Gosford-Wyong area in the north.	Low. Not recorded and suitable habitat does not occur at the Site	None
Melaleuca deanei	Deane's Melaleuca	V	V	Grows in wet heath on sandstone in coastal districts from Berowra to Nowra.	Low. Not recorded and suitable habitat does not occur at the Site	None
Pelargonium sp. Striatellum	Omeo's Stork's-bill	E	E	Flowering occurs from October to March. Occurs in habitat usually located just above the high water level of irregularly inundated or ephemeral lakes. During dry periods, the species is known to colonise exposed lake beds. The species is known to form clonal colonies by rhizomatous propagation.	Low. Not recorded and suitable habitat does not occur at the Site	None
Persoonia hirsuta	Hairy Geebung	E	E	Distributed from Singleton in the north, along the east coast to Bargo in the south and the Blue Mountains to the west. A large area of occurrence, but occurs in small populations, increasing the species' fragmentation in the landscape. Found in sandy soils in dry sclerophyll open forest, woodland and heath on sandstone. Usually present as isolated individuals or very small populations. Probably killed by fire (as other Persoonia spp. Are) but will regenerate from seed.	Low. Not recorded and suitable habitat does not occur at the Site	None
Persoonia nutans	Nodding Geebung	E	E	Confined to aeolian and alluvial sediments and occurs in a range of sclerophyll forest and woodland vegetation	Low. Not recorded and suitable habitat	None

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of Occurrence	Potential Impact
				communities with the majority of individuals occurring within Agnes Banks woodland or Castlereagh Scribbly Gum woodland. Restricted to the Cumberland Plain in western Sydney between Richmond in the north and Macquarie Fields in the south.	does not occur at the Site	
Pimelea curviflora var. curviflora		V	V	Confined to the coastal area of Sydney between northern Sydney in the south and Maroota in the north-west. Former range extended south to the Parramatta River and Port Jackson region including Five Dock, Bellevue Hill and Manly. Occurs on shale-lateritic soils over sandstone and shale-sandstone transition soils on ridgetops and upper slopes amongst woodlands.	Low. Not recorded and suitable habitat does not occur at the Site	None
Pimelea spicata	Spiked Rice-flower	E	E	Low. Not recorded and suitable habitat does not occur at the Site	Low. Not recorded and suitable habitat does not occur at the Site	None
Pomaderris prunifolia	P. prunifolia in the Parramatta, Auburn, Strathfield and Bankstown Local Government Areas	EP	-	Known from only three sites within the listed local government areas at Rydalmere, within Rookwood Cemetery and at The Crest of Bankstown. At Rydalmere it occurs along a road reserve near a creek among grass species on sandstone. At Rookwood Cemetery it occurs in a small gully of degraded Cooks River - Castlereagh Ironbark forest on shale soils.	Low. Not recorded and suitable habitat does not occur at the Site	None
Prostanthera marifolia	Seaforth Mintbush	CE	CE	Occurs in localised patches in or in close proximity to the endangered Duffys forest ecological community. Located on deeply weathered clay-loam soils associated with ironstone and scattered shale lenses a soil type which only occurs on ridge tops and has been extensively urbanised.	Low. Not recorded and suitable habitat does not occur at the Site	None
Pterostylis saxicola	Sydney Plains Greenhood	E	E	Restricted to western Sydney between Freemans Reach in the north and Picton in the south. Most commonly found growing in small pockets of shallow soil in depressions on sandstone rock shelves above cliff lines. The vegetation communities above the shelves where Sydney Plains Greenhood occurs are sclerophyll forest or woodland on shale-sandstone transition soils or shale soils.	Low. Not recorded and suitable habitat does not occur at the Site	None

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of Occurrence	Potential Impact
Syzygium paniculatum	Magenta Lilly Pilly	E	V	Found only in NSW, in a narrow, linear coastal strip from Bulahdelah to Conjola State forest. On the south coast the species occurs on grey soils over sandstone, restricted mainly to remnant stands of littoral rainforest. On the central coast it occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities.	Low. Not recorded and suitable habitat does not occur at the Site	None
Tetratheca juncea	Black-eyed Susan	V	V	Confined to the northern portion of the Sydney Basin bioregion and the southern portion of the North Coast bioregion in the local government areas of Wyong, Lake Macquarie, Newcastle, Port Stephens, Great Lakes and Cessnock. It is usually found in low open forest-woodland with a mixed shrub understorey and grassy groundcover. The majority of populations occur on low nutrient soils associated with the Awaba Soil Landscape. Cryptic species that requires survey in September-October.	Low. Not recorded and suitable habitat does not occur at the Site	None
Thesium australe	Austral Toadflax	V	V	Grows in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. It is also found in Tasmania and Queensland and in eastern Asia. Occurs in grassland or grassy woodland. Grows on Kangaroo Grass tussocks but has also been recorded within the exotic Coolatai Grass.	Low. Not recorded and suitable habitat does not occur at the Site	None
Wahlenbergia multicaulis	Tadgell's Bluebell in the local government areas of Auburn, Bankstown, Baulkham Hills, Canterbury, Hornsby, Parramatta and Strathfield	EP	-	Found in disturbed sites and grows in a variety of habitats including forest, woodland, scrub, grassland and the edges of watercourses and wetlands. Typically occurs in damp, disturbed sites (with natural or human disturbance of various forms) typically amongst other herbs rather than in the open.	Low. Not recorded and suitable habitat does not occur at the Site	None
Wilsonia backhousei	Narrow-leafed Wilsonia	V	-	In NSW Narrow-leaf Wilsonia is found on the coast between Mimosa Rocks National Park and Wamberal north of Sydney. This is a species of the margins of salt marshes and lakes.	Low. Not recorded and suitable habitat does not occur at the Site	None
Zannichellia palustris		E	-	Grows in fresh or slightly saline stationary or slowly flowing water. NSW populations behave as annuals dying back	None onsite. Occurs in the wetland	Unlikely. No direct impacts and only a small proportion of offsite habitat will be

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of Occurrence	Potential Impact
				completely every summer. Distribution in NSW is within the lower Hunter and in wetlands at Bicentennial Park Homebush.	habitat to east of the Site.	subject to overshadowing and light spill.

Niche Environment and Heritage

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