181 JAMES RUSE DRIVE

Flora and Fauna Assessment

For:

Statewide Planning Pty Ltd

September 2014

Final

PO Box 2474
Carlingford Court 2118

Report No. 14047RP4

The preparation of this report has been in accordance with the brief provided by the Client and has relied upon the data and results collected at or under the times and conditions specified in the report. All findings, conclusions or recommendations contained within the report are based only on the aforementioned circumstances. The report has been prepared for use by the Client and no responsibility for its use by other parties is accepted by Cumberland Ecology.

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Table of Contents

EXECUTIVE SUMMARY

1 INTRODUCTION

1.1 Purpose of the Report 1.1

1.2 Project Description 1.2

1.3 Development Proposal 1.4

1.4 Relevant Legislation 1.4

2 METHODOLOGY

2.1 Literature Review and Database Analysis 2.1

2.2 Field Surveys 2.1

2.2.1 Flora Survey 2.1

2.2.2 Fauna Habitat Assessment 2.2

2.3 Limitations 2.2

3 RESULTS

3.1 Vegetation in the Study Area 3.1

3.2 Threatened Vegetation Communities 3.3

3.3 Flora 3.3

3.4 Fauna 3.4

4 IMPACT ASSESSMENT AND MITIGATION

4.1 Impacts on Vegetation Communities 4.1

4.2 Impacts on threatened flora 4.1

4.3 Impacts on Threatened Fauna 4.1

4.4 Impacts to Parramatta River 4.1

4.5 Recommended Mitigation Measures 4.2

5 CONCLUSION

REFERENCES

Table of Appendices

A. **LIKELIHOOD OF OCCURRENCE OF THREATENED AND MIGRATORY SPECIES**

B. **RECORDED FLORA SPECIES**

List of Tables

1.1	Relevant Legislation	1.4
3.1	List of fauna species recorded on subject site during surveys	3.4
A.1	Likelihood of Occurrence of Threatened Flora	A.1
A.2	Likelihood of Occurrence of Threatened and Migratory Fauna	A.5
B.1	Flora Species recorded within the Study Area	B.1

List of Figures

1.1	Location of Subject Site	1.3

List of Photographs

3.1	Strip of planted *Lophostemon confertus* along the western boundary of the site	3.1
3.2	Planted Eucalypts in the central area of the site. Species include *Corymbia maculata, Eucalyptus tereticornis*, and *Eucalyptus cladocalyx*	3.2

List of Photographs

3.3	*Cinnamomum camphora* individuals near the eastern boundary of the site	3.2
3.4	*Corymbia eximia* and *Eucalyptus tereticornis* individuals in the central eastern area of the site	3.3

Glossary of Terms

EEC	Endangered Ecological Community
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
EP&A Act	Environmental Planning and Assessment Act 1979
LEP	Local Environment Plan
LGA	Local Government Area
Locality	Area within the 100km2 area/10 km radius of the subject site utilised for threatened species database searches.
OEH	NSW Office of Environment and Heritage
DoE	Commonwealth Department of the Environment
Subject Site	The area for the proposed development being the property at 181 James Ruse Drive, Camellia.
Threatened species	Includes those species that are listed under the EPBC Act or the TSC Act
TSC Act	Threatened Species Conservation Act 1995

Executive Summary

S1 Introduction

Cumberland Ecology has been commissioned by Moran Corporation Pty Ltd on behalf of Statewide Planning Pty Ltd to conduct an ecological assessment to support a Development Application (DA) for the site located at 181 James Ruse Drive, Parramatta NSW (hereafter referred to as "the subject site"). This report assesses the potential impacts of the proposed development on ecological values of the area, specifically on threatened flora, fauna or endangered ecological communities known to occur within the locality.

The scope of this report includes a summary of the results of site survey, description of vegetation, description of fauna habitats, assessment of the likelihood of threatened flora and fauna species occurring on the subject site, consideration of the potential impacts of the proposed development and recommendations regarding mitigation and compensatory measures to reduce the impacts of the development.

S2 The Proposed Development

The proposed development involves redeveloping the subject site into a commercial area. The proposed development entails the development of retail and commercial buildings across the majority of the site with recreational areas including a food court, cafes, and a bistro, along the foreshore.

S3 Survey Methods

Database analysis, vegetation/flora surveys and fauna habitat surveys were undertaken in May and August 2014. All vascular plants were recorded or collected and were identified to species level where possible. The fauna habitat search included the inspection of tree hollows and bush rock, as well as a search for nests, pellets, scats, tracks and scratch marks.

S4 Results

The subject site has previously been developed and exists in a highly modified condition, typified by large concrete slabs and disused roads. Existing vegetation on the subject site mainly occurs in areas between concrete slabs and asphalt. The vegetation within the subject site is dominated by exotic species and does not conform to any description of a native vegetation unit. The majority of the remnant trees appear to be planted and are composed of a mixture of planted native and exotic species.

A total of 134 plant species were recorded during surveys. The subject site is dominated by exotic plant species, including noxious and significant environmental weeds such as *Lantana camara* (Lantana) and *Ligustrum lucidum* (Broad-Leaved Privet). No threatened flora species

or threatened ecological communities listed were recorded within the subject site and none are considered likely to occur.

Although some marginal habitat is available for many fauna species within the study area, it is too disturbed and fragmented for the majority of fauna species to use it other than for occasional foraging purposes. There are a few scattered log piles within the study area which could provide potential habitat for small, common urban reptiles.

No threatened fauna species were detected within the study site. There is potential for threatened and migratory species, particularly wetland birds, to pass through the subject site. However there are no tree hollows or nests, suggesting that these fauna species would only use the site as part of a much larger foraging range.

S5 Impact Assessment

The proposed development will involve clearing areas of predominantly exotic vegetation.

As no threatened flora species or ecological communities were detected on the subject site or considered likely to occur, the proposed development is not considered likely to have a significant impact on any threatened flora species or ecological communities.

Some marginal foraging habitat for threatened fauna species and migratory species will be removed for the proposed development. However none of these are likely to be dependent on habitat within the site for their survival. The birds in particular are highly mobile species that access resources from a wide area. The proposed development is, therefore, not considered likely to have a significant impact on any threatened or migratory fauna species.

S6 Mitigation Measures

A number of mitigation measures are recommended for the proposed project. These mitigation measures include sediment/erosion control measures and weed management, particularly to prevent degradation of the vegetation at the northern end of the study area along the Parramatta River. Furthermore, the foreshore area will be remediated under a Voluntary Planning Agreement. Remediation measures include removal of asbestos materials and revegatation of mangroves along the foreshore area.

S7 Conclusion

The subject site is dominated by exotic plant species, including noxious and significant environmental weeds, and has minimal habitat potential for threatened species. No significant impact is predicted to occur to threatened species or endangered ecological communities as a result of the development. Therefore, the preparation of a Species Impact Statement (SIS) or Referral to the Commonwealth Department of the Environment is not warranted.

Chapter 1

Introduction

1.1 Purpose of the Report

Cumberland Ecology Pty. Ltd. (Cumberland Ecology) has been commissioned by Moran Corporation Pty Ltd on behalf of Statewide Planning to conduct an ecological assessment to support a proposed Development Application (DA) for 181, James Ruse Drive, Camellia (the subject site)

The purpose of this report is to describe the current biodiversity values of the subject site and to assess the potential impacts of the proposed development on flora and fauna, particularly threatened species, populations and communities that are listed under the schedules of the NSW Threatened Species Conservation Act 1995 (TSC Act) and the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).

The specific aims of this report are to:

- Describe the vegetation communities present, identifying significant flora, including threatened communities listed under the TSC Act and the EPBC Act and any other communities of high conservation value;
- Assess the likelihood that threatened or regionally significant flora and fauna could occur on the subject site;
- Identify key areas of habitat for fauna and faunal movement corridors;
- Describe the types and extent of potential impacts arising from development of the subject site and assess the significance of impacts as they relate to threatened communities and species; and
- Where relevant, recommend measures for mitigation in order to manage impacts on flora and fauna or habitats of conservation value.

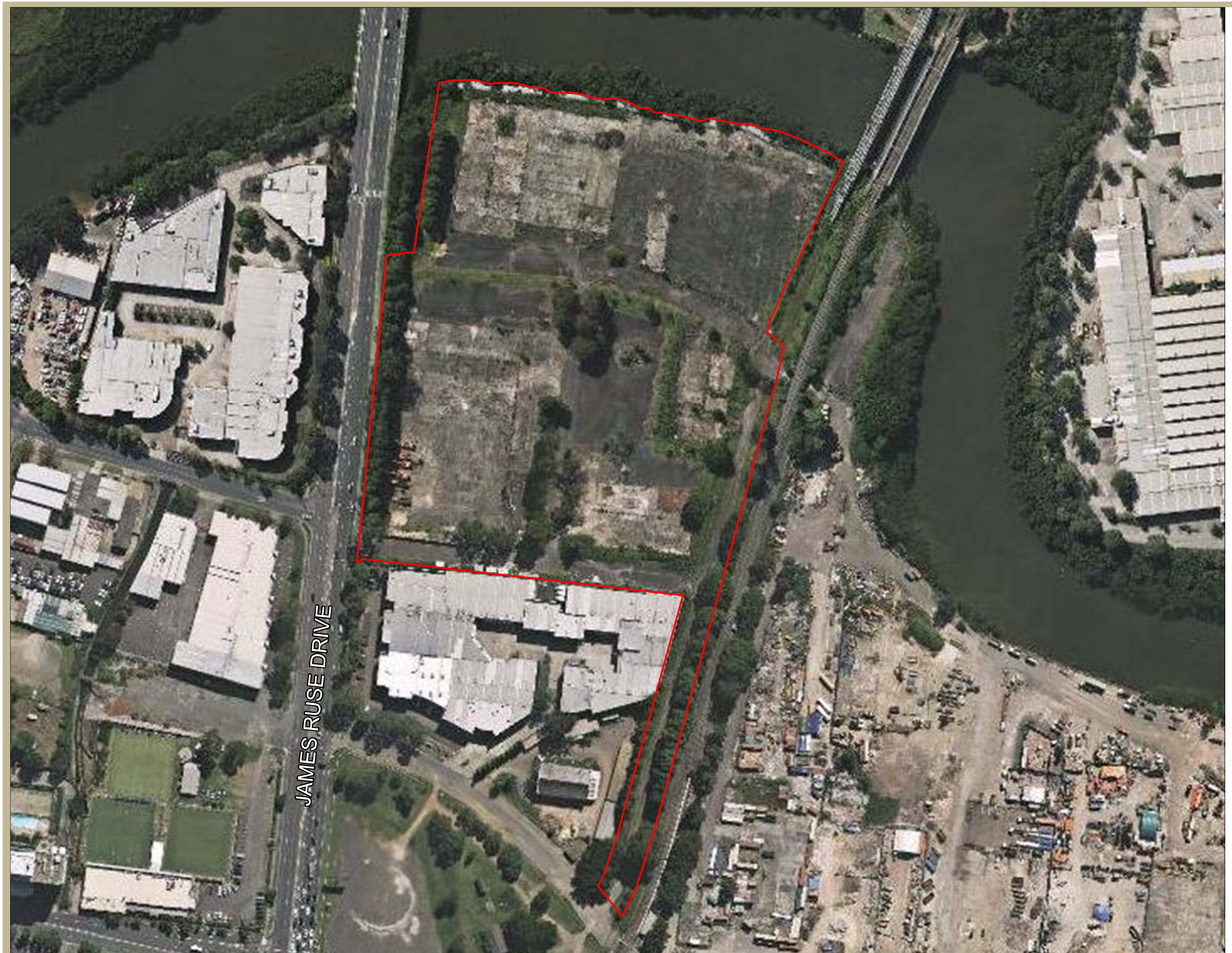
1.2 Project Description

The subject site is located along James Ruse Drive in Camellia, NSW and is zoned B5: Business Development under the Parramatta Local Environment Plan 2011.

The subject site is surrounded by developments and infrastructure along the western, southern and eastern boundaries and by the Parramatta River along the northern boundary. The northern border of the site for the proposed development is contiguous with a linear patch of mangroves growing alongside Parramatta River. The location of the subject site is shown in **Figure 1.1**.

The subject site has been previously developed and exists in a highly modified condition. While the subject site currently does not contain buildings, it is typified by large concrete slabs and disused roads. Prior studies have also determined the presence of Asbestos Containing Materials (ACMs) within the subject site (Benbow Environmental 2013).

Coordinate System: MGA Zone 56 (GDA 94)



Legend

Subject Site

Grid North

Image Source:
Image © SIX Maps (1-4-2012)

CUMBERLAND ECOLOGY

I:\...\14047\Figures\RP3\20140901\Figure 1.1

Figure 1.1. Location of Subject Site

50 0 50 100 150 200 m

1.3 Development Proposal

Statewide Planning has received gateway approval from the Minister for Planning relating to the future urban development of the subject site. The proposed development involves redeveloping the site into a mixed use development and includes ground floor retail and residential tower buildings in a master planned urban estate. The future development of the site incorporates recreational areas including food retail, cafes, and a bistro, along the foreshore.

Previous site uses have resulted in the subject site containing a large amount of buried asbestos and other contaminates on the site. As a part of the proposed remediation of the land, the entire subject site is to be excavated with various waste material contained in on site containment cells.

1.4 Relevant Legislation

A number of State and Commonwealth Acts and Policies are relevant to the proposed development. These are listed in Table 1.1.

Table 1.1 Relevant Legislation

Legislation	Relevant Objectives	How it applies to this Project
State		
Environmental Planning and Assessment Act 1979	To encourage the proper management, development and conservation of natural and artificial resources for the purpose of promoting the social and economic welfare of the community and a better environment.	This Act is the principal planning instrument in NSW and as such dictates the assessment approach for the Proposal, including flora and fauna impact assessment and consideration of other Acts and planning policies.
Threatened Species Conservation Act 1995	Provides for the conservation of threatened species, populations and ecological communities and sets out a number of specific objectives relating to the conservation of biological diversity and the promotion of ecologically sustainable development.	The TSC Act establishes that a person must not, by an act or an omission, do anything that causes damage to any habitat of a threatened species, an endangered population or an endangered ecological community.
Parramatta Local Environment Plan (LEP) 2011	State Government requires all Councils in NSW to prepare new planning controls based on a standardised approach across the	The land within the subject site is zoned under the LEP as B5: Business Development.

Table 1.1 Relevant Legislation

Legislation	Relevant Objectives	How it applies to this Project
	State. The LEP controls the way in which land can be developed within the Parramatta Local Government Area.	
Noxious Weed Act 1993	A local control authority may require owners or occupiers of land (other than public authorities or other local control authorities) to control noxious weeds.	A number of noxious weeds occur on the site (refer to Section 3.3.2)
Commonwealth		
Environment Protection and Biodiversity Conservation Act 1999	To provide for the protection of the environment, particularly, Matters of National Environmental Significance (MNES) which include nationally listed threatened species and ecological communities, and migratory species.	Impacts to MNES and migratory species listed under the EPBC Act with the potential to occur on the site need to be assessed.

Chapter 2

Methodology

2.1 Literature Review and Database Analysis

Database analysis was conducted for the locality using the Office of Environment and Heritage (OEH) Atlas of NSW Wildlife Database (BioNet), the Department of the Environment, (DoE) EPBC Protected Matters Search Tool (PMST) database and the NSW Primary Industries database for Noxious Weed Declarations.

The BioNet search generated records for threatened species and ecological communities listed under the TSC Act within a 100km^2 area which encompassed the proposed development area while the PMST search generated a list of potentially occurring flora, fauna and ecological communities listed under the EPBC Act within a 10 km radius of the proposed development. The NSW Primary Industries database provided a list of Noxious Weed Declarations for the Parramatta LGA

The flora and fauna lists generated from the BioNet and PMST database searches were used to assist on-ground surveys targeting threatened species known from, or with the potential to occur in the locality.

2.2 Field Surveys

Field surveys were conducted by a botanist on the 19th of May 2014 and two ecologists on the 25th August 2014 to identify key ecological issues or potential threatened species occurrences on site and to conduct flora surveys and fauna habitat assessments.

2.2.1 Flora Survey

General flora surveys involved undertaking detailed meander surveys across the subject site and surrounding vegetation up to a distance of 5m from the proposed development (collectively known as the study area) to ground-truth the occurrence and extent of vegetation. Photographs were taken at several locations to record condition of the vegetation. All plant species encountered were recorded and notes were made regarding whether plants were indigenous, planted or exotic.

All vascular plants recorded were identified using keys and nomenclature provided in Harden (1990-1993) and Brooker et al (2006). Where known, taxonomic and nomenclatural changes

have been incorporated into the results, as derived from *PlantNET* (Botanic Gardens Trust, 2013).

2.2.2 Fauna Habitat Assessment

The fauna habitat assessment within the study area included consideration of important indicators of habitat condition and complexity including the occurrence of microhabitats such as tree hollows, fallen logs, bush rock and wetland areas such as creeks and soaks. Structural features considered included the nature and extent of the understorey and ground stratum and extent of canopy. Tree hollows were used as a general indication of habitat quality for arboreal fauna, hollow dwelling birds and bats. Tree hollows observed during surveys were noted and the general vegetation condition and tree maturity was used to predict whether trees on site were likely to contain hollows. Opportunistic observations of fauna were also noted and recorded.

2.3 Limitations

Conditions within the study area had been suitable to enable identification of most plants to species level to be made at the time of the survey. However some plant species only flower at particular times of the year, and are difficult to notice when they are not flowering. As the flora survey was undertaken during a single month (May), some species may, therefore, be present that were not recorded. Accordingly, an assessment of the likelihood of occurrence of all threatened flora species listed for the locality in the database searches was undertaken to supplement the flora survey (**Appendix A**).

Despite this limitation, it is probable that the vast majority of species have been recorded, and that issues including conservation significance of the flora, condition and viability of bushland and likely impact on native vegetation have been satisfactorily assessed.

Fauna surveys relied on literature review, database analysis, and fauna habitat assessment. In general, opportunistic observations of fauna provide a “snapshot” of some of the fauna present on a site that were active during the time of the surveys and therefore not all fauna utilising the study area are likely to have been recorded during surveys. An assessment of the likelihood of occurrence of threatened and migratory fauna species listed for the locality in the database searches (excluding open water marine species such as sharks, turtles and whales) was undertaken to supplement the fauna habitat assessment (**Appendix A**). The combination of these research techniques is considered appropriate for assessing the habitat values of the site for threatened fauna and migratory avifauna.

Chapter 3

Results

3.1 Vegetation in the Study Area

The subject site has been extensively modified and currently exists in a highly disturbed condition (Photographs 3.1 – 3.4). The vegetation within the subject site consists of a number of planted trees and understorey species in areas between concrete and asphalt, likely remnants of gardens. The vegetation is dominated by exotic weed species and does not conform to any description of a native vegetation unit.

Photograph 3.1 Strip of planted *Lophostemon confertus* along the western boundary of the site

Photograph 3.2 Planted Eucalypts in the central area of the site. Species include *Corymbia maculata*, *Eucalyptus tereticornis*, and *Eucalyptus cladocalyx*

Photograph 3.3 *Cinnamomum camphora* individuals near the eastern boundary of the site

Photograph 3.4 *Corymbia eximia* and *Eucalyptus tereticornis* individuals in the central eastern area of the site

Tree species on the site consist of exotic species, such as *Cinnamomum camphora* (Camphor Laurel), and a number of planted, native tree species, some endemic to the Sydney region such as *Eucalyptus parramattensis* (Parramatta Red Gum), and others from other regions of Australia such as *Eucalyptus cladocalyx* (Sugar Gum).

Areas containing soil along the southern boundary currently contain exotic grasses and herbs, and exotic shrub species such as *Lantana camara* (Lantana) and *Ligustrum lucidum* (Broad-leaved Privet).

The northern border of the site for the proposed development is contiguous with a linear patch of mangroves consisting of the species *Avicennia marina* (Grey Mangrove) and *Aegiceras corniculatum* (River Mangrove) growing alongside Parramatta River.

3.2 Threatened Vegetation Communities

The vegetation within the study area is dominated by exotic weeds and does not conform to any published description of a native vegetation community. No threatened ecological communities listed under the TSC Act and/or EPBC Act were recorded within the subject site and none are considered likely to occur.

3.3 Flora

A total of 134 plant species were recorded during surveys. A full list of flora species detected during site surveys is provided in **Appendix B**.

Individuals of *Eucalyptus nicholii* were recorded within the subject site. This species is listed as Vulnerable under the EPBC Act and the TSC Act within its natural range. This species does not naturally occur in Sydney (OEH 2014) and is commonly planted as a street tree in the region. The individuals present onsite are therefore not be considered as threatened as they occur as planted individuals outside of their natural range.

Seven of the exotic plant species recorded in the study area: *Lantana camara* (Lantana), *Rubus fruticosus* (Blackberry), *Ligustrum lucidum* (Broad-leaved Privet), *Olea europaea ssp cuspidata* (African Olive), *Ricinus communis* (Castor Oil Plant), *Senecio madagascarienses* (Fireweed) and *Ipomoea indica* (Morning Glory) are listed as Declared Noxious Weeds under the Noxious Weeds Act 1993 by the Parramatta LGA. Lantana, Blackberry and Fireweed are further classified as Weeds of National Significance (WONS) under the National Weeds Strategy.

No threatened flora species were found during surveys of the site and no species are considered likely to occur there due to lack of suitable habitat. Thirteen threatened flora species listed under the TSC Act and/or the EPBC Act have been recorded for the locality. The likelihood of these species occurring within the study area has been determined in **Appendix A**.

3.4 Fauna

The vegetation within the study area has very limited habitat potential for fauna due to its disturbed condition and lack of microhabitats such as fallen logs and bush rock. There is also very limited habitat potential for tree hollow-dependent fauna as the trees present in the area don't provide any hollows. However, many of the plants, including exotics, can provide potential foraging resources for nectarivorous mammals and birds that may use the subject site from time to time as part of a larger foraging range. The Parramatta River boardering the study area provides small areas of habitat for common frogs and semi-aquatic reptiles which may utilise the study area.

A few fauna species that are common in disturbed environments were recorded during the field survey. **Table 3.1** below lists the fauna species detected on site during surveys.

Table 3.1 List of fauna species recorded on subject site during surveys

Class	Scientific Name	Exotic	Common Name	Recording Method
Aves	*Hirundo neoxena*		Welcome Swallow	Visual Observation
Aves	*Threskiornis molucca*		Australian White Ibis	Visual Observation
Aves	*Neochmia temporalis*		Red-browed Finch	Visual Observation
Reptiles	*Lampropholis guichenoti*		Garden skink	Visual Observation

These species are common in the locality. No threatened fauna species listed under the TSC Act and EPBC Act were recorded from the subject site.

Thirty-eight threatened native fauna species listed under the TSC Act and/or the EPBC Act, including eighteen migratory bird species under the EPBC Act, have been recorded for the locality. The likelihood of these species occurring within the study area has been assessed and the results presented in **Appendix A**.

Although some marginal habitat is available for many species in the wider locality, the study area is too disturbed for most of these species to use it other than for occasional foraging purposes. The lack of large mature trees with hollows on the subject site prohibits hollow-dependent fauna from nesting or roosting there.

The Grey-headed Flying-fox (*Pteropus poliocephalus*) has been recorded along the Parramatta River and may use the study area and adjoining vegetation occasionally as part of a wider foraging area although the extent of foraging resources in the study area is relatively low. No breeding camps are present in the study area.

Chapter 4

Impact Assessment and Mitigation

4.1 Impacts on Vegetation Communities

Past and current use of the study area has entailed clearing and modification of the majority of native vegetation. The vegetation within the study area is dominated by exotic weeds and does not conform to the description of any native vegetation community. No threatened vegetation communities, listed under the TSC Act or the EPBC Act, are present within or near the study area and the proposed development will not significantly impact on any threatened vegetation community.

4.2 Impacts on threatened flora

No threatened flora species, listed under the TSC and/or EPBC Act were recorded or are considered to have potential to occur within the study area. The proposed development, therefore, will have no significant impacts upon threatened flora species.

4.3 Impacts on Threatened Fauna

The study area potentially provides marginal foraging opportunities for some threatened fauna but is unlikely to exclusively support a local population of any threatened fauna species. Likewise, any migratory birds are considered unlikely to utilise the study area and surrounding vegetation for roosting or feeding. Therefore the proposed development is not considered likely to have a significant impact on any threatened or migratory fauna species.

4.4 Impacts to Parramatta River

Clearing and development processes can potentially cause indirect impacts to the creek and local waterways through a number of threatening processes, including, but not limited to:

- Altering the water quality entering the creek and waterways; and
- Increased run-off and sedimentation caused by construction activities.

These can all impact on the natural ecological processes that take place in the river. A number of mitigation measures including management of erosion, run-off and sediment

control will need to be put in place prior to construction to minimise indirect impacts to the creek and surrounding native vegetation communities.

4.5 Recommended Mitigation Measures

The proposed development will not have any significant impacts on TSC or EPBC listed threatened species or communities within the study area. However development procedures can have detrimental effects on native communities within and adjacent to the study area and mitigation measures are recommended to prevent further degradation of existing native remnants.

Recommended mitigation measures include

- Avoidance, where ever possible, of the removal of native trees and shrubs;
- Development of an appropriate Weed Management Plan compliant with Council strategy and the Noxious Weed Act 1993 to prevent further outbreaks and propagation of weed species; and
- Appropriate sediment and erosion control measures to prevent run-off into the Parramatta River and drainage systems.

Chapter 5

Conclusion

Past and current use of the study area and surrounding areas has involved large amounts of clearing and considerable modification of the majority of pre-existing native vegetation. The proposed development will involve a combination of utilising previously cleared and modified areas and the partial removal of some exotic vegetation.

A number of non-endemic native species occur that are commonly planted in gardens and as street trees such as *Corymbia citriodora* (Lemon-scented Gum) *Lophostemon confertus* (Queensland Brush Box), and *Eucalyptus nicholii* (Narrow-leaved Black Peppermint). Although *Eucalyptus nicholii* is a listed threatened species under the TSC Act and the EPBC Act, the removal of the individuals present within the subject site is not considered to constitute a signifcant impact as they occur as artifically planted individual outside of its natural range.

No threatened flora and fauna species or populations (listed under the TSC Act and/or the EPBC Act) were detected in the study area. Some threatened species have been recorded from the wider locality, however potentially suitable habitats for threatened fauna species is highly limited.

Considering that no threatened flora species were recorded on the site, the trees on site are not members of an intact, native vegetation community, and no hollows to provide fauna habitat were observed, the removal of vegetation does not pose an ecological constraint to the development of the site. If additional plantings of local native trees and shrubs are made, and the weed species are removed within the study area, there is potential to improve the habitat available for native flora and fauna species.

No significant impact is predicted to occur to threatened species or endangered ecological communities as a result of the proposed development, and the preparation of a Species Impact Statement (SIS) is not likely to be required. A referral to the Commonwealth Department of the Environment, under the EPBC Act is also not required.

References

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Harden, G. J. 1990-1993. Flora of NSW Volumes 1-4. New South Wales University Press, Kensington

OEH. 2014. Narrow-leaved Black Peppermint - profile. Office of Environment and Heritage, Hurstville

Appendix A

Likelihood of Occurrence of Threatened and Migratory Species

Table A.1 Likelihood of Occurrence of Threatened Flora

Class	Scientific name	Common name	TSC Act	EPBC Act	Habitat Requirements	Likelihood of occurrence (Unlikely, Low, Possible, Confirmed)
Flora	*Acacia pubescens*	Downy Wattle	V, P	V	Occurs on alluviums, shales and at the intergrade between shales and sandstones. The soils are characteristically gravely soils, often with ironstone. Occurs in open woodland and forest, in a variety of plant communities, including Cooks River/Castlereagh Ironbark Forest, Shale/Gravel Transition Forest and Cumberland Plain Woodland.	No suitable habitat available Unlikely to be present within the subject site.
Flora	*Callistemon linearifolius*	Netted Bottle Brush	V,P,3		Found in dry sclerophyll forest on the coast and adjacent ranges	No suitable habitat available Unlikely to be present within the subject site.
Flora	*Epacris purpurascens var. purpurascens*		V, P		Found in various habitat types, mainly containing strong shale influence.	No suitable habitat available Unlikely to be present within the subject site.

Table A.1 Likelihood of Occurrence of Threatened Flora

Class	Scientific name	Common name	TSC Act	EPBC Act	Habitat Requirements	Likelihood of occurrence (Unlikely, Low, Possible, Confirmed)
Flora	*Grammitis stenophylla*	Narrow-leaf Finger Fern	E1, P, 3		Moist places, usually near streams, on rocks or in trees, in rainforest and moist eucalypt forest.	No suitable habitat available Unlikely to be present within the subject site.
Flora	*Hibbertia superans*		E1, P		Found on sandstone ridgetops often near the shale/sandstone boundary. Occurs in both open woodland and heathland, and appears to prefer open disturbed areas, such as tracksides.	No suitable habitat available Unlikely to be present within the subject site.
Flora	*Persoonia nutans*	Nodding Geebung	E1, P	E	Northern populations are confined to aeolian and alluvial sediments and occur in a range of sclerophyll forest and woodland vegetation communities, with the majority of individuals occurring within Agnes Banks Woodland or Castlereagh Scribbly Gum Woodland and some in Cooks River / Castlereagh Ironbark Forests. Southern	No suitable habitat available Unlikely to be present within the subject site.

Table A.1 Likelihood of Occurrence of Threatened Flora

Class	Scientific name	Common name	TSC Act	EPBC Act	Habitat Requirements	Likelihood of occurrence (Unlikely, Low, Possible, Confirmed)
					populations also occupy tertiary alluvium, but extend onto shale sandstone transition communities and into Cooks River / Castlereagh Ironbark Forest.	
Flora	*Pimelea curviflora var. curviflora*		V, P	V	Occurs in open forest on sandy soil derived from sandstone and on lateritic soils.	No suitable habitat available Unlikely to be present within the subject site.
Flora	*Pimelea spicata*	Spiked Rice-flower	E1, P	E	this species is found on well-structured clay soils. associated with Grey Box communities (particularly Cumberland Plain Woodland variants and Moist Shale Woodland) and in areas of ironbark.	No suitable habitat available Unlikely to be present within the subject site.
Flora	*Pomaderris prunifolia*	P. prunifolia in the Parramatta, Auburn, Strathfield and Bankstown Local	E2		At Rydalmere it occurs along a road reserve near a creek, among grass species on sandstone. At Rookwood Cemetery it occurs in a	No suitable habitat available Unlikely to be present within the subject site.

Table A.1 Likelihood of Occurrence of Threatened Flora

Class	Scientific name	Common name	TSC Act	EPBC Act	Habitat Requirements	Likelihood of occurrence (Unlikely, Low, Possible, Confirmed)
		Government Areas			small gully of degraded Cooks River / Castlereagh Ironbark Forest on shale soils.	
Flora	*Tetratheca glandulosa*		V, P		Occur in areas of shale-sandstone transition habitat.	No suitable habitat available. Not detected during surveys. Unlikely to occur.
Flora	*Triplarina imbricata*	Creek Triplarina	E1,P	E	Occurs along watercourses in low open forest with Water Gum (Tristaniopsis laurina) or in montane bogs, often with Baekea amissa.	No suitable habitat available. Not detected during surveys. Unlikely to occur.
Flora	*Wilsonia backhousei*	Narrow-leafed Wilsonia	E2		This is a species of the margins of salt marshes and lakes.	No suitable habitat available. Not detected during surveys. Unlikely to occur.

Table A.2 Likelihood of Occurrence of Threatened and Migratory Fauna

Class	Family	Scientific name	Common name	TSC Act	EPBC Act	Habitat Requirements	Likelyhood of occurrence (Unlikely, Low, Possible, Confirmed)
AMPHIBIA							
	Hylidae	Litoria aurea	Green and Golden Bell Frog	E1,P	V	Inhabits marshes, dams and stream-sides, particularly those containing bullrushes (Typha spp.) or spikerushes (Eleocharis spp.).	Unlikely to occur due to lack of suitable habitat and recent records.
	Myobatrachidae	Pseudophryne australis	Red-crowned Toadlet	V,P		Occurs in open forests, at periodically wet drainage lines below sandstone ridges. Mainly found on	Unlikely to occur due to lack of suitable habitat and recent records.

Table A.2 Likelihood of Occurrence of Threatened and Migratory Fauna

Class	Family	Scientific name	Common name	TSC Act	EPBC Act	Habitat Requirements	Likelyhood of occurrence (Unlikely, Low, Possible, Confirmed)
						Hawkesbury and Narrabeen Sandstones.	
AVES							
	Acanthizidae	Chthonicola sagittata	Speckled Warbler	V		Occupies a wide range of Eucalyptus dominated communities that have a grassy understorey, often on rocky ridges or in gullies. Typical habitat would include scattered native tussock grasses, a sparse shrub layer, some	No suitable habitat available. Unlikely to occur

Table A.2 Likelihood of Occurrence of Threatened and Migratory Fauna

Class	Family	Scientific name	Common name	TSC Act	EPBC Act	Habitat Requirements	Likelyhood of occurrence (Unlikely, Low, Possible, Confirmed)
						eucalypt regrowth and an open canopy.	
	Accipitridae	Haliaeetus leucogaster	White-bellied Sea-Eagle	P	C	Australian distribution along the coastline; in NSW, also extends inland along some of the larger waterways. Generally forage over large expanses of open water, in-shore waters and open terrestrial habitats.	No suitable habitat available. Unlikely to occur
	Accipitridae	Hieraaetus morphnoides	Little Eagle	V,P		Occupies habitats rich in	No suitable habitat available. Unlikely

Table A.2 Likelihood of Occurrence of Threatened and Migratory Fauna

Class	Family	Scientific name	Common name	TSC Act	EPBC Act	Habitat Requirements	Likelyhood of occurrence (Unlikely, Low, Possible, Confirmed)
						prey within open eucalypt forest, woodland, or open woodland. Sheoak or acacia woodlands and riparian woodlands of interior NSW are also used. For nest sites it requires a tall living tree within a remnant patch.	to occur
	Apodidae	Apus pacificus	Fork-tailed Swift	P	C,J,K	Non-breeding visitor to all parts of Australia. Mostly found over dry or open	No suitable habitat available. Unlikely to occur

Table A.2 Likelihood of Occurrence of Threatened and Migratory Fauna

Class	Family	Scientific name	Common name	TSC Act	EPBC Act	Habitat Requirements	Likelyhood of occurrence (Unlikely, Low, Possible, Confirmed)
						habitats, including riparian woodland and tea-tree swamps, low scrub, heathland or saltmarsh of inland plains	
	Apodidae	Hirundapus caudacutus	White-throated Needletail	P	C,J,K	Non-breeding visitor to Australia. Occur over most types of habitat, particularly above wooded areas including open forest and rainforest, between trees or in clearings and	No suitable habitat available. Unlikely to occur

Table A.2 Likelihood of Occurrence of Threatened and Migratory Fauna

Class	Family	Scientific name	Common name	TSC Act	EPBC Act	Habitat Requirements	Likelyhood of occurrence (Unlikely, Low, Possible, Confirmed)
						below the canopy. Less commonly recorded flying above woodland and treeless areas, such as grassland or swamps.	
	Ardeidae	Ardea ibis	Cattle Egret	P	C,J	Occurs in tropical and temperate grasslands, woodlands, terrestrial wetlands and cropland with poor drainage.	No suitable habitat available. Unlikely to occur
	Charadriidae	Pluvialis fulva	Pacific Golden Plover	P	C,J,K	Found on muddy, rocky	No suitable habitat available. Unlikely

Table A.2 Likelihood of Occurrence of Threatened and Migratory Fauna

Class	Family	Scientific name	Common name	TSC Act	EPBC Act	Habitat Requirements	Likelyhood of occurrence (Unlikely, Low, Possible, Confirmed)
						and sandy wetlands, shores, paddocks, saltmarsh, coastal golf courses, estuaries and lagoons.	to occur
	Laridae	Hydroprogne caspia	Caspian Tern	P	C,J	Usually found near the coast, in extensive wetlands, on coastal and interior beaches and sheltered estuaries.	No suitable habitat available. Unlikely to occur
	Meliphagidae	Anthochaera phrygia	Regent Honeyeater	E4A,P	E	Inhabits dry open forest and woodland,	Unlikely to occur due to low number of records and

Table A.2 Likelihood of Occurrence of Threatened and Migratory Fauna

Class	Family	Scientific name	Common name	TSC Act EPBC Act	Habitat Requirements	Likelyhood of occurrence (Unlikely, Low, Possible, Confirmed)
					particularly Box-Ironbark woodland, and riparian forests of River Sheoak. Regent Honeyeaters inhabit woodlands that support a significantly high abundance and species richness of bird species. These woodlands have significantly large numbers of mature trees, high canopy	lack of appropriate habitat.

Table A.2 Likelihood of Occurrence of Threatened and Migratory Fauna

Class	Family	Scientific name	Common name	TSC Act EPBC Act	Habitat Requirements	Likelyhood of occurrence (Unlikely, Low, Possible, Confirmed)
					cover and abundance of mistletoes.	
	Meliphagidae	Epthianura albifrons	White-fronted Chat	V,P	Gregarious species, usually found foraging on bare or grassy ground in wetland areas, singly or in pairs. They are insectivorous, feeding mainly on flies and beetles caught from or close to the ground.	No suitable habitat available. Unlikely to occur
	Meliphagidae	Epthianura albifrons	White-fronted Chat population in the Sydney Metropolitan Catchment Management Area	E2,V,P	Regularly observed in the saltmarsh of	No suitable habitat available. Unlikely to occur

Table A.2 Likelihood of Occurrence of Threatened and Migratory Fauna

Class	Family	Scientific name	Common name	TSC Act	EPBC Act	Habitat Requirements	Likelyhood of occurrence (Unlikely, Low, Possible, Confirmed)
						Newington Nature Reserve (with occasional sightings from other parts of Sydney Olympic Park and in grassland on the northern bank of the Parramatta River). Current estimates suggest this population consists of 8 individuals. Regularly observed in the saltmarsh and on the sandy	

Table A.2 Likelihood of Occurrence of Threatened and Migratory Fauna

Class	Family	Scientific name	Common name	TSC Act EPBC Act	Habitat Requirements	Likelyhood of occurrence (Unlikely, Low, Possible, Confirmed)
					shoreline of a small island of Towra Point Nature Reserve. This population is estimated to comprise 19-50 individuals.	
	Petroicidae	Petroica boodang	Scarlet Robin	V,P	Breeds in drier eucalypt forests and temperate woodlands, often on ridges and slopes, within an open understorey of shrubs and grasses and sometimes open areas. Abundant	Unlikely to occur due to low number of records.

Table A.2 Likelihood of Occurrence of Threatened and Migratory Fauna

Class	Family	Scientific name	Common name	TSC Act EPBC Act	Habitat Requirements	Likelyhood of occurrence (Unlikely, Low, Possible, Confirmed)
					logs and coarse woody debris are important structural components of its habitat. In autumn and winter it migrates to more open habitats such as grassy open woodland or paddocks with scattered trees. It forages from low perches, feeding on invertebrates taken from the ground, tree	

Table A.2 Likelihood of Occurrence of Threatened and Migratory Fauna

Class	Family	Scientific name	Common name	TSC Act	EPBC Act	Habitat Requirements	Likelyhood of occurrence (Unlikely, Low, Possible, Confirmed)
						trunks, logs and other coarse woody debris.	
	Psittacidae	Lathamus discolor	Swift Parrot	E1,P,3	E	Occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs)	No suitable habitat available. Unlikely to occur.
	Psittacidae	Polytelis swainsonii	Superb Parrot	V,P,3	V	Inhabit Box-Gum, Box-Cypress-pine and Boree Woodlands and River Red Gum Forest.	No suitable habitat available. Unlikely to occur.
	Scolopacidae	Actitis hypoleucos	Common Sandpiper	P	C,J,K	Found in coastal	No suitable habitat

Table A.2 Likelihood of Occurrence of Threatened and Migratory Fauna

Class	Family	Scientific name	Common name	TSC Act	EPBC Act	Habitat Requirements	Likelyhood of occurrence (Unlikely, Low, Possible, Confirmed)
						or inland wetlands, both saline or fresh. It is found mainly on muddy edges or rocky shores. During the breeding season in the northern hemisphere, it prefers freshwater lakes and shallow rivers.	available. Unlikely to occur.
	Scolopacidae	Calidris acuminata	Sharp-tailed Sandpiper	P	C,J,K	Prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent	No suitable habitat available. Unlikely to occur.

Table A.2 Likelihood of Occurrence of Threatened and Migratory Fauna

Class	Family	Scientific name	Common name	TSC Act	EPBC Act	Habitat Requirements	Likelyhood of occurrence (Unlikely, Low, Possible, Confirmed)
						sedges, grass, saltmarsh or other low vegetation.	
	Scolopacidae	Calidris canutus	Red Knot	P	C,J,K	Gather on the coast in sandy estuaries with tidal mudflats.	No suitable habitat available. Unlikely to occur
	Scolopacidae	Calidris ferruginea	Curlew Sandpiper	E1,P	C,J,K	Occurs mainly on intertidal mudflats in coastal areas including sheltered estuaries and bays. Less often found inland in appropriate water sources such as dams	No suitable habitat available. Unlikely to occur

Table A.2 Likelihood of Occurrence of Threatened and Migratory Fauna

Class	Family	Scientific name	Common name	TSC Act	EPBC Act	Habitat Requirements	Likelyhood of occurrence (Unlikely, Low, Possible, Confirmed)
						and lakes.	
	Scolopacidae	Calidris ruficollis	Red-necked Stint	P	C,J,K	Found on the coast, in sheltered inlets, bays, lagoons, estuaries, intertidal mudflats and protected sandy or coralline shores. They may also be seen in saltworks, sewage farms, saltmarsh, shallow wetlands including lakes, swamps, riverbanks,	No suitable habitat available. Unlikely to occur

Table A.2 Likelihood of Occurrence of Threatened and Migratory Fauna

Class	Family	Scientific name	Common name	TSC Act	EPBC Act	Habitat Requirements	Likelyhood of occurrence (Unlikely, Low, Possible, Confirmed)
						waterholes, bore drains, dams, soaks and pools in saltflats, flooded paddocks or damp grasslands.	
	Scolopacidae	Gallinago hardwickii	Latham's Snipe	P	C,J,K	Seen in small groups or singly in freshwater wetlands on or near the coast, generally among dense cover. They are found in any vegetation around wetlands, in sedges, grasses, lignum,	No suitable habitat available. Unlikely to occur

Table A.2 Likelihood of Occurrence of Threatened and Migratory Fauna

Class	Family	Scientific name	Common name	TSC Act	EPBC Act	Habitat Requirements	Likelyhood of occurrence (Unlikely, Low, Possible, Confirmed)
						reeds and rushes and also in saltmarsh and creek edges on migration. They also use crops and pasture.	
	Scolopacidae	Limosa lapponica	Bar-tailed Godwit	P	C,J,K	Inhabit estuarine mudflats, beaches and mangroves. They are common in coastal areas around Australia.	No suitable habitat available. Unlikely to occur
	Scolopacidae	Limosa limosa	Black-tailed Godwit	V,P	C,J,K	Primarily a coastal species. Usually found in sheltered bays, estuaries and	No suitable habitat available. Unlikely to occur

Table A.2 Likelihood of Occurrence of Threatened and Migratory Fauna

Class	Family	Scientific name	Common name	TSC Act EPBC Act	Habitat Requirements	Likelyhood of occurrence (Unlikely, Low, Possible, Confirmed)
					lagoons with large intertidal mudflats and/or sandflats. Further inland, it can also be found on mudflats and in water less than 10 cm deep, around muddy lakes and swamps. Individuals have been recorded in wet fields and sewerage treatment works. Forages for insects,	

Table A.2 Likelihood of Occurrence of Threatened and Migratory Fauna

Class	Family	Scientific name	Common name	TSC Act	EPBC Act	Habitat Requirements	Likelyhood of occurrence (Unlikely, Low, Possible, Confirmed)
						crustaceans, molluscs, worms, larvae, spiders, fish eggs, frog eggs and tadpoles in soft mud or shallow water. Roosts and loafs on low banks of mud, sand and shell bars.	
	Scolopacidae	Numenius madagascariensis	Eastern Curlew	P	C,J,K	Found on intertidal mudflats and sandflats, often with beds of seagrass, on sheltered coasts, especially	No suitable habitat available. Unlikely to occur

Table A.2 Likelihood of Occurrence of Threatened and Migratory Fauna

Class	Family	Scientific name	Common name	TSC Act	EPBC Act	Habitat Requirements	Likelyhood of occurrence (Unlikely, Low, Possible, Confirmed)
						estuaries, mangrove swamps, bays, harbours and lagoons.	
	Scolopacidae	Tringa nebularia	Common Greenshank	P	C,J,K	Found both on the coast and inland, in estuaries and mudflats, mangrove swamps and lagoons, and in billabongs, swamps, sewage farms and flooded crops.	No suitable habitat available. Unlikely to occur
	Scolopacidae	Tringa stagnatilis	Marsh Sandpiper	P	C,J,K	Lives in permanent or ephemeral	No suitable habitat available. Unlikely to occur

Table A.2 Likelihood of Occurrence of Threatened and Migratory Fauna

Class	Family	Scientific name	Common name	TSC Act EPBC Act	Habitat Requirements	Likelyhood of occurrence (Unlikely, Low, Possible, Confirmed)
					wetlands of varying salinity, including swamps, lagoons, billabongs, saltpans, saltmarshes, estuaries, pools on inundated floodplains, and intertidal mudflats and also regularly at sewage farms and saltworks.	
	Strigidae	Ninox connivens	Barking Owl	V,P,3	Found in open forest and woodland, including	Low. Potential to occur within the site boundary; however few

Table A.2 Likelihood of Occurrence of Threatened and Migratory Fauna

Class	Family	Scientific name	Common name	TSC Act EPBC Act	Habitat Requirements	Likelyhood of occurrence (Unlikely, Low, Possible, Confirmed)
					fragmented remnants.	recent records reduces the probability of the species occurring.
	Strigidae	Ninox strenua	Powerful Owl	V,P,3	Habitat for this species is widespread and is primarily tall moist eucalypt forest of the eastern tableland edge and the mosaic of wet and dry sclerophyll forests occurring on undulating gentle terrain nearer the coast. Optimal habitat	Low. Minimal foraging habitat present on site. Potential to occur although very low

Table A.2 Likelihood of Occurrence of Threatened and Migratory Fauna

Class	Family	Scientific name	Common name	TSC Act	EPBC Act	Habitat Requirements	Likelyhood of occurrence (Unlikely, Low, Possible, Confirmed)
						includes a tall shrub layer and abundant hollows supporting high densities of arboreal marsupials. Pairs occupy large, probably permanent home and nest in large hollows.	
	Threskiornithidae	Plegadis falcinellus	Glossy Ibis	P	C	Preferred habitat for foraging and breeding are fresh water marshes at the edges of lakes and rivers,	No suitable habitat available. Unlikely to occur

Table A.2 Likelihood of Occurrence of Threatened and Migratory Fauna

Class	Family	Scientific name	Common name	TSC Act	EPBC Act	Habitat Requirements	Likelyhood of occurrence (Unlikely, Low, Possible, Confirmed)
						lagoons, flood-plains, wet meadows, swamps, reservoirs, sewage ponds, rice-fields and cultivated areas under irrigation.	
MAMMALIA							
	Dasyuridae	Dasyurus maculatus	Spotted-tailed Quoll	V,P	E	Occurs in wide variety of habitats from open woodland to rainforests in large remnants. Dens in tree hollows, hollow logs or rock crevices.	Unlikely to occur due to low number of records and lack of favourable habitat.

Table A.2 Likelihood of Occurrence of Threatened and Migratory Fauna

Class	Family	Scientific name	Common name	TSC Act EPBC Act	Habitat Requirements	Likelyhood of occurrence (Unlikely, Low, Possible, Confirmed)
	Emballonuridae	Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V,P	Roosts singly or in small groups in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows. Forage in most habitats and appear to defend aerial territories.	Potential to forage along riparian corridor to the north. Low numbers of records indicate unlikely presence
	Molossidae	Mormopterus norfolkensis	Eastern Freetail-bat	V,P	Occurs in dry sclerophyll forest and woodland east of the Great Dividing Range. Roosts mainly in tree hollows but	Possible. Potential to forage along riparian corridor to the north

Table A.2 Likelihood of Occurrence of Threatened and Migratory Fauna

Class	Family	Scientific name	Common name	TSC Act EPBC Act	Habitat Requirements	Likelyhood of occurrence (Unlikely, Low, Possible, Confirmed)
					will also roost under bark or in man-made structures	
	Pteropodidae	Pteropus poliocephalus	Grey-headed Flying-fox	V,P	Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops	Possible. Potential to forage along riparian corridor to the north of the subject site.
	Vespertilionidae	Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V,P	Forages in forested areas, catching moths	Possible. Potential to forage within the site.

Table A.2 Likelihood of Occurrence of Threatened and Migratory Fauna

Class	Family	Scientific name	Common name	TSC Act EPBC Act	Habitat Requirements	Likelyhood of occurrence (Unlikely, Low, Possible, Confirmed)
					and other flying insects above the tree tops. Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures	Unlikely to occur due to minimal foraging habitat
	Vespertilionidae	Falsistrellus tasmaniensis	Eastern False Pipistrelle	V,P	Prefers moist habitats, with trees taller than 20 m. Generally roosts in eucalypt hollows.	Unlikely as there are no tree hollows present on site.
	Vespertilionidae	Myotis macropus	Southern Myotis	V,P	Generally roost close to water in	Possible. Potential to forage along

Table A.2 Likelihood of Occurrence of Threatened and Migratory Fauna

Class	Family	Scientific name	Common name	TSC Act	EPBC Act	Habitat Requirements	Likelyhood of occurrence (Unlikely, Low, Possible, Confirmed)
						caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage.	riparian corridor to the north
	Vespertilionidae	Scoteanax rueppellii	Greater Broad-nosed Bat	V,P		Utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. Although this species usually	Possible. Potential to forage along riparian corridor to the north

Table A.2 Likelihood of Occurrence of Threatened and Migratory Fauna

Class	Family	Scientific name	Common name	TSC Act	EPBC Act	Habitat Requirements	Likelyhood of occurrence (Unlikely, Low, Possible, Confirmed)
						roosts in tree hollows, it has also been found in buildings.	

Appendix B

Recorded Flora Species

Table B.1 Flora Species recorded within the Study Area

Species name	Common name
Acacia decurrens	Black Wattle
Acacia parramattensis	Sydney Green Wattle
Acetosa sagittata*	Turkey Rhubarb
Aegiceras corniculatum	River Mangrove
Ageratina adenophora*	Crofton Weed
Allocasuarina littoralis	Black She-oak
Araujia sericifera*	Moth Vine
Avicennia marina	Grey Mangrove
Bidens pilosa*	Cobblers Pegs
Brassica rapa*	Field Mustard
Chloris gayana*	Rhodes Grass
Cinnamomum camphora*	Camphor Laurel
Cirsium vulgare*	Scotch Thistle
Cortaderia selloana*	Pampas Grass
Corymbia citriodora#	Lemon-scented Gum
Corymbia eximia	Yellow Blood Wood
Corymbia maculata	Spotted Gum
Cotoneaster glaucophyllus*	
Cupressus sp.*	Exotic Cypress Species
Cynodon dactylon*	Couch
Cyperus gracilis	Slender Flat-sedge
Dichondra repens	Kidney Weed
Ehrharta erecta*	Panic Veldtgrass
Eragrostis curvula*	African Love Grass
Eucalyptus cladocalyx#	Sugar Gum
Eucalyptus grandis	Flooded Gum
Eucalyptus microcorys#	Tallow Wood
Eucalyptus nicholii#	Narrow-leaved Black Peppermint
Eucalyptus parramattensis	Parramatta Red Gum
Eucalyptus tereticornis	Forest Red Gum
Ficus macrophylla#	Moreton Bay Fig
Foeniculum vulgare*	Fennel

Table B.1 Flora Species recorded within the Study Area

Species name	Common name
Genista monspessulana8	Montpellier Broom
Grevillea robusta*	Silky Oak
Ipomoea indica*	Morning Glory
Lantana camara*	Lantana
Ligustrum lucidum*	Broad-leaved Privet
Lophostemon confertus#	Queensland Brush Box
Melaleuca quinquenervia	Broad-leaved Paperbark
Microlaena stipoides	Weeping Meadow Grass
Nerium oleander*	Oleander
Notelaea longifolia	Mock Olive
Olea europaea ssp cuspidata*	African Olvie
Paspalum dilatatum*	Paspalum
Pennisetum clandestinum*	Kikuyu
Pittosporum undulatum	Sweet Pittosporum
Plantago lanceolata	Lamb's Tongue
Ricinus communis*	Castor Oil Plant
Rubus fruticosus*	Blackberry
Senecio madagascariensis*	Fireweed
Setaria parviflora*	Pigeon Grass
Sida rhombifolia*	Paddy's Lucerne
Solanum sp.*	
Sonchus oleraceus*	Common Sowthistle
Sporobolus elongatus	Slender Rat's Tail Grass
Taraxacum officinale*	Dandelion
Tristaniopsis laurina	Water Gum
Verbena bonariensis*	Purpletop
Vicia sativa*	

# indicates a non-local native species

* indicates an introducted/exotic species