ATTACHMENT F

Flora and Fauna Assessment - Footprint Green Pty Ltd

flora & fauna assessment, planning proposal – deferred area 15

at Killara Golf Course & 552-554 Pacific Highway, Killara

7th November 2016

prepared by

Mark Couston - Ass. Dip. Env. Ctrl. (CSU), Grad. Dip. Env. Mgmt. (CSU),
Cert. Soil & Water Mgmt. (UWS), MECA.
OEH - Scientific Licence No. S L100777, DPI - Animal Research Authority 04-4786

Footprint Green Pty Ltd
Arboricultural, Environmental & Horticultural Consultants
5 Watkins Road, Avalon Beach, NSW 2107
Email: mail@footprintgreen.com.au
Ph: (02) 99188877
Fax: (02) 99188876
ABN 34 097 138 817

contents

list of figures

Footprint Green Pty Ltd
Arboricultural, Environmental & Horticultural Consultants
5 Watkins Road, Avalon Beach, NSW 2107
Email: mail@footprintgreen.com.au
Ph: (02) 99188877
Fax: (02) 99188876
ABN 34 097 138 817

executive summary

This report has been prepared in conjunction with a planning proposal to rezone the area referred to as Deferred Area 15 in Ku-ring-gai Local Environmental Plan, 2015) at the site known as Killara Golf Course and the properties of 552 & 554 Pacific Highway, Killara.

The report identifies the flora species on the site and fauna species likely to reside on or use the site as part of their foraging range. Specific assessment of the properties has been undertaken to identify habitats of threatened species, populations and ecological communities listed in the schedules of the Threatened Species Conservation Act (NSW) 1995 & Environmental Protection Biodiversity Conservation Act (Cwlth) 1999.

The subject site has an area of approximately 4.5ha and has been largely developed and contains the Killara golf course tees, greens, fairways, car parking areas, driveways & club house, 2 tennis courts, 2 bowling greens and 2 developed commercial properties on the Pacific Highway. The planning proposal aims to rezone these areas from 2(b) and 2(c2) to R3 Medium Density Residential and R2 Low Density Residential.

The subject site has been developed and the habitats have been extensively modified since prior to 1943. The vegetation on the site is dominated by large open grass areas, garden beds, and indigenous, non-indigenous native and exotic trees. A number of indigenous species have been planted on the site including Sydney Blue Gums (*Eucalyptus saligna*) e.g. a semi-mature tree in a carpark traffic island, Spiny-headed Mat-rush (*Lomandra longifolia*) as landscape border plantings, Blueberry Ash (*Elaeocarpus reticulatus*) as vegetation screening. Other indigenous species that are not characteristic of the habitats on the site and have been planted on the site include River Oak/River Sheoak (*Casuarina cunninghamiana*), Swamp Oak (*Casuarina glauca*) and Paperparks (*Melaleuca quinquenervia*), Dwarf/Scrub Apple (*Angophora hispida*) and Yellow Bloodwood (*Corymbia eximia*).

Despite the extent of development and modification of habitats on the site, 3 threatened species and relics of a the critically endangered Blue Gum High Forest ecological community have been recorded on the site. Consideration has also been given to threatened species known to occur within 5km of the site. Field surveys and habitat assessments have been carried out primarily targeting threatened species and those threatened species that have some habitat relationships with the habitats on site include;

- Wallangarra White Gum (*Eucalyptus scoparia*);
- Magenta Lillypilly (*Syzygium paniculatum*);
- Eastern False Pipistrelle (*Falsistrellus tasmaniensis*);
- Eastern Freetail Bat (*Mormopterus norfolkensis*);
- Yellow-bellied Sheathtail Bat (*Saccolaimus flaviventris*);
- Greater Broad-nosed Bat (*Scoteanax rueppellii*);
- Blue Gum High Forest Ecological Community

Whilst Wallangarra White Gum (*Eucalyptus scoparia*) was recorded on the site, the species is known to be frequently propagated and made available through commercial nurseries. The subject site is well beyond the natural range of the species which occurs in the Tenterfield area in northern NSW. Because of this, the species is not given any further consideration in this planning process.

The Magenta Lillypilly (*Syzygium paniculatum*) was recorded on the site in a modified habitat along the southern boundary of the subject site. This species has also been frequently propagated and made available through commercial nurseries. The single tree is a mature specimen and potentially is planted from commercial stock, however the species has been recorded in the Sydney region and to take a precautionary approach, the species has been considered in context of this planning proposal.

The key habitat features for the above mentioned threatened species that need to be taken into account in the planning proposal include:

- habitat of the Magenta Lillypilly (*Syzygium paniculatum*):
- habitat of the stands of remnant Blue Gum High Forest trees;
- diurnal roosting habitats in mature trees and seasonal bark sheaths;

Traditional planning mechanisms to protect biodiversity values include:

- land use zoning in Local Environmental Plans (LEPs):
- biodiversity provisions in LEPs, and
- development controls in DCPs.

To integrate the key habitat features into the planning proposal and the current Ku-ring-gai Local Environmental Plan, 2015 (KLEP, 2015), the key habitat features should be identified as Areas of Biodiversity Significance and subject to the provisions of Clause 6.3 Biodiversity Protection of the KLEP (2015) and subsequent development controls.

The subject site does not contain critical habitat listed under Part 3 Division 1 of the *Threatened Species Conservation Act 1995 (NSW).*

Provided that the areas of biodiversity significance as shown in Figure 7.1 are subject to the provisions of Clause 6.3 Biodiversity Protection of Ku-ring-gai Local Environmental Plan, 2015, the planning proposal is unlikely to have an adverse impact on the habitats of threatened species, populations or ecological communities listed in the schedules of the *Threatened Species Conservation Act 1995 (NSW)* and the *Environment Protection & Biodiversity Conservation Act 1999 (Cwlth)*;

1. introduction

1.1 Background

This report has been prepared in conjunction with a planning proposal to rezone the area referred to as Deferred Area 15 in Ku-ring-gai Local Environmental Plan, 2015) at the site known as Killara Golf Course and the properties of 552 & 554 Pacific Highway, Killara.

The report identifies the flora species on the site and fauna species likely to reside on or use the site as part of their foraging range. Specific assessment of the properties has been undertaken to identify habitats of threatened species, populations and ecological communities listed in the schedules of the *Threatened Species Conservation Act (NSW) 1995* & *Environmental Protection Biodiversity Conservation Act (Cwlth) 1999*.

The report has been commissioned by Killara Golf Club and site instructions have been provided by Ian Glendinning Planning. Site inspections and field work were conducted between the 1st December 2015 and the 29th January 2016 and on the 7th November 2016.

For the purposes of this report the upper, eastern parts of the Killara Golf Course, referred to as Deferred Area 15 (KLEP, 2014) and the properties known as 552 & 554 Pacific Highway, Killara will be referred to as the subject.

1.2 Existing site & proposed zoning

The subject site has an area of approximately 4.5ha and has been largely developed and contains the Killara golf course tees, greens, fairways, car parking areas, driveways & club house, 2 tennis courts 2 bowling greens and 2 developed commercial properties on the Pacific Highway. The planning proposal aims to rezone these areas from 2(b) and 2(c2) to R3 Medium Density Residential and R2 Low Density Residential.

Figure 1.1 View of the Killara Golf Clubhouse looking north with open turf areas, garden beds and remnant indigenous trees.

1.3 Planning proposals & rezoning

The rezoning of land itself does not have any direct impact on the local ecology nor threatened species however rezoning of land does provide for some form of subsequent development which could impact on biodiversity values. Traditional planning mechanisms to protect biodiversity values include:

- land use zoning in Local Environmental Plans (LEPs):
- biodiversity provisions in LEPs, and
- development controls

1.4 NSW environmental planning & assessment

Whilst there several State Acts and planning instruments that relate to flora and fauna issues those covered in this report include:

- species, populations and ecological communities listed in the schedules of the *Threatened Species Conservation Act 1995 (NSW);*

1.5 Commonwealth context

This report also identifies flora and fauna species or communities, relevant to the site that are listed under Part 13 Division 1 of the *Environment Protection & Biodiversity Act 1999 (Cwlth)* (EPBC). Species or communities listed in the Act are considered to be "matters of national environmental significance" and consideration needs to be given as to whether the proposed development will or is likely to have a "significant impact" on "matters of national environmental significance". In determining whether a "significant impact" will occur, consideration is given to;

- EPBC Act Administrative guidelines on significance (DEH 2006)

To minimise duplication in the environmental assessment procedures, a bilateral agreement was made in January 2007 between the Commonwealth & NSW Governments giving accreditation of New South Wales assessment processes in relation to threatened species, populations and ecological communities. The agreement provides for "Controlled actions" as defined in the *Environment Protection & Biodiversity Act 1999 (Cwlth)* relating to threatened species, to no longer require assessment under Part 8 of the *Environment Protection & Biodiversity Act 1999 (Cwlth)* where they are assessed under Part 3A, 4 or 5 of the *Environmental Planning and Assessment Act 1979 (NSW)*.

2. the site

2.1 General information

The site is situated on the western side of the Pacific Highway at Killara and the surrounding landscape comprises of residential and commercial developments and public open space area.

The general site characteristics are:

Site Area	4.5ha (approx..)
Landform Morphology	Crest / Maximal Upper Slope / Waning Lower Slope
Aspect	South west
Geology	Wianamatta Shale
Soil Landscape	Glenorie Soil Landscape
Watercourse	Overland flow no defined channel
Catchment	Honeysuckle Creek
Receiving Waters	Lane Cove River /Port Jackson
Vegetation	Open turf areas, formal exotic gardens, planted non-indigenous native species and planted and remnant indigenous trees.

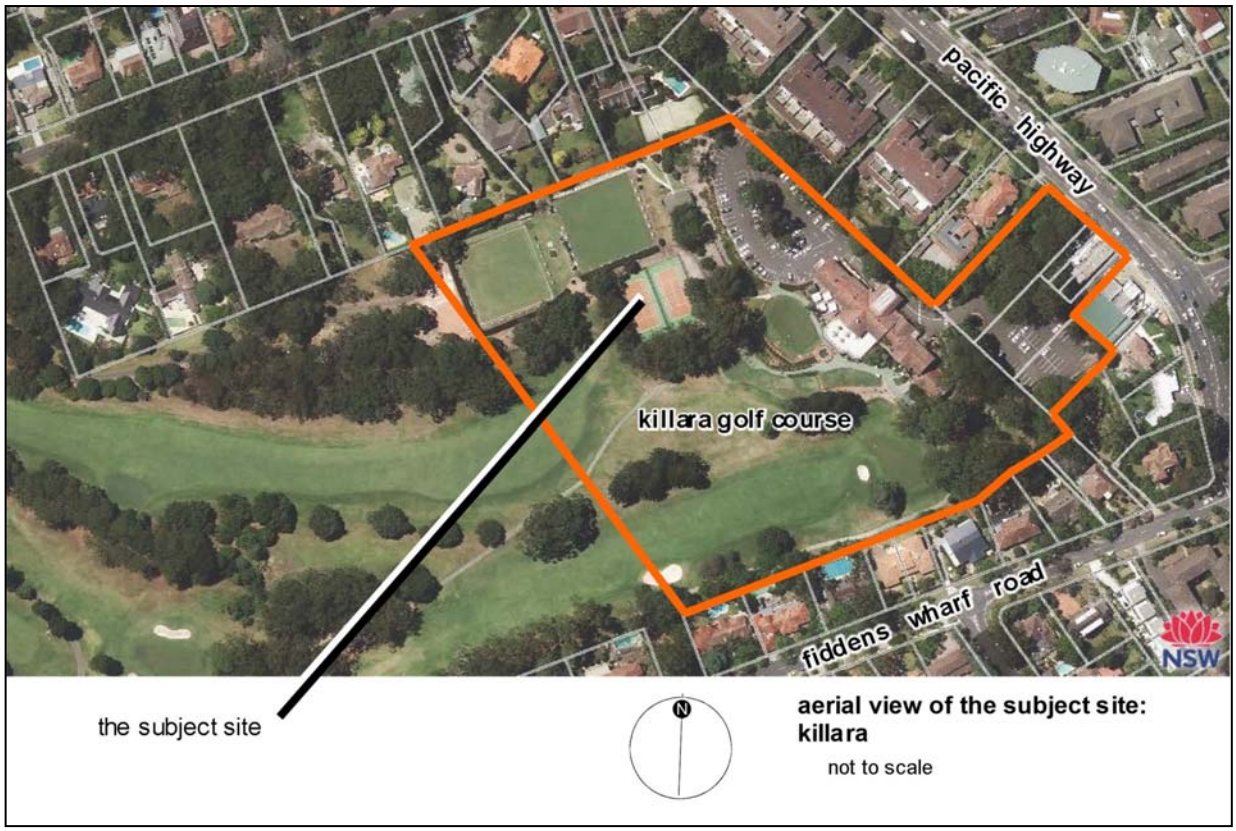

Figure 2.1 Aerial view of the subject site.

3. flora & fauna survey

3.1 Flora species survey methods

3.1.1 Flora literature search

Flora records were obtained from the NSW Office of Environment & Heritage's (OEH, 2016) Bionet Atlas searching a 10km grid square centred on the site (MGA 56 co-ordinates E 329450 and N 6261800).

3.1.2 Flora field surveys

The flora survey covered an area of approximately 3 hectares using the Random Meander Method described by Cropper (1993) involving 16 person hours and was conducted between the 01/12/15 and the 29/01/16. Specific effort was undertaken to identify optimal and sub-optimal natural habitats of threatened species and communities and in these areas detailed searches were undertaken.

Species identifications are consistent with the nomenclature in Harden (1992, 1993, 2000 & 2002) with recent name changes as amended in the Royal Botanic Gardens Sydney Plantnet website. Where some taxonomic uncertainty exists, samples were taken for verification using recognised floristic keys.

3.2 Fauna species survey methods

3.2.1 Fauna Literature search

Fauna records were obtained from the NSW Office of Environment & Heritage's (OEH, 2016) Wildlife Atlas searching a 10km grid square centred on the site (MGA 56 co-ordinates E 329450 and N 6261800).

3.2.2 Fauna field surveys

The fauna surveys carried out have departed from those outlined in Threatened Biodiversity Survey & Assessment Guidelines for Developments & Activities Working Draft (OEH, 2004) because of the extent of site development, site modifications, the simplified habitats and the site's urban context. Fauna investigations have been taken into account in:

- habitat assessments;
- diurnal bird survey
- nocturnal ultrasonic bat detection;
- remote camera surveys, and
- opportunistic sightings conducted as part of other site surveys.

3.2.2.1 Habitat Assessment

To overcome the limitations associated with short term surveys and seasonal variations, habitat assessments are carried out to identify key habitat features, such as trees with hollows, rock overhangs and watercourses, and to identify potential habitats where threatened fauna species could reside, find refuge, breed or forage. This habitat assessment was carried out in conjunction with the flora survey on the 23/06/15.

3.2.2.2 Diurnal bird survey

Three (3), 60 minute surveys were undertaken, of which 2 were conducted in the morning of the 01/12/15 and 06/12/15, and 1 was conducted on the afternoon of 29/01/16. These surveys were generally conducted at points along a transect across the site. Additional data was also collected as incidental and opportunistic observations.

3.2.2.3 Ultrasonic bat survey

Ultrasonic bat detection was undertaken over 6 nights commencing on the evening of the 01/12/15 through to the morning of the 06/12/15. Bat ultrasonic recordings were taken using an Anabat Express recording between sunrise and sunset each day. Recordings were analysed by Lesryk Environmental Consultants.

3.2.2.4 Remote camera surveys

Two (2) remote cameras were used on the site recording continuously during the day and night between the afternoon of the 01/12/15 and the morning of 07/12/15. The remote cameras used were UOVision UV565 HD “Black Ops” and were triggered by infra-red motion sensors with nocturnal infra-red flash.

3.2.2.5 Opportunistic sighting, calls, scats and scratchings

During the course of individual surveys opportunistic observations, calls, scats, tracks and scratchings were also recorded both within the study area and locally off site.

3.3 Survey findings

3.3.1 Flora site data

The following table identifies flora species:

- listed in the schedules of the *Environment Protection & Biodiversity Conservation Act 1999 (Cwlth)* and recorded within a 10km grid square centered on the site in the Wildlife Atlas (OEH, 2016) post 1950;
- listed in the schedules of the *Threatened Species Conservation Act 1995 (NSW)* and recorded within a 10km grid square centered on the site in the Wildlife Atlas (OEH, 2016) post 1950, and
- recorded on the site as part of field surveys.

OEH Wildlife Atlas (2015)	Recorded on subject site	Family	Genus species	Common Name	Autochthony	Conservation Status
✔- Recorded, - Planted Native or Indigenous Specimen. **Unprotected** / **Protected** - Schedule 13 National Parks & Wildlife Act 1974 (NSW), **Vulnerable NSW** / **Endangered NSW / Critically Endangered NSW** - NSW Threatened Species Conservation Act 1995 (NSW), **Noxious** - Noxious Weeds Act 1993 (NSW), **Critically Endangered Cwlth** / **Endangered Cwlth** / **Vulnerable Cwlth** - Environment Protection & Biodiversity Conservation Act 1999 (Cwlth).						
	✔	Aceraceae	*Acer palmatum*	Japanese Maple	Exotic	Unprotected
	✔	Agapanthacea	*Agapanthus africanus*	Agapanthus	Exotic	Unprotected
	✔	Agavaceae	*Cordyline sp.*	Cordyline	Native	Unprotected
	✔	Alliaceae	*Ophiopogon japonicus*	Mondo Grass	Exotic	Unprotected
	✔	Amaryllidaceae	*Clivia miniata*	Kaffir Lily	Exotic	Unprotected
	✔	Amaryllidaceae	*Crinum pedunculatum*	Crinum / Swamp Lily	Indigenous	Unprotected
	✔	Anacardiaceae	*Harpephyllum caffrum*	Kaffir Plum	Exotic	Unprotected
	✔	Anacardiaceae	*Schinus areira*	Peppercorn Tree	Exotic	Unprotected
	✔	Apocynaceae	*Nerium oleander*	Oleander	Exotic	Unprotected
	✔	Apocynaceae	*Plumeria rubra*	Frangipanni	Exotic	Unprotected
	✔	Apocynaceae	*Trachelospermum jasminoides*	Star Jasmine	Exotic	Unprotected
	✔	Araceae	*Monstera deliciosa*	Fruit-salad Plant	Exotic	Unprotected
	✔	Araceae	*Phillodendron selloum*	Phillodendron	Exotic	Unprotected
	✔	Araliaceae	*Hedera helix*	English Ivy	Exotic	Unprotected
	✔	Araliaceae	*Schefflera actinophylla*	Umbrella Tree	Exotic	Unprotected
	✔	Araucariaceae	*Araucaria bidwillii*	Bunya Pine	Native	Unprotected
	✔	Araucariaceae	*Araucaria cunninghamii*	Hoop Pine	Exotic	Unprotected

OEH Wildlife Atlas (2015)	Recorded on subject site	Family	Genus species	Common Name	Autochthony	Conservation Status
✔- Recorded, 🌲 - Planted Native or Indigenous Specimen. **Unprotected** / **Protected** - Schedule 13 National Parks & Wildlife Act 1974 (NSW), **Vulnerable NSW** / **Endangered NSW / Critically Endangered NSW** - NSW Threatened Species Conservation Act 1995 (NSW), **Noxious** - Noxious Weeds Act 1993 (NSW), **Critically Endangered Cwlth** / **Endangered Cwlth** / **Vulnerable Cwlth** - Environment Protection & Biodiversity Conservation Act 1999 (Cwlth).						
	✔	Araucariaceae	*Araucaria heterophylla*	Norfolk Island Pine	Native	Unprotected
	✔	Arecaceae	*Archontophoenix cunninghamii*	Bangalow Palm	Native	Protected
	✔	Arecaceae	*Howea forsteriana*	Kentia Palm	Native	Unprotected
	✔	Asparagaceae	*Asparagus aethiopicus*	Asparagus Fern	Exotic	Noxious
	✔	Aspleniaceae	*Asplenium nidus*	Birds-nest Fern	Native	Protected
	✔	Asteraceae	*Sonchis oleraceus*	Common Sow Thistle	Exotic	Unprotected
	✔	Berberidaceae	*Nandina domestica*	Sacred Bamboo	Exotic	Unprotected
	✔	Bignoniaceae	*Jacaranda mimosifolia*	Jacaranda	Exotic	Unprotected
	✔	Cannabaceae	*Celtis sp.*	Hackberry	Exotic	Unprotected
	✔	Caprifoliaceae	*Lonicera japonica*	Japanese Honeysuckle	Exotic	Unprotected
	✔🌲	Casuarinaceae	*Casuarina cunninghamiana*	River Oak/River Sheoak	Indigenous	Protected
	✔🌲	Casuarinaceae	*Casuarina glauca*	Swamp Oak	Indigenous	Unprotected
	✔	Commelinacea	*Commelina cyanea*	Scurvy Weed	Indigenous	Unprotected
	✔	Commelinaceae	*Tradescantia fluminensis*	Wandering Jew	Exotic	Unprotected
	✔	Convolvulaceae	*Dichondra repens*	Kidney Weed	Indigenous	Unprotected
	✔	Convolvulaceae	*Ipomoea indica*	Blue Morning Glory	Exotic	Noxious
	✔🌲	Cunoniaceae	*Ceratopetalum gummiferum*	Christmas Bush	Indigenous	Protected
	✔	Cupressaceae	*Chamaecyparis sp.*	Cypress Pine	Exotic	Unprotected
	✔	Cyatheaceae	*Cyathea cooperi*	Straw Treefern	Native	Protected
	✔	Cyperaceae	*Cyperus rotundus*	Nutgrass	Exotic	Unprotected
✔		Dilleniaceae	*Hibbertia sp. Turramurra*	Julian's Hibertia	Indigenous	Critically Endangered NSW
	✔	Doryanthaceae	*Doryanthes excelsa*	Gymea/Giant Lily	Native	Protected
	✔🌲	Elaeocarpaceae	*Elaeocarpus reticulatus*	Blueberry Ash	Indigenous	Unprotected
✔		Elaeocarpaceae	*Tetratheca glandulosa*	Glandular Pink-bell	Indigenous	Vulnerable NSW, Cwth
	✔	Ericaceae	*Arbutus unedo*	Irish Strawberry Tree	Exotic	Unprotected
	✔	Ericaceae	*Azalea sp.*	Azalea (horticultural)	Exotic	Unprotected
✔		Ericaceae	*Epacris purpurascens var. purpurascens*	-	Indigenous	Vulnerable NSW
	✔	Euphorbiaceae	*Euphorbia peplus*	Petty Spurge	Exotic	Unprotected

OEH Wildlife Atlas (2015)	Recorded on subject site	Family	Genus species	Common Name	Autochthony	Conservation Status
✔- Recorded, - Planted Native or Indigenous Specimen. **Unprotected** / **Protected** - Schedule 13 National Parks & Wildlife Act 1974 (NSW), **Vulnerable NSW** / **Endangered NSW / Critically Endangered NSW** - NSW Threatened Species Conservation Act 1995 (NSW), **Noxious** - Noxious Weeds Act 1993 (NSW), **Critically Endangered Cwlth** / **Endangered Cwlth** / **Vulnerable Cwlth** - Environment Protection & Biodiversity Conservation Act 1999 (Cwlth).						
	✔	Euphorbiaceae	*Ricinus communis*	Castor Oil Plant	Exotic	Unprotected
	✔	Fabaceae	*Acacia binervia*	Coast Myall	Indigenous	Unprotected
✔		Fabaceae	*Acacia pubescens*	Downy Wattle	Indigenous	Vulnerable NSW, Cwth
	✔	Fabaceae	*Hardenbergia violacea*	False Sarsaparilla	Indigenous	Unprotected
	✔	Fabaceae	*Vicia sativa*	Vetch	Exoitc	Unprotected
	✔	Fabaceae	*Acacia fimbriata*	Fringed Wattle	Indigenous	Unprotected
	✔	Geraniaceae	*Geranium sp. (exotic)*	Horticultural specimen	Exotic	Unprotected
	✔	Geraniaceae	*Geranium homeanum*	-	Indigenous	Unprotected
	✔	Haemodoraceae	*Anigozanthus sp.*	Kangaroo Paw	Native	Unprotected
✔		Haloragaceae	*Haloragodendron lucasii*	Hal	Indigenous	Endangered NSW, Cwlth
	✔	Hamamelidaceae	*Liquidambar styraciflua*	Sweet Gum	Exotic	Unprotected
	✔	Hydrangeaceae	*Hydrangea sp.*	Hydrangea	Exotic	Unprotected
	✔	Iridaceae	*Dietes bicolor*	Dietes	Exotic	Unprotected
	✔	Lauraceae	*Cinnamomum camphora*	Camphor Laurel	Exotic	Noxious
	✔	Liliaceae	*Dianella tasmanica*	Tasman Flax-lily	Native	
	✔	Lomandraceae	*Lomandra hystrix*	-	Native	Unprotected
	✔	Lomandraceae	*Lomandra longifolia*	Spiny-headed Mat-rush	Indigenous	Unprotected
	✔	Lythraceae	*Lagerstroemia indica*	Crepe Myrtle	Exotic	Unprotected
	✔	Malaceae	*Eriobotrya japonica*	Loquat	Exotic	Unprotected
✔		Malvaceae	*Lasiopetalum joyceae*	-	Indigenous	Vulnerable NSW, Cwth
	✔	Malvaceae	*Modiola caroliniana*	Red-flowered Mallow	Exotic	Unprotected
	✔	Malvaceae	*Sida rhombifolia*	Paddy's Lucerne	Exotic	Unprotected
	✔	Melastomataceae	*Tibouchina sp.*	-	Exotic	Unprotected
	✔	Meliaceae	*Melia azedarach*	White Cedar Tree	Exotic	Unprotected
	✔	Myrtaceae	*Agonis flexuosa*	Willow Myrtle/ Peppermint	Exotic	Unprotected
	✔	Myrtaceae	*Angophora hispida*	Drarf/Scrub Apple	Indigenous	Unprotected
✔		Myrtaceae	*Callistemon linearifolius*	Netted Bottle Brush	Indigenous	Vulnerable NSW
	✔	Myrtaceae	*Callistemon salignus*	Willow Bottlebrush	Indigenous	Unprotected

OEH Wildlife Atlas (2015)	Recorded on subject site	Family	Genus species	Common Name	Autochthony	Conservation Status
✔- Recorded, - Planted Native or Indigenous Specimen. **Unprotected** / **Protected** - Schedule 13 National Parks & Wildlife Act 1974 (NSW), **Vulnerable NSW** / **Endangered NSW / Critically Endangered NSW** - NSW Threatened Species Conservation Act 1995 (NSW), **Noxious** - Noxious Weeds Act 1993 (NSW), **Critically Endangered Cwlth** / **Endangered Cwlth** / **Vulnerable Cwlth** - Environment Protection & Biodiversity Conservation Act 1999 (Cwlth).						
	✔	Myrtaceae	*Callistemon viminalis*	Weeping Bottlebrush	Native	Unprotected
	✔	Myrtaceae	*Corymbia citriodora*	Lemon Scented Gum	Native	Unprotected
	✔	Myrtaceae	*Corymbia eximia*	Yellow Bloodwood	Indigenous	Unprotected
✔		Myrtaceae	*Darwinia biflora*	-	Indigenous	Vulnerable NSW, Cwth
✔		Myrtaceae	*Eucalyptus camfieldii*	Heart-Leaved Stringybark	Indigenous	Vulnerable NSW, Cwth
	✔	Myrtaceae	*Eucalyptus ficifolia*	Scarlet Flowering Gum	Native	
	✔	Myrtaceae	*Eucalyptus microcorys*	Tallow-wood	Native	Unprotected
✔		Myrtaceae	*Eucalyptus nicholii*	Narrow-Leaf Peppermint	Native	Vulnerable NSW
	✔	Myrtaceae	*Eucalyptus pilularis*	Blackbutt	Indigenous	Unprotected
	✔	Myrtaceae	*Eucalyptus saligna*	Sydney Blue Gum	Indigenous	Unprotected
	✔	Myrtaceae	*Eucalyptus scoparia*	Wallangarra White Gum	Native	Endangered NSW, Vulnerable Cwth
✔		Myrtaceae	*Leptospermum deanei*	-	Indigenous	Vulnerable NSW, Cwth
	✔	Myrtaceae	*Lophostemon confertus*	Brushbox	Native	Unprotected
✔		Myrtaceae	*Melaleuca deanei*	Deane's Melaleuca	Indigenous	Vulnerable NSW, Cwth
	✔	Myrtaceae	*Melaleuca quinquenervia*	Paperpark	Native	Unprotected
	✔	Myrtaceae	*Syncarpia glomulifera*	Turpentine	Indigenous	Unprotected
	✔	Myrtaceae	*Syzygium oleosum*	Blue Lillypilly	Native	Unprotected
✔	✔	Myrtaceae	*Syzygium paniculatum*	Magenta Lillypilly	Indigenous	Vulnerable NSW, Cwth
	✔	Nyctaginaceae	*Bougainvillea sp.*	Bougainvillea	Exotic	Unprotected
	✔	Oleaceae	*Ligustrum lucidum*	Large Leaf Privet	Exotic	Noxious
	✔	Oleaceae	*Ligustrum sinense*	Small Leaf Privet	Exotic	Noxious
✔		Orchidaceae	*Cryptostylis hunteriana*	Leafless Tongue-orchid	Indigenous	Vulnerable NSW, Cwth
✔		Orchidaceae	*Genoplesium baueri*	Midge Orchids	Indigenous	Vulnerable NSW
	✔	Oxalidaceae	*Oxalis radicosa*			U
	✔	Oxalidaceae	*Oxalis rubens*			U
	✔	Passifloraceae	*Passiflora edulis*	Common Passionfruit	Exotic	Unprotected
	✔	Pittosporaceae	*Pittosporum undulatum*	Native Daphne	Indigenous	Unprotected
	✔	Plantaginaceae	*Plantago hispida*	Plantain	Exotic	Unprotected

OEH Wildlife Atlas (2015)	Recorded on subject site	Family	Genus species	Common Name	Autochthony	Conservation Status
✔- Recorded, - Planted Native or Indigenous Specimen. **Unprotected** / **Protected** - Schedule 13 National Parks & Wildlife Act 1974 (NSW), **Vulnerable NSW** / **Endangered NSW / Critically Endangered NSW** - NSW Threatened Species Conservation Act 1995 (NSW), **Noxious** - Noxious Weeds Act 1993 (NSW), **Critically Endangered Cwlth** / **Endangered Cwlth** / **Vulnerable Cwlth** - Environment Protection & Biodiversity Conservation Act 1999 (Cwlth).						
	✔	Poaceae	*Bromus catharticus*	Barnyard Grass	Exotic	Unprotected
	✔	Poaceae	*Cynodon dactylon*	Couch Grass	Exotic	Unprotected
	✔	Poaceae	*Ehrharta erecta*	Panic Veldtgrass	Exotic	Unprotected
	✔	Poaceae	*Microlaena stipoides*	Weeping Grass	Indigenous	Unprotected
	✔	Poaceae	*Oplismenus imbecillis*	Basket Grass	Indigenous	Unprotected
	✔	Poaceae	*Pennisetum clandestinum*	Kikuyu Grass	Exotic	Unprotected
	✔	Poaceae	*Phyllostachys aurea*	Fishpole Bamboo	Exotic	Noxious
	✔	Poaceae	*Poa annua*	Winter Grass	Exotic	Unprotected
	✔	Polygonaceae	*Acetosa sagittata*	Potato Vine	Exotic	Unprotected
	✔	Primulaceae	*Anagallis arvensis*	Scarlet/Blue Pimpernel	Exotic	Unprotected
	✔	Proteaceae	*Banksia spinulosa*	Hairpin Banksia	Indigenous	Unprotected
	✔	Proteaceae	*Buckinghamia celsissima*	Ivory Curl Tree	Native	
	✔	Proteaceae	*Grevillea banksii x G. bipinnatifida*	Grevillia Robyn Gordon	Native	Unprotected
✔		Proteaceae	*Grevillea parviflora subsp. Parviflora*	Small-flower Grevillea	Indigenous	Vulnerable NSW, Cwth
	✔	Proteaceae	*Grevillea robusta*	Silky Oak	Native	Unprotected
✔		Proteaceae	*Persoonia hirsuta*	Hairy Geebung	Indigenous	Endangered NSW, Cwlth
	✔	Rosaceae	*Photinia glabra*	Japanese Photinia	Exotic	Unprotected
	✔	Rosaceae	*Rosa sp.*	Rose	Exotic	Unprotected
	✔	Rubiaceae	*Galium aparine*	Goosegrass		U
	✔	Rutaceae	*Murraya paniculata*	Orange Blossom	Exotic	Unprotected
	✔	Sapindaceae	*Alectryon tomentosus*	Hairy Bird's Eye	Native	Unprotected
	✔	Sapindaceae	*Cardiospermum grandiflorum*	Balloon Vine	Exotic	Unprotected
	✔	Solanaceae	*Cestrum nocturnum*	Night-blooming Jasmine	Exotic	Unprotected
	✔	Solanaceae	*Solanum nigrum*	Blackberry Nightshade	Exotic	Unprotected
	✔	Sterculiaceae	*Brachychiton acerifolius*	Illawarra Flame Tree	Native	Unprotected
	✔	Strelitziaceae	*Strelitzia nicolai*	Bird of Paradise	Exotic	Unprotected
	✔	Theaceae	*Camellia japonica*	Camellia	Exotic	Unprotected
	✔	Theaceae	*Camellia sasanqua*	Camellia	Exotic	Unprotected

OEH Wildlife Atlas (2015)	Recorded on subject site	Family	Genus species	Common Name	Autochthony	Conservation Status
✔- Recorded, 🌲 - Planted Native or Indigenous Specimen. **Unprotected** / **Protected** - Schedule 13 National Parks & Wildlife Act 1974 (NSW), **Vulnerable NSW** / **Endangered NSW / Critically Endangered NSW** - NSW Threatened Species Conservation Act 1995 (NSW), **Noxious** - Noxious Weeds Act 1993 (NSW), **Critically Endangered Cwlth** / **Endangered Cwlth** / **Vulnerable Cwlth** - Environment Protection & Biodiversity Conservation Act 1999 (Cwlth).						
	✔	Theaceae	*Franklinia axillaris*	Gordonia	Exotic	Unprotected
✔		Thymelaeaceae	*Pimelea curviflora var. curviflora*	Curved Rice-flower	Indigenous	Vulnerable NSW, Cwth
	✔	Tropaeolaceae	*Tropaeolum majus*	Nasturtium	Exotic	Unprotected
	✔	Ulmaceae	*Trema aspera*	Poison Peach	Indigenous	Unprotected
	✔	Verbenaceae	*Verbena spp.*	Purple Top	Exotic	Unprotected
	✔🌲	Xanthorrhoeaceae	*Xanthorrhoea spp.*	Grass Tree	Indigenous	Protected
	✔	Zingiberaceae	*Hedychium gardnerianum*	Ginger Lily	Exotic	Unprotected

3.3.2 Fauna site data

The following table identifies fauna species:

- listed in the schedules of the *Environment Protection & Biodiversity Conservation Act 1999 (Cwlth)* and recorded within a 10km grid square centered on the site in the Wildlife Atlas (OEH 2016) post 1950;
- listed in the schedules of the *Threatened Species Conservation Act 1995 (NSW)* and recorded within a 10km grid square centered on the site in the Wildlife Atlas (OEH 2016), post 1950;
- recorded on the site as part of field surveys.

OEH Wildlife Atlas (2015)	Recorded on Site	Class	Genus species	Common Name	Autochthony	Conservation Status
✔- Recorded / Identified, ✔θ Record Highly Probable, ✔ Record Probable, ✔ Record Likely / Possible. **Unprotected** / **Protected** - National Parks & Wildlife Act 1974 (NSW), **Vulnerable NSW** / **Endangered NSW** - NSW Threatened Species Conservation Act 1995 (NSW), **Critically Endangered Cwlth** / **Endangered Cwlth** / **Vulnerable Cwlth** - Environment Protection & Biodiversity Conservation Act 1999 (Cwlth)						
✔		Amphibia	*Heleioporus australiacus*	Giant Burrowing Frog	Native	Vulnerable NSW, Cwth
✔		Amphibia	*Litoria aurea*	Green and Golden Bell Frog	Native	Endangered NSW, Vulnerable Cwth
✔		Amphibia	*Pseudophryne australis*	Red-crowned Toadlet	Native	Vulnerable NSW
	✔	Arachnida	*Isopedella sp.*	Common Huntsman	Native	Unprotected
	✔	Arachnida	*Nephila plumipes*	Golden Orb Spider	Native	Unprotected
	✔	Arachnida	*Phonognatha sp.*	Leaf-curling Spider	Native	Unprotected
	✔	Aves	*Acridotheres tristis*	Indian Mynah	Introduced	Unprotected
✔		Aves	*Anthochaera phrygia*	Regent Honeyeater	Native	Critically Endangered NSW, Endagered Cwlth
✔		Aves	*Botaurus poiciloptilus*	Australasian Bittern	Native	Vulnerable NSW
✔		Aves	*Callocephalon fimbriatum*	Gang-gang Cockatoo	Native	Vulnerable NSW
✔		Aves	*Calyptorhynchus lathami*	Glossy Black-Cockatoo	Native	Vulnerable NSW
	✔	Aves	*Columba livia*	Rock Dove/ Feral Pigeon	Introduced	Unprotected
	✔	Aves	*Corvus coronoides*	Australian Raven	Native	Protected
	✔	Aves	*Cracticus tibicen*	Australian Magpie	Native	Protected
	✔	Aves	*Cracticus torquatus*	Grey Butcherbird	Native	Protected
✔		Aves	*Daphoenositta chrysoptera*	Varied Sittella	Native	Vulnerable NSW
✔		Aves	*Ephippiorhynchus asiaticus*	Black-necked Stork	Native	Endangered NSW
✔		Aves	*Glossopsitta pusilla*	Little Lorikeet	Native	Vulnerable NSW

OEH Wildlife Atlas (2015)	Recorded on Site	Class	Genus species	Common Name	Autochthony	Conservation Status
✔- Recorded / Identified, ✔θ Record Highly Probable, ✔ Record Probable, ✔ Record Likely / Possible. **Unprotected** / **Protected** - National Parks & Wildlife Act 1974 (NSW), **Vulnerable NSW** / **Endangered NSW** - NSW Threatened Species Conservation Act 1995 (NSW), **Critically Endangered Cwlth** / **Endangered Cwlth** / **Vulnerable Cwlth** - Environment Protection & Biodiversity Conservation Act 1999 (Cwlth)						
✔		Aves	*Haematopus fuliginosus*	Sooty Oystercatcher	Native	Vulnerable NSW
✔		Aves	*Hieraaetus morphnoides*	Little Eagle	Native	Vulnerable NSW
	✔	Aves	*Hirundo neoxena*	Welcome Swallow	Native	Protected
✔		Aves	*Ixobrychus flavicollis*	Black Bittern	Native	Vulnerable NSW
✔		Aves	*Lathamus discolor*	Swift Parrot	Native	Endangered NSW, Cwlth
✔		Aves	*Limicola falcinellus*	Broad-billed Sandpiper	Migratory	Vulnerable NSW
	✔	Aves	*Manorina melanocephala*	Noisy Miner	Native	Protected
✔		Aves	*Nettapus coromandelianus*	Cotton Pygmy-Goose	Native	Endangered NSW
✔		Aves	*Ninox connivens*	Barking Owl	Native	Vulnerable NSW
✔		Aves	*Ninox strenua*	Powerful Owl	Native	Vulnerable NSW
✔		Aves	*Pandion cristatus*	Eastern Osprey	Native	Vulnerable NSW
✔		Aves	*Petroica boodang*	Scarlet Robin	Native	Vulnerable NSW
✔		Aves	*Polytelis swainsonii*	Superb Parrot	Native	Vulnerable NSW, Cwth
✔		Aves	*Ptilinopus superbus*	Superb Fruit-Dove	Native	Vulnerable NSW
	✔	Aves	*Strepera graculina*	Pied Currawong	Native	Protected
	✔	Aves	*Trichoglossus haematodus*	Rainbow Lorikeet	Native	Protected
✔		Aves	*Tyto novaehollandiae*	Masked Owl	Native	Vulnerable NSW
	✔	Insecta	*Apis mellifera*	European Honey Bee	Introduced	Unprotected
	✔	Insecta	*Nomia sp.*	Native Bee	Native	Unprotected
✔		Mammalia	*Cercartetus nanus*	Eastern Pigmy-possum	Native	Vulnerable NSW
✔		Mammalia	*Chalinolobus dwyeri*	Large-eared Pied Bat	Native	Vulnerable NSW, Cwth
	✔	Mammalia	*Chalinolobus gouldii*	Gould's Wattled Bat	Native	Protected
✔		Mammalia	*Dasyurus maculatus*	Spotted-tailed Quoll	Native	Vulnerable NSW, Endangered Cwth
✔		Mammalia	*Falsistrellus tasmaniensis*	Eastern False Pipistrelle Bat	Native	Vulnerable NSW
	✔	Mammalia	*Felis catus*	Cat	Introduced	Unprotected
✔		Mammalia	*Isoodon obesulus obesulus*	Southern Brown Bandicoot	Native	Endangered NSW, Cwlth
✔		Mammalia	*Miniopterus australis*	Little Bentwing-bat	Native	Vulnerable NSW
✔		Mammalia	*Miniopterus schreibersii oceanensis*	Eastern Bent-wing Bat	Native	Vulnerable NSW

OEH Wildlife Atlas (2015)	Recorded on Site	Class	Genus species	Common Name	Autochthony	Conservation Status
✔- Recorded / Identified, ✔θ Record Highly Probable, ✔ Record Probable, ✔ Record Likely / Possible. **Unprotected** / **Protected** - National Parks & Wildlife Act 1974 (NSW), **Vulnerable NSW** / **Endangered NSW** - NSW Threatened Species Conservation Act 1995 (NSW), **Critically Endangered Cwlth** / **Endangered Cwlth** / **Vulnerable Cwlth** - Environment Protection & Biodiversity Conservation Act 1999 (Cwlth)						
✔		Mammalia	*Mormopterus norfolkensis*	East-coast Free-tailed Bat	Native	Vulnerable NSW
	✔	Mammalia	*Mormopterus ridei*	Eastern Freetail Bat	Native	Protected
✔		Mammalia	*Myotis macropus*	Southern Myotis	Native	Vulnerable NSW
✔		Mammalia	*Petaurus australis*	Yellow-bellied Glider	Native	Vulnerable NSW
✔		Mammalia	*Pseudomys novaehollandiae*	New Holland Mouse	Native	Protected NSW, Vulnerable Cwlth
✔		Mammalia	*Pteropus poliocephalus*	Grey-headed Flying-fox	Native	Vulnerable NSW, Cwth
	✔	Mammalia	*Rattus rattus*	Black Rat	Introduced	Unprotected
✔		Mammalia	*Saccolaimus flaviventris*	Yellow-bellied Sheathtail Bat	Native	Vulnerable NSW
✔	✔	Mammalia	*Scoteanax rueppellii*	Greater Broad-nosed Bat	Native	Vulnerable NSW
	✔	Reptilia	*Lampropholis delicata*	Delicate Skink	Native	Protected
	✔	Reptilia	*Saltuarius swaini*	Southern Leaf-tailed Gecko	Native	Protected
✔		Reptilia	*Varanus rosenbergi*	Rosenberg's Goanna /Heath Monitor	Native	Vulnerable NSW

3.3.3 Ecological communities site data

The following table identifies ecological communities based upon community descriptions in determinations by NSW Scientific Committee and those described in the Native Vegetation of the Sydney Metropolitan Authority Area (OEH 2013) and include communities:

- listed in the schedules of the *Environment Protection & Biodiversity Conservation Act 1999 (Cwlth)* and recorded in the vicinity of the site (OEH, 2013);
- listed in the schedules of the *Threatened Species Conservation Act 1995 (NSW)* and recorded in the vicinity of the site (OEH, 2013);
- considered as possibly occurring within the region, and
- recorded on the site from field surveys.

OEH (2013)	Recorded On Site	Community name	Conservation Status
Vulnerable NSW / Endangered NSW - Threatened Species Conservation Act 1995 (NSW), **Critically Endangered Cwth** / **Endangered Cwth** / **Vulnerable Cwth** - Environment Protection & Biodiversity Conservation Act 1999 (Cwth)			
✔	✔ some component species	Blue Gum High Forest	Critically Endangered NSW, Cwlth
✔		Sydney Turpentine Ironbark Forest	Endangered NSW, Critically Endangered Cwlth
✔		Duffy's Forest	Endangered NSW

3.3.4 Population site data

The following table identifies threatened populations:

- listed in the schedules of the *Threatened Species Conservation Act 1995 (NSW)* and recorded within 5km of the site in the Wildlife Atlas (OEH, 2016) post 1950,
- recorded on the site as part of field surveys.

OEH Wildlife Atlas (2015)	Recorded on Site	Type	Population Name	Conservation Status
Vulnerable NSW / Endangered NSW - Threatened Species Conservation Act 1995 (NSW), **Critically Endangered Cwth** / **Endangered Cwth** / **Vulnerable Cwth** - Environment Protection & Biodiversity Conservation Act 1999 (Cwth)				
✔		Fauna	Gang-gang Cockatoo, *Callocephalon fimbriatum* (Grant), population in the Hornsby and Ku-ring-gai Local Government Areas	Endangered NSW

4. habitat assessment

4.1 Local & regional habitat context

The site is located within a developed residential area at Killara and is isolated from the larger bushland areas of Lane Cove National Park, to the west, and Garigal National Park, to the east.

Within the local area there are scattered pockets of indigenous trees in the parks, local streets and adjacent sports fields.

Beyond the boundaries of the subject site the Killara Golf Course extends to the west and south west and contains open grass areas, stands of remnant and planted trees and small pockets of bushland. Similar habitats exist on Gordon Golf Course to the north west of the site.

Figure 4.1 Aerial view of the subject site in context with the surrounding landuses

The faunal composition on the site is also influenced by more typical urban native fauna including aggressive species such as Pied Currawong (*Strepera graculina*) and Noisy Miner (*Manorina melanocephala*) or resilient, adaptable species such as Grass/Delicate Skink (*Lampropholis delicata*) and Common Brushtail Possum (*Trichosurus vulpecula*).

Trees and pockets of vegetation in urban areas can also typically provide core refuge habitat for some small mammals such Ringtail Possum (*Pseudocheirus peregrinus*). Whilst these may be considered common species they are often the prey of threatened species such as Powerful Owl (*Ninox strenua*).

Fauna that do not reside locally and have broader foraging ranges are expected to be able to frequent the site. Some of these species such as the Grey-headed Flying-fox (*Pteropus poliocephalus*) and Powerful Owl (*Ninox strenua*) are listed in the schedules of the *Threatened Species Conservation Act (NSW) 1995.*

The urban habitats are not considered to be breeding or foraging habitat for sensitive species such as Regent Bowerbird *(Sericulus chrysocephalus*), Red-capped Robin (*Petroica goodenovii*), and Scarlet Honeyeater (*Myzomela sanguinolenta*) whose range does not usually extend outside larger bushland reserves.

4.2 Local habitat connectivity

Being in a developed urban area, the local vegetation occurs as scattered trees amongst residential properties and within the golf course itself. There are no contiguous links of natural habitats between the site and the larger natural bushland habitats in Lane Cove National Park or Garigal National Park.

Fauna frequenting the site or moving through the site are typically those species capable of adapting or habituating to urban areas with fragmented habitats.

4.3 Site habitats

The subject site has been developed and the habitats have been extensively modified since prior to 1943.

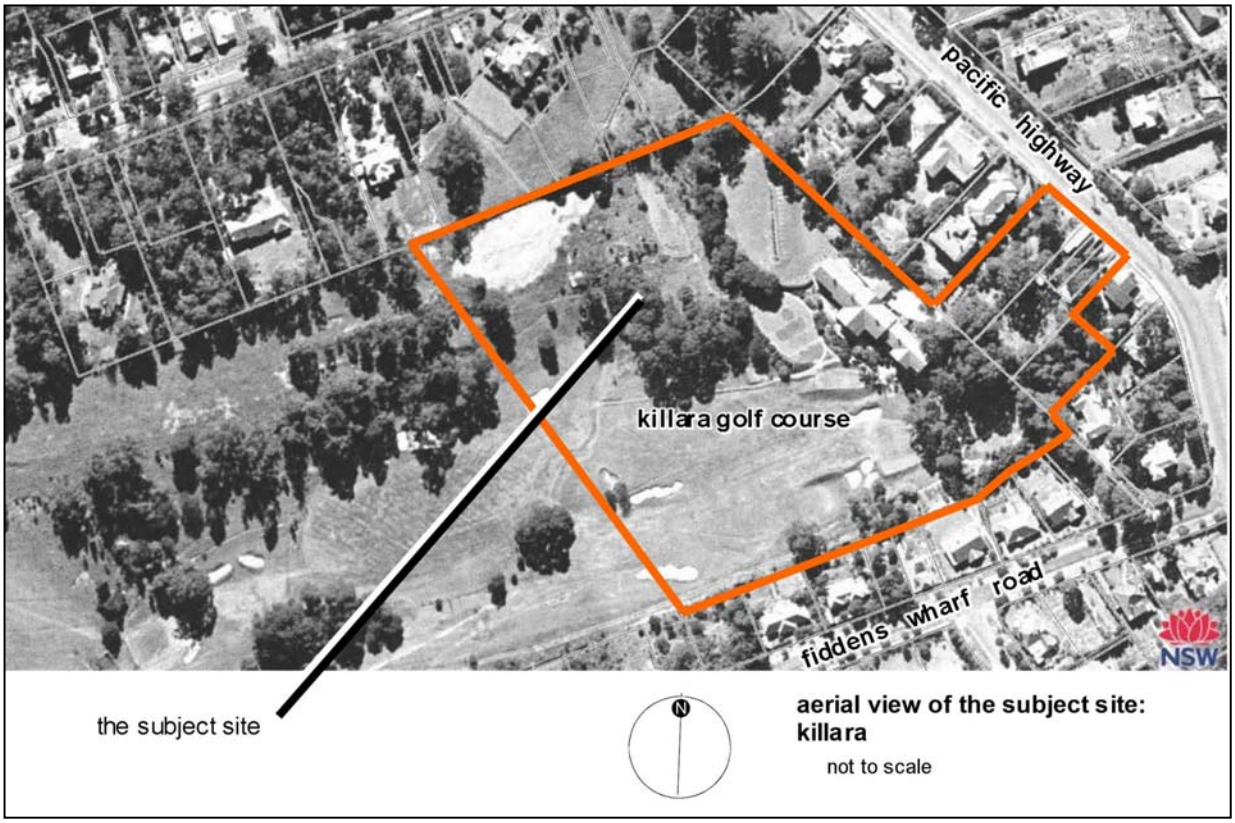

Figure 4.2 Aerial view of the subject site taken in 1943

4.3.1 Vegetation on the subject site

The vegetation on the site is dominated by large open grass areas, garden beds, and indigenous, non-indigenous native and exotic trees.

A number of indigenous species have been planted on the site including Sydney Blue Gums (*Eucalyptus saligna*) e.g. a semi-mature tree in a carpark traffic island, Spiny-headed Mat-rush (*Lomandra longifolia*) as landscape border plantings, Blueberry Ash (*Elaeocarpus reticulatus*) as vegetation screening.

Other indigenous species that are not characteristic of the habitats on the site and have been planted on the site include River Oak/River Sheoak (*Casuarina cunninghamiana*), Swamp Oak (*Casuarina glauca*) and Paperparks (*Melaleuca quinquenervia*), Dwarf/Scrub Apple (*Angophora hispida*) and Yellow Bloodwood (*Corymbia eximia*).

Two (2) threatened flora species were recorded on the site as part of the field surveys. These being:

- Magenta Lillypilly (*Syzygium paniculatum*), a single tree on the southern side of the 18 fairway adjacent the southern boundary of the site, and
- Wallangarra White Gum (*Eucalyptus scoparia*) as an individual tree adjacent the south eastern carpark.

Both of these species have been widely propagated by commercial nurseries and used in the horticultural / landscape industry.

Whilst the majority of the site contains exotic vegetation, this section of the report primarily highlights the indigenous and native vegetation on the site.

Figure 4.3 Typical view of the mix of vegetation on the site.

Figure 4.4 Formal character of the exotic vegetation adjacent the bowling greens on the site.

The main vehicle entrance into the golf club is off the Pacific Highway where vegetation is located garden beds either side of the driveway. The vegetation is dominated by several mature planted, non-indigenous Tallowwoods (*Eucalyptus microcorys*) towards the entrance with several Sydney Blue Gums (*Eucalyptus saligna*) are located towards the club house. The understorey primarily consists of exotic plants species. Parts of this area have been landscaped using indigenous species such as Spiny-headed Mat-rush (*Lomandra longifolia*) and native species such as Gymea Lily (*Doryanthes excelsa*).

Figure 4.5 The southern side of the entrance driveway off the Pacific Highway with a mature Sydney Blue Gum (*Eucalyptus saligna*) in the backdrop.

The carpark on the north western side of the clubhouse has been terraced and a low retaining wall has been formed partway along on the upslope eastern side. Several mature Sydney Blue Gums (*Eucalyptus saligna*) remain in this area along with mature non-indigenous native species such as Brushbox (*Lophostemon confertus*).

Figure 4.6 The north western carpark looking upslope with a mature Sydney Blue Gum (*Eucalyptus saligna*) and a mature non-indigenous Brushbox (*Lophostemon confertus*)

In the middle of the carpark a traffic island has been created within which both indigenous trees such Sydney Blue Gum (*Eucalyptus saligna*) and non-indigenous Tallowwoods (*Eucalyptus microcorys*) have been planted along with indigenous shrubs such as Spiny-headed Mat-rush (*Lomandra longifolia*)

The lower side of the north western carpark is dominated by exotic planting and includes non-indigenous species such as Scarlet Flowering Gum (*Eucalyptus ficifolia*). Straw Treefern (*Cyathea cooperi*) and Dwarf/Scrub Apple (*Angophora hispida*) have also been planted and these are not characteristic of the indigenous community that occurs on the site.

Adjacent the tennis courts exotic plantings occur along with plantings of River Oak/River Sheoak (*Casuarina cunninghamiana*), Swamp Oak (*Casuarina glauca*) and Paperparks (*Melaleuca quinquenervia*). These native species are also not characteristic of the natural habitats nor the original community, however the 3 mature Sydney Blue Gum (*Eucalyptus saligna*) occur in this area and remnant trees that are evident in the 1943 aerial photos (refer figure 4.2).

Below, to the south of the bowling greens, is a battered slope with a low retaining wall at the toe of the batter. This area contains a number of semi-mature Sydney Blue Gums (*Eucalyptus saligna*) along with planted Jacarandas (*Jacaranda mimosifolia*) and Gymea Lily (*Doryanthes excelsa*). Based upon the 1943 aerial photos, this area appears to have been cleared of native vegetation in the past.

Figure 4.7 The low retaining wall at the toe of the batter below the bowling greens.

Below the carpark to the south east of the club house the battered slope contains a mature remnant Sydney Blue Gums (*Eucalyptus saligna*) along with some immature saplings. Below this slope is the cleared grass terrace used for putting and driving practice beyond which is a stand of semi-mature Sydney Blue Gums (*Eucalyptus saligna*) in an open mulched area.

Figure 4.8 The slope below the south eastern carpark with a mature remnant Sydney Blue Gum (*Eucalyptus saligna*) along with some immature saplings.

Figure 4.9 The stand of semi-mature remnant Sydney Blue Gums (*Eucalyptus saligna*) to the south of the practice green.

The allotments known as 552 & 554 Pacific Highway, Killara are extensively developed and contain little or no vegetation.

Figure 4.10 The rear of 552 & 554 Pacific Highway, Killara

4.3.2 Fauna habitats

The topography over the subject site ranges from being moderate to gently sloping. In terms of natural habitat there are no rock outcrops, caves or rock undercroft areas. There is no defined watercourse or standing water on the subject site and stormwater flows through either piped drains or overland sheet flow.

The trees on the subject site do not contain large habitat hollows suitable for large forest owls, however the taller canopy trees may contain smaller hollows.

One (1) threatened fauna species was recorded on the site as part of the field surveys being the Greater Broadnosed Bat (*Scoteanax rueppellii*) recorded during 1 night of a 6 night survey

There are a number of microchiropteran bat species that are known to occur within the vicinity of the site. These include the more common Gould's Wattled Bat (*Chalinolobus gouldii*) along with others such as Eastern Free-tail Bat (*Mormopterus ridei*).

The subject site is not considered to be habitat for native ground dwelling mammals nor Gliders (*Petaurus sp.*), however arboreal mammals such as Common Ringtail Possum (*Pseudocheirus peregrinus*) and Common Brushtail Possum (*Trichosurus vulpecular)* are likely to occur. The Eucalyptus sp. on and adjacent the site, may provide regional foraging opportunities when in flower for more mobile species such as Grey-headed Flying-fox (Pteropus poliocephalus).

Noisy Miners (*Manorina melanocephala*) and Rainbow Lorikeets (*Trichoglossus haematodus*) were observed on and adjacent the site and were the dominant bird species. Other bird species such as Sulphur-crested Cockatoo (*Cacatua galerita*) Laughing Kookaburra (*Dacelo novaeguineae*) and Australian Raven (*Corvus coronoides*) were also heard calling in the local area or were observed on the site. These species are considered to be typical of the resilient and aggressive avifauna found in urban areas where some tree cover remains and these species are known to adapt and survive well in urban landscapes.

The range and populations of several native hollow using bird species has increased significantly since European settlement (Gibbons & Lindenmayer, 2002) and these species typically include Rainbow Lorikeet (*Trichoglossus haematodus*) and Sulphur-crested Cockatoo (*Cacatua galerita*). Being more resilient to habitat modification and/or aggressive to other species, these species tend to dominate where there is competition for nest sites.

Noisy Miners (*Manorina melanocephala*) are also known to defend territories and aggressively drive other bird species away. It is thought that aggressive species particularly Noisy Minors (*Manorina melanocephala*) may be displacing the threatened species Regent Honeyeater (*Xanthomyza phrygia*) (Franklin et al., 1989, Grey et al., 1998).

Avifauna studies in urban areas have identified that many bird species are selective in their habitat and foraging range, depending upon the extent of tree cover (Catterall, Green & Jones 1991). Certain species are restricted to forest areas, others prefer the forest edges, some have a preference for treed suburbs and others favour urban areas with little tree cover. Although the study was restricted to birds they can be considered surrogate indicators for the types of fauna species expected to be found. The modified structure of the vegetation in the surrounding developed urban areas and the lineal extent of the riparian vegetation is likely to provide habitats for species that have habituated to urban areas.

The faunal composition in the subject site is considered to be consistent with that found in the local urban areas and the faunal compositions in these areas tend to be:

- aggressive or dominating species such as Rainbow Lorikeet (*Trichoglossus haematodus*) and Noisy Miner (*Manorina melanocephala*);
- resilient and adaptable species such as Common Brushtail Possum (*Trichosurus vulpecular);*
- species that reside off site in larger bushland reserves and have broad foraging ranges such as Powerful Owl (*Ninox strenua*) and Grey-headed Flying-fox (*Pteropus poliocephalus),* and
- occasional species that seasonally migrate from other areas and take advantage of breeding and foraging opportunities such as Channel-billed Cuckoo (*Scythrops novaehollandiae)*.

4.4 External influences affecting habitat potential

Being surrounded by urban developments the potential habitat on the site is influenced by the adjacent activities. These external influences include vehicular movements, noise, modified habitats and the presence of domestic pets all of which limit the site's potential as habitat for ground native dwelling fauna.

4.5 Ecological community prior to the original development

With very few indigenous flora species on the site it is difficult to positively classify the vegetation community that existed prior to the original development using published floristic models, however the site contains canopy tree species that are characteristic of the Blue Gum High Forest. Published vegetation mapping (OEH 2013) also indicates that the indigenous tree canopies as being characteristic of the Blue Gum High Forest.

Based upon the remnant trees on the site, indigenous trees in the surrounding area, the geographical location of the site, the local topography and published mapping; it is considered that the original vegetation prior to development of the site (pre 1943) was consistent with that currently described by the NSW Scientific Committee (2007) as the critically endangered Blue Gum High Forest ecological community.

4.6 Critical habitat

Critical habitat is declared under the provisions of the *Threatened Species Conservation Act 1995 (NSW)* and this site is not listed as being part of any gazetted critical habitat. Currently the critical habitats listed in the schedules of the Act are

- Gould's Petrel;
- Little Penguin habitat in Sydney's North Harbour;
- Mitchell's Rainforest Snail in Stott's Island Nature Reserve;
- *Wollemia nobilis* (The Wollemi Pine);
- *Bomaderry zieria* within the Bomaderry bushland - critical habitat recommendation, and
- Eastern Suburbs Banksia Scrub Endangered Ecological Community - critical habitat recommendation.

The site is not considered to be critical habitat for the purposes of the *Threatened Species Conservation Act 1995 (NSW)*.

5. blue gum high forest

5.1 Critically Endangered Ecological Community - Blue Gum High Forest

The Blue Gum High Forest was initially listed in the schedules of the *Threatened Species Conservation Act 1995 (NSW)* as an endangered ecological community on 5th September 1997.

In 2002 amendments were made to the *Threatened Species Conservation Act 1995 (NSW)* introducing new categories to the schedules of Act. On the 20th April 2007 the Blue Gum High Forest was declared as being a critically endangered ecological community, which was the first community in NSW to be listed in this category.

Prior to European settlement, about 200 years ago, Blue Gum High Forest is estimated to have covered an area of approximately 3,700 ha. Blue Gum High Forest has a very highly restricted geographic distribution, and is currently estimated to cover an area of 180 ha (Tozer 2010). Its current extent amounts to less than 10% of this original distribution. The distribution comprises a series of small remnant patches with an estimated 20ha in conservation reserves (Tozer 2010).

Highly modified relics of the community also persist as small clumps of trees without a native understorey. All remnants of the community are now surrounded by urban development and consequently, the distribution of Blue Gum High Forest is severely fragmented. (NSW Scientific Committee, 2007).

The dominant eucalypts of the community live for several hundred years. Blue Gum High Forest has therefore undergone a dramatic reduction in its geographic distribution within a time span appropriate to the life cycle and habitat characteristics of its component species. Small-scale clearing associated with residential subdivision, road upgrading, extension and maintenance of service easements, etc. pose a threat of ongoing decline in the extent of the community. Clearing of native vegetation is also listed as a Key Threatening Process under the *Threatened Species Conservation Act 1995 (NSW),* (NSW Scientific Committee, 2007) and is relevant to this community.

5.2 Determining the extent of the Blue Gum High Forest ecological community

Where highly modified relics of the Blue Gum High Forest occur as individual trees in modified urban environments, the extent of habitat is often determined by the extent of tree canopy cover.

This method, however, may be problematic in developed urban areas where buildings, retaining walls, constructed infrastructure or other paved areas are often constructed beneath the canopy of indigenous trees and these are likely to restrict radial pattern of tree root development and the extent of habitat of individual trees. In other situations, where excavation or fill material has changed the soil levels, the original habitat may not exist.

5.3 Extent & nature of the Blue Gum High Forest on the subject site in relation to the *Threatened Species Conservation Act 1995 (NSW)*

The subject site has been extensively modified and a number of indigenous and non-indigenous trees have been planted. In relation to the indigenous trees on subject site, the NSW Scientific Committee (2007) states that the extent of the community can persist as highly modified relics as small clumps of trees without a native understorey. The term “relic” implies that the tree must be of an age class which has some association with the past.

The extent of the critically endangered Blue Gum High Forest ecological community on the site determined by the extent of habitat of the mature indigenous canopy trees. Whilst some large mature trees are obviously considered “relics” the extent of the community has also been extended, as a precautionary practice, to include the majority of locally indigenous trees on the subject site.

Some small patches of resilient indigenous ground cover species can be found in the open lawn and garden areas, however with the absence of canopy trees, modified habitat conditions and dominance of exotic ground cover species; it is unlikely that the community will recover in these areas by natural regeneration processes. Outside the habitats of the indigenous trees, the site does not contain habitat of the Blue Gum High Forest.

In comparison with Blue Gum High Forest that occurs in natural undisturbed habitats, the community on this site is simplified in terms of species diversity and structural complexity. Despite this the indigenous trees on the site satisfy the description of the Blue Gum High Forest by the NSW Scientific Committee (2007)

The extent of indigenous canopy trees and the extent of the critically endangered Blue Gum High Forest ecological community is shown in Figure 5.1 of this report.

5.4 Extent & nature of the Blue Gum High Forest on the site in relation to the Environment Protection & Biodiversity Act 1999 (Cwlth)

The Blue Gum High Forest of the Sydney basin Bioregion is listed as a critically endangered ecological community in the Environment Protection and Biodiversity Conservation Act 1999 (Cwlth).

There are however significant differences between the Commonwealth and State descriptions of the community. Only high quality remnant patches with characteristic native plant species present in all structural layers are considered to be the Blue Gum High Forest community for the purposes of the Environment Protection and Biodiversity Conservation Act 1999 (Cwlth) and in particular where the forest has native species in all structural layers and occurs in:

- Patch areas are > 1 hectare with a tree canopy cover of > 10%, or
- Patch areas are > 1 hectare with a tree canopy of < 10% within areas of native vegetation area of > 5 hectares

Stands of trees that are characteristic of the canopy of the Blue Gum High Forest where the native forest understorey is absent are not considered to be Blue Gum High Forest for the purposes of the Environment Protection and Biodiversity Conservation Act 1999 (Cwlth), however they are recognised as being important biodiversity reservoirs.

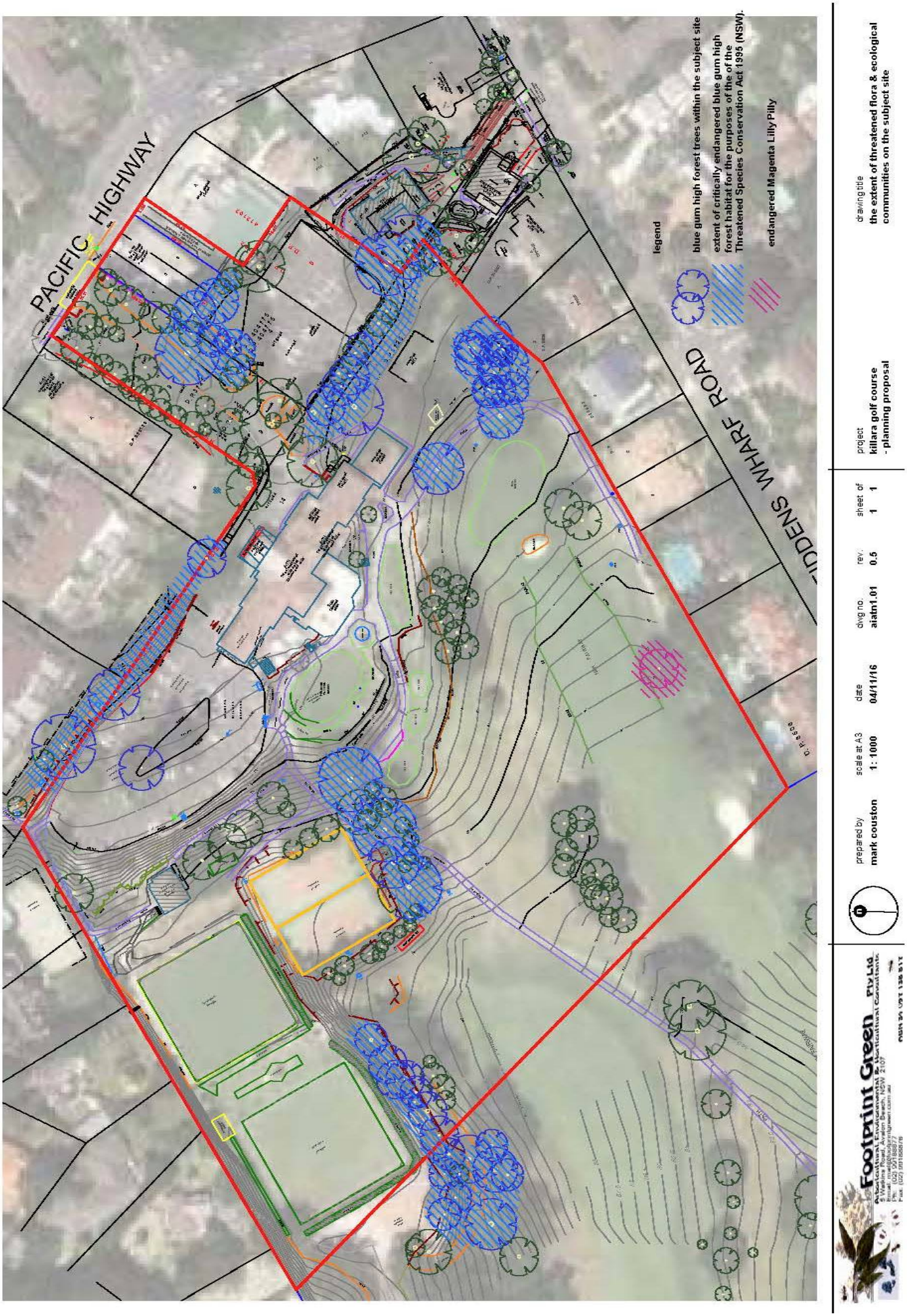

Figure 5.1 The extent of threatened flora & ecological communities on the site.

6. relationship between threatened species and site habitats

6.1 Threatened species habitat assessment

The following assessment is made in relation to threatened species, communities or populations identified in the previous data tables despite whether they were recorded as part of the field surveys associated with this report or have been recorded previously in the vicinity of the site. The following habitat assessment takes into account the habitats on the site and the relationship between these habitats and those of threatened species, communities and populations.

In accordance with the Threatened Species Assessment Guidelines (OEH, 2007) if adequate surveys/studies have been carried out that clearly show that a species: does not occur within the study area; will not use the habitats on the site on occasion, or will not be influenced by off-site impacts, the species does not need further consideration.

6.2 Threatened flora habitat assessment

Conservation Status	Genus species	Common Name	Habitat Requirements	No. of records within 10km grid search (OEH, 2015)	Likelihood of Occurrence on site	Relationship to the site
✕ Site not considered significant habitat for the species, ✔ Potentially affected community requiring consideration in the site planning process and potentially requires assessment under s.5a of *Environmental Planning and Assessment Act 1979 (NSW)*						
Vulnerable NSW, Cwth	*Acacia pubescens*	Downy Wattle	*Acacia pubescens* is restricted to the Sydney region and its distribution is concentrated around the Bankstown-Fairfield-Rookwood area and the Pitt Town area, with isolated occurrences at Barden Ridge, Oakdale and Mountain Lagoon. The species occurs in open woodland and forest, in a number of plant communities including Cooks River / Castlereagh Ironbark Forest, Shale Gravel Transition Forest or Shale Plains Woodland. The topography of the habitat of the species is flat to gently undulating, a characteristic of the Cumberland Plain region (Bannerman & Hazelton 1989).	1	Habitat not present, unlikely to occur	✕
Vulnerable NSW	*Callistemon linearifolius*	Netted Bottle Brush	The species has been recorded growing in dry sclerophyll forest on the coast and adjacent ranges. Its known distribution occurs from the Georges River to Hawkesbury River in the Sydney area and north to Nelson Bay. Other records in 2000 have been from Coal Cliffs in the Southern Rivers CMA. Within the Sydney area, recent records are predominately limited to the Hornsby Plateau area near the Hawkesbury River and 4 records of the species also occur within Pittwater. Currently only 5-6 populations of the previous 22 populations remain. Three of these populations occur within Ku-ring-gai Chase National Park, Lion Island Nature Reserve, and Spectacle Island Nature Reserve.	7	Habitat not present, unlikely to occur	✕
Vulnerable NSW, Cwth	*Cryptostylis hunteriana*	Leafless Tongue-orchid	The species flowers from December through to February, often in association with *Cryptostylis erecta* and *Cryptostylis subulata*. Flowers are green, red, black, and are carried on an auxiliary (lateral) raceme. It is chiefly a coastal species but can be found in a range of habitats including areas bordering swamps to open forest. This species, favours dry sclerophyll forests, heaths, dunes (including stabilised sands), riparian areas, swampy forests, swampy areas and wetlands.	1	Habitat not present, unlikely to occur	✕
Vulnerable NSW, Cwth	*Darwinia biflora*	-	Occurs on the edges of weathered shale capped ridges particularly at the interface with Hawkesbury sandstone. Most sites are on Lucas Heights Soil Landscape. The vegetation association often includes *Eucalyptus haemastoma, Corymbia gummifera* and or *E. squamosa* and the structure is usually woodland, open forest or scrub-heath (OEH, 2003).	156	Habitat not present, unlikely to occur	✕
Vulnerable NSW	*Epacris purpurascens var. purpurascens*	-	*Epacris purpurascens var. purpurascens* is found at 30 locations in and around Sydney extending from Gosford in the north, Narrabeen in the east, Silverdale in the west and Avon Dam vicinity in the south. Its habitat consists of ridgetop drainage depressions supporting wet heath within or adjoining shale cap communities such as Stringybark and Ironbark woodlands and various shale/sandstone transition forest (OEH, 2002).	11	Habitat not present, unlikely to occur	✕
Vulnerable NSW, Cwth	*Eucalyptus camfieldii*	Heart-Leaved Stringybark	This species is found on lateritic soils of the Mittagong formation and in Hawkesbury sandstone. Usually located on upper slopes and ridge tops its habitat is characterized by well drained soils and associated with dry sclerophyll woodlands and scrub.	11	Habitat not present, unlikely to occur	✕

Conservation Status	Genus species	Common Name	Habitat Requirements	No. of records within 10km grid search (OEH, 2015)	Likelihood of Occurrence on site	Relationship to the site
✖ Site not considered significant habitat for the species, ✔ Potentially affected community requiring consideration in the site planning process and potentially requires assessment under s.5a of *Environmental Planning and Assessment Act 1979 (NSW)*						
Vulnerable NSW	*Eucalyptus nicholii*	Narrow-Leaf Peppermint	The species is endemic on the northern tablelands of NSW however it is widely planted as an urban street tree and in gardens It is quite rare in the wild and is confined to the New England Tablelands of NSW, where it occurs from Nundle to north of Tenterfield, largely on private property. The species grows in dry grassy woodland, on shallow and infertile soils, mainly on growing on porphyry or granite soils (Brooker & Kleinig, 1999).	2	Habitat not present, outside the natural range of the species	✖
Endangered NSW, Vulnerable Cwth	*Eucalyptus scoparia*	Wallangarra White Gum	Occuring mainly in Queensland, the species reaches its southern natural distribution limits in northern NSW. There are only 3 known natural locations where small populations occur. All 3 locations occur in the Tenterfield area none of which occur in conservation reserves (OEH 2002). The species has been used in the horticultural industry and has been planted widely as a street tree and as an ornamental species around Sydney.	0	Habitat not present, outside the natural range of the species, but recorded on site.	✔
Vulnerable NSW	*Genoplesium baueri*	Midge Orchids	Is a terrestrial herb that grows in sparse sclerophyll forests and moss gardens over sandstone from the Hunter Valley to the Nowra district (Harden 1993). The species has been recorded from locations between Nowra and Pittwater and may occur as far north as Port Stephens. About half the records were made before 1960 with most of the older records being from Sydney suburbs including Asquith, Cowan, Gladesville, Longueville and Wahroonga. The species has been recorded at locations now likely to be within the following conservation reserves: Berowra Valley Regional Park, Royal National Park and Lane Cove National Park (NSW Scientific Committee 2004).	1	Habitat not present, unlikely to occur	✖
Vulnerable NSW, Cwth	*Grevillea parviflora subsp. Parviflora*	Small-flower Grevillea	The occurs in sandy or light clay soils usually over thin shales, often with lateritic ironstone gravels and nodules. Sydney region occurrences are usually on Tertiary sands and alluvium, and soils derived from the Mittagong Formation. Soil landscapes include Lucas Heights or Berkshire Park (NSW Scientific Committee 1998),	1	Habitat not present, unlikely to occur	✖
Endangered NSW, Cwlth	*Haloragodendron lucasii*	Hal	Found in the upper reaches of Middle Harbour and Cowan Creek it is usually found growing in moist damp sandstone habitats with shallow soils adjacent creeks or adjacent soaks associated with sandstone benches.	17	Habitat not present, unlikely to occur	✖
Critically Endangered NSW	*Hibbertia sp. Turramurra*	Julian's Hibbertia	The species is known to grow in a forest with canopy species including *Eucalyptus pilularis, E. resinifera, Corymbia gummifera* and *Angophora costata* with an open understorey containing species within the families of Poaceae, Orchidaceae and Fabaceae. The species is endemic to NSW where it is restricted to three known locations in the northern Sydney suburbs of Turramurra, North Ryde and Cheltenham (NSW Scientific Committee 2015).	1	Habitat not present, unlikely to occur	✖
Vulnerable NSW, Cwth	*Lasiopetalum joyceae*	-	The species is typically occurs on ridgetops of the Hornsby Plateau and is known to occur from at 34 sites between Berrilee and Duffys Forest. It is an erect open shrub and is found growing on shale/sandstone transitional soils often associated with laterites. It can be found growing within a variety of communities ranging from open forests, woodlands & heathland.	1	Habitat not present, unlikely to occur	✖
Vulnerable NSW, Cwth	*Leptospermum deanei*	-	Found in Devlin's Creek in Pennant Hills Park, Cheltenham, amongst sandstone rocks in sandy soil adjacent creek/watercourse and occurs in woodland on lower hill slopes or near creeks with sandy alluvial soil or sand over sandstone.	4	Habitat not present, unlikely to occur	✖

Conservation Status	Genus species	Common Name	Habitat Requirements	No. of records within 10km grid search (OEH, 2015)	Likelihood of Occurrence on site	Relationship to the site
✘ Site not considered significant habitat for the species, ✔ Potentially affected community requiring consideration in the site planning process and potentially requires assessment under s.5a of *Environmental Planning and Assessment Act 1979 (NSW)*						
Vulnerable NSW, Cwth	*Melaleuca deanei*	Deane's Melaleuca	Found in similar habitats to *Darwinia biflora*, it occurs on the edges of weathered shale capped ridges particularly at the intergrade with Hawkesbury sandstone. Most sites are on Lucas Heights Soil Landscape and prefers an open habitat.	7	Habitat not present, unlikely to occur	✘
Endangered NSW, Cwlth	*Persoonia hirsuta*	Hairy Geebung	The species typically grows on sandstone amongst heath and low woodland. It has been recorded growing in the Duffy's Forest association on lateritic soils. It occurs in small numbers in woodlands and dry sclerophyll forest on sandstone and is known from a number of locations from Gosford and Hill Top to Glen Davis, at Putty and in the Royal National Park.	1	Habitat not present, unlikely to occur	✘
Vulnerable NSW, Cwth	*Pimelea curviflora var. curviflora*	Curved Rice-flower	This species is confined to the coastal areas around Sydney found growing on Hawkesbury sandstone (Harden 2000) or on lateritic soils in similar habit to that occupied by the Duffys Forest association (Smith & Smith 2000).	4	Habitat not present, unlikely to occur.	✘
Vulnerable NSW, Cwth	*Syzygium paniculatum*	Magenta Lillypilly	The species has been known to be associated with coastal dunes and Littoral Rainforest and is also found in riparian habitats (Payne 1997). The species has been commercially propagated and sold and is known to have been planted in a variety of urban habitats. The species has been recorded growing on moist slopes on Narrabeen Group geology (Smith & Smith 2000).	15	A mature specimen occurs on the golf course.	✔
Vulnerable NSW, Cwth	*Tetratheca glandulosa*	Glandular Pink-bell	This species typically grows on dryer open sites of Hawkesbury sandstone and can be found in open forests, woodlands and scrub. Grows in sandy or rocky heath or scrub (Gardner & Murray ex. Harden 1992).	21	Habitat not present, unlikely to occur.	✘

6.3 Threatened fauna habitat assessment

Conservation Status (NSW)	Class	Genus species	Common Name	Habitat	No. of records within 10km grid search (OEH, 2015)	Likelihood of Occurrence on site	Relationship to the site
✘ Site not considered significant habitat for the species, ✔ Potentially affected species requiring consideration in the site planning process and subsequent development on the site.							
Vulnerable NSW, Cwth	Amphibia	*Heleioporus australiacus*	Giant Burrowing Frog	Sandy soil on sandstone ridges where sandy creek banks provide opportunities for burrowing. Tadpoles are typically found in rocky pools in the upper reaches of permanent and ephemeral creeks (Mahoney 1993)	3	Habitat not present, unlikely to occur.	✘
Endangered NSW, Vulnerable Cwth	Amphibia	*Litoria aurea*	Green and Golden Bell Frog	The species has a range extending at lower altitudes along eastern NSW and eastern Victoria. Its habitat includes in and at the edges of permanent slow moving or still, streams ponds, swamps and dams (Cogger 2000) and requires well-vegetated creeks, dams and swamps.	3	Habitat not present, unlikely to occur.	✘
Vulnerable NSW	Amphibia	*Pseudophryne australis*	Red-crowned Toadlet	Red-crowned Toadlets do not usually live along permanent flowing water courses such as occur in gullies, instead preferring permanently moist soaks, areas of dense ground vegetation or litter along or near head-water stream beds. It is known to inhabit upper forested slopes and ridges on Hawkesbury sandstone or Narrabeen group preferring is moist sandstone habits with grass and debris near ephemeral watercourses. Red-crowned Toadlets have not been recorded breeding in permanently flowing streams or waters that are even mildly polluted (OEH, 2002).	66	Habitat not present, unlikely to occur.	✘
Endangered NSW, Cwth	Aves	*Anthochaera phrygia*	Regent Honeyeater	Once considered abundant across south-eastern Australia its population is in decline (Garnett 1992), In New South Wales, the species are mostly recorded in forest associations of box/ironbark and they prefer the wetter sites within these associations. Riparian forests of *Casuarina cunninghamiana* (River Oak) with *Amyema ambagei*, (Needle-leaf Mistletoe) are also important for feeding and breeding. Nectar is the principal food, but sugary exudates from insects are also used, and insects are essential for breeding (Oliver, 1998, 2000). Important feed trees are *Eucalyptus sideroxylon* (Mugga Ironbark), *Eucalyptus albens* (White Box), *Eucalyptus melliodora* (Yellow Box) and *Eucalyptus leucoxylon* (Yellow Gum) however the species also use other woodland types and wet lowland coastal forest dominated by *Eucalyptus robusta* (Swamp Mahogany) or *Corymbia maculata* (Spotted Gum) when shortages of preferred food trees occur (Franklin et al., 1989, Ley and Williams, 1992, Webster and Menkhorst, 1992, Geering and French, 1998, Oliver, 1999). It is thought that aggressive species particularly *Manorina melanocephala* (Noisy Miner) may be displacing the Regent Honeyeater (Franklin et al., 1989, Grey et al., 1998).	4	Core breeding habitat not present, low seasonal foraging habitat present likely to be displaced by urban avifauna, Unlikely to occur.	✘

Conservation Status (NSW)	Class	Genus species	Common Name	Habitat	No. of records within 10km grid search (OEH, 2015)	Likelihood of Occurrence on site	Relationship to the site
✗ Site not considered significant habitat for the species, ✔ Potentially affected species requiring consideration in the site planning process and subsequent development on the site.							
Vulnerable NSW	Aves	*Botaurus poiciloptilus*	Australasian Bittern	The Australian Bittern inhabits terrestrial and estuarine wetlands, generally where there is permanent water. The species prefers shallow, freshwater or brackish swamps and wetlands with dense vegetation, including sedges, rushes and reeds. (Marchant & Higgins 1990; Garnett 1992). The nest is constructed of trampled reeds and rushes and is generally located amongst dense vegetation over shallow water and at dusk, the species forages in shallow water up to 30cm deep, primarily feeding on frogs, fish, invertebrates (including crayfish), leaves and fruit (Barker & Vestjens 1989).	2	Habitat not present, unlikely to occur.	✗
Vulnerable NSW	Aves	*Callocephalon fimbriatum*	Gang-gang Cockatoo	With a range restricted to south eastern NSW and south eastern Victoria the species feeds on terminal leaves of eucalypts or in hawthorn hedges and nests in deep hollows in eucalypts (Slater 1993). The species occurs in a variety of forests and woodlands and the last known breeding population in metropolitan Sydney area is in the Hornsby/ Ku-ring-gai area. The species shows a strong nest site fidelity (NSW Scientific Committee 2001).	39	Core breeding habitat not present, low foraging potential Unlikely to occur.	✗
Vulnerable NSW	Aves	*Calyptorhynchus lathami*	Glossy Black-Cockatoo	Considered rare in a national context, but moderately common in N.S.W. Because of its dependence on one type of food it is considered to be vulnerable. It nests in large hollows of dead trees and roosts in both wet and dry eucalypts, feeding in open Casuarina woodland, primarily where the Black She-oak (*Allocasuarina littoralis*) and Forest Oak (*Allocasuarina torulosa*) occurs.	11	Core breeding habitat not present, foraging habitat not present. Unlikely to occur	✗
Vulnerable NSW	Aves	*Daphoenositta chrysoptera*	Varied Sittella	The Varied Sittella inhabits forests and woodlands in over most of the Australian mainland except the treeless deserts and open grasslands. Distribution in NSW is nearly continuous from the coast to the far west (OEH, 2005). The species is considered to be sedentary and often re-uses the same upright fork or tree in successive years for nesting. The Varied Sittella feeds on arthropods gleaned from crevices in rough or decorticating bark, dead branches, standing dead trees, and from small branches and twigs in the tree canopy. The sedentary nature of the Varied Sittella makes cleared agricultural land a potential barrier to movement. Survival and population viability are sensitive to habitat isolation, reduced patch size and habitat simplification, including reductions in tree species diversity, tree canopy cover, shrub cover, ground cover, logs, fallen branches and litter (NSW Scientific Committee 2010). The Varied Sittella is also adversely affected by the dominance of Noisy Miners in woodland patches (NSW Scientific Committee 2010).	2	Disturbed open landscape is not considered to be habitat and it is likely to be displaced by urban avifauna, Unlikely to occur.	✗

Conservation Status (NSW)	Class	Genus species	Common Name	Habitat	No. of records within 10km grid search (OEH, 2015)	Likelihood of Occurrence on site	Relationship to the site
✖ Site not considered significant habitat for the species, ✔ Potentially affected species requiring consideration in the site planning process and subsequent development on the site.							
Endangered NSW	Aves	*Ephippiorhynchus asiaticus*	Black-necked Stork	The species inhabits permanent freshwater wetlands including margins of billabongs, swamps, shallow floodwaters, and adjacent grasslands and savannah woodlands; can also be found occasionally on inter-tidal shorelines, mangrove margins and estuaries. Feeds in shallow, still water on a variety of prey including fish, frogs, eels, turtles, crabs and snakes. A large nest, up to 2 m in diameter, is made in a live or dead tree, in or near a freshwater swamp. The species is widespread across coastal northern and eastern Australia, becoming increasingly uncommon further south into NSW, and rarely south of Sydney. Some birds may move long distances and can be recorded well outside their normal range (NSW Scientific Committee, 2008).	1	Habitat not present, unlikely to occur.	✖
Vulnerable NSW	Aves	*Glossopsitta pusilla*	Little Lorikeet	Little Lorikeet occur along the east coast of Australia from Cairns to Adelaide. In New South Wales their distribution extends from the coast to the western slopes of the Great Dividing Range to Albury, Parkes, Dubbo and Narrabri (Barrett et al. 2003).They are generally considered to be nomadic and individuals can at any time of year when nectar and pollen, particularly on profusely-flowering eucalypts, is available. The species also feed on flowering Melaleucas and Mistletoes. (NSW Scientific Committee, 2009). Little Lorikeets nest in small hollows usually in live trees and nest-hollows are used "traditionally", with the same hollow known to be occupied for at least 29 years (not necessarily by the same individuals) (Courtney & Debus 2006). The breeding season extends from May to September (Higgins 1999).	6	Core breeding habitat limited by competition with resident urban fauna, low foraging potential. Unlikely to occur	✖
Vulnerable NSW	Aves	*Haematopus fuliginosus*	Sooty Oystercatcher	Sooty Oystercatchers are found around the entire Australian coast, and the offshore islands, being most common in Bass Strait. Small numbers of the species are evenly distributed along the NSW coast. The species breeds in spring and summer, almost exclusively on offshore islands, and occasionally on isolated promontories (OEH, 2005) and is not known to breed in northern Sydney (Smith & Smith 2000). The species foraged on inter-tidal rock platforms along the coast favouring rocky headlands, rocky shelves, exposed reefs with rock pools, beaches and muddy estuaries where it feeds limpets and mussels.	3	Habitat not present, unlikely to occur.	✖
Vulnerable NSW	Aves	*Hieraaetus morphnoides*	Little Eagle	The Little Eagle occurs throughout Australia and occupies habitats that are rich in prey within open eucalypt forest, woodland or open woodland habitats. Sheoak or acacia woodlands and riparian woodlands of interior NSW are also used. The species nests in tall living trees within a remnant patch of vegetation, where pairs build a large stick nest in winter and lay in early spring. The species preys on birds, reptiles and mammals and occasionally large insects (NSW Scientific Committee, 2009).	7	Core breeding habitat not present and limited by competition with resident urban fauna, low foraging potential. Unlikely to occur	✖

Conservation Status (NSW)	Class	Genus species	Common Name	Habitat	No. of records within 10km grid search (OEH, 2015)	Likelihood of Occurrence on site	Relationship to the site
✗ Site not considered significant habitat for the species, ✔ Potentially affected species requiring consideration in the site planning process and subsequent development on the site.							
Vulnerable NSW	Aves	*Ixobrychus flavicollis*	Black Bittern	Is known to inhabit mangroves and streamside vegetation including small creeks. Feeding is mostly undertaken at night where they stand and wait for small insects, crustaceans and small fish.	4	Habitat not present, unlikely to occur.	✗
Endangered NSW, Cwlth	Aves	*Lathamus discolor*	Swift Parrot	The Swift Parrot inhabits eucalypt forests and breeds in hollows of mature and senescing trees in Tasmania. On the mainland it feeds off winter flowering Eucalypts although it will also feed on lerps, honeydew, Banksia nectar, fruits, seeds and other plant material as well as insects and their larvae (Forshaw & Cooper 1981, Garnett 1992). In New South Wales important foraging tree species include, *Eucalyptus macrocarpa* (Grey Box), *Eucalyptus sideroxylon* (Mugga Ironbark) on the western slopes and *Eucalyptus tereticornis* (Forest Red Gum), *Eucalyptus fibrosa* (Red Iron Bark), *Corymbia maculata* (Spotted Gum), *Eucalyptus robusta* (Swamp Mahogany) and *Corymbia gummifera* (Red Bloodwood) (Swift Parrot Recovery Team, 2000). Since 1980 there have been some 60 sightings recorded in the Wildlife Atlas database (OEH 2016) within the Sydney Metropolitan Areas and locally small flocks were reported at Ingleside in 1986 (Cooper 1990). In 1938 hundreds of Swift Parrots were reported feeding in *Eucalyptus robusta* (Swamp Mahogany) in Warriewood (Hindwood 1939).	6	Not considered to be core breeding habitat, low winter foraging opportunities available. Unlikely to occur	✗
Vulnerable NSW	Aves	*Limicola falcinellus*	Broad-billed Sandpiper	Migrant from Eurasia and is common to mudflats, saltmarsh estuaries and occasionally fresh water swamps. Scarce migrant to the Sydney Bioregion.	1	Habitat not present, unlikely to occur.	✗
Endangered NSW	Aves	*Nettapus coromandelianus*	Cotton Pygmy-Goose	It is locally common in eastern Queensland and is rare in NSW. Its typical habitat is lilly covered lagoons, dams and ponds (Slater 1993).	4	Habitat not present, unlikely to occur.	✗
Vulnerable NSW	Aves	*Ninox connivens*	Barking Owl	The species can be found inhabiting eucalypt forests, paperbark and other woodlands, dense scrubs, foothills; river red gums and other large trees near watercourses. The species is dependent on large hollows of mature eucalypts for nests. The bird feeds on prey such as rabbits, rats, gliders and birds such as Rosella and starlings (Smith & Smith 2000).	7	Core breeding habitat not present, roosting habitat not present, low foraging potential. Unlikely to occur	✗
Vulnerable NSW	Aves	*Ninox strenua*	Powerful Owl	The species has a range of 400 -1500ha (Davey 1993) and is known to nest in hollows in Eucalypts between 9-37m above ground usually in secluded well-vegetated gullies and usually occupying the largest emergent trees. Powerful Owls live alone or in pairs which occupy a permanent territory containing a number of roost sites and one or more nesting sites. The species feeds over a large range on small to medium sized mammals, including gliders, ringtail possum and immature brushtail possums.	233	Core breeding habitat not present, roosting habitat not present, low foraging potential. Unlikely to occur	✗

Conservation Status (NSW)	Class	Genus species	Common Name	Habitat	No. of records within 10km grid search (OEH, 2015)	Likelihood of Occurrence on site	Relationship to the site
✘ Site not considered significant habitat for the species, ✔ Potentially affected species requiring consideration in the site planning process and subsequent development on the site.							
Vulnerable NSW	Aves	*Petroica boodang*	Scarlet Robin	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. After breeding, some Scarlet Robins disperse to the lower valleys and plains of the tablelands and slopes. Some birds may appear as far west as the eastern edges of the inland plains in autumn and winter. Scarlet Robin habitat usually contains abundant logs and fallen timber: these are important components of its habitat. The Scarlet Robin breeds on ridges, hills and foothills of the western slopes, the Great Dividing Range and eastern coastal regions; this species is occasionally found up to 1000 metres in altitude. The Scarlet Robin is primarily a resident in forests and woodlands, but some adults and young birds disperse to more open habitats after breeding. Birds forage from low perches, fence-posts or on the ground, from where they pounce on small insects and other invertebrates which are taken from the ground, or off tree trunks and logs; they sometimes forage in the shrub or canopy layer. Scarlet Robin pairs defend a breeding territory and they may raise two or three broods in each season. Birds usually occur singly or in pairs, occasionally in small family parties; pairs stay together year-round. In autumn and winter, the Scarlet Robin joins mixed flocks of other small insectivorous birds which forage through dry forests and woodlands (OEH, 2005).	1	Core breeding habitat limited by competition with resident urban fauna, low foraging potential. Unlikely to occur	✘
Vulnerable NSW, Cwth	Aves	*Polytelis swainsonii*	Superb Parrot	The species previously had a distribution range from Melbourne (VIC) to northern NSW on the western slopes of the Great Dividing Range (Higgins 1999). Currently it occupies areas within the ACT, surrounding Parks & Wagga Wagga and the Riverina districts in NSW (Webster 1998). In NSW the species is known to nest in riparian woodlands of *Eucalyptus camaldulensis* (River Red Gum) and forage in woodlands particularly in *Eucalyptus melliodora* (Yellow Box). While they use riparian woodlands, they are rarely seen crossing expansive areas of open ground. (Webster 1988, Davidson & Chandler 1992). They feed on seeds of herbaceous plants, grass seed, eucalypt blossoms, and agricultural grain spills from transport trucks.	1	Core breeding habitat limited by competition with resident urban fauna, low foraging potential. Unlikely to occur	✘
Vulnerable NSW	Aves	*Ptilinopus superbus*	Superb Fruit-Dove	It is a nomadic species known to occur from Indonesia, New Guinea, and north-eastern Queensland. It is considered to be a regular Autumn Winter migrant to the Hunter, Sydney and Illawarra regions. It is a common species in much of its usual range in northern Australia and is considered a vagrant but scarce species in N.S.W. (Slatter 1993).	6	Not considered to be core breeding habitat, low foraging potential. Unlikely to occur.	✘

Conservation Status (NSW)	Class	Genus species	Common Name	Habitat	No. of records within 10km grid search (OEH, 2015)	Likelihood of Occurrence on site	Relationship to the site
✗ Site not considered significant habitat for the species, ✔ Potentially affected species requiring consideration in the site planning process and subsequent development on the site.							
Vulnerable NSW	Aves	*Tyto novaehollandiae*	Masked Owl	It is generally considered as a bird of forest margins recorded in wet and dry open forests and woodlands and urban areas (Debus & Rose 1994). The southern subspecies occupies a home range of 5 -10 km2 within a diverse range of habitats that provide large hollow-bearing trees for roosting and nesting (Kavanagh & Murray 1996) often in riparian forests. It has also been known to roost and nest in caves and preys on mammals typically less than 600g such as rats, mice, rabbits, sugar gliders and ringtail possums (Slater 1993, Debus & Rose 1994).	1	Core breeding habitat not present, roosting habitat not present, low foraging potential. Unlikely to occur	✗
Vulnerable NSW	Mammalia	*Cercartetus nanus*	Eastern Pigmy-possum	Is found in a range of habitats from rainforest, sclerophyll forests to sclerophyll tree heath and the species range extends from south eastern Qld to south eastern SA and Tasmania (Australian Museum 2000). It feeds primarily on nectar and pollen from banksias, eucalypts and callistemon. It is generally nocturnal and whilst preferring to nest in small tree hollows it has been found in small constructed nests of shredded bark. It appears to be solitary with males having a range of about 0.68 ha and females having a range of 0.35 ha (Turner & Ward, 2000).	6	Suitable habitat not present, unlikely to occur.	✗
Vulnerable NSW, Cwth	Mammalia	*Chalinolobus dwyeri*	Large-eared Pied Bat	Their known range extends along the east coast and ranges of southern Qld the central and northern coast and ranges of NSW. This species is rarely sighted and therefore is poorly known, due to its confusion prior to 1966 with *Chalinolobus picatus* (Little Pied Bat) which found in northern Australia and Queensland. The species roosts in the day in small groups in shallow caves and mines and it is presumed that individuals hibernate deep in caves during the cooler months (Hoye & Dwyer 2000). They also have been recorded roosting in abandoned bottle shaped mud nests of *Hirundo ariel* (Fairy Martins) and feed on small flying insects (Hoye & Dwyer 2000).	1	Core breeding habitat not present, low foraging potential.	✗
Vulnerable NSW, Endangered Cwth	Mammalia	*Dasyurus maculatus*	Spotted-tailed Quoll	Found in a range of habitats and generally preying on medium size mammals and birds such as possums, small wallabies, rats, birds, domestic fowl, bandicoots, rabbits and also feed on insects and carrion. It is estimated that the range of the species is in the order of 500 – 3000ha using hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky-cliff faces as den sites.	5	Habitat not present, unlikely to occur.	✗
Vulnerable NSW	Mammalia	*Falsistrellus tasmaniensis*	Eastern False Pipistrelle	The Eastern False Pipistrelle is found on the south-east coast and ranges of Australia, from southern Queensland to Victoria and Tasmania. The species prefers moist habitats, with trees taller than 20 m and generally roosts in eucalypt hollows, but has also been found under loose bark on trees or in buildings. The species forages on beetles, moths, weevils and other flying insects above or just below the tree canopy. The species hibernates in winter and females are pregnant in late spring to early summer.	2	Not considered to be core breeding habitat, some diurnal roosting habitat, low foraging potential.	✔

Conservation Status (NSW)	Class	Genus species	Common Name	Habitat	No. of records within 10km grid search (OEH, 2015)	Likelihood of Occurrence on site	Relationship to the site
✗ Site not considered significant habitat for the species, ✔ Potentially affected species requiring consideration in the site planning process and subsequent development on the site.							
Endangered NSW, Cwlth	Mammalia	*Isoodon obesulus obesulus*	Southern Brown Bandicoot (eastern)	The species has a patchy distribution along the southeast coast in NSW and reaches its most northern limit at the Hawkesbury River and has been recorded in the larger tracts of bushland in Ku-ring-gai Chase, Garigal National Parks and in Nadgee Nature Reserve. This species prefers sandy soil with scrubby vegetation and /or areas of low ground cover that is periodically burnt (Braithwait 1995). The species displays a preference for regenerating sites following disturbance (OEH, 2006) The species is known to feed on ants, beetle larvae and plant material and some fungal species and whilst recorded in Ku-ring-gai Chase and Garigal National Parks. The species is not known to occur in small patches of bushland <40ha in size (Atkin, 1983) and adjacent the urban / bushland interface. The Long-nosed Bandicoot is common in smaller reserves and urban areas of Ku-ring-gai.	99	Not considered to be core breeding or foraging habitat, Unlikely to occur.	✗
Vulnerable NSW	Mammalia	*Miniopterus australis*	Little Bentwing-bat	The distribution of the species is primarily along the eastern coast of Australia extending from Cape York to Taree in NSW. Incidental records have been recently in the Sydney and Hunter Region. There is some evidence that pregnant females from the Central Coast and Lower Hunter district migrate north every winter (Williams R. pers com.) The nearest known breeding colony is Willi Willi Caves near Kempsey. It appears that the southern most breeding population seem to depend upon the larger nursery colony of *Miniopterus schreibersii* (Eastern Bentwing-bat) to produce higher ambient temperatures to rear its young (Australian Museum 2000). The species roosts in caves or tunnels and feeds on insects flying beneath the tree canopy.	3	Core breeding habitat not present, low foraging potential.	✗
Vulnerable NSW	Mammalia	*Miniopterus schreibersii oceanensis*	Eastern Bent-wing Bat	The species has been recorded along the north coast of Australia from Qld to Vic and parts of northern WA and NT. Having been recorded in a variety of habitats it is typically found in well-timbered valleys. It roosts during the daylight hours in caves and has been recorded roosting in large storm water pipes. They fly quickly above tree tops in valleys, making fast dives to catch prey which are insects, mostly moths.	45	Core breeding habitat not present, limited foraging potential.	✗
Vulnerable NSW	Mammalia	*Mormopterus norfolkensis*	Eastern Freetail Bat	Has a range along the eastern coastal strip Australia extending from southern Queensland to southern NSW. Has been recorded roosting in tree hollows and feeds on flying insects. They forage above the tree canopy in forests or along the edges of forests (Allison & Hoye 2000). The habitat preference of this species is unclear. It has been predominantly recorded in dry eucalypt forest and woodland, but has been recorded in moist and edge environments. The wing morphology indicates that this species is adapted to the more open habitats.	13	Not considered to be core breeding habitat, some diurnal roosting habitat, low foraging potential.	✔

Conservation Status (NSW)	Class	Genus species	Common Name	Habitat	No. of records within 10km grid search (OEH, 2015)	Likelihood of Occurrence on site	Relationship to the site
✗ Site not considered significant habitat for the species, ✔ Potentially affected species requiring consideration in the site planning process and subsequent development on the site.							
Vulnerable NSW	Mammalia	*Myotis macropus*	Southern Myotis	The species has a range extending along the coastal areas of Australia from Victoria through NSW and Qld to NT and northern WA. The species roosts in caves or overhangs never far from water bodies such as lakes streams and reservoirs. Their main diet is aquatic insects and it is also known to feed of flying insects (Richards 2000).	2	Not considered to be core roosting habitat, low foraging habitat.	✗
Vulnerable NSW	Mammalia	*Petaurus australis*	Yellow-bellied Glider	Known to occur in a variety of habitats, they are usually associated with tall mature wet eucalypts. Their dens are often located in smooth barked eucalypts and their diet includes sap, nectar, honeydew and manna as well as insects. The species is known to have a large home range of about 35 hectares and may travel up to 2km to forage in a single night.	1	Habitat not present, unlikely to occur.	✗
Protected NSW, Vulnerable Cwlth	Mammalia	*Pseudomys novaehollandiae*	New Holland Mouse	The species is known to inhabit open heathlands, woodlands and forests with a heathland understorey and vegetated sand dunes and is a social animal, living predominantly in burrows shared with other individuals (Kemper, 1980; Lazenby et al., 2008). The species is nocturnal and omnivorous, feeding on seeds, insects, leaves, flowers and fungi, and is therefore likely to play an important role in seed dispersal and fungal spore dispersal. The home range of the New Holland Mouse ranges from 0.44 ha to 1.4 ha (Lazenby et al., 2008) and populations appear to peak during early to mid stages of vegetation succession typically after fires (Fox and Mckay, 1981).	2	Not considered to be core breeding habitat or foraging habitat, unlikely to occur	✗
Vulnerable NSW, Cwth	Mammalia	*Pteropus poliocephalus*	Grey-headed Flying-fox	The species has 2 permanent maternal colonies in Sydney at Gordon and at Cabramatta. Other colonies exist at the Botanical Gardens and at Avalon Beach. The species predominately feeds on nectar and when blossoms are unavailable it feeds on fruit.	1123	Not considered to be core breeding or roosting habitat, limited foraging potential.	✗
Vulnerable NSW	Mammalia	*Saccolaimus flaviventris*	Yellow-bellied Sheathtail Bat	The species is widely distributed across Australia in NSW, Qld, NT Vic and the northern parts of WA eastern SA. The species is known to occur in open grasslands and in open forests and usually are found in small colonies of up to 30. The species roost in hollows in old trees and sometimes in the abandoned nests of sugar gliders and they forage on flying insects, including beetles. They fly quickly and are not good at twisting and turning when chasing their prey. And they usually eat their prey as they are flying (Australian Museum 1999).	3	Not considered to be core breeding habitat, some diurnal roosting habitat, low foraging potential.	✔
Vulnerable NSW	Mammalia	*Scoteanax rueppellii*	Greater Broad-nosed Bat	The species occurs along the Australian east coast from the New South Wales / Victorian border to Cairns. It is found in a variety of habitats but its slow and direct flight favours habitats such as open woodlands, cleared lands and open creek corridors. It usually flies at a height of 3-6m and feeds off large slow flying insects such as beetles. It is thought that it may also prey on other bats. The species roosts in tree hollows and females congregate in suitable trees to give birth (Hoye & Richards ex Australian Museum 2000).	2	Not considered to be core breeding habitat, some diurnal roosting habitat, low foraging potential.	✔

Conservation Status (NSW)	Class	Genus species	Common Name	Habitat	No. of records within 10km grid search (OEH, 2015)	Likelihood of Occurrence on site	Relationship to the site
✘ Site not considered significant habitat for the species, ✔ Potentially affected species requiring consideration in the site planning process and subsequent development on the site.							
Vulnerable NSW	Reptilia	*Varanus rosenbergi*	Rosenberg's Goanna /Heath Monitor	The species is typically found in woodland and heathland on sandy soils associated with ridge top plateaus (Smith & Smith 2000). It is diurnal scavenger and shelters in burrows logs and rock crevices (Cogger 2000). It breeds in spring and summer and lays eggs in termite mounds that are important habitat features. It feeds on a range of species, including invertebrates, small lizards, snakes and bird eggs. The species can be confused with the more common *Varanus varius* (Lace Monitor) which is more commonly occurs in gully forests.	7	Habitat not present, unlikely to occur.	✘

6.4 Threatened ecological community habitat assessment

Conservation Status	Ecological Community	Habitat	Likelihood of Occurrence on site	Relationship to the site
✘ Site not considered significant habitat for the community, ✔ Potentially affected species requiring consideration in the site planning process and subsequent development on the site.				
Critically Endangered, NSW, Cwlth	Blue Gum High Forest	The forest is confined to soils derived from the Wianamatta Shale group and is distinct from the open forests occurring in sandstone gullies or on alluvial soils (NSW Scientific Committee 1997). Characteristic tree species include *Eucalyptus saligna, Eucalyptus pilularis, Eucalyptus paniculata, Angophora floribunda and Allocasuarina torulosa*. (NSW Scientific Committee 2007),	Some component species present.	✔
Endangered NSW, Critically Endangered Cwlth	Sydney Turpentine Forest	The forest typically occurs on plateaus and hillsides and on the margins of shale capping over sandstone. Characteristic tree species include *Syncarpia glomulifera*, *Eucalyptus globoidea, Eucalyptus resinifera, Eucalyptus paniculata, Angophora costata and Angophora floribunda.* Sydney Turpentine Ironbark Forest was originally forest, but may now exist as woodland or as remnant trees (NSW Scientific Committee 1998),	Habitat not present	✘
Endangered	Duffy's Forest	The forest occurs on lateritic soils and deeply weathered shale soils typically found on lower ridges in Ku-ring-gai. Characteristic tree species include *Eucalyptus capitellata, Eucalyptus sieberi, Eucalyptus oblonga, and Angophora costata.*	Habitat not present.	✘

6.5 Threatened population habitat assessment

Conservation Status	Type	Population Name	Habitat	Likelihood of Occurrence on site	Relationship to the site
✗ Site not considered significant habitat of the population, ✔ Potentially affected population requiring consideration in the site planning process and subsequent development on the site.					
Endangered NSW	Fauna	Gang-gang Cockatoo, *Callocephalon fimbriatum* (Grant), population in the Hornsby and Ku-ring-gai Local Government Areas	With a range restricted to south eastern NSW and south eastern Victoria the species feeds on terminal leaves of eucalypts or in hawthorn hedges and nests in deep hollows in eucalypts (Slater 1993). The species occurs in a variety of forests and woodlands and the last known breeding population in metropolitan Sydney area is in the Hornsby/ Ku-ring-gai area. The species shows a strong nest site fidelity (NSW Scientific Committee 2001). This population is bounded by Beecroft – Cheltenham in the west, Epping – North Epping in the south, Turramurra – South Turramurra in the east, and Thornleigh – Wahroonga to the north. The population encompasses, but is not restricted to, Pennant Hills Park and parts of Lane Cove National Park. Individual birds are likely on occasion to move across the population boundary.	Core breeding habitat not present, low foraging potential. Unlikely to occur.	✗

7. site rezoning & planning mechanisms

7.1 theatened species

Through field surveys, habitat assessments and literature/database searches 7 threatened species and 1 ecological community has been identified as having some habitat relationships those on site. These being;

- Wallangarra White Gum (*Eucalyptus scoparia*);
- Magenta Lillypilly (*Syzygium paniculatum*);
- Eastern False Pipistrelle (*Falsistrellus tasmaniensis*);
- Eastern Freetail Bat (*Mormopterus norfolkensis*);
- Yellow-bellied Sheathtail Bat (*Saccolaimus flaviventris*);
- Greater Broad-nosed Bat (*Scoteanax rueppellii*);
- Blue Gum High Forest Ecological Community

Whilst Wallangarra White Gum (*Eucalyptus scoparia*) was recorded on the site, the species is known to be frequently propagated and made available through commercial nurseries. The subject site is well beyond the natural range of the species which occurs in the Tenterfield area in northern NSW. Because of this, the species is not given any further consideration in this planning process.

The Magenta Lillypilly (*Syzygium paniculatum*) was recorded on the site in a modified habitat along the southern boundary of the subject site. This species has also been frequently propagated and made available through commercial nurseries. The tree is a mature specimen and potentially is planted from commercial stock, however the species has been recorded in the Sydney region and to take a precautionary approach, the species has been considered in context of this planning proposal.

7.2 Key habitat features

The key habitat features for the above mentioned threatened species that need to be taken into account in the planning proposal include:

- habitat of the Magenta Lillypilly (*Syzygium paniculatum*):
- habitat of the stands of remnant Blue Gum High Forest trees;
- diurnal roosting habitats in mature trees and seasonal bark sheaths;

7.3 Appropriate planning mechanisms to conserve key habitat features

The planning proposal aims to rezone the subject site from 2(b) and 2(c2) to R3 Medium Density Residential and R2 Low Density Residential.

To integrate the key habitat features into the planning proposal and the current Ku-ring-gai Local Environmental Plan, 2015 (KLEP, 2015), the key habitat features should be identified as Areas of Biodiversity Significance and subject to the provisions of Clause 6.3 Biodiversity Protection of the KLEP (2015) and subsequent development controls.

Figure 7.1 Areas of the subject site containing biodiversity significance.

8. conclusion

The subject site does not contain critical habitat listed under Part 3 Division 1 of the *Threatened Species Conservation Act 1995 (NSW).*

Provided that the areas of biodiversity significance as shown in Figure 7.1 are subject to the provisions of Clause 6.3 Biodiversity Protection of Ku-ring-gai Local Environmental Plan, 2015, the planning proposal is unlikely to have an adverse impact on the habitats of threatened species, populations or ecological communities listed in the schedules of the *Threatened Species Conservation Act 1995 (NSW)* and the *Environment Protection & Biodiversity Conservation Act 1999 (Cwlth).*

references

Allison, F.R. and Hoye, G.A. (2000) Eastern Freetail-bat *Mormopterus norfolkensis* pp 484 in Strahan, R. (ed.). The Mammals of Australia. Reed Books, Sydney.

Atkins, K. (1998). Habitat and distribution of *Perameles nasuta* and *Isoodon obesulus* in Bushland Remnants in Sydney. MSc Thesis, School of Biological Sciences, Macquarie University.

Australian Museum, (2000) *The Mammals of Australia*, Revised Edition, Reed New Holland, Ed. R. Strahan

Aitken, P.F. (1983). Mammals. In 'Natural History of the South-East.' (Tyler, M.J., Twidale, C.R., Ling, J.K. and Holmes, J.W. eds), pp 127-133. Royal Society of South Australia, Adelaide.

Bannerman S.M. & Hazelton P.A. (1989). *Soil landscapes of the Penrith 1:100 000 Sheet*. Soil Conservation Service of NSW, Sydney, NSW.

Barker R.D. & Vestjens W.J.M. (1989). The Food of Australian Birds: Volume 1 Non-Passerines. CSIRO, Melbourne.

Barrett G, Silcocks A, Barry S, Cunningham R, Poulte, R (2003) *The New Atlas of Australian Birds*'. (Birds Australia, Melbourne)

Brooker M.I & Kleinig D.A. (1999) *Field Guide to Eucalypts, Volume 1 South-eastern Australia*, Bloomings Books, Victoria.

Catterall, C.P., Green, R.L., & Jones, N. (1991) Habitat use by birds across a forest-suburb interface in Brisbane: Implications for Corridors. *In Nature Conservation 2: The Role of Corridors*, ed. D.A. Saunders & R.J. Hobs, Surrey Beatty & Sons

Cockburn A (1990) Life history of the bandicoots: developmental rigidity and phenotypic plasticity. *In 'Bandicoots and Bilbies'* (eds JH Seebeck, PR Brown, RL Wallis and Kemper CM) pp. 285-292 (Surrey Beatty & Sons: Chipping Norton, NSW)

Cogger HG, Cameron EE, Sadlier RA & Eggler P (1993). The Action Plan for Australian Reptiles, *Australian Nature Conservation Agency, December 1993*

Cogger H.G. (2000), *Reptiles & Amphibians of Australia 6th ed*. Reed Holland, Sydney.

Cooper, R.M. (1990), New South Wales Bird Report. *Australian Birds* 23: 68-101.

Courtney J, Debus SJS (2006) Breeding habits and conservation status of the Musk Lorikeet *Glossopsitta concinna* and Little Lorikeet *G. pusilla* in Northern New South Wales. *Australian Field Ornithology* 23**,** 109-124.

Cropper (1993) *Management of Endangered Plants*. CSIRO Publishing, Melbourne

Davey S M (1993). Notes on the habitat of four Australian owl species. Pp. 126-142 in Olsen, P (ed.), *Australian Raptor Studies*. Australasian Raptor Association, RAOU, Melbourne.

Debus S J S, Shepherd R B and Rose A B (1998). Diet of The Barking Owl *Ninox connivens* near Armidale, New South Wales. *Aust. Bird Watcher* 17: 302-305.

Debus S J S, Shepherd R B and Rose A B (1999). Non-breeding diet of the Barking Owl near Armidale, New South Wales. *Aust. Bird Watcher* 18: 43-45.

Debus S.J.S. & Rose, A.B. (1994) The Masked Owl - Tyto novaehollandiae in New South Wales. *Australian Birds 28 (supplement),* pp40-64)

Dwyer, P.D. (2000) Little Bentwing-bat *Miniopterus australis*, pp 492 in Strahan, R. (ed.). The Mammals of Australia. Reed Books, Sydney.

Forshaw, J.M. & Cooper, W.T. (1981) *Australian Parrots*. 2nd edition, Lansdown Editions, Melbourne.

Fox BJ and McKay GM (1981). Small mammal responses to pyric successional changes in eucalypt forest. Australian Journal of Ecology 9: 241-252.

Franklin, D.C., Menkhorst, P.W. & Robinson, J.L. (1989). Ecology of the Regent Honeyeater *Xanthomyza phrygia. Emu* 89:140-154.

Garnett, S. (1992) Threatened and Extinct Birds of Australia. *RAOU Report No.82*, Royal Ornithologists Union of Australia & Australian National Parks & Wildlife Service.

Geering, D. & French, K. (1998). Breeding biology of the Regent Honeyeater *Xanthomyza phrygia* in the Capertee Valley, New South Wales*. Emu* 98:104-116.

Gibbons P. & Lindenmayer D. (2002) *Tree Hollows and Wildlife Conservation in Australia,* CSIRO Publishing, Collingwood, Vic.

Glen A.S & Dickman C.R. Diet of the spotted-tailed quoll (*Dasyurus maculatus*) in eastern Australia: effects of season, sex and size**,** School of Biological Sciences, University of Sydney, NSW, *Australia Journal of Zoology* Volume **269** Issue **2,** Pages 241 – 248 Published Online**:** 27 Mar 2006

Grey, M.J., Clarke, M.F. & Loyn, R.H. (1998). Influence of the Noisy Miner *Manorina melanocephala* on avian biodiversity and abundance in remnant Grey Box woodland. *Pac. Conserv. Biol.* 4:55-69.

Harden, G. (2000) *Flora of NSW: Volume 1,* New South Wales University Press, Kensington.

Harden, G. (2002) *Flora of NSW: Volume 2,* New South Wales University Press, Kensington.

Harden, G. (1992) *Flora of NSW Volume 3,* New South Wales University Press, Kensington.

Harden, G. (1993) *Flora of NSW Volume 4,* New South Wales University Press, Kensington.

Higgins, P.J. (ed.) 1999. Handbook of Australian, New Zealand and Antarctic Birds. Vol. 4. Parrots to Dollarbird. Oxford University Press, Melbourne.

Hindwood, K.A. (1939). Nectar-feeding birds near Sydney. *Emu* 34; 40-44.

Hoye & Richards (1995) Large-eared Pied Bat *Chalinolobus dwyeri*, p 527-528 in Strahan, R. (ed.). The Mammals of Australia. Reed Books, Sydney.

Kemper CM (1980). Description of Pseudomys novaehollandiae burrows located with radioisotopes. *Australian Mammalogy* 4: 141-143.

Lazenby BT, Pye T, Richardson A and Bryant SA (2008). Towards a habitat model for the New Holland Mouse Pseudomys novaehollandiae in Tasmania – population vegetation associations and an investigation into individual habitat use. Australian Mammalogy 29: 137-148.

Ley, A.J & Williams, MB (1994). Breeding behaviour and morphology of the Regent Honeyeater *Xanthomyza phrygia* near Armidale, New South Wales. *Aust. Bird Watcher* 15:366-376.

Mahoney, M.J. (1993), The Status of Frogs in the Watagan Mountains area, the Central Coast of N.S.W. pp 257 –264, *Herpetology in Australia – A Diverse Discipline*, ed D. Lunney & D. Ayres, Trans. Of the Royal Zool. Soc. NSW, Mosman

Marchant, S. & Higgins, P. J. (eds) (1990). *The Handbook of Australian, New Zealand and Antarctic Birds. Oxford University Press, Melbourne.*

Menkhorst, P. W & Lumsden, L. F. (1995). Eastern False Pipistrelle. *Falsistrellus tasmaniensis* (Gould, 1858). In P. W. Menkhorst (ed). *Mammals of Victoria*: 178-179.

NSW Scientific Committee (1997) *Final Determinations 1997, Blue Gum High Forest* pp47-48, NSW National Parks & Wildlife Service.

NSW Scientific Committee (1998) *Final Determinations 1998, Sydney Turpentine Ironbark Forest* pp 68-70, Office of Environment & Heritage

NSW Scientific Committee (1998) *Final Determinations 1998, Pimelea curviflora* (a small shrub) - vulnerable species listing, NSW National Parks & Wildlife Service

NSW Scientific Committee (1998) *Grevillea parviflora subsp. parviflora (a shrub) - vulnerable species listing*- NSW Office of Environment & Heritage Final Determination 12/06/1998.

NSW Scientific Committee (2001) Gang-gang Cockatoo, Callocephalon fimbriatum in the Hornsby and Ku-ring-gai Local Government Areas – endangered population listing, 23/02/01 NSW Office of Environment & Heritage

NSW Scientific Committee (2004) *Genoplesium baueri (an orchid) – vulnerable species listing*, 23/07/04 NSW National Parks & Wildlife Service

NSW Scientific Committee (2007) Blue Gum High Forest in the Sydney Basin Bioregion - critically endangered ecological community listing. NSW Office of Environment & Heritage

NSW Scientific Committee (2008) *Black-necked stork - endangered species listing - final determination*, 12/02/08, NSW Scientific Committee, Department of Environment, Climate Change & Water

NSW Scientific Committee (2009) Little Lorikeet- vulnerable listing Office of Environment and Heritage, NSW Department of Premier and Cabinet

NSW Scientific Committee (2010) Little Eagle *Hieraaetus morphnoides* (Gould 1841) - vulnerable species listing, 12/02/10 NSW Office of Environment & Heritage

NSW Scientific Committee (2010) *Scarlet Robin Petroica boodang* (Lesson 1838) - vulnerable species listing of Environment and Heritage, NSW Department of Premier and Cabinet

NSW Scientific Committee (2015) *Hibbertia sp. Turramurra Final Determination* 02/10/15 Office of Environment and Heritage, NSW Department of Premier and Cabinet

OEH (2002) *Threatened Species Information Epacris purpurascens var. purpurascens*, May 2002, Office of Environment and Heritage, NSW Department of Premier and Cabinet

OEH, (2002) *Threatened Species Information Red-crowned Toadlet Pseudophryne australis (Gray 1835),* May 2002, NSW Office of Environment and Heritage, NSW Department of Premier and Cabinet.

OEH, (2002) *Wallangarra White Gum – profile,* 7th Sep 2012, NSW Office of Environment and Heritage, NSW Department of Premier and Cabinet.

OEH, (2003) *Threatened Species Information Darwinia biflora,* May 2003, NSW Office of Environment and Heritage, NSW Department of Premier and Cabinet.

OEH (2004), *Threatened Species Biodiversity Survey and Assessment: Guidelines for Developments and Activities Working Draft*, Office of Environment and Heritage, NSW Department of Premier and Cabinet, November 2004.

OEH (2005) *Sooty Oystercatcher – profile*, Office of Environment and Heritage, NSW Department of Premier and Cabinet

OHE, (2005) *Threatened Species Information Pink Robin,* Office of Environment and Heritage, NSW Department of Premier and Cabinet

OEH (2005) Varied Sittella - *species profile Daphoenositta chrysoptera,,* Office of Environment and Heritage, NSW Department of Premier and Cabinet.

OEH (2006), *Southern Brown Bandicoot Isoodon obesulus*, *Recovery Plan*, November 2006, Office of Environment and Heritage, NSW Department of Premier and Cabinet

OEH (2006) Recovery Plan for the Large Forest Owls: Powerful Owl Ninox strenua, Sooty Owl Tyto tenebricosa, Masked Owl Tyto novaehollandiae, Office of Environment and Heritage, NSW Department of Premier and Cabinet, October 2006

OEH (2007) *Threatened Species Assessment Guidelines*, NSW Office of Environment and Heritage, NSW Department of Premier and Cabinet, August 2007

OEH (2010) Wallangarra White Gum - *species profile Eucalyptus scoparia,*, Office of Environment and Heritage, NSW Department of Premier and Cabinet.

OEH (2013) *Native Vegetation of the Sydney Metropolitan Area*, mapping available on line through Six Viewer Vegetation Information System (VIS) Map Catalogue, NSW Office of Environment and Heritage, NSW Department of Premier and Cabinet

OEH (2016), *Bionet Atlas*, (search 10km grid square centred on AMG co-ordinates E 329450 and N 6261800, Office of Environment and Heritage, NSW Department of Premier and Cabinet.

Oliver, D.L. (1999). Breeding behaviour of the endangered Regent Honeyeater *Xanthomyza phrygia* near Armidale, NSW. *Aust. J. Zool*. 98:97-103.

Oliver, D.L. (2000). Foraging behaviour and resource selection of the Regent Honeyeater *Xanthomyza phrygia* in northern New South Wales. *Emu* 100:12-30.

Payne, R. (1997) *The Distribution and Reproductive Ecology of Syzygium paniculatum and Syzygium australe (Myrtaceae) in the Gosford-Wyong Region*. Unpublished Thesis prepared for the award of Masters of Natural Resources, University of New England. Armidale NSW.

Richards, G. (1995) Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*) pp 467-8 in Strahan, R. (ed.). The Mammals of Australia. Reed Books, Sydney.

Richards, G. (2000) Large-Footed Myotis (Myotis adversus) flaviventris) pp 521-3 in Strahan, R. (ed.). The Mammals of Australia. Reed Books, Sydney.

Slater, P., Slater P. & Slater R. (1993) The *Slater field guide to Australian Birds*. Revised edition Reed New Holland.

Smith, J. & Smith, P. (2000) *Management Plan for Threatened Fauna & Flora in Pittwater*, prepared for Pittwater Council.

Smith, J. & Smith, P. (2000) *Survey of the Duffys Forest Vegetation Community*, prepared for NSW National Parks & Wildlife Service and Warringah Council.

Swift Parrot Recovery Team (2000) Swift Parrot Recovery Plan 2000-2005, Department of Primary Industries, Water and Environment, Hobart.

Taylor I R, Kirsten I and Peake P (2002). Habitat, breeding and conservation of the Barking Owls (*Ninox connivens*) in northeastern Victoria, Australia. Pp. 116-124 in Newton I, Kavanagh R, Olsen J and Taylor I (eds.), *Ecology and Conservation of Owls*. CSIRO Publishing, Collingwood.

Tozer, M. (2003) The Native Vegetation of the Cumberland Plain, Western Sydney: Systematic Classification and Field Identification of Communities, *Cunninghamia* **8(1)**: 1-75pp, Royal Botanical Gardens Sydney.

Turner, V. & Ward, S.J. (2000), Eastern Pygmy Possum, pp217-218in *Mammals of Australia*. Ed. R Strahan, Australian Museum & Reed New Holland.

Webster, R. (1998). New South Wales Superb Parrot Polytelis swainsonii *Draft Recovery Plan*. NSW National Parks & Wildlife Service, Sydney.

Webster, R. & Menkhorst, P. (1992). The Regent Honeyeater (Xanthomyza phrygia): population status and ecology in Victoria and New South Wales. *Arthur Rylah Inst. Tech. Rep. Ser.* 126, Department of Conservation and Environment, Melbourne.

Zillman E E (1964). *Observations on the Winking or Barking Owl*. *Aust. Bird Watcher* **2**: 102-104.