Flora and Fauna Assessment

58 Laitoki Road, Terrey Hills NSW

Report prepared by Narla Environmental Pty Ltd
for Calderflower Architects

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NARLA
environmental

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Report Certification

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As Principal of Narla Environmental Pty Ltd, I Kurtis Lindsay, certify that:

- This assessment has been prepared in accordance with the brief provided by the client.
- All field workers involved in the preparation of this project were appropriately licensed under section 132C of the Biodiversity Conservation Act 2016 and the Department of Primary Industries Animal Research Authority.
- The information presented in this report is a true and accurate record of the study findings in the opinion of the authors.
- Any change to this document undertaken without the approval of Narla Environmental Pty Ltd renders this document void.

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1. Introduction

1.1 Project Proposal

Narla Environmental Pty Ltd (Narla) was engaged by Calder Flower Architects (the proponent) to undertake a Flora and Fauna Assessment (FFA) in association with the Development Application (DA) for the proposed development of 58 Laitoki Road, Terrey Hills (Lot 368/ DP752017), here after referred to as the 'Subject Site' (**Figure 2**).

The proposed works involve the demolition of existing dwellings and ancillary structures, and the partial clearing of both native and exotic vegetation for the construction of a multi-structured aged care facility development within the Subject Site.

Narla have produced this report in order to assess any potential impacts associated with the proposed development, and recommend appropriate measures to mitigate any potential ecological impacts in line with the requirements of the Consent Authority, the Northern Beaches Council.

1.2 Site Description and Location

The Subject Site is situated at the intersection of Cooyong and Laitoki Roads, within the suburb of Terrey Hills which is situated in The Northern Beaches Local Government Area (LGA) (**Figure 2**). The Subject Site covers an area of approximately 1.95ha. The Subject Site exists on a west facing slope on a footing of Hawkesbury Sandstone. The elevation varies from 199 metres (m) to 173m above mean sea level.

The Subject Site is currently occupied by low density residential dwellings and equine training and holding facilities. Native vegetation fringes the eastern and south-eastern boundaries of the Subject Site with a number of small pockets scattered throughout the centre of the Site.

1.3 Qualifying for the Biodiversity Offset Scheme

Local developments in the Northern Beaches Council are assessed under Part 4 of *the Environmental Planning and Assessment Act 1979* (EP&A Act). Developments of this nature qualify to be assessed under the Biodiversity Offset Scheme (BOS) if:

- the development involves clearing of native vegetation that exceeds the BOS Clearing Threshold (**Table 1**) - the area threshold varies depending on the minimum lot size (shown in the Lot Size Maps made under the relevant Local Environmental Plan (LEP), or actual lot size (where there is no minimum lot size provided for the relevant land under the LEP).

  or

- the development impacts an area mapped in 'orange' on the Biodiversity Values map published by the Minister for the Environment (**Figure 1**). An impact specifically relates to the clearing of vegetation, excavation of the soil, or impacting of threatened species habitat within this area.

  or

- the development is considered likely to significantly affect threatened species based on the test of significance (5-part test) in section 7.3 of the *Biodiversity Conservation Act 2016* (BC Act).

Table 1. Area clearing thresholds table (relevant threshold in bold).

Minimum lot size associated with the property	Threshold for clearing, above which the BAM and offsets scheme apply
Less than 1 ha	0.25 ha or more
1 ha to less than 40 ha	**0.5 ha or more**
40 ha to less than 1000 ha	1 ha or more
1000 ha or more	2 ha or more

The proposed development does not trigger the BOS since:

- the proposed development will not involve clearing of vegetation in excess of 0.5 ha, and
- the proposed development will not impact upon an area mapped on the Biodiversity Value Map (**Figure 1**).

Since the BOS is not triggered, a test of significance (5-part test) will be sufficient to assess impacts of the proposed development upon matters listed under the BC Act and its regulations as amended.

Figure 1: Biodiversity Value Map – Subject Site (Red Polygon) Approximate Development Location (White Polygon)

1.3.1 Environmental Objectives

This development will abide by the environmental objectives of the Warringah DCP, which are to:

- To protect environmentally sensitive areas from overdevelopment or visually intrusive development so that scenic qualities, as well as the biological and ecological values of those areas, are maintained
- To achieve environmentally, economically and socially sustainable development for the community of Warringah

1.3.2 Zoning

The site is zoned 'RU4 - Primary Production Small Lots' which limits the type and size of development permitted under the Warringah LEP 2011.

The objectives of the RU4 Primary Production Small Lots are as follows:

- To enable sustainable primary industry and other compatible land uses.
- To encourage and promote diversity and employment opportunities in relation to primary industry enterprises, particularly those that require smaller lots or that are more intensive in nature.
- To minimise conflict between land uses within this zone and land uses within adjoining zones.
- To minimise the impact of development on long distance views of the area and on views to and from adjacent national parks and bushland.
- To maintain and enhance the natural landscape including landform and vegetation.
- To ensure low intensity of land use other than land uses that are primary industry enterprises.
- To maintain the rural and scenic character of the land.

The proposed works will be subject to intensive impact assessment through this implementation of this report. The Subject Site will be managed in perpetuity by a detailed Biodiversity Management Plan (BMP) that is to be reviewed every five years. The objectives of the BMP are to maintain and enhance the landscape including landform and vegetation and to maintain the rural and scenic character of the land. It is therefore considered that the proposed development is consistent with the with the objectives of the zone.

Figure 2: Subject Site, proposed development and mapped riparian corridor

1.3.3 Topography, geology and soils

The Subject Site is situated predominantly within the Somersby soil landscape with a small portion of the western extent of the Subject Site situated on the Gymea soil landscape (Chapman & Murphy 1989).

The Somersby soil landscape occurs as undulating low rises and plains on plateau surfaces. Local relief is up to 40 m. Slope gradients are generally <15 %. Ridges and crests are broad and valleys are wide and open. Rock outcrop is absent. Crests are broad and convex, valleys are narrow and concave. Extensively cleared, low eucalypt open-woodland and scrubland.

The Gymea soil landscape occurs on undulating to rolling rises and low hills on Hawkesbury Sandstone. Local relief 20-80 m, slopes 10-25%. Rock outcrop <25%. Broad convex crests, moderately inclined sideslopes with wide benches, localised rock outcrop on low broken scarps. Extensively cleared open-forest (dry sclerophyll forest) and eucalypt woodland.

1.3.4 Hydrology

The Neverfail Gully watercourse enters a small section of the western extent of the Subject Site and closely adjoins the remainder of the western border however occurs within the neighbouring lot. The Subject Site exists on a west facing slope that adheres to the gentle undulations of the surrounding lands. Stormwater runoff from within the property will run in a westerly direction before entering Neverfail Gully.

1.4 Scope of assessment

This Flora and Fauna Assessment was produced as an auxiliary requirement associated with this DA.

The objectives of this Flora and Fauna Assessment were to:

- Undertake background research to determine the likelihood for New South Wales and/or Commonwealth threatened biota to utilise or occur within the Subject Site during a point in their lifecycles.
- Establish the likelihood of occurrence of migratory species, threatened species, endangered populations and threatened ecological communities as listed under the New South Wales *Threatened Species Conservation Act 1995* (BC Act) and/or the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).
- Assess the proposed development against all relevant local government, state and commonwealth policy and legislation, including impacts to species, populations and communities listed under the BC Act and EPBC Act
- Identify and map the distribution of vegetation communities in the subject area and discuss patch size and condition
- Record presence and the extent of any Priority Weeds listed under the *Biosecurity Act 2015*
- Provide recommendation of any impact mitigation measures, controls or additional actions to be taken to protect or improve environmental outcomes of the proposed development.

1.5 Legislative Environmental Protections and Requirements

Table 2. Application of relevant State and Federal legislation to the proposed development

Legislation/ Policy	Relevant Ecological Feature on Site	Triggered	Action Required
Environmental Planning and Assessment Act 1979 (EP&A Act)	All features	Yes	This Report and all subsequent recommendations relevant to the DA (the planning process).
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)	No EPBC Act (Commonwealth) Threatened Species or Ecological Communities are represented within the Subject Site. No threatened flora or fauna listed under the EPBC Act were observed on the Subject Site at the time of assessment. Suitable habitat for one EPBC Act (Commonwealth) threatened fauna species is present.	Yes	An assessment of significance of impact from the proposed DA on Matters of National Environmental Significance (MNES)EPBC Act *Assessment of Significant Impact Criteria*
Biodiversity Conservation Act 2016 (BC Act)	*Duffys Forest Ecological Community in the Sydney Basin Bioregion* which is listed under BC Act (NSW) as a Critically Endangered Ecological Community is present on the Subject Site. No threatened flora or fauna listed under the BC Act were observed on the Subject Site at the time of assessment. Suitable habitat for a suite of threatened fauna species is present within the Subject Site.	Yes	A test of significance of impact from the proposed DA on BC Act listed threatened species (5-part Test of Impact Significance) pursuant s.7.3 of the BC Act.
Native Vegetation Act 1993 (NV Act)	This Act does not apply to vegetation within the Northern Beaches LGA.	No	None
Biosecurity Act 2015 (BS Act)	Four weeds listed under the Biosecurity Act in the Greater Sydney Region were observed within the Subject Site. These included Ground Asparagus (*Asparagus aethiopicus*), Green Cestrum (*Cestrum parqui*), Lantana (*Lantana camara*), Fireweed (*Senecio madagascariensis*) and Blackberry *(Rubus fruticosus aggregate*).	Yes	Follow the Mandatory or Regionally Recommended Measures outlined for each identified weed species. Ongoing management of weed species within the Subject Site will be outlined in the corresponding
Coastal Protection Act 1979 (NSW)	The Subject Site is not located in a mapped coastal zone.	No	None
State Environmental Planning Policy No. 14 - Coastal Wetlands (SEPP 14)	There are no SEPP 14 Coastal Wetlands on site or in the vicinity or storm water discharge areas.	No	None
State Environmental Planning Policy No 19 - Bushland in Urban Areas (SEPP 19)	Subject Site does not directly border any council park or bushland areas.	No	None
State Environmental Planning Policy No. 26 - Littoral Rainforest (SEPP 26)	There are no mapped areas of Littoral Rainforest protected under SEPP 26 within the Subject Site or in close vicinity.	No	None

Legislation/ Policy	Relevant Ecological Feature on Site	Triggered	Action Required
State Environmental Planning Policy No. 44 - Koala Habitat Protection (SEPP 44)	The Subject Site contains >1hectare of potential habitat and contains species of feed tree listed under SEPP44 Schedule 1. This site does not however constitute 'core koala habitat' as there is no resident population and no recent proximal records.	No	None, however to protect potential habitat, adherence to recommended controls and mitigation actions outlined throughout this document and within species assessments.
State Environmental Planning Policy No. 71 - Coastal Protection (SEPP 71)	The Subject Site is located outside of designated coastal zones.	No	None
Fisheries Management Act 1994	No designated stream, lacustrine or marine environments occur within the Subject Site therefore this legislation does not apply to the Subject Site. A search for species listed under the FM Act failed to reveal any threatened species occurring within the freshwater catchment of the Subject Site.	No	None

1.5.1 Application of the Environmental Planning and Assessment Act 1979

The proposed development is to be assessed pursuant to Part 4 section 76A of the EP&A Act and all of its regulations as amended. This requires the applicant to address the requirements of all relevant environmental planning instruments including all relevant SEPP and the Warringah Local Environmental Plan 2013 (LEP). This report addresses such requirements and will be presented to the consent authority, Northern Beaches Council upon submission of the DA for the proposed development.

1.5.2 Warringah Development Control Plan

The overriding objective of the DCP is to create and maintain a high level of environmental quality throughout Warringah. Development should result in an increased level of local amenity and environmental sustainability (DCP 2011).

Additional protections provided within Warringah DCP which are applicable to the site owing to its location are 'Preservation of Trees or Bushland Vegetation' (E1), 'Prescribed Vegetation' (E2), Threatened species, populations, ecological communities listed under State or Commonwealth legislation, or High Conservation Habitat (E3) and habitat features 'retaining unique environmental features' (E6).

The relevant objectives of each relevant part of the DCP have been summarised below:

- To protect and enhance the urban forest of the Northern Beaches. (E1)
- To effectively manage the risks that come with an established urban forest through professional management of trees. (E1)
- To minimise soil erosion and to improve air quality, water quality, carbon sequestration, storm water retention, energy conservation and noise reduction. (E1)
- To protect, enhance bushland that provides habitat for locally native plant and animal species, threatened species populations and endangered ecological communities. (E1)
- To promote the retention and planting of trees which will help enable plant and animal communities to survive in the long-term. (E1)
- To preserve and enhance the area's amenity, whilst protecting human life and property. (E2, E3)
- To improve air quality, prevent soil erosion, assist in improving water quality, carbon sequestration, storm water retention, energy conservation and noise reduction. (E2, E3)

- To provide habitat for local wildlife, generate shade for residents and provide psychological & social benefits. (E2, E3)
- To protect and promote the recovery of threatened species, populations and endangered ecological communities. (E2, E3)
- To protect and enhance the habitat of plants, animals and vegetation communities with high conservation significance. (E2, E3)
- To retain and enhance native vegetation communities and the ecological functions of wildlife corridors. (E2)
- To reconstruct habitat in non-vegetated areas of wildlife corridors that will sustain the ecological functions of a wildlife corridor and that, as far as possible, represents the combination of plant species and vegetation structure of the original 1750 community. (E2)
- Promote the retention of native vegetation in parcels of a size, condition and configuration which will as far as possible enable plant and animal communities to survive in the long-term. (E2); and
- To conserve those parts of land which distinguish it from its surroundings. (E6)

The proposed development complies with requirements of the DCP by ensuring the proposed building footprint is concentrated to a low impact area of the property and will be designed to respond to the unique natural environmental features present within the Subject Site

The Subject Site is located outside of DCP mapped *Threatened and High Conservation Habitat* (E3) areas however contains potential habitat for threatened species, as identified in the NSW Wildlife Atlas.

1.5.3 Proximal National Parks

The nearest National Park to the Subject Site is Ku-Ring-Gai Chase National Park, which lies approximately 700 m to the north. The native vegetation and habitat identified within the Subject Site has no direct connection to the vegetation of the National Park.

Garigal National Park lies to the South of the Subject Site, at a distance of roughly 2.9 km. This National Park is separated from the Subject Site by private property and Mona Vale Road. The only connectivity between the Subject Site and this National Park would occur through wind and fauna assisted plant and fungi propagule dispersal.

1.6 Study Limitations

This study was not intended to provide a complete inventory of all species which occur on the Subject Site; rather it was to provide an assessment into the likelihood of occurrence of any significant ecological features (migratory species, threatened species, communities and populations) on the Subject Site, and the potential for impacts from the proposed works on any of those ecological features.

The species inventory provided for the Subject Site was restricted to what was observed during the survey period by the Narla Ecologists. The timing of the survey may not have coincided with emergence times of some species of flora and fauna, such as seasonally flowering ground orchids or seasonal migratory fauna. Likewise, weather conditions may have played a role in the emergence or activity levels of certain species.

To account for those species that could not be identified during the field survey, detailed habitat assessments were combined with desktop research and local ecological knowledge to establish an accurate prediction of the potential for such species to occur on or adjacent the Subject Site.

2. Methodology

2.1 Desktop Assessment and Literature Review

A thorough literature review of local information relevant to the locality and the Northern Beaches Local Government Area (LGA) was undertaken. Relevant literature that were reviewed in preparation of this report included:

- Relevant State and Commonwealth Databases
  - Protected Matters Search Tool (Commonwealth of Australia 2018)
  - NSW Bionet. The website of the Atlas of NSW Wildlife (OEH 2018a)
  - Atlas of Living Australia Spatial Portal (ALA 2018)

- NSW Scientific Committee Final Determinations for:
  - Duffys Forest ecological community in the Sydney Basin Bioregion - endangered ecological community listing (NSW Scientific Committee 2011)

- State and Federal Conservation Advice for threatened species and EEC including:
  - Approved Recovery Plan for *Grevillea caleyi* (DEC 2004)
  - *Darwinia biflora* Recovery Plan (DECC 2004)
  - Recovery Plan for *Melaleuca deanei*, (NSW) (DEC 2010)
  - Recovery Plan for *Microstis angusii* (DEC 2010)
  - Approved Recovery Plan for Southern Brown Bandicoot (DEC 2006)
  - Draft National Recovery Plan for the Grey-headed Flying-fox (*Pteropus poliocephalus*) (Commonwealth of Australia 2017)
  - Recovery Plan for the Large Forest Owls: Powerful Owl *Ninox strenua* Sooty Owl *Tyto tenebricosa* Masked Owl *Tyto novaehollandiae* (DEC 2006)
  - National Recovery Plan for the Spotted-tailed Quoll Dasyurus maculatus. Commonwealth of Australian 2016)
  - National Recovery Plan for the Swift Parrot Lathamus discolor (Saunders and Tzaros 2011)
  - National Recovery Plan for the Regent Honeyeater (*Anthochaera phrygia*) (Commonwealth of Australia 2016)

- Vegetation Mapping
  - The Native Vegetation of the Sydney Metropolitan Area. (OEH 2016a;2016b)
  - New South Wales Vegetation Information System (VIS) 2.1 (OEH 2017)

- State and Federal Guidelines
  - Threatened Species Survey and Assessment: Guidelines for developments and activities. Working Draft. (DEC 2004)
  - Threatened species survey and assessment guidelines: field survey methods for fauna: Amphibians (DEC 2009)
  - Guidelines for Ecologically Sustainable Fire Management (NPWS 2004)
  - Planning for Bushfire Protection. A guide for councils, planners, fire authorities and developers (NSW RFS 2016)
  - NSW Guideline to Surveying Threatened Plants (OEH 2016b)
  - Environmental Impact Assessment Guidelines: Tetratheca glandulosa (NSW NPWS 2002)
  - Survey guidelines for Australia's threatened birds. Guidelines for detecting birds listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth of Australia 2010a)

- Survey guidelines for Australia's threatened bats. Guidelines for detecting bats listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999(Commonwealth of Australia 2010b)
- Survey guidelines for Australia's threatened frogs. Guidelines for detecting frogs listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth of Australia 2010c)
- Survey guidelines for Australia's threatened mammals. Guidelines for detecting mammals listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth of Australia 2011)
- Survey guidelines for Australia's threatened orchids. Guidelines for detecting bats listed as 'threatened' under the Environment Protection and Biodiversity Conservation Act 1999(Commonwealth of Australia 2013)

- Council Documents:
  - Creek Management Study Final (Warringah 2004)
  - Warringah Natural Area survey: Vegetation communities and plant species (Warringah 2005a)
  - Warringah Natural Area survey: Vegetation history and wildlife corridors (Warringah 2005b)
  - Warringah Natural Area Survey: Vegetation History and Wildlife Corridors 2009 Update (Smith and Smith 2009)
  - Plan of Management: Threatened Bushland Reserves (Duffys Forest Ecological Community) (Warringah 2008a; 2008b)
  - Warringah Tree Preservation Order Policy (Warringah 2003)
  - Warringah DCP 2011
  - Warringah LEP 2011
  - Weeds declared in the Local Control Authority area of Northern Beaches Council (DPI 2017)
  - Warringah Council Flora and Fauna Assessment Report Guidelines (Warringah 2014)

- Scientific Publications
  - Warringah Natural Area Survey: Vegetation History and Wildlife Corridors 2009 Update (Smith, P. and Smith, J. 2009)

Preparation of this Flora and Fauna Report also involved the review of accompanying project documents including:

- Waterway Impact Statement and Riparian Management Plan (Martens 2018)
- Landscape Plan (Arterra 2019a)
- Arboricultural Assessment (Arterra 2019c)
- Tree Protection Specification & Schedule (Arterra 2019b)
- Site Plan (Calder Flower 2018)
- Site Compatibility Certificate (Calder Flower 2016)

Online databases and literature review were utilised to gain an understanding of the natural environment and ecology of the Subject Site and its surrounds to an area of approximately 10 km². Searches utilising NSW Wildlife Atlas (Bionet) and the Commonwealth Protected Matters Search Tool were conducted to identify current threatened and migratory flora and fauna records within a 10km² search area centred on the Subject Site. This data was used to assist in establishing the presence or likelihood of any such ecological values as occurring on or adjacent the Subject Site, and helped inform our Ecologist on what to look for during the site assessment.

Soil landscape and geological mapping was examined to gain an understanding of the environment on the Subject Site and assist in determining whether any threatened flora or ecological communities may occur there (Herbert 1983, Chapman & Murphy 1989).

2.2 Ecological Site Assessment

An ecological survey of the Subject Site was undertaken by Narla Ecologists Kurtis Lindsay, Leo Skowronek, Guy Smith and Christopher Moore on 2nd May, 25th July and 27th July 2018.

During the Subject Site assessment, the following activities were undertaken:

- Identifying and recording the vegetation communities present on the Subject Site, with focus on identifying any threatened ecological communities (TEC).
- Recording a detailed list of flora species encountered on the Subject Site, with a focus on threatened species, species diagnostic of threatened ecological communities and priority weeds.
- Recording opportunistic sightings of any fauna species seen or heard on or within the immediate surrounds of the Subject Site.
- Identifying and recording the locations of notable fauna habitat such as important nesting, roosting or foraging microhabitats.
- Targeting the habitat of any threatened and regionally significant fauna including:
    - Tree hollows (habitat for threatened large forest owls, parrots, cockatoos and arboreal mammals)
    - Caves and crevices (habitat for threatened reptiles, small mammals and microbats)
    - Termite mounds (habitat for threatened reptiles and the echidna)
    - Soaks (habitat for threatened frogs and dragonflies)
    - Wetlands (habitat for threatened fish, frogs and water birds)
    - Drainage lines (habitat for threatened fish and frogs)
    - Fruiting trees (food for threatened frugivorous birds and mammals)
    - Flowering trees (food for threatened nectivorous mammals and birds)
    - Trees and shrubs supporting nest structures (habitat for threatened birds and arboreal mammals), and
    - Any other habitat features that may support fauna (particularly threatened) species.
- Assessing the connectivity and quality of the vegetation within the Subject Site and surrounding area.

The following sections of this report detail the site assessments undertaken by Narla Environmental including the survey methods and the weather conditions experienced in the lead-up and during each assessment.

2.2.1 Weather conditions prior and during the general flora and fauna surveys

A summary of the weather conditions in the locality of the Subject Site during the survey. Terrey Hills weather station observations are included in **Table 3** below and are typical of the conditions during that time of the year. This information is provided by the Bureau of Meteorology (2018).

Table 3. Weather conditions taken from the nearest weather station (Terrey Hills) in the lead up to and during the field surveys (BOM 2018) (Survey dates in bold).

Site Assessment – Weather Observations			
Survey date	**Minimum Temp. °C**	**Maximum Temp. °C**	**Rainfall (mm)**
02/05/2018	**13.1**	**22.7**	**0**
21/07/2018	6.0	15.6	0
22/07/2018	4.0	15.5	0
23/07/2018	4.1	17.5	0
24/07/2018	9.6	22.5	0
25/07/2018	**10.9**	**20.8**	**0**
26/07/2018	8.8	18.9	0
27/07/2018	**6.4**	**18.8**	**0**

2.2.2 General Fauna Survey Methods

2.2.2.1 Automated wildlife cameras

A single automated, arboreal wildlife camera was deployed within the south-eastern extent of the Subject Site over a three day period. This was installed within moderate quality native vegetation, with the aim of identifying the arboreal fauna species that use the vegetation within the Subject Site. The camera was baited with honey and installed to target arboreal mammals including the threatened Eastern Pygmy Possum (*Cercartetus nanus*) and Squirrel Glider (*Petaurus norfolcensis*).

2.2.2.2 Bird Census

During the site assessment undertaken, the attending ecologists undertook a 20-minute bird census. The census involved identifying and recording all bird species observed within a 20-minute time period.

A general list of all bird species encountered during the surveys was also collected.

2.2.2.3 Opportunistic sightings and analysis of scats, tracks and traces

During the comprehensive site assessment opportunistic fauna observations including sightings, scats, tracks, characteristic scraps on trees, burrows and bone were collected. These were identified within the site, and/or used as focus areas to position additional targeted survey techniques to determine species presence.

2.2.3 Vegetation Community Assessment

In assessing the vegetation/plant communities across the subject site, Narla first assessed aerial imagery, geological mapping, soil landscape mapping and topographic mapping, in addition to existing vegetation mapping (Sydney Metropolitan Vegetation Mapping [OEH 2016a; 2016b]) to stratify the Subject Site into distinct units. The Ecologists then visited each unique stratified unit and used the 'random meander method' (Cropper 1993) to further validate and delineate vegetation stratigraphic unit across the Subject Site. Where the boundaries of vegetation stratigraphic units differed from existing Sydney Metropolitan Vegetation Mapping (OEH 2016a; 2016b) these boundaries were delineated on paper maps in the field and recorded in a GPS. Photographs were taken throughout this time for reference.

Two BioMetric vegetation plots (20 m x 20 m) were sampled to collect floristic data to assist with the determination of each vegetation community within the Subject Site. This data, along with opportunistic floristic data collected from each stratigraphic unit was compared against a suite of Sydney Metropolitan Vegetation Mapping 'positive diagnostic tests' (OEH 2016a; 2016b) to determine each vegetation community against a suite of possible/candidate communities.

Narla allocated each vegetation stratigraphic unit to a 'vegetation community' from OEH (2016a;2016b) based on the number of 'positive diagnostic species' recorded within each stratigraphic unit. The vegetation community description that shared the most 'positive diagnostic' species with each stratigraphic unit was assigned to that stratigraphic unit.

Figure 3: Historic vegetation mapping surrounding the Subject Site

2.2.4 Targeted Threatened Flora Surveys

Targeted surveys were undertaken for threatened flora considered to have reasonable potential to occur within the Subject Site were targeted in threatened flora surveys are listed in **Table 4**.

Targeted flora surveys involved detailed searches of available habitat by specialists. A total of 18 person hours of targeted flora survey was conducted over the course of the comprehensive site assessment.

Any tentative threatened species found were photographed and specimens taken for identification utilising formal keys. Where necessary this involved the use of a microscope. Any confirmed or plausible specimens identified were GPS tagged, for future reference.

Where identification of plausible specimens could not be made with absolute confidence by Narla Ecologists, specimens were collected and sent to the National Herbarium for expert identification.

Table 4. Optimal survey periods for the threatened flora species targeted.

Species	BC Act Status	EPBC Act Status	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Angus's Onion Orchid (*Microtis angusii*)	E	E												
Bauer's Midge Orchid (*Genitoplesium baeuri*)	E	E												
Camfield's Stringybark *(Eucalyptus camfieldii)*	V	V												
Caley's Grevillia (*Grevillea caleyi*)	CE	CE												
Deane's Paperbark (Melaleuca deanei)	V	V												
Epacris purpurascens var. purpurascens	V	-												
Joyce's Lasiopetalum *(Lasiopetalum joyceae)*	V	V												
Leafless Tongue Orchid (*Cryptostylis hunteriana*)	V	V												
Narrow-leaf Finger Fern (Grammitis stenophylla)	E	-												
Hairy Geebung *(Persoonia hirsuta)*	E	E												
Curved Rice Flower *(Pimelea curviflora var. curviflora)*	V	V												
Glandular Pink bell *(Tetratheca glandulosa)*	V	-												

KEY Flowering Period; Sporadic flowering/ identifiable from other features

V=Vulnerable, E=Endangered, CE=Critically Endangered

3. Results and Discussion

3.1 Flora

A comprehensive suite of native flora species were recorded on the Subject Site by Narla during the detailed site assessment undertaken (**Appendix A**). It is likely that more flora species will be identified across the Subject Site with increased survey intensity over a wider seasonal and temporal gradient.

Low to moderate quality native bushland extends across the eastern and south-eastern extents of the Subject Site. The remainder of the site is comprised of historically cleared and weed infested land with small pockets of native vegetation remaining, primarily canopy tree species. The vegetated fringes of the south-western, western and northern extents of the Subject Site supported a high diversity and cover of exotic flora species comprised of environmental weeds, garden escapees and five Priority Weed species (**Table 6**).

3.1.1 Threatened Flora

Despite extensive targeted surveys, no threatened flora species were recorded within the Subject Site.

3.1.2 Vegetation Communities

Existing Sydney Metropolitan Vegetation Mapping (OEH 2016a; 2016b) did not classify any vegetation within the Subject Site, however, this historical mapping is of low-reliability owing to its coarse scale of combined with a lack of ground truthing undertaken during its production.

The Sydney Metropolitan Vegetation Mapping Project (OEH 2016a; 2016b) identified the following vegetation communities within the immediate vicinity of the Subject Site:

- Sydney Ironstone Bloodwood-Silvertop Ash Forest (S_DSF14),
- Urban Exotic/Native (Urban_E/N)

Narla Environmental carried-out detailed vegetation mapping through assessment of the landscape features (topography, geology and soils) of the site in, combination with detailed and systematic floristic data collected. This data confirmed that the Subject Site contained four distinct native vegetation communities (for diagnostic summary and nomenclature refer to **Table 5**):

1. Duffy's Forest Vegetation Community (an EEC)
2. Weeds and Exotic Vegetation
3. Historically Cleared Exotic Grassland

A large area, occupying the majority of the centre of the Subject Site, was historically cleared of native vegetation and consisted primarily exotic groundcover species. The area represents a highly-disturbed landscape which is exposed to regular disturbance by domestic horses *(Equus caballus*). This area is mapped as '*Historically Cleared Exotic Grassland*' (**Figure 4**) as it is dominated by perennial exotic grasses (*Pennisetum clandestunum* and *Paspalum dialatatum*) and contains less than 5% native groundcover.

Adjacent to the historically cleared areas, along the northern, southern and western boundaries of the Subject Site, dense stands of tall, woody weeds have established. These areas include a multitude of significant environmental and priority weeds which pose a severe threat to the vegetation and floristic biodiversity of the Subject Site if left unmanaged.

The native vegetation present primarily within the eastern extent, south-eastern boundary and localised pockets within the centre of the Site and along the western boundary have been identified as conforming to the '*Duffys Forest Ecological Community in the Sydney Basin Bioregion*' (TSSC 2002). This community is listed as an Endangered Ecological Community (EEC) within New South Wales under the BC Act and is of high retention value.

Table 5. Vegetation communities confirmed present within the Subject Site.

In Text Reference	Total Extent at the Time of Survey (ha)	Total Extent Proposed post Development (Ha)	Sydney Metropolitan CMA Unit	NSW PCT ID	BC Act	EPBC Act
Duffy's Forest EEC (Native Vegetation)	0.28		Sydney Ironstone - Bloodwood-Silvertop Ash Forest (S_DSF14)	1786 Red Bloodwood – Silvertop Ash – Stringybark open forest on ironstone in the Sydney region (previously 1085)	Duffys Forest Ecological Community in the Sydney Basin Bioregion-EEC	Not Listed
Weeds and Exotic Vegetation	0.17	0.00	na	na	na	na
Historically Cleared Exotic Grassland	1.50	0.00	na	na	na	na
Total Native Vegetation	**0.28**	**0.81**				
Total Exotic Vegetation	1.67	0.00				

Figure 4: Vegetation communities confirmed within the Subject Site by Narla Environmental.

3.1.2.1 Duffys Forest Ecological Community in the Sydney Basin Bioregion

An occurrence of 'PCT 1786 Sydney Ironstone Bloodwood-Silvertop Ash Forest' was identified within the Subject Site (**Plate 1**). This vegetation meets the thresholds to be considered as '*Duffys Forest in the Sydney Basin Bioregion Endangered Ecological Community'* (EEC) (TSSC 2002) here forward referred to as 'Duffys Forest EEC'. This community has a highly-restricted distribution known almost entirely from suburbs of northern Sydney, including the local government areas of Northern Beaches, Kur-ring-gai and Hornsby Local Government Areas, although it may occur elsewhere in the Sydney Basin Bioregion. Duffys Forest has been mapped within the southern reaches of Kur-ring-gai Chase National Park and the northern edge of Garigal National Park (NSW Scientific Committee 2002).

The occurrence of Duffys Forest was determined by the dominance of *Eucalyptus sieberi*, *Corymbia gummifera*. *Eucalyptus capitellata* and scattered *Angophora costata* within the canopy along with an understorey of *Ceratopetalum gummiferum, Allocasuarina littoralis,* and *Banksia serrata* overlying a sparse and partially weed infested lower shrub and ground layer. The vegetation occurred on a soils derived from a deep laterite layer, which was noticeably outcropping in parts of the subject site.

Plate 1. Duffys Forest EEC identified within the Subject Site

3.1.3 Noxious and Environmental Weeds

Weed infestations are concentrated to the external fringes of the Subject Site with localised occurrences scattered throughout the centre of the property. The most severe woody weed infestations occur along the western boundary of the Subject Site within the riparian corridor of Neverfail Gully as well as in select areas along the southern boundary of the property. These weed infestations also contain dense herbaceous, vine and graminoid weed infestations. Within the areas containing intact bushland, weed density decreases however scattered exotic species remain at low levels.

Five Priority Weed species were identified within the Subject Site (**Table 6**) as listed within the Northern Beaches LGA (DPI 2018). All noxious weed infestations were largely concentrated within the margins of the property as well as the riparian corridor in the western extent of the Subject Site. All of the identified Priority Weed species besides *Cestrum parqui* are also listed as Weeds of National Significance (WoNS) and as such, are to be controlled where possible.

The Subject Site also contains a suite of commonly occurring environmental weeds that are dispersed throughout the entirety of the Subject Site (**Appendix B**).

Table 6. Inventory of the Priority Weeds identified within the Subject Site.

Species	Priority Weed Duty	Management Requirement
Rubus fruticosus species aggregate (Blackberry)	Prohibition on dealings	Must not be imported into the State or sold
Cestrum parqui (Green Cestrum)	Regional Recommended Measure	Land managers should mitigate the risk of new weeds being introduced to land used for grazing livestock. Land managers should mitigate spread from their land. Plant should not be bought, sold, grown, carried or released into the environment
Asparagus aethiopicus (Ground Asparagus)	Prohibition on dealings	Must not be imported into the State or sold
Senecio madagascariensis (Fireweed)	Prohibition on dealings	Must not be imported into the State or sold
Lantana camara (Lantana)	Prohibition on dealings	Must not be imported into the State or sold

3.2 Fauna

All native fauna species are listed as 'protected' under the *Biodiversity Conservation Act 1974*. None of the species identified within the Subject Site are listed as threatened species under either State or Commonwealth legislation. A small suite of exotic birds were recorded species encountered and discussed further in **section 3.2.2**.

Birds were the most diverse and species rich group identified, reflective of the wide array of foraging and nesting resources provided within the Subject Site. A suite of relatively common urban and forest birds were identified within the Subject Site during the comprehensive site assessment (**Appendix A**). A significant observation was a single *Coracina papuensis* (White-bellied Cuckoo-shrike). This bird is not listed as threatened or migratory, albeit has not been recorded from the Northern beaches area for many years.

A single native mammal species, *Trichosurus vulpecula* (Common Brushtail Possum), was identified within the Subject Site on remote camera within the south-eastern extent of the Site.

A common aquatic frog species, *Crinia signifera* (Common Eastern Froglet) was recorded. It is expected that other common frogs including *Litoria peronii* (Peron's Tree Frog) and *Litoria fallax* (Dwarf Tree Frog) also inhabit the subject site.

The common snake, *Morelia spilota* (Diamond Python) was recorded on the Subject Site, along with the *Lampropholis delicata* (Common Garden Sunskink).

3.2.1 Threatened Fauna Habitat

A thorough assessment of fauna habitat availability across the Subject Site was conducted. The habitat assessment provided an understanding of the fauna species (including threatened species) that may potentially occur on the Subject Site during part of their lifecycle. Abundant sheltering habitat for a wide range of local and highly-mobile fauna was identified throughout the Subject Site.

Hollow-bearing trees may provide habitat for reptiles, frogs, arboreal mammals and microchiropteran bats (microbats). A total of twenty-seven (27) hollow-bearing trees were situated throughout the Subject Site, within these trees, a total of forty-nine (49) potential tree hollows were identified during survey (**Figure 5**) comprising;

- Thirty (30) small hollows (2.5cm-5cm);
- Thirteen (13) medium hollows (5-10cm); and
- Six (6) large hollows (>10cm).

The subject site may be utilised by a number of threatened insectivorous microchiropteran bats for roosting and foraging. Multiple hollow-bearing trees were identified within the Subject Site. These provided suitable habitat for threatened hollow-roosting microchiropteran bats including:

- *Mormopterus norfolkensis* (Eastern Freetail-bat);
- *Saccolaimus flaviventris (*Yellow-bellied Sheathtail-bat);
- *Falsistrellus tasmaniensis* (Eastern False Pipistrelle);
- *Miniopterus australis* (Little Bentwing-bat);
- *Miniopterus schreibersii oceanensis* (Eastern Bentwing Bat)
- *Myotis macropus* (Southern Myotis); and
- *Scoteanax rueppellii* (Greater Broad-nosed Bat).

Coarse woody debris, large logs and leaf-litter, that may provide foraging habitat for invertebrates, small reptiles and frogs, however it is not expected that any threatened species would utilise such habitat on the Subject Site.

A suite of foraging habitat, including fruit and flower-bearing trees provide foraging habitat for local and nomadic fauna, including:

- *Pteropus poliocephalus* (Grey-headed Flying Fox) (vulnerable BC Act and EPBC Act)
- *Anthochaera phrygia* (Regent Honeyeater) (critically endangered BC Act and EPBC Act)
- *Lathamus discolor* (Swift Parrot) (endangered BC Act and critically endangered EPBC Act)
- *Glossopsitta pusilla* (Little Lorikeet) (vulnerable BC Act).

Rough-barked woodland trees and dense woodland shrubs provided potential foraging and nesting for the following vulnerable, insectivorous bird species:

- *Daphoensitta chrysoptera* (Varied Sittella)
- *Artamus cyanopterus* (Dusky Woodswallow)

However, the paucity of local records of either species, and the abundance of aggressive Noisy Miner and predatory birds renders the Subject Site largely unsuitable for these two sensitive woodland birds.

A scattering of *Allocasuarina littoralis* (Black She-oak) provide potential, intermittent foraging habitat for *Calyptorhynchus lathami* (Glossy Black Cockatoo) across the subject site.

Small-medium sized mammals and birds within the site are likely to attract large predatory birds including:

- *Ninox connivens* (Barking Owl);
- *Tyto novaehollandiae* (Masked Owl);
- *Ninox strenua* (Powerful Owl);
- *Haliaeetus leucogaster* (White-bellied Sea Eagle);
- *Lophoictinia isura* (Square-tailed Kite); and
- *Hieraaetus morphnoides* (Little Eagle).

No existing tree hollows identified were suitable for large hollow roosting owls or cockatoos, this was owing to the exposed position of the hollows amongst a historically cleared and disturbed landscape dominated by aggressive, common diurnal birds that are likely to out-compete any threatened diurnal birds that would utilise these nesting resources.

There were no soaks or wetlands considered suitable to support threatened amphibians, including *Litoria aurea* (Green and Golden Bell Frog), *Pseudophryne australis* (Red-crowned Toadlet) or *Heleioporus australiacus* (Giant Burrowing Frog). The nearest suitable habitat was a weed-infested, polluted stream that would not be suitable for inhabitation by these sensitive, vulnerable frog species.

Termite mounds, tree hollows and hollow logs provided some shelter resources for Varanus rosenbergi (Rosenberg's Monitor). Abundant vertebrates across the subject site provided prey for this species. However, this mobile lizard is unlikely to rely on any habitat on the subject site, such that the proposed development could place it at risk of local extinction. The species is likely to continue to occur on the subject site unhindered post development.

The total list of threatened species deemed as having potential to occur in the Subject Site is presented (**Table 7**) With numerous proximal and recent records, and the occurrence of potential characteristic habitat available within the site, a list of additional threatened fauna species were considered to have potential to utilise the Subject Site at some stage during their lifecycle. In accordance with the precautionary principle, each of these species was given careful consideration through the application of a 5-Part Test.

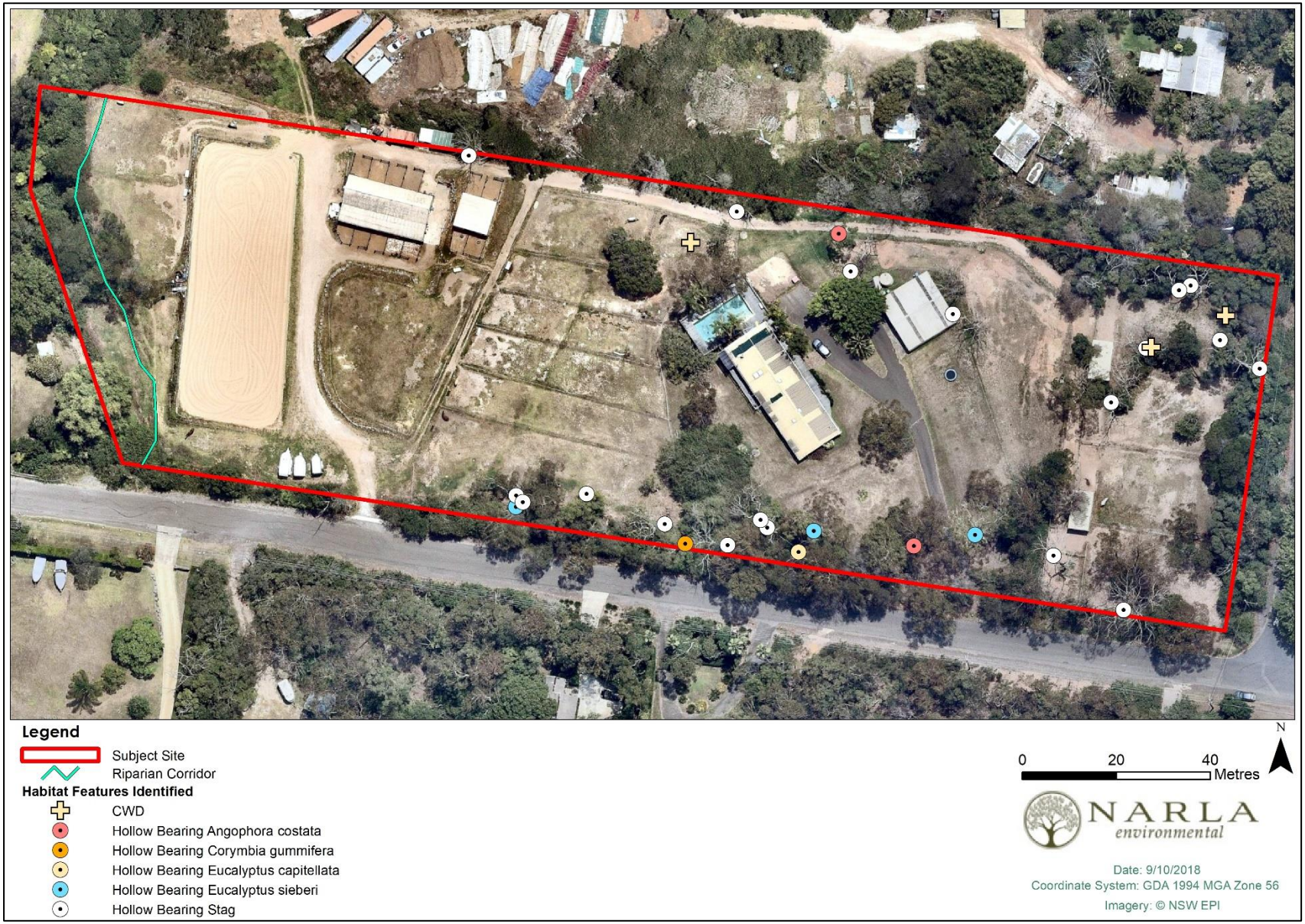

Figure 5: Habitat features identified within the Subject Site

3.2.2 Pest Fauna

During surveys undertaken by Narla Environmental, a number of exotic fauna species were identified within the Subject Site. This included:

- *Sturnus tristis* (Common Myna)
- *Pycnonotus jocosus* (Red-whiskered Bulbul)
- *Spilopelia chinensis* (Spotted Dove)
- *Turdus merula* (European Blackbird)
- *Pycnotus jucosus* (Red-whiskered Bulbul)
- *Felis catus* (Domestic Cat)

Predation of native fauna by Cats have been listed as Key Threatened Process (KTP) under the BC Act.

The exotic bird species present on the subject site were considered to present lower risk to the ecology of the Subject Site.

It is not expected that the proposed development will exacerbate any threats associated with these species.

3.3 Threats and Threat Mitigation

3.3.1 Key Threatening Processes

The proposed development will not significantly exacerbate any Key Threatening Processes (KTP) (as listed under the BC Act) provided the relevant recommendations made within this report are adhered to.

The following KTPs are already in action within the Subject Site:

1. Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants
2. Clearing of native vegetation
3. Predation by the European Red Fox *Vulpes vulpes* (Linnaeus, 1758)
4. Predation by the Feral Cat *Felis catus* (Linnaeus, 1758)
5. Invasion of native plant communities by exotic perennial grasses
6. Invasion and establishment of exotic vines and scramblers
7. Aggressive exclusion of birds from woodland and forest habitat by abundant Noisy Miners, *Manorina melanocephala*

Additional KTPs which have potential to occur without adherence to appropriate management or control measures:

1. Infection of native plants by *Phytophthora cinnamomi*
2. Introduction and establishment of Exotic Rust Fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae
3. Loss of hollow-bearing trees
4. Removal of dead wood and dead trees
5. Removal of bush rock

All KTPs that occur or have potential to occur on the Subject Site have been addressed within this Flora and Fauna Assessment. On the condition that mitigation actions and additional ecological recommendation are adhered to, no significant increase in the action of KTPs will occur within the Subject Site.

3.3.2 Vegetation Clearing

The proposed development will require clearing of a small area of native vegetation from the Subject Site. Out of the total of 0.28ha of native vegetation that occurred on the subject at the time of preparing this report, a maximum of 0.09ha of native vegetation is expected to be removed from the Subject Site to allow for the construction of the proposed development and ancillary structures. This includes all hard landscaping, landscaped stormwater disposal, effluent disposal pathways and driveways.

All native vegetation required to be removed as a result of the proposed development is representative of Duffys Forest EEC. To compensate for this, at least 0.59ha of native vegetation will be replaced across the Subject Site through active revegetation with local provenance flora representative of the vegetation communities required to be removed (**Figure 6**).

The proposed native revegetation areas will be managed under a site-specific Biodiversity Management Plan (BMP) for at least five (5) years post implementation (Narla Environmental 2019).

The loss of approximately 0.09ha of Duffys Forest EEC and subsequent revegetation of approximately 0.59ha of locally indigenous native species representative of this community (Arterra 2019a), will result in a net gain in Duffys Forest EEC within the Subject Site and surrounding locality. This vegetation will be controlled of weeds and managed for improved composition and structural complexity to ensure a net gain in biodiversity for the subject site and locality.

Figure 6: Areas proposed for native revegetation in relation to the proposed development (footprint and revegetation areas digitised from Arterra 2019a)

3.4 Arboricultural Assessment and Tree Removal

A Tree Protection Specification and Schedule assessment was undertaken by Arterra (2019b). The Arborist identified ninety-five (95) trees that have been recommended to be removed as a result of proposed development footprint (Arterra 2019b).

A total of fifty-seven (57) trees have been identified for retention throughout the construction phases (Arterra 2019b). The Arborist report identified the presence of tree species representative of the Duffys Forest EEC, as well as their occurrence within suitable geological and ecological environments to conform to the scientific listing of this EEC (Arterra 2019c). Given the ecological significance of the tree species representative of Duffys Forest EEC, they were provided a greater weighting when considering their value for retention in relation to the establishment of the proposed development (Arterra 2019c).

3.5 Bushfire Mitigation

The Subject Site does not occur within identified Bushfire Prone Land and as such, does not require the completion of a Bushfire Hazard Assessment and subsequent establishment of a prescribed Asset Protection Zone (APZ).

3.6 Erosion and Sedimentation

The proposed construction works will create areas of exposed soil which will increase the potential risk of erosion and sedimentation. Sediment transport can result in imbalances in nutrient levels across the site and may provide a source of contamination and siltation into the mapped Riparian Corridor (RC) within the western extent of the Subject Site, down slope of the proposed development.

Prior to the commencement of construction works, the 'Blue Book' (Landcom 2004) should be consulted to ensure any additional necessary erosion controls are adequately installed. This may also involve mitigation measures to control any changes to stormwater flow over the construction site.

If topsoil stripping is required, ensure any topsoil stripped from bushland areas is stockpiled following best practice methodology to retain topsoil biota and seedbank. Areas of topsoil stripped from non-bushland areas should not be introduced into bushland area or bushland margins due to the risk of facilitating weed spread. Select storage, stockpiling and laydown sites away from native vegetation.

Post construction, revegetation and bush regeneration works are to be undertaken by qualified Bushland Restoration Professionals to encourage the growth of vegetation which will assist in stabilising soils in the long term. Exposed soil which is present within areas of the Subject Site currently, will likewise be addressed.

3.7 Potential Threats to Duffy's Forest EEC

The proposed development will not result in a significant impact to a local occurrence of Duffy's Forest EEC. An estimated area of 0.09ha of the community is expected to be removed as a result of the proposed development. The extent of the community expected to be removed is severely weed infested, isolated (from historical clearing) and in a low to moderate condition class.

As a result of the proposed development, an estimated 0.59ha is to be revegetated with locally indigenous, native flora species representative of the Duffys Forest EEC. The implementation of this vegetation will result in a net gain in Duffys Forest EEC within the Subject Site and locality.

Areas of Duffys Forest EEC to be retained are to be protected from the adverse effects of construction including dust, erosion and sedimentation as well as contamination throughout the entire construction process.

3.8 Landscape Plan

A detailed landscape plan was developed for the Subject Site by Arterra (2019) with advice from Narla Environmental (**Appendix D**). This plan outlines areas where proposed revegetation and protection of locally indigenous native flora largely representative of the Duffys Forest EEC will occur to aid in increasing overall extent of Duffys Forest EEC while maintaining habitat connectivity across the Subject Site. The native revegetation will replace the existing cleared land and weed-infestations that currently dominate the majority of the Subject Site, and provide for the potential expansion of existing native flora patches.

The landscape plan (Arterra 2019) does not include the riparian corridor. This area will be managed under a Biodiversity Management Plan (BMP). The BMP (Narla Environmental 2019) will guide the revegetation species selections and plantings in this zone.

3.9 Efforts to Avoid and Minimise Impacts

In order to reduce and minimise impacts to native biodiversity, the proposed development has been deliberately centred upon historically cleared, developed and grazed lands infested by environmental weeds and Priority Weeds.

The proposed development footprint has been modified in order to avoid any direct clearing-related impact to the mapped riparian corridor (an area of 'Biodiversity Value') within the western extent of the Subject Site. This decision was made under the advice of Narla Environmental. Selecting this location has significantly reduced the risk of ecological impact that development could have within the property.

Under the proposed development footprint, the high conservation-value attributes within the surrounding areas of the Subject Site will be protected, maintained and enhanced through implementation of the proposed landscape plan and corresponding BMP (Narla Environmental 2019).

The impact assessments provided in this report assess the potential direct and indirect impacts of the proposed development and associated ancillary works on state (BC Act) listed threatened species, endangered populations and ecological communities that occur or have potential to occur within the Subject Site.

Tests of Significance (5-part test) were undertaken to assess the potential for impact of the proposed development upon the one (1) Endangered Ecological Communities (EECs) that was confirmed as present within the Subject Site. In exercising the precautionary principle, assessments of significance were also undertaken for all potentially occurring threatened species (**Table 7**).

The 5-Part Tests are presented in **Appendix C** of this report. Implementation of the 5-part tests revealed that the proposed development will have no significant impact on the long-term viability of any local occurrence of TEC, local populations of any threatened species or endangered population. Therefore, no further impact assessment is required pursuant section 7.3 of the BC Act or its regulations as amended.

Table 7: List of potential threatened fauna that may occupy the Subject Site at some stage of their lifecycles

Scientific Name	Grouping	BC Act	EPBC Act	Foraging Habitat Present on Site	Breeding Habitat Present on Subject Site	Anticipated Impact	5-Part Test Required?
Dusky Woodswallow (*Artamus cyanopterus cyanopterus*)	Woodland/ Forest Birds	V	-	Low quality foraging habitat is present in trees located in vegetated areas, however, the subject site is dominated by aggressive Noisy Miners which has prevents colonisation by sensitive, threatened woodland bird species.	Low quality nesting habitat is present in trees located in vegetated areas, however, the subject site is dominated by aggressive Noisy Miners which has prevents colonisation by sensitive, threatened woodland bird species.	Negligible. Small area of potential habitat proposed to be removed by the proposal.	No
Black-chinned Honeyeater (*Melithreptis gularis gularis*)		V	-				
Varied Sittella (*Daphoenositta chrysoptera*)		V	-				
Glossy Black-Cockatoo (*Calyptorhynchus lathami*)	Hollow-nesting Cockatoo	V	-	A total of twenty-eight (28) Allocasuarina littoralis are present within the Subject site.	None. No suitable hollows identified with the Subject Site. Nesting habitat is sub-optimal due to current high levels of human traffic within site which is currently occupied by a residential dwelling and horse agistment facility.	A total of two (2) preferred foraging trees for this species are expected to be removed by the proposed development. Foraging habitat is sub-optimal due to current high levels of human traffic within site which is currently occupied by a residential dwelling and horse agistment facility.	**Yes**

Scientific Name	Grouping	BC Act	EPBC Act	Foraging Habitat Present on Site	Breeding Habitat Present on Subject Site	Anticipated Impact	5-Part Test Required?
Little Lorikeet (*Glossopsitta pusilla*)	Nomadic Nectarivorous Birds	V	-	Foraging habitat (flowering trees and lerp) present throughout vegetated areas of site.	Yes. Suitably-sized tree hollows are present within the Subject Site.	Negligible, no anticipated net loss of foraging (suitable lerp/nectar-bearing trees) or breeding habitat. Suitable foraging habitat will be retained and enhanced post activity.	**Yes**
Swift Parrot (*Lathamus discolor*)		E	CE	Foraging habitat (flowering trees and lerp) present throughout vegetated areas of site.	None, this species only breeds in Tasmania.		
Regent Honeyeater (*Anthochaera phrygia*)		CE	CE	Foraging habitat (flowering trees and lerp) present throughout vegetated areas of site.	None. The site does not occur within a recognised breeding area for this species.		
White-bellied Sea-Eagle (*Haliaeetus leucogaster*)	Diurnal Raptorial Birds	V	-	Small-medium sized mammal and bird prey.	No suitably tall trees identified within Subject Site.	None. No suitable large, undisturbed, trees will be removed. Foraging habitat is sub-optimal due to current high levels of human traffic within site which is currently occupied by a residential dwelling and horse agistment facility.	**Yes**
Little Eagle (*Hieraaetus morphnoides*)		V	-				

Scientific Name	Grouping	BC Act	EPBC Act	Foraging Habitat Present on Site	Breeding Habitat Present on Subject Site	Anticipated Impact	5-Part Test Required?
Square-tailed Kite (*Lophoictinia isura*)		V	-				
Powerful Owl (*Ninox strenua*)	Owls	V	-	Small-medium sized mammals and birds.	None. No suitable hollows identified with the Subject Site.	None. No suitable large tree hollows are to be removed. Foraging habitat is sub-optimal due to increased proximal human traffic within site	**Yes**
Barking Owl (*Ninox connivens*)		V	-	Small-medium sized mammals and birds.	None. No suitable hollows identified with the Subject Site.	None. No suitable large tree hollows are to be removed. Foraging habitat is sub-optimal due to increased proximal human traffic within site	**Yes**
Masked Owl (*Tyto novaehollandiae*)		V	-				
Sooty Owl (*Tyto tenebricosa*)		v	-				
Yellow-bellied Glider (*Petaurus australis*)	Large Hollow-dwelling Arboreal Mammals	V	-	No feed trees identified within Subject Site.	None. No suitable hollows identified with the Subject Site.	Negligible, no anticipated net loss of foraging or breeding habitat	No
Squirrel Glider (*Petaurus norfolcensis*)		V	-	Low quality foraging habitat throughout vegetated areas of site.			

Scientific Name	Grouping	BC Act	EPBC Act	Foraging Habitat Present on Site	Breeding Habitat Present on Subject Site	Anticipated Impact	5-Part Test Required?
Eastern Pygmy Possum (*Cercartetus nanus*)	Small Hollow-dwelling Arboreal Mammals	V	-	Low quality foraging habitat throughout vegetated areas of site.	Yes. Suitably-sized tree hollows are present within the Subject Site.	Negligible. Small area of potential habitat proposed to be removed by the proposal.	**Yes**
Spotted-tailed Quoll (*Dasyurus maculatus*)	Terrestrial Mammals	V	E	Negligible. Potential foraging habitat within the Subject Site has been historically degraded and is subject to ongoing human disturbance.	The Subject Site experiences ongoing human disturbance and has been subject to historic cleating and habitat modification. No suitable breeding habitat for this species is present within the Subject Site.	Negligible, no anticipated net loss of foraging or breeding habitat.	No
Southern Brown Bandicoot (Isoodon obesulus)		V	E				
New Holland Mouse (*Pseudomys novaehollandiae*)		-	V				

Scientific Name	Grouping	BC Act	EPBC Act	Foraging Habitat Present on Site	Breeding Habitat Present on Subject Site	Anticipated Impact	5-Part Test Required?
Grey-headed Flying-fox (*Pteropus poliocephalus*)	Nomadic Nectarivorous Bats	V	V	Fruit and flower-bearing trees present.	No recorded roost camps.	Negligible, no anticipated net loss of foraging or breeding habitat	**Yes**
Eastern Freetail-bat (*Mormopterus norfolkensis*)		V	-	Ample foraging habitat throughout site.	Tree hollows suitable for roosting microbats occur within the Subject Site.	Negligible, no anticipated net loss of foraging or breeding habitat	**Yes**
Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)		V	-				
Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*)		V	-				

Scientific Name	Grouping	BC Act	EPBC Act	Foraging Habitat Present on Site	Breeding Habitat Present on Subject Site	Anticipated Impact	5-Part Test Required?
Little Bentwing-bat (*Miniopterus australis*)	Hollow Dwelling Microbats	V	-				
Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*)		V	-				
Southern Myotis (*Myotis macropus*)		V	-				
Greater Broad-nosed Bat (*Scoteanax rueppellii*)		V	-				
Red-crowned Toadlet (*Pseudophryne australis*)	Sandstone Frogs	V	-	Low quality foraging habitat present within the wider locality. No suitable habitat identified within the subject site or proposed area of impact.	No suitable habitat identified within the subject site or proposed area of impact.	Negligible, no anticipated loss of foraging or breeding habitat.	No
Giant Burrowing Frog (*Heleioporus australiacus*)		E	V				

Scientific Name	Grouping	BC Act	EPBC Act	Foraging Habitat Present on Site	Breeding Habitat Present on Subject Site	Anticipated Impact	5-Part Test Required?
Rosenberg's Goanna (Varanus rosenbergi)	Terrestrial Reptile	V	-	Low quality foraging habitat present within the wider Subject Site.	Low quality Breeding habitat present within the wider Subject Site. None identified within the proposed area of impact.	Negligible, no anticipated loss of foraging or breeding habitat.	No

4. Recommendations

This section of the report details recommended measures for mitigating potential ecological impacts associated with the proposed development. These measures include ameliorative or compensatory measures to ensure expected impacts are avoided, minimised or managed appropriately, including the provision of adequate buffers to sensitive features and the protection species/populations and communities. This document provides detailed recommended actions for on-going management of the substantial ecological assets present within the Subject Site.

4.1 Assigning a Project Ecologist

Prior to commencement of any vegetation clearing, weed removal or construction works, a Project Ecologist should be assigned to oversee relevant works and ensure the proponent is adhering to the recommendations of this FFA. The Project Ecologist must as a minimum:

- have a relevant tertiary degree in Science, Biology, Ecology, Environmental Science, Environmental Management or Natural Resource Management,
- be fully licensed under the *Biodiversity Conservation Act 2016* (or equivalent) and,
- be fully licensed with a NSW Animal Research Authority (or equivalent) permitting the handling, relocation and humane euthanasia of all terrestrial fauna.

4.2 Natural Hydrology

No development is proposed within the mapped riparian corridor in the western extent of the Subject Site (**Figure 2**). Ensuring adherence to the recommendations of this report and the corresponding Waterway Impact Statement and Riparian Management Plan undertaken by Martens (2018), the proposed development is not expected to adversely impact on the natural hydrology of the Subject Site or the adjoining Neverfail Gully watercourse. All relevant protections are to be implemented to prevent potential detrimental impacts to Neverfail Gully and its adjoining Riparian corridor resulting from the proposed development.

4.3 Work Site Delineation

All native vegetation and fauna habitat areas should be delineated by the Project Ecologist prior to any works commencing on the Subject Site.

Protective structures should be established around all boundaries of the Duffys Forest EEC to be retained prior to the commencement of any works.

4.4 Tree Removal and Thinning

The use of heavy machinery such as bulldozers, mulchers and excavators may be used for the purpose of tree removal from the construction footprint only. No heavy machinery should be permitted within the mapped Riparian Corridor at any time.

Where tree lopping or felling is required within, all work is to be undertaken by hand using chainsaws and pulleys. No heavy machinery should be used within close proximity to Native vegetation to be retained.

4.5 Preclearing Survey and Fauna Management

All vegetation on the Subject Site has potential to contain nesting or sheltering fauna including threatened species. Prevention of harm to native fauna is a requirement of the *Prevention of Cruelty to Animals Act 1979* and the *NSW National Parks and Wildlife Act 1974*.

Prior to the removal of any vegetation, including weed infestations, a detailed preclearing assessment should be undertaken by the Project Ecologist or their delegate. The pre-clearing assessment will allow identification of any habitat containing fauna which may be harmed during the clearing process, such as hollow-bearing trees, cavernous rock outcrops, soaks, and nests.

An Ecologist pre-clearing assessment should occur no more than 1-2 weeks prior to the commencement of clearing works, and at least 12 hours prior to commencement of clearing works.

The Project Ecologist will identify and delineate which of the trees (including dead trees) scheduled for removal from the proposed development area contain fauna habitat. This will take place during a pre-clearing survey of the Subject Site prior to any tree removal works taking place. All tree hollows removed are to be replaced within suitable vegetation elsewhere within the Subject Site at the compensatory ratio of 1:2 (two nest boxes per tree hollow removed). Tree hollow replacement is discussed further in **Section 4.9.**

The Project Ecologist should be notified to attend the Subject Site in the event that fauna is found within the proposed construction footprint and cannot make their own way out. The Ecologist should take appropriate action to rescue and relocate the fauna.

4.6 Ecologist Clearing Supervision

The Project Ecologist or their delegate should be present on site to supervise all vegetation removal work and tree lopping work that is undertaken within the Subject Site. No hollow-bearing trees should be removed or lopped without an Ecologist present to supervise the works and capture and relocate any displaced fauna.

4.7 Weed Management

Ongoing weed management is recommended throughout all areas of native vegetation both remnant and revegetated. The management of these areas is recommended to be managed under a BMP (Narla Environmental 2019). All BMP implementation works should be undertaken by qualified Bushland Restoration Professionals, with experience working in areas that support Duffys Forest EEC and locally occurring threatened flora species. All Bushland Restoration site supervisors should have the ability to identify any additional threatened flora which may emerge during the weed management works.

Extensive weed management will be undertaken across all weed infested portions of the remnant vegetation and Riparian Corridor that remain within the Subject Site. A BMP (Narla Environmental 2019) will guide the ongoing management of weed incursions and native regeneration efforts within the Subject Site and immediate surrounds where relevant.

4.8 Revegetation and Landscaping

Native vegetation on the Subject Site will be restored through intensive revegetation to be implemented through the Landscape Plan (Arterra 2019a) and BMP (Narla Environmental 2019).

To compensate for the loss of 0.09ha of Duffys Forest EEC from within the Subject Site, an estimated total of 0.59ha hectares of native vegetation representative of this community on the Subject Site will be restored through intensive revegetation to be implemented through the application of the Landscape Plan (Arterra 2019a) and recommended BMP (Narla Environmental 2019). This will be undertaken by Bushland Restoration professionals.

All areas designated for native revegetation (**Figure 6**), are to be revegetated with locally indigenous, native species representative of Duffys Forest EEC. Native revegetation efforts are recommended to be guided by a site specific BMP (Narla Environmental 2019). No exotic flora, Banksia hybrids/cultivars or Grevillea hybrids/cultivars are to be installed within the Subject Site.

Larger, more contiguous areas to be revegetated in the southern and western extents of the site are to be protected by permanent post and rail fencing on all sides (**Figure 6**). Gates are to be installed at regular intervals along the fencing to allow for access and egress into the revegetation areas.

4.9 Nest Hollow Augmentation

At least two (2) augmented nest hollows should be installed across the Subject Site to replace every tree hollow removed to facilitate the development. Augmented nest hollows may include a combination of:

- artificial nest boxes (constructed of marine ply),
- capped hollow logs, or
- tree hollow excision (performed only by an experienced and qualified arborist with a chainsaw).

Because of the low accuracy in counting hollow numbers in standing trees, the final number of actual tree hollows removed should be determined by an Ecologist after each tree has been felled. Ratios of artificial nest hollow sizes installed, should be reflective of the nest hollow size classes in the trees or limbs removed. This will ensure no net loss of fauna nest hollow habitat across the Subject Site.

4.10 Pest Fauna Management

Pest fauna such as feral cats, foxes and rabbits should be managed as effectively as possible, within the boundaries of the *Local Land Services Act 2013*. The use of trapping, shooting and/or baiting to control foxes, feral cats and rabbits should be explored by the proponent in order to manage these pests for biodiversity conservation purposes.

Wandering pets should be discouraged from entering the Subject Site. This may be achieved through the installation of fencing and/or by erecting signs to educate local pet owners. By excluding pest fauna there will be a net gain achieved for the proposed development by reducing the risk of negative interactions occurring between native and exotic animals.

5. Conclusion

Following the completion of this assessment, Narla Environmental are satisfied that the proposed development had been appropriately located entirely within the area identified as having least ecological impact. Narla Environmental support the approval of the proposed development subject to the implementation of the recommendations outlined in this report and the accompanying technical reports.

From a biodiversity conservation perspective, it is considered that if the proposed development is approved, the Subject Site will receive a long-term net gain in biodiversity values through extensive efforts to protect, maintain and enhance the vegetation, flora and fauna on the Subject Site.

The production of a comprehensive Biodiversity Management Plan will aim to protect and enhance the existing habitat on the Subject Site to promote the native flora, maintain and enhance the extent of EEC.

Assessments of Significance pursuant to s. 7.3 of the BC Act (5-Part Tests) of threatened species, populations and communities known or predicted to occur on the Subject Site revealed no significant impact would occur as a result of the proposed development, subject to intense, on-going management of the Subject Site for the objective of maintaining and enhancing local and regional biodiversity.

It is recommended that the proposed development is approved since the requirements to assess potential impacts to threatened species, populations and ecological communities have been met pursuant to Part 4 of the EP&A Act, the Warringah LEP, Warringah DCP and all relevant SEPP, plans and policies.

References

Arterra (2019a) Landscape Design Concept Plan

Arterra (2019b) Tree Protection Specification & Schedule

Arterra (2019c) Arboricultural Impact Assessment Report

Atlas of Living Australia (ALA) (2018) Atlas of Living Australia. Spatial Portal http://spatial.ala.org.au/

Australian Native Plants Society (Australia) (ANSPA) (2010) Threatened Flora Lists: ROTAP Coding System http://anpsa.org.au/coding.html

Briggs, J.D. and Leigh, J.H.C. (1996) Rare or Threatened Australian Plants: 1995 Revised Edition. CSIRO Division of Plant Industry/Australian National Parks and Wildlife Service. CSIRO Publishing, Melb.

Calder Flower Architects (Calder Flower) (2016) Site Compatibility Certificate – Terrey Hills Proposed Residential Aged Care, 58 Laitoki Road, NSW

Calder Flower Architects (Calder Flower) (2018) Site Plan - 58 LAITOKI ROAD TERREY HILLS, NSW 2084

Chapman and Murphy (1989) Soil Landscapes of the Sydney 1:100 000 Sheet. Soil. Conservation Service of NSW, Sydney.

Churchill, S. (1998) Australian Bats, Reed New Holland, Sydney.

Commonwealth of Australia (2010a) Survey guidelines for Australia's threatened birds. Guidelines for detecting birds listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999

Commonwealth of Australia (2010b) Survey guidelines for Australia's threatened bats. Guidelines for detecting bats listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999

Commonwealth of Australia (2010b) Survey guidelines for Australia's threatened frogs. Guidelines for detecting frogs listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999

Commonwealth of Australia (2011) Survey guidelines for Australia's threatened mammals. Guidelines for detecting mammals listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999

Commonwealth of Australia (2013) Survey guidelines for Australia's threatened orchids. Guidelines for detecting orchids listed as 'threatened' under the Environment Protection and Biodiversity Conservation Act 1999

Commonwealth of Australia (2015) Referral guideline for 14 birds listed as migratory species under the EPBC Act.

Commonwealth of Australia (2016) National Recovery Plan for the Regent Honeyeater (*Anthochaera phrygia*)

Commonwealth of Australia (2017) Draft National Recovery Plan for the Grey-headed Flying-fox (Pteropus poliocephalus) guidelines

Cropper S.C. (1993) Management of Endangered Plants. CSIRO Publishing, Collingwood, Victoria, Australia

Department of Environment and Conservation (DEC) (2004a) Approved Recovery Plan for *Grevillea caleyi* R. Br. (Proteaceae), Department of Environment and Conservation (NSW), Hurstville.

Department of Environment and Conservation (DEC) (2004c) *Darwinia biflora Recovery Plan*. NSW Department of Environment and Conservation, Hurstville.

Department of Environment and Conservation (DEC) (2006a) Southern Brown Bandicoot (Isoodon obesulus) Recovery Plan. NSW DEC, Hurstville NSW.

Department of Environment and Conservation (DEC) (2006b) Recovery Plan for the Large Forest Owls: Powerful Owl Ninox strenua Sooty Owl Tyto tenebricosa Masked Owl Tyto novaehollandiae. DEC NSW, Sydney.

Department of Environment and Conservation (DEC) (2007). Threatened Species Assessment Guidelines: The Assessment of Significance. Department of Environment and Climate Change NSW.

Department of Environment and Conservation (DEC) (2009) Threatened species survey and assessment Department of Environment and Conservation, Hurstville, NSW.

Department of Environment, Climate Change and Water (NSW) (2010) Recovery Plan for Microstis angusii, Department of Environment, Climate Change and Water (NSW), Sydney

Department of Environment, Climate Change and Water (NSW) (2010), Recovery Plan for Melaleuca deanei, Department of Environment, Climate Change and Water (NSW), Sydney.

Department of Environment, Climate Change and Water NSW (DECCW) (2011) Operational Manual for BioMetric 3.1. Department of Environment, Climate Change and Water NSW, Sydney.

Department of Environment, Land, Water and Planning (2016) National Recovery Plan for the Spotted-tailed Quoll Dasyurus maculatus. Australian Government, Canberra.

Department of Environmental Conservation (DEC) (2004b) Threatened Species Survey and Assessment: Guidelines for developments and activities (working draft), New South Wales

Department of Primary Industries (DPI) (2018) Weeds declared in the Local Control Authority area of Northern Beaches Council, NSW Weeds Wise http://weeds.dpi.nsw.gov.au/WeedDeclarations?RegionId=75

Department of the Environment (DotE) 2018. Protected Matters Search Tool http://www.environment.gov.au/epbc/protect/index.html

Harden, G.J . (ed) (2002). Flora of New South Wales Volume 2. NSW University Press: Sydney.

Harden, G.J. (ed) (1992). Flora of New South Wales Volume 3. NSW University Press: Sydney.

Harden, G.J. (ed) (1993). Flora of New South Wales Volume 4. NSW University Press: Sydney.

Harden, G.J. (ed) (2000). Flora of New South Wales Volume 1. NSW University Press: Sydney.

Herbert, C. (1983) Geology of the 1:100 000 Sheet 9130, Geological Survey of NSW, Sydney.
http://www.bionet.nsw.gov.au/

Landcom (2004) Managing Urban Stormwater: Soils and Construction 'The Blue Book', Volume 1, Fourth Edition, New South Wales Government, ISBN 0-9752030-3-7

Martens Consulting Engineers (Martens) (2018) Waterway Impact Statement and Riparian Management Plan – Proposed Seniors Living Development, 58 Laitoki Road, Terrey Hills

Narla Environmental (2019) Biodiversity Management Plan - 58 Laitoki Road, Duffys Forest

NSW Scientific Committee (2011) Duffys Forest ecological community in the Sydney Basin Bioregion - endangered ecological community listing, NSW Scientific Committee - final determination
http://www.environment.nsw.gov.au/determinations/DuffysForestEcologicalCommunitySydneyEndComListing.htm

Office of Environment and Heritage (OEH) (2016a) The Native Vegetation of the Sydney Metropolitan Area. Volume 1: Technical Report. Version 2.0, Department of Premier and Cabinet, Sydney.

Office of Environment and Heritage (OEH) (2016b) The Native Vegetation of the Sydney Metropolitan Area. Volume 2: Vegetation Community Profiles. Version 3.0, Department of Premier and Cabinet, Sydney.

Office of Environment and Heritage (OEH) (2015) Urban Green Cover in NSW: Technical Guidelines, prepared by the Government Architect's Office for the Office of Environment and Heritage, Goulbourn Street, Sydney 2000

Office of Environment and Heritage (OEH) (2016) NSW Guide to Surveying Threatened Plants

Office of Environment and Heritage (OEH) (2017a) New South Wales Vegetation Information Sydney 2.1
http://www.environment.nsw.gov.au/NSWVCA20PRapp/LoginPR.aspx

Office of Environment and Heritage (OEH) (2018a) NSW Bionet. The website of the Atlas of NSW Wildlife

PlantNET (2018) The NSW Plant Information Network System, Royal Botanic Gardens and Domain Trust, Sydney.
http://plantnet.rbgsyd.nsw.gov.au

Saunders, D.L. and Tzaros, C.L. (2011) National Recovery Plan for the Swift Parrot Lathamus discolor, Birds Australia, Melbourne.

Smith, P. and Smith, J. (2009) Warringah Natural Area Survey: Vegetation History and Wildlife Corridors 2009 Update

Threatened Species Scientific Committee (TSSC) (2002) Duffys Forest ecological community in the Sydney Basin Bioregion - endangered ecological community listing NSW Scientific Committee - final determination

Threatened Species Scientific Committee (TSSC) (2015) Conservation Advice: Grevillea *caleyi* Caley's grevillea, Established under the Environment Protection and Biodiversity Conservation Act 1999, Approved by the Minister's delegate on 01/10/2015

Warringah Council (2003) Tree Preservation Order Policy

Warringah Council (2004) Creek Management Study Final, prepared by Montgomery Watson Harza (MWH) Australia Pty Ltd, Project Number – 831000070A

Warringah Council (2004) Water Sensitive Urban Design, STR-PL 820, Warringah Council Policy Manual, September 2004

Warringah Council (2005a) Warringah Natural Area survey: Vegetation communities and plant species, Prepared by P&J Smith Ecological Consultants

Warringah Council (2005b) Warringah Natural Area survey: Vegetation history and wildlife corridors, Prepared by P&J Smith Ecological Consultants

Warringah Council (2008a) Plan of Management: Threatened Bushland Reserves (Duffys Forest Ecological Community North), Final, June 2008

Warringah Council (2009) Waterways Protection of Waterways and Riparian Land Policy, Policy No. PL 740 https://www.warringah.nsw.gov.au/sites/default/files/documents/general-information/waterways/protectionofwaterwaysandriparianlandpolicy.pdf

Warringah Council (2011a) Warringah Local Environment Plan
Warringah Council (2011b) Warringah Development Control Plan
https://eservices1.warringah.nsw.gov.au/ePlanning/live/pages/plan/book.aspx?exhibit=DCP

Warringah Council (2014) Creek Management Study (Final), Prepared for Council by MWH Australia Pty Ltd, March 2014

Warringah Council (2014) Flora and Fauna Assessment Report Guidelines

Appendices

Appendix A: Fauna species identified within the Subject Site

Appendix B: Flora species identified within the Subject Site

Appendix C: Assessments of Significance under s5AA of the Environmental Planning and Assessment Act 1979 (5-Part Tests)

Appendix D: Landscape Plan

Appendix A: Fauna species identified within the Subject Site

Class	Scientific Name	Common Name	Status
Amphibia	*Crinia signifera*	Common Eastern Froglet	Protected – BC Act
Aves	*Acanthorhynchus tenuirostri*	Eastern Spinebill	Protected – BC Act
Aves	*Accipiter fasciatus*	Brown Goshawk	Protected – BC Act
Aves	*Acridotheres tristis*	Common Myna	Not protected
Aves	*Alectura lathami*	Australian Brush Turkey	Protected – BC Act
Aves	*Anthochaera chrysoptera*	Little Wattlebird	Protected – BC Act
Aves	*Cacatua galerita*	Sulphur Crested Cockatoo	Protected – BC Act
Aves	*Calyptorhynchus funereus*	Yellow-tailed Black Cockatoo	Protected – BC Act
Aves	*Columba livia*	Rock Dove	Not protected
Aves	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike	Protected – BC Act
Aves	*Coracina papuensis*	White-bellied Cuckoo-shrike	Protected – BC Act
Aves	*Corvus coronoides*	Australian Raven	Protected – BC Act
Aves	*Cracticus torquatus*	Grey Butcherbird	Protected – BC Act
Aves	*Cracticus torquatus*	Red Wattlebird	Protected – BC Act
Aves	*Dacelo novaeguineae*	Laughing Kookaburra	Protected – BC Act
Aves	*Eolophus roseicapilla*	Galah	Protected – BC Act
Aves	*Eopsaltria australis*	Eastern Yellow Robin	Protected – BC Act
Aves	*Geopelia humeralis*	Bar-shouldered Dove	Protected – BC Act
Aves	*Glossopsitta concinna*	Musk Lorikeet	Protected – BC Act
Aves	*Grallina cyanoleuca*	Magpie-lark	Protected – BC Act
Aves	*Gymnorhina tibicen*	Australian Magpie	Protected – BC Act
Aves	*Hirundo neoxena*	Welcome swallow	Protected – BC Act
Aves	*Lichenostomus chrysops*	Yellow-faced Honeyeater	Protected – BC Act
Aves	*Malurus cyaneus*	Superb Fairywren	Protected – BC Act
Aves	*Manorina melanocephala*	Noisy Miner	Protected – BC Act
Aves	*Meliphaga lewinii*	Lewin's honeyeater	Protected – BC Act
Aves	*Neochmia temporalis*	Red-browed finch	Protected – BC Act
Aves	*Pachycephala pectoralis*	Australian Golden Whistler	Protected – BC Act
Aves	*Pardalotus punctatus*	Spotted Pardalote	Protected – BC Act
Aves	*Passer domesticus*	House sparrow	Not protected
Aves	*Psophodes olivaceus*	Eastern Whipbird	Protected – BC Act
Aves	*Pycnonotus jocosus*	Red-whiskered bulbul	Not protected
Aves	*Rhipidura albiscapa*	Grey Fantail	Protected – BC Act
Aves	*Rhipidura leucophrys*	Willie Wagtail	Protected – BC Act

Class	Scientific Name	Common Name	Status
Aves	*Sericornis frontalis*	White-browed Scrubwren	Protected – BC Act
Aves	*Strepera graculina*	Pied Currawong	Protected – BC Act
Aves	*Trichoglossus moluccanus*	Rainbow Lorikeet	Protected – BC Act
Aves	*Turdus merula*	Common Blackbird	Not protected
Aves	*Vanellus miles*	Masked Lapwing	Protected – BC Act
Aves	*Zosterops lateralis*	Silvereye	Protected – BC Act
Reptilia	*Morelia spilota*	Diamond Python	Protected – BC Act
Reptilia	*Lampropholis guichenoti*	Common Garden Sunskink	Protected – BC Act

Appendix B: Flora species identified within the Subject Site

Scientific Name	Exotic/Non-indigenous	Canopy	Midstory	Groundcover
Acacia parramattensis		x		
Angophora costata		x		
Banksia serata		x		
Ceratopetalum gummiferum		x		
Corymbia gummifera		x		
Eucalyptus sieberi		x		
Pittosporum undulatum		x		
Acacia floribunda			x	
Allocasuarina littoralis			x	
Callistemon citrinus			x	
Cissus antarctica				x
Cynodon dactylon				x
Dianella caerulea				x
Digitaria parviflora				x
Entolasia stricta				x
Eucalyptus capitellata		x		
Eucalyptus oblonga		x		
Eucalyptus haemastoma		x		
Ficus benjamina				
Geranium homeanum				x
Grevillea linearifolia			x	
Hakea salicifolia				
Homalanthus populifolius			x	
Lomandra longifolia				x
Microlaena stipoides				x
Oxalis perennans				x
Petrophile pulchella				x
Syncarpia glomulifera			x	
Themeda triandra				x
Xylomelum pyriforme			x	
Eucalyptus scoparia	x	x		
Cinnamomum camphora	x	x		
Corymbia citriodora	x			
Acetosa sagittata	x			x
Ageratina adenophora	x			x
Andropogon virginicus	x			x
Araujia sericifera	x			x

Scientific Name	Exotic/Non-indigenous	Canopy	Midstory	Groundcover
Araucaria columnaris	x	x		
Asparagus aethiopicus	x			x
Bidens pilosa	x			x
Capsella bursa-pastoris	x			x
Cardamine hirsuta	x			x
Cenchrus clandestinus	x			x
Cestrum parqui	x		x	
Chlorophytum comosum	x			x
Cordyline sp (cultivar)	x			x
Cotoneaster glaucophyllus	x			
Delairea odorata	x			x
Ehrharta erecta	x			x
Euphorbia peplus	x			x
Freesia sp	x			x
Hedera helix	x			x
Hedychium gardnerianum	x			x
Ipomoea indica	x			x
Lantana camara	x			x
Ligustrum sinense	x		x	
Modiola caroliniana	x			x
Passiflora edulis	x			x
Paspalum dialatatum	x			x
Pennisetum clandestinum	x			x
Phytolacca octandra	x			x
Plantago lanceolata	x			x
Poa annua	x			x
Rhoicissus rhombidea	x			x
Rubus fruticosus agg.	x			x
Rumex obtusifolius	x			x
Senecio madagascariensis	x			x
Senna pendula	x		x	
Sida rhombifolia	x			x
Solanum nigrum	x			x
Solanum mauritianum	x		x	
Soliva sessilis	x			x
Sonchus oleraceus	x			x
Stachys arvensis	x			x
Taraxacum officinale	x			x
Tradescantia fluminensis	x			x

Scientific Name	Exotic/Non-indigenous	Canopy	Midstory	Groundcover
Trifolium repens	x			x
Urtica urens	x			x
Verbena bonariensis	x			x
Vinca major	x			x

Appendix C: Assessments of Significance under s5AA of the Environmental Planning and Assessment Act 1979 (5-Part Tests)

Environmental Planning and Assessment Act 1979 and Biodiversity Conservation Act 2016– Assessment of Significance (5-part Test) for **Grey-headed Flying-Fox** **(Pteropus poliocephalus)**	
BC Act Status: Vulnerable	
Species Ecology	Grey-headed Flying-fox forage opportunistically, often at distances up to 30 km from camps, and occasionally up to 60-70 km per night, in response to patchy food resources. This species is a canopy-feeding frugivore, blossom-eater and nectarivore of rainforests, open forests, woodlands, Melaleuca swamps and Banksia woodlands. As such, the species contributes important ecosystem function by providing a means of seed dispersal and pollination for many indigenous tree species. Grey-headed Flying-fox feed on introduced trees including commercial fruit crops. Grey-headed Flying-foxes congregate in large numbers at roosting sites (camps) that may be found in rainforest patches, Melaleuca stands, mangroves, riparian woodland or modified vegetation in urban areas. Individuals generally exhibit a high fidelity to traditional camps and return annually to give birth and rear offspring. The Grey-headed Flying-fox show a regular pattern of seasonal movement. Much of the population concentrates in May and June in northern NSW and Queensland where animals exploit winter-flowering trees such as Swamp Mahogany Eucalyptus robusta, Forest Red Gum E. tereticornis and Paperbark Melaleuca quinquenervia.
(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,	The proposed development is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction. There were no known roosts or camps of Grey-headed Flying-fox within the subject site or in the surrounding area during the undertaking of this assessment. However, the subject site may provide intermittent potential foraging habitat to this species when habitat trees are flowering and fruiting. A small area of potential foraging habitat for this species is predicted to be removed for the proposed development (0.09ha). While these trees provide potential foraging and shelter for the species, these trees are located in a highly-disturbed area with a high level of human traffic. As a result, it is likely that these trees provide sub-optimal ecological value to the species. A proposed area of 0.59ha surrounding the proposed development is to be rehabilitated and revegetated with locally indigenous, native vegetation representative of that required to be removed. This will result in a net gain in foraging habitat available within the Subject Site for this species. Extensive suitable potential habitat for the species will remain within the broader subject site and in the adjacent bushland including Ku-Ring-Gai Chase National Park. The proposed action will not cause a significant loss in habitat resources and therefore will not have an adverse effect such that will be likely to reduce the viability of a local population, such that the species is likely to be placed at risk of extinction.

Environmental Planning and Assessment Act 1979 and Biodiversity Conservation Act 2016– Assessment of Significance (5-part Test) for **Grey-headed Flying-Fox** **(Pteropus poliocephalus)**		
BC Act Status: Vulnerable		
(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:	(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or	Not applicable – This species is not an ecological community.
	(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,	Not applicable – This species is not an ecological community.
(c) in relation to the habitat of a threatened species or ecological community:	(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and	i) Based on the proposed design, approximately 0.09ha of potential foraging habitat is expected to be removed. While these trees provide potential foraging and shelter for the species, they are located in highly-disturbed areas with a high level of human traffic. As a result, it is likely that these trees provide sub-optimal ecological value to the species. A detailed pre-clearing survey and assessment will be required to quantify the exact number of fruit-bearing and flowering trees lost. The loss of these fruit and nectar-bearing trees and shrubs will be replaced with equivalent locally-indigenous species surrounding the proposed development footprint covering an increased area of 0.59ha. Extensive suitable potential habitat for the species will remain within the broader subject site and in the nearby bushland including the nearby Ku-Ring-Gai Chase National Park.
	(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and	ii) The habitat available on the subject site for this species will not become fragmented from other areas as a result of the proposed development. As the species is highly mobile, minor loss of select trees and shrubs from within the subject site is not considered likely to significantly affect the species. Habitat connectivity will continue to occur across the greater landscape including along the riparian corridor of Neverfail Gully.

<table>
<tr><td colspan="3">Environmental Planning and Assessment Act 1979 and Biodiversity Conservation Act 2016– Assessment of Significance (5-part Test)
for
Grey-headed Flying-Fox
(Pteropus poliocephalus)</td></tr>
<tr><td colspan="3">BC Act Status: Vulnerable</td></tr>
<tr><td></td><td>(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,</td><td>iii) The potential habitat to be removed/ modified is of low importance to the long-term survival of this species within the locality. The proposed development will be situated predominantly in a disturbed and historically cleared landscape containing a small area of potential habitat (0.09ha) that provides sub-optimal foraging habitat for the species in comparison to the extensive potential foraging habitat provided by nearby bushland including the nearby Ku-Ring-Gai Chase National Park.</td></tr>
<tr><td>(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),</td><td colspan="2">The development proposed is not likely to have an adverse effect on any declared area of outstanding biodiversity value, directly or indirectly.</td></tr>
<tr><td>(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.</td><td colspan="2">The following Key Threatening Processes (KTPs) listed under Schedule 4 of the BC Act are relevant to the protection of potential habitat within the subject site for these species:
▪ Clearing of native vegetation
▪ Predation by the European Red Fox Vulpes Vulpes (Linnaeus, 1758)
▪ Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants
▪ Invasion of native plant communities by African Olive Olea europaea subsp. cuspidata (Wall. ex G. Don) Cif.
▪ Invasion and establishment of exotic vines and scramblers
▪ Predation by the Feral Cat Felis catus
Potential foraging habitat removed will be replaced at over twelve times the rate of removal. Replacement trees suitable to the foraging of the species will be considered and addressed in the landscaping plan.
All environmental and priority weed species present within the subject site will be removed and replaced with native flora.</td></tr>
<tr><td colspan="3">Conclusion
The proposed development will pose no significant impact on a local population of the Grey-headed Flying Fox (Pteropus poliocephalus) therefore the proposed action requires no further impact assessment pursuant to the Biodiversity Conservation Act 2016.</td></tr>
<tr><td colspan="3">References
NSW Office of Environment and Heritage (2017) Grey-headed Flying-fox (Pteropus poliocephalus) – Species Conservation Project
NSW Government (2017) NSW Legislation: Biodiversity Conservation act 2016 No 63, Schedule 4: Key Threatening Processes https://www.legislation.nsw.gov.au/acts/2016-63.pdf</td></tr>
</table>

Environmental Planning and Assessment Act 1979 and Biodiversity Conservation Act 2016– Assessment of Significance (5-part Test) for **Glossy Black-Cockatoo** **(*Calyptorhynchus lathami*)**		
BC Act Status: Vulnerable		
Species Ecology	The Glossy Black Cockatoo is uncommon although widely distributed in open forest and woodlands from the central Queensland coast to East Gippsland in Victoria, and inland to the southern tablelands and central western plains of NSW. It feeds almost exclusively on Casuarina spp. and Allocasuarina spp. seeds, with Black Sheoak (Allocasuarina littoralis) and Forest She-oak (A. torulosa) particularly important are important food sources. This species, like many large cockatoos requires large hollow-bearing eucalyptus trees within which it nests. In order to be suitable for breeding sites, hollows must have a diameter of >15cm. Breeding takes place between March and May, when a single egg is laid.	
(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,	The proposed action will not cause a net loss in habitat resources and therefore will not have an adverse effect such that will be likely to reduce the viability of a local population, such that the species is likely to be placed at risk of extinction. There is abundant *Allocasuarina littoralis* on the Subject Site. Glossy Black Cockatoo reside in the nearby Ku-ring-gai Chase National Park and birds from this population may visit the Subject Site on occasion for foraging purposes. Permanent residence or breeding on the Subject Site is highly unlikely. A small area of potential foraging habitat for this species (0.09 ha) will be removed by the proposed construction works. This habitat will be replaced through implementation of the landscape plan (0.59 ha) and restoration and revegetation of all weed infested areas on the Subject Site. A total of 2 potential feed trees and shrubs (Allocasuarina littoralis) are expected to be removed from the Subject Site in order to facilitate the proposed construction. These trees are to be replaced within the proposed revegetation area. No tree hollows suitable for the breeding of this species will be removed for the proposed development. All suitable foraging and shelter trees outside of the proposed construction footprint will be retained un effected by the proposed development.	
(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:	(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or	Not applicable – This species is not an ecological community.
	(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be	Not applicable – This species is not an ecological community.

Environmental Planning and Assessment Act 1979 and Biodiversity Conservation Act 2016– Assessment of Significance (5-part Test) for **Glossy Black-Cockatoo** **(*Calyptorhynchus lathami*)**		
BC Act Status: Vulnerable		
	placed at risk of extinction,	
(c) in relation to the habitat of a threatened species or ecological community:	(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and	i) A small area of potential foraging habitat for this species (0.09 ha) will be removed by the proposed construction works. This habitat will be replaced through implementation of the landscape plan (0.59 ha) and restoration and revegetation of all weed infested areas on the Subject Site. A total of 2 potential feed trees and shrubs (Allocasuarina littoralis) are expected to be removed from the Subject Site in order to facilitate the proposed construction. These trees are to be replaced within the proposed revegetation area. No tree hollows suitable for the breeding of this species will be removed for the proposed development. All suitable foraging and shelter trees outside of the proposed construction footprint will be retained un effected by the proposed development. Extensive suitable habitat will remain on the Subject Site and in the adjoining Ku-ring-gai Chase National Park, which provides approximately 150km2 of potential habitat.
	(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and	ii) The habitat present within the Subject Site is unlikely to become fragmented or isolated from other areas of habitat as a result of the proposed development. All remnant bushland outside of the construction footprint it to be retained and protected (a total of 0.23 ha). Throughout and post the proposed development the recommended complementary BMP will guide enhancement of habitat through installation of additional foraging resources such as Allocasuarina littoralis to increase habitat and connectivity across the site. The habitat on the Subject Site will not become fragmented from other areas because the Glossy Black Cockatoo is mobile and able to move over distances much larger than the width of the subject property. Connectivity will continue to occur to adjoining vegetation to the

Environmental Planning and Assessment Act 1979 and Biodiversity Conservation Act 2016– Assessment of Significance (5-part Test) for **Glossy Black-Cockatoo** **(*Calyptorhynchus lathami*)**		
BC Act Status: Vulnerable		
		south-east of the Subject Site as well as along the Riparian Corridor of Neverfail Gully. No effects to Glossy Black-Cockatoo movement across the Subject Site, and between the Subject Site and adjoining bushland outside of the Subject Site will occur. This is because the species is highly mobile and able to move subject to food availability. The majority of remnant habitat on the Subject Site, including the location of habitat connectivity will be retained (0.23ha ha) and enhanced. Furthermore, the remaining area of the Subject Site outside of the development footprint (0.59ha) will be revegetated with locally indigenous vegetation, including abundant Glossy Black-Cockatoo feed trees.
	(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,	iii) The potential habitat to be removed/ modified is of low importance to the long-term survival of this species within the locality. The proposed development will be situated predominantly in lands that are mostly cleared of native vegetation. A small area of vegetation (0.09 ha) will be removed by the proposed construction works. The habitat to be removed is of low-moderate quality and will be replaced with a total of 0.59ha of locally indigenous, native species representative of those proposed to be removed by the development.
(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),	The development proposed is not likely to have an adverse effect on any declared area of outstanding biodiversity value, directly or indirectly.	
(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.	The following Key Threatening Processes (KTPs) listed under Schedule 4 of the BC Act are relevant to the protection of potential habitat within the subject site for these species: ▪ Clearing of native vegetation ▪ Loss of hollow-bearing trees ▪ Infection of native plants by Phytophthora cinnamomi ▪ Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants	

Environmental Planning and Assessment Act 1979 and Biodiversity Conservation Act 2016– Assessment of Significance (5-part Test) for **Glossy Black-Cockatoo** **(*Calyptorhynchus lathami*)**	
BC Act Status: Vulnerable	
	This report address all KTPs, ensuring there is no increase in their effect which may result for the proposed development works. Key components include the adoption of a strict hygiene plan to prevent the introduction/ spread of plant viruses and additional landscaping/ vegetation management to enhance existing habitat, and the replacement of native foraging trees lost in a ratio of 3:1.
Conclusion The proposed development will pose no significant impact on a local population of the Glossy Black Cockatoo (*Calyptorhynchus lathami*) therefore the proposed action requires no further impact assessment pursuant to the *Biodiversity Conservation Act 2016*.	
References: NSW Office of Environment and Heritage (2016) Glossy Black-Cockatoo (Calyptorhynchus lathami)– Conservation Projects and Species Profile http://www.environment.nsw.gov.au/savingourspeciesapp/project.aspx?ProfileID=10140 NSW Government (2016) Threatened Species Conservation Act 1995 101- Schedule 3: Key Threatening Processes, NSW Legislation http://www.legislation.nsw.gov.au/#/view/act/1995/101/full	

Environmental Planning and Assessment Act 1979 and Biodiversity Conservation Act 2016– Assessment of Significance (5-part Test) for **Eastern Pygmy – possum (*Cercartetus nanus*)**		
BC Act Status: Vulnerable		
Species Ecology	The Eastern Pygmy-possum is found in south-eastern Australia, from southern Queensland to eastern South Australia and in Tasmania. In NSW it extends from the coast inland as far as the Pilliga, Dubbo, Parkes and Wagga Wagga on the western slopes. Shelters in tree hollows, rotten stumps, holes in the ground, abandoned bird-nests, Ringtail Possum (Pseudocheirus peregrinus) dreys or thickets of vegetation, (e.g. grass-tree skirts); nest-building appears to be restricted to breeding females; tree hollows are favoured but spherical nests have been found under the bark of eucalypts and in shredded bark in tree forks.	
(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,	The proposed action will not cause a net loss in habitat resources and therefore will not have an adverse effect such that will be likely to reduce the viability of a local population, such that the species is likely to be placed at risk of extinction. A small area of potential foraging habitat for this species (0.09 ha) will be removed by the proposed construction works. This habitat will be replaced through implementation of the landscape plan (0.59 ha) and restoration and revegetation of all weed infested areas on the Subject Site. The Subject site contains a total of 27 hollow bearing trees containing a total of 49 potential tree hollows. While these trees provide potential foraging and shelter for the species, these trees are located in a highly-disturbed area with a high level of human traffic. As a result, it is likely that these trees provide sub-optimal ecological value to the species. All confirmed hollows removed through the proposed development will be replaced with augmented hollows (nest boxes or chainsaw hollows) at a rate of 1:2 (to new hollows for each hollow removed). These hollows will be erected in remaining vegetation within the subject site. The proposed development will lead to a net increase in both foraging and roosting habitat available for the species within the Subject Site. It is considered unlikely that the proposed development would adversely impact upon the viability of any local population of listed bat species.	
(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:	(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or	Not applicable – These species are not an ecological community.
	(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,	Not applicable – These species are not an ecological community.

Environmental Planning and Assessment Act 1979 and Biodiversity Conservation Act 2016– Assessment of Significance (5-part Test) for **Eastern Pygmy – possum (*Cercartetus nanus*)**		
BC Act Status: Vulnerable		
(c) in relation to the habitat of a threatened species or ecological community:	(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and	i) The proposed action is unlikely to adversely effect upon the life cycle Eastern Pygmy-possum. A small area of potential foraging habitat for this species (0.09 ha) will be removed by the proposed construction works. all suitably sized tree hollows for this species removed are to be replaced by specially designed nest boxes at the compensatory ratio of 1:2. Extensive suitable habitat will remain on the Subject Site and in the adjoining Ku-ring-gai Chase National Park, which provides approximately 150km2 of potential habitat.
	(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and	ii) The habitat present within the Subject Site is unlikely to become fragmented or isolated from other areas of habitat as a result of the proposed development. All remnant bushland outside of the construction footprint it to be retained and protected (a total of 0.23 ha). Throughout and post the proposed development the recommended complementary BMP will guide enhancement of habitat through installation of additional foraging resources (i.e. *Banksia spp.*) to increase habitat and connectivity across the site. The habitat on the Subject Site will not become fragmented from other areas. Connectivity will continue to occur to adjoining vegetation to the south-east of the Subject Site as well as along the Riparian Corridor of Neverfail Gully. No effects to the movement of this species across the Subject Site, and between the Subject Site and adjoining bushland outside of the Subject Site will occur. The majority of remnant habitat on the Subject Site, including the location of habitat connectivity will be retained (0.23ha ha) and enhanced. Furthermore, the remaining area of the Subject Site outside of the development footprint (0.59ha) will be revegetated with locally indigenous vegetation representative of that required to be removed.

<table>
<tr><td colspan="3">Environmental Planning and Assessment Act 1979 and Biodiversity Conservation Act 2016– Assessment of Significance (5-part Test)

for

Eastern Pygmy – possum (Cercartetus nanus)</td></tr>
<tr><td colspan="3">BC Act Status: Vulnerable</td></tr>
<tr><td></td><td>(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,</td><td>iii) The potential habitat to be removed/ modified is of low importance to the long-term survival of these species within the locality. The Subject Site contains a paucity of the preferred forage plant (Banksia ericifolia). The proposed development will be situated predominantly in lands that are mostly cleared of native vegetation. A small area of vegetation (0.09 ha) will be removed by the proposed construction works. The habitat to be removed is of low-moderate quality and will be replaced with a total of 0.59ha of locally indigenous, native species representative of Duffys Forest EEC, inclusive of Banksia spp.</td></tr>
<tr><td>(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),</td><td colspan="2">The development proposed is not likely to have an adverse effect on any declared area of outstanding biodiversity value, directly or indirectly.</td></tr>
<tr><td>(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.</td><td colspan="2">The following Key Threatening Processes (KTPs) listed under Schedule 4 of the BC Act are relevant to the protection of potential habitat within the subject site for these species:

▪ Loss of hollow-bearing trees
▪ Clearing of native vegetation
▪ Predation by the European Red Fox Vulpes Vulpes (Linnaeus, 1758)
▪ Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants
▪ Invasion and establishment of exotic vines and scramblers
▪ Predation by the Feral Cat Felis catus
Potential foraging habitat removed will be replaced at over twelve times the rate of removal. Replacement trees suitable to the foraging of the species will be considered and addressed in the landscaping plan.
All environmental and priority weed species present within the subject site will be removed and replaced with native flora.</td></tr>
<tr><td colspan="3">Conclusion
The proposed development will pose no significant impact on a local population of the Eastern Pygmy-possum (Cercartetus nanus) therefore the proposed action requires no further impact assessment pursuant to the Biodiversity Conservation Act 2016.</td></tr>
<tr><td colspan="3">References:
NSW Office of Environment and Heritage (2017) Eastern Pygmy-possum – profile https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10155
NSW Government (2016) Biodiversity Conservation Act 2016 101- Schedule 4: Key Threatening Processes, NSW Legislation https://www.legislation.nsw.gov.au/#/view/act/2016/63/sch4</td></tr>
</table>

Environmental Planning and Assessment Act 1979 and Biodiversity Conservation Act 2016– Assessment of Significance (5-part Test) for **Nomadic Nectarivorous Birds** **Regent Honeyeater (*Anthochaera Phrygia*)[1]** **Swift Parrot (*Lathamus discolor*)[2]** **Little Lorikeet (*Glossopsitta pusilla*)[3]**	
BC Act Status: [1]Critically Endangered, [2]Endangered, 3Vulnerable	
Species Ecology	The Regent Honeyeater breeds in a few, select locations between north-eastern Victoria and northern NSW. Breeding has not been recorded from Sydney (east of the ranges) in many decades. The closes known breeding site is the Capertee Valley (north-west of Sydney). The Regent Honeyeater is highly nomadic outside the breeding season. It has been recorded throughout the Sydney region and may occur wherever suitable food resources are present. Every few years non-breeding flocks are seen foraging in flowering coastal Swamp Mahogany and Spotted Gum forests, particularly on the central coast and occasionally on the upper north coast. They forage on lerps and other insects, although they show a stronger preference for nectar from flowering Eucalyptus, Angophora and Mistletoes that grow in the Western Sydney area. The Swift Parrot breeds in tree hollows in Tasmanian Blue Gum forest on Tasmania and migrates to the NSW cost for the autumn and winter each year. During this time flocks of Swift Parrot become nomadic as they follow irruptions of food resources, including flowering trees including Eucalyptus, Angophora, Corymbia, Mistletoes and lerp (leaf psyllid insect exudate). Every few years non-breeding flocks are seen foraging in flowering coastal Swamp Mahogany and Spotted Gum forests, particularly on the central coast and occasionally on the upper north coast. Swift Parrot has been recorded throughout the Sydney region wherever suitable food sources are present. It forages predominantly on lerps on all Eucalyptus and Angophora that grow in this area. The Little Lorikeet mostly occurs in dry, open eucalyptus forests and woodlands. The species does not undergo regular migration, but instead is considered nomadic with irregular large or small influxes of individuals occurring at any time of year. This is usually in response to seasonal variations in food supply. Little Lorikeets often forage in small groups with other species of lorikeet, feeding primarily on nectar and pollen from tall eucalyptus species. The Little Lorikeet may also forage within melaleucas and mistletoes. Breeding activity is largely known from the western slopes, where birds utilise small hollows (~3cm) within living smooth barked trees.
(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be	The proposed action will not cause a net loss in habitat resources and therefore will not have an adverse effect such that will be likely to reduce the viability of a local population, such that the species is likely to be placed at risk of extinction. A small area of potential foraging habitat for these species (0.09 ha) will be removed by the proposed construction works. This habitat will be replaced through implementation of the landscape plan (0.59 ha) and restoration and revegetation of all weed infested areas on the Subject Site. All native revegetation undertaken will be representative if that required for removal. The Subject site contains a total of 27 hollow bearing trees. On the advice of a professionally conducted pre-clearing and vegetation clearing supervision assessment, all suitably sized tree hollows suitable for the Little Lorikeet removed are to be replaced by specially designed nest boxes at the compensatory ratio of 1:2 within retained native vegetation.

Environmental Planning and Assessment Act 1979 and Biodiversity Conservation Act 2016– Assessment of Significance (5-part Test) for **Nomadic Nectarivorous Birds** **Regent Honeyeater (*Anthochaera Phrygia*)[1]** **Swift Parrot (*Lathamus discolor*)[2]** **Little Lorikeet (*Glossopsitta pusilla*)[3]**		
BC Act Status: [1]Critically Endangered, [2]Endangered, 3Vulnerable		
placed at risk of extinction,	No breeding habitat for either the Regent Honeyeater or Swift Parrot was present within the Subject Site.All suitable foraging and shelter trees outside of the proposed construction footprint will be retained un effected by the proposed development.	
(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:	(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or	Not applicable – This species is not an ecological community.
	(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,	Not applicable – This species is not an ecological community.
(c) in relation to the habitat of a threatened species or ecological community:	(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and	i) The proposed action is unlikely to adversely effect upon the life cycle of any of these species. A small area of potential foraging habitat for these species (0.09 ha) will be removed by the proposed construction works. An area of 0.59ha is proposed to be revegetated with locally indigenous, native vegetation representative of that removed. All suitably sized tree hollows for the Little Lorikeet removed are to be replaced by specially designed nest boxes at the compensatory ratio of 1:2. Extensive suitable habitat will remain on the Subject Site and in the adjoining Ku-ring-gai Chase National Park, which provides approximately 150km2 of potential habitat.

Environmental Planning and Assessment Act 1979 and Biodiversity Conservation Act 2016– Assessment of Significance (5-part Test) for **Nomadic Nectarivorous Birds** **Regent Honeyeater (*Anthochaera Phrygia*)[1]** **Swift Parrot (*Lathamus discolor*)[2]** **Little Lorikeet (*Glossopsitta pusilla*)[3]**		
BC Act Status: [1]Critically Endangered, [2]Endangered, 3Vulnerable		
	(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and	ii) The habitat present within the Subject Site is unlikely to become fragmented or isolated from other areas of habitat as a result of the proposed development. All remnant bushland outside of the construction footprint it to be retained and protected (a total of 0.23 ha). Throughout and post the proposed development the recommended complementary BMP will guide enhancement of habitat through installation of additional foraging resources to increase habitat and connectivity across the site. The habitat on the Subject Site will not become fragmented from other areas. Connectivity will continue to occur to adjoining vegetation to the south-east of the Subject Site as well as along the Riparian Corridor of Neverfail Gully. No effects to the movement of these species across the Subject Site, and between the Subject Site and adjoining bushland outside of the Subject Site will occur. This is because the species are highly mobile and able to move subject to food availability. The majority of remnant habitat on the Subject Site, including the location of habitat connectivity will be retained (0.23ha ha) and enhanced. Furthermore, the remaining area of the Subject Site outside of the development footprint (0.59ha) will be revegetated with locally indigenous vegetation representative of that required to be removed.
	(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,	iii) The potential habitat to be removed/ modified is of low importance to the long-term survival of these species within the locality. The proposed development will be situated predominantly in lands that are mostly cleared of native vegetation. A small area of vegetation (0.09 ha) will be removed by the proposed construction works. The habitat to be removed is of low-moderate quality and will be replaced with a total of 0.59ha of locally indigenous, native species representative of those proposed to be removed by the development. All potentially suitable tree hollows for the Little Lorikeet identified within the Subject Site identified for removal are to be replaced

<table>
<tr><td colspan="3">Environmental Planning and Assessment Act 1979 and Biodiversity Conservation Act 2016– Assessment of Significance (5-part Test)

for

Nomadic Nectarivorous Birds

Regent Honeyeater (Anthochaera Phrygia)[1]
Swift Parrot (Lathamus discolor)[2]
Little Lorikeet (Glossopsitta pusilla)[3]</td></tr>
<tr><td colspan="3">BC Act Status: [1]Critically Endangered, [2]Endangered, 3Vulnerable</td></tr>
<tr><td></td><td></td><td>with species specific nest boxes within remnant vegetation elsewhere within the Subject Site.</td></tr>
<tr><td>(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),</td><td colspan="2">The development proposed is not likely to have an adverse effect on any declared area of outstanding biodiversity value, directly or indirectly.</td></tr>
<tr><td>(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.</td><td colspan="2">The following Key Threatening Processes (KTPs) listed under Schedule 4 of the BC Act are relevant to the protection of potential habitat within the subject site for these species:

▪ Loss of hollow-bearing trees
▪ Clearing of native vegetation
▪ Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants
▪ Invasion and establishment of exotic vines and scramblers
Potential foraging habitat removed will be replaced at over twelve times the rate of removal. Replacement trees suitable to the foraging of the species will be considered and addressed in the landscaping plan.
All environmental and priority weed species present within the subject site will be removed and replaced with native flora.</td></tr>
<tr><td colspan="3">Conclusion
The proposed development will pose no significant impact on a local population on the Regent Honeyeater (Anthochaera phrygia), Swift Parrot (Lathamus discolor) or Little Lorikeet (Glosspsitta pusilla) therefore the proposed action requires no further impact assessment pursuant to the Biodiversity Conservation Act 2016.</td></tr>
<tr><td colspan="3">References:
Commonwealth of Australia Department of the Environment (DoE) (2015) Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) (s266B) Approved Conservation Advice (including listing advice) for Conservation Advice Anthochaera phrygia regent honeyeater
Commonwealth of Australia Department of the Environment (DoE) (2016) Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) (s266B) Approved Conservation Advice (including listing advice) for Conservation Advice Lathamus discolor swift parrot
NSW Office of Environment and Heritage (2016) Regent Honeyeater (Anthochaera phrygia)- Conservation Projects http://www.environment.nsw.gov.au/savingourspeciesapp/ViewFile.aspx?ReportProjectID=148
NSW Office of Environment and Heritage (2016) Saving our Species. Regent Honeyeater (Anthochaera phrygia) http://www.environment.nsw.gov.au/savingourspeciesapp/project.aspx?ProfileID=10841
NSW Office of Environment and Heritage (2016a) Saving our Species. Swift Parrot (Lathamus discolor) http://www.environment.nsw.gov.au/savingourspeciesapp/project.aspx?ProfileID=10455</td></tr>
</table>

Environmental Planning and Assessment Act 1979 and Biodiversity Conservation Act 2016– Assessment of Significance (5-part Test) For **Hollow Dwelling Bats** **Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)** **Eastern Freetail-bat (*Mormopterus norfolkensis*)** **Greater Broad-nosed Bat (*Scoteanax rueppellii*)** **Southern Myotis (*Myotis macropus*)** **Little Bent-wing Bat (*Miniopterus australis*)** **Yellow-bellied Sheath-tailed Bat (*Saccolaimus flaviventris*)** **Golden-tipped bat (*Kerivoula papuensis*)** **Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*)**	
BC Act Status: Vulnerable	
Species Ecology	The Eastern False Pipistrelle is found on the south-east coast and ranges of Australia, from southern Queensland to Victoria and Tasmania. Prefers moist habitats, with trees taller than 20 m. The Eastern Freetail-bat is found along the east coast from south Queensland to southern NSW. Occur in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. Usually solitary but also recorded roosting communally. The Greater Broad-nosed Bat is found mainly in the gullies and river systems that drain the Great Dividing Range, from north-eastern Victoria to the Atherton Tableland. It extends to the coast over much of its range. Utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. Forages after sunset, flying slowly and directly along creek and river corridors at an altitude of 3 - 6 m. Open woodland habitat and dry open forest suits the direct flight of this species. The Southern Myotis generally roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. Forage over streams and pools catching insects and small fish by raking their feet across the water surface. Little Bentwing-bats roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day. The Yellow-bellied Sheath-tailed Bat roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows. Eastern Bentwing-bats occur along the east and north-west coasts of Australia. Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. All species: All of these microbats share foraging requirements. They all forage for flying insects at varying heights within woodland and forested areas with open or closed canopies, with the exception of the Southern Myotis which primarily forages above waterbodies. Each of these species has specific requirements for maternity roosts (breeding sites), but they all require short term roosting habitat when not breeding.

<table>
<tr><td colspan="3">Environmental Planning and Assessment Act 1979 and Biodiversity Conservation Act 2016– Assessment of Significance (5-part Test)
For

Hollow Dwelling Bats

Eastern False Pipistrelle (Falsistrellus tasmaniensis)
Eastern Freetail-bat (Mormopterus norfolkensis)
Greater Broad-nosed Bat (Scoteanax rueppellii)
Southern Myotis (Myotis macropus)
Little Bent-wing Bat (Miniopterus australis)
Yellow-bellied Sheath-tailed Bat (Saccolaimus flaviventris)
Golden-tipped bat (Kerivoula papuensis)
Eastern Bentwing-bat (Miniopterus schreibersii oceanensis)</td></tr>
<tr><td colspan="3">BC Act Status: Vulnerable</td></tr>
<tr><td></td><td colspan="2">All of these bat species primarily roost within tree hollows, under decorticating bark or occasionally within manmade structures. The habitat used by these species on the subject property, includes tree hollows which would most likely only be used for temporary roosting by small groups and individuals.

Foraging habitat that may be used by these microbat species are the spaces between trees that may be used for foraging. Use of the site by any of these species is expected to be limited, as they are all expected to forage over larger areas.</td></tr>
<tr><td>(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,</td><td colspan="2">The proposed development is unlikely to have an adverse effect on the life cycle of the species such that a viable local population of these species is likely to be placed at risk of extinction.
The Subject site contains a total of 27 hollow bearing trees containing a total of 49 potential tree hollows. While these trees provide potential foraging and shelter for the species, these trees are located in a highly-disturbed area with a high level of human traffic. As a result, it is likely that these trees provide sub-optimal ecological value to the species. All confirmed hollows removed through the proposed development will be replaced with augmented hollows (nest boxes or chainsaw hollows) at a rate of 1:2 (to new hollows for each hollow removed). These hollows will be erected in remaining vegetation within the subject site. The proposed development will lead to a net increase in both foraging and roosting habitat available for these species within the Subject Site.
It is considered unlikely that the proposed development would adversely impact upon the viability of any local population of listed bat species.</td></tr>
<tr><td>(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:</td><td>(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or</td><td>Not applicable – These threatened hollow-roosting microbat species do not constitute an ecological community.</td></tr>
</table>

Environmental Planning and Assessment Act 1979 and Biodiversity Conservation Act 2016– Assessment of Significance (5-part Test) For **Hollow Dwelling Bats** **Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)** **Eastern Freetail-bat (*Mormopterus norfolkensis*)** **Greater Broad-nosed Bat (*Scoteanax rueppellii*)** **Southern Myotis (*Myotis macropus*)** **Little Bent-wing Bat (*Miniopterus australis*)** **Yellow-bellied Sheath-tailed Bat (*Saccolaimus flaviventris*)** **Golden-tipped bat (*Kerivoula papuensis*)** **Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*)**		
BC Act Status: Vulnerable		
	(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,	Not applicable – These threatened hollow-roosting microbat species do not constitute an ecological community.
(c) in relation to the habitat of a threatened species or ecological community:	(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and	i) . The Subject site contains a total of 27 hollow bearing trees containing a total of 49 potential tree hollows. While these trees provide potential foraging and shelter for the species, these trees are located in a highly-disturbed area with a high level of human traffic. As a result, it is likely that these trees provide sub-optimal ecological value to the species. All confirmed hollows removed through the proposed development will be replaced with augmented hollows (nest boxes) at a rate of 1:2. The proposed area of potential habitat removed (0.09ha) will be replaced as a result of the implementation of the prescribed landscape plan and result in an increase in potential roosting and foraging habitat for these species (0.59ha). The proposed development will lead to a net increase in both foraging and roosting habitat available for these species within the Subject Site Extensive suitable potential habitat for the species will remain within the broader subject site and in nearby bushland including Ku-Ring-Gai Chase National Park.

Environmental Planning and Assessment Act 1979 and Biodiversity Conservation Act 2016– Assessment of Significance (5-part Test) For **Hollow Dwelling Bats** **Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)** **Eastern Freetail-bat (*Mormopterus norfolkensis*)** **Greater Broad-nosed Bat (*Scoteanax rueppellii*)** **Southern Myotis (*Myotis macropus*)** **Little Bent-wing Bat (*Miniopterus australis*)** **Yellow-bellied Sheath-tailed Bat (*Saccolaimus flaviventris*)** **Golden-tipped bat (*Kerivoula papuensis*)** **Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*)**		
BC Act Status: Vulnerable		
	(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and	ii) The habitat available on the subject site for this species will not become fragmented from other areas as a result of the proposed development. As these species are mobile, minor loss of select trees from within the subject site is not considered likely to significantly affect the species. Habitat connectivity will continue to occur across the greater landscape.
	(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,	iii) The habitat proposed to be removed or modified as a result of the proposed development is of low importance to the long-term survival of the species within the locality. The proposed development will be situated predominantly in a disturbed and historically cleared landscape containing sub-optimal habitat for the listed species in comparison to the extensive potential foraging habitat provided by bushland in the wider locality including Ku-Ring-Gai Chase National Park.

Environmental Planning and Assessment Act 1979 and Biodiversity Conservation Act 2016– Assessment of Significance (5-part Test) For **Hollow Dwelling Bats** **Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)** **Eastern Freetail-bat (*Mormopterus norfolkensis*)** **Greater Broad-nosed Bat (*Scoteanax rueppellii*)** **Southern Myotis (*Myotis macropus*)** **Little Bent-wing Bat (*Miniopterus australis*)** **Yellow-bellied Sheath-tailed Bat (*Saccolaimus flaviventris*)** **Golden-tipped bat (*Kerivoula papuensis*)** **Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*)**	
BC Act Status: Vulnerable	
(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),	The development proposed is not likely to have an adverse effect on any declared area of outstanding biodiversity value, directly or indirectly.
(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.	The KTPs relevant to these hollow-dwelling microbats within the study area are: ▪ Clearing of native vegetation ▪ High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition ▪ Loss of hollow-bearing trees ▪ Removal of dead wood and dead trees The proposed works are considered unlikely to result in a significant increased impact on these species, under the provision that the mitigation recommendations outlined in this report are followed. These mitigation actions will result in no net loss of habitat, addition of habitat trees recommended within the subject site.
Conclusion The proposed development will pose no significant impact on a local population on the Eastern False Pipistrelle (Falsistrellus tasmaniensis), Eastern Freetail-bat (Mormopterus norfolkensis), Greater Broad-nosed Bat (Scoteanax rueppellii), Southern Myotis (Myotis macropus), Little Bent-wing Bat (Miniopterus australis), Yellow-bellied Sheath-tailed Bat (Saccolaimus flaviventris) or the Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis)* therefore the proposed action requires no further impact assessment pursuant to the *Biodiversity Conservation Act 2016.*	
References NSW Office of Environment and Heritage (2017) Eastern Bentwing-bat – profile https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10534 NSW Office of Environment and Heritage (2017) Golden-tipped Bat – profile https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10444 NSW Office of Environment and Heritage (2017) Greater Broad-nosed Bat – profile https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10748	

Environmental Planning and Assessment Act 1979 and Biodiversity Conservation Act 2016– Assessment of Significance (5-part Test)
For

Hollow Dwelling Bats

Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)
Eastern Freetail-bat (*Mormopterus norfolkensis*)
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Golden-tipped bat (*Kerivoula papuensis*)
Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*)

BC Act Status: Vulnerable

NSW Office of Environment and Heritage (2017) Little Bentwing-bat – profile https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10533
NSW Office of Environment and Heritage (2017) Eastern False Pipistrelle – profile https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10331
NSW Office of Environment and Heritage (2017) Southern Myotis – profile https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10549
NSW Office of Environment and Heritage (2017) Yellow-bellied Sheathtail-bat – profile https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10741
NSW Office of Environment and Heritage (2017) Eastern Freetail-bat – profile https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10544

NSW Government (2017) NSW Legislation: Biodiversity Conservation act 2016 No 63, Schedule 4: Key Threatening Processes https://www.legislation.nsw.gov.au/acts/2016-63.pdf

Environmental Planning and Assessment Act 1979 and Biodiversity Conservation Act 2016– Assessment of Significance (5-part Test) for **Nocturnal Raptorial Birds** **Powerful Owl (Ninox strenua)** **Barking Owl (Ninox connivens)** **Masked Owl (Tyto novaehollandiae)** **and** **Diurnal Raptorial Birds** **White-bellied Sea-Eagle (Haliaeetus leucogaster)** **Little Eagle (Hieraaetus morphnoides)** **Square-tailed Kite (Lophoictinia isura)**	
BC Act Status: Vulnerable	
Species Ecology	The Powerful Owl is found in tall forests across eastern Australia, south of the tropics. It is mostly found east of the Great Dividing Range. The species is not common but it is widespread in NSW. Multiple breeding pairs exist in Sydney. The Species usually requires large hollows to nest in. The Powerful Owl nests in large tree hollows (at least 0.5 m deep), in large eucalypts (diameter at breast height of 80-240 cm) that are at least 150 years old. While the female and young are in the nest hollow the male Powerful Owl roosts nearby (10-200 m) guarding them, often choosing a dense "grove" of trees that provide concealment from other birds that harass him. Pairs of Powerful Owls demonstrate high fidelity to a large territory, the size of which varies with habitat quality and thus prey densities. In good habitats, a mere 400 ha can support a pair; where hollow trees and prey have been depleted the owls need up to 4000 ha. The Barking Owl is found throughout continental Australia except for the central arid regions. Although common in parts of northern Australia, the species has declined greatly in southern Australia and now occurs in a wide but sparse distribution in NSW. Core populations exist on the western slopes and plains (especially the Pilliga) and in some northeast coastal and escarpment forests. Many populations have crashed as woodland on fertile soils was cleared, leaving linear riparian strips of remnant trees as the last inhabitable areas. Sometimes extend their home range into urban areas, hunting birds in garden trees and insects attracted to streetlights. The Masked Owl extends from the coast where it is most abundant to the western plains. Overall records for this species fall within approximately 90% of NSW, excluding the most arid north-western corner. There is no seasonal variation in its distribution. Pairs have a large home-range of 500 to 1000 hectares. Roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting. The White-bellied Sea-Eagle is a large eagle that has long broad wings and a short, wedge-shaped tail. The White-bellied Sea-eagle is distributed around the Australian coastline, including Tasmania, and well inland along rivers and wetlands of the Murray Darling Basin. In New South Wales it is widespread along the east coast, and along all major inland rivers and waterways. The Little Eagle is found throughout the Australian mainland excepting the most densely forested parts of the Dividing Range escarpment. It occurs as a single population throughout NSW. Occupies open eucalypt forest, woodland or open woodland. Sheoak or Acacia woodlands and riparian woodlands of interior NSW are also used. Nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter.

<table>
<tr><td colspan="3">Environmental Planning and Assessment Act 1979 and Biodiversity Conservation Act 2016– Assessment of Significance (5-part Test)

for

Nocturnal Raptorial Birds

Powerful Owl (Ninox strenua)
Barking Owl (Ninox connivens)
Masked Owl (Tyto novaehollandiae)
and

Diurnal Raptorial Birds

White-bellied Sea-Eagle (Haliaeetus leucogaster)
Little Eagle (Hieraaetus morphnoides)
Square-tailed Kite (Lophoictinia isura)</td></tr>
<tr><td colspan="3">BC Act Status: Vulnerable</td></tr>
<tr><td></td><td colspan="2">The Square-tailed Kite ranges along coastal and subcoastal areas from south-western to northern Australia, Queensland, NSW and Victoria. Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses. In arid north-western NSW, has been observed in stony country with a ground cover of chenopods and grasses, open acacia scrub and patches of low open eucalypt woodland. Is a specialist hunter of passerines, especially honeyeaters, and most particularly nestlings, and insects in the tree canopy, picking most prey items from the outer foliage.</td></tr>
<tr><td>(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,</td><td colspan="2">The proposed action will not cause a net loss in habitat resources and therefore will not have an adverse effect such that will be likely to reduce the viability of a local population, such that the species is likely to be placed at risk of extinction.

A small area of potential foraging habitat for this species (0.09 ha) will be removed by the proposed construction works. This habitat will be replaced through implementation of the landscape plan (0.59 ha) and restoration and revegetation of all weed infested areas on the Subject Site resulting in a net gain in potential foraging habitat within the Subject Site. The Subject Site does not contain any suitable breeding habitat suitable for these species.</td></tr>
<tr><td rowspan="2">(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:</td><td>(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or</td><td>Not applicable – This species is not an ecological community.</td></tr>
<tr><td>(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be</td><td>Not applicable – This species is not an ecological community.</td></tr>
</table>

Environmental Planning and Assessment Act 1979 and Biodiversity Conservation Act 2016– Assessment of Significance (5-part Test) for **Nocturnal Raptorial Birds** **Powerful Owl (Ninox strenua)** **Barking Owl (Ninox connivens)** **Masked Owl (Tyto novaehollandiae)** **and** **Diurnal Raptorial Birds** **White-bellied Sea-Eagle (Haliaeetus leucogaster)** **Little Eagle (Hieraaetus morphnoides)** **Square-tailed Kite (Lophoictinia isura)**		
BC Act Status: Vulnerable		
	placed at risk of extinction,	
(c) in relation to the habitat of a threatened species or ecological community:	(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and	i) The proposed action is unlikely to adversely effect upon the life cycle of these species. A small area of potential foraging habitat for this species (0.09 ha) will be removed by the proposed construction works. A larger area of 0.59ha is proposed to be revegetated with vegetation representative of that removes, resulting in a net gain in foraging habitat for these species. No suitable breeding habitat for these species is present or expected to be removed from the Subject Site. Extensive suitable habitat will remain on the Subject Site and in the adjoining Ku-ring-gai Chase National Park, which provides approximately 150km2 of potential habitat.
	(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and	ii) The habitat present within the Subject Site is unlikely to become fragmented or isolated from other areas of habitat as a result of the proposed development. All remnant bushland outside of the construction footprint it to be retained and protected (a total of 0.23 ha). Throughout and post the proposed development the recommended complementary BMP will guide enhancement of habitat through installation of additional foraging resources to increase habitat and connectivity across the site (0.59 Ha) . The habitat on the Subject Site will not become fragmented from other areas. Connectivity will continue to occur to adjoining vegetation to the south-east of the Subject Site as well as along the Riparian Corridor of Neverfail Gully. No effects to the

Environmental Planning and Assessment Act 1979 and Biodiversity Conservation Act 2016– Assessment of Significance (5-part Test) for **Nocturnal Raptorial Birds** **Powerful Owl (Ninox strenua)** **Barking Owl (Ninox connivens)** **Masked Owl (Tyto novaehollandiae)** **and** **Diurnal Raptorial Birds** **White-bellied Sea-Eagle (Haliaeetus leucogaster)** **Little Eagle (Hieraaetus morphnoides)** **Square-tailed Kite (Lophoictinia isura)**		
BC Act Status: Vulnerable		
		movement of these species across the Subject Site, and between the Subject Site and adjoining bushland outside of the Subject Site will occur. This is because these species are highly mobile and able to move subject to food availability. The majority of remnant habitat on the Subject Site, including the location of habitat connectivity will be retained (0.23ha ha) and enhanced. Furthermore, the remaining area of the Subject Site outside of the development footprint (0.59ha) will be revegetated with locally indigenous vegetation representative of that required to be removed.
	(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,	iii) The potential habitat to be removed/ modified is of low importance to the long-term survival of these species within the locality. The proposed development will be situated predominantly in lands that have already been cleared of native vegetation. A small area of vegetation (0.09 ha) will be removed by the proposed construction works. The habitat to be removed is of low-moderate quality and will be replaced with a total of 0.59ha of locally indigenous, native species representative of those proposed to be removed by the development.
(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),	The development proposed is not likely to have an adverse effect on any declared area of outstanding biodiversity value, directly or indirectly.	

Environmental Planning and Assessment Act 1979 and Biodiversity Conservation Act 2016– Assessment of Significance (5-part Test) for **Nocturnal Raptorial Birds** **Powerful Owl (Ninox strenua)** **Barking Owl (Ninox connivens)** **Masked Owl (Tyto novaehollandiae)** **and** **Diurnal Raptorial Birds** **White-bellied Sea-Eagle (Haliaeetus leucogaster)** **Little Eagle (Hieraaetus morphnoides)** **Square-tailed Kite (Lophoictinia isura)**	
BC Act Status: Vulnerable	
(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.	The following Key Threatening Processes (KTPs) listed under Schedule 4 of the BC Act are relevant to the protection of potential habitat within the subject site for these species: ▪ Loss of hollow-bearing trees ▪ Clearing of native vegetation ▪ Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants ▪ Invasion and establishment of exotic vines and scramblers Potential foraging habitat removed will be replaced at over twelve times the rate of removal. Replacement trees suitable to the foraging of the species will be considered and addressed in the landscaping plan. All environmental and priority weed species present within the subject site will be removed and replaced with native flora.
Conclusion There is not expected to be any adverse effect on the Powerful Owl (*Ninox strenua*), Barking Owl *(Ninox connivens*), Masked Owl (*Tyto novaehollandiae*), White-bellied Sea-Eagle (Haliaeetus leucogaster), Little Eagle (Hieraaetus morphnoides) and Square-tailed Kite (Lophoictinia isura) within the Subject Site associated with the proposed development; as such, this does not constitute a significantly adverse effect upon these species such that a local viable population could be placed at risk of extinction, therefore the proposed development requires no further impact assessment.	
References: The Office of Environment and Heritage (2017) Little Eagle (Hieraaetus morphnoides) – Profile https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=20131 The Office of Environment and Heritage (2017) Square-tailed Kite (Lophoictinia isura)– Profile https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10495 The Office of Environment and Heritage (2015) White-bellied Sea-Eagle (Haliaeetus leucogaster)– Profile https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=20322 The Office of Environment and Heritage (2017) Powerful Owl (Ninox strenua) – Profile https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10562 The Office of Environment and Heritage (2017) Barking Owl (Ninox connivens) – Profile https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10561 The Office of Environment and Heritage (2017) Masked Owl (Tyto novaehollandiae) – Profile https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10820 Biodiversity Conservation Act 2016 101- Schedule 4: Key Threatening Processes, NSW Legislation https://www.legislation.nsw.gov.au/#/view/act/2016/63/sch4	

Environmental Planning and Assessment Act 1979 and Biodiversity Conservation Act 2016– Assessment of Significance (5-part Test) for **Duffys Forest ecological community in the Sydney Basin Bioregion**		
BC Act Status: Endangered Ecological Community		
Species Ecology	Duffys Forest Ecological Community is the accepted name for the ecological community that is dominated by a combination of Silver-top Ash (*Eucalyptus sieberi*), Red Bloodwood (*Corymbia gummifera*) and Brown Stringybark (*Eucalyptus capitellata*) and occurs on the ridgetops, plateaus, upper slopes and occasionally mid slopes on Hawkesbury sandstone geology, typically in association with laterite soils and soils derived from shale and laminite lenses. It has the structural form predominantly of open-forest to woodland. The Duffys Forest Ecological Community has been reported from the Warringah, Pittwater, Ku-ring-gai, Hornsby and Manly Local Government Areas, although it may occur elsewhere in the Sydney Basin Bioregion.	
(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,	Not Applicable – Duffys Forest is not a species.	
(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:	(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or	i) No, the proposed development is not likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, . Only a small area of native vegetation representative of the Duffys Forest assemblage will be removed as a part of the works (0.09ha). All remaining Duffys Forest representative vegetation will be retained and enhanced by weeding and infil planting as guided by the BMP and corresponding landscape plan (Arterra 2019a). A combined area of 0.59ha of native vegetation representative of the Duffys Forest EEC will be planted around the perimeter of the Subject Site. Combined with weed management efforts and regeneration of Duffys Forest representative vegetation, the subject site should receive an overall gain in Duffys Forest EEC.

Environmental Planning and Assessment Act 1979 and Biodiversity Conservation Act 2016– Assessment of Significance (5-part Test) for **Duffys Forest ecological community in the Sydney Basin Bioregion**		
BC Act Status: Endangered Ecological Community		
	(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,	ii) The proposed development is not likely to modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction. The proposed landscape plan and BMP will result in an overall improved composition of Duffys Forest EEC across the subject site. This will be achieved through planting of local provenance Duffys Forest EEC species, as well as managing the entire site of weeds.
(c) in relation to the habitat of a threatened species or ecological community:	(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and	i) Only a small area of native vegetation representative of the Duffys Forest assemblage will be removed as a part of the works (0.09ha). This will be replaced through revegetation with 0.59 ha of Duffys Forest EEC elsewhere across the subject site.
	(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and	ii) The Duffys Forest representative vegetation within the site is currently isolated from patches of Duffys Forest that occur throughout the greater landscape due to historical land-clearing, development, grazing and other peri-urban land uses. The proposed BMP will result in improved habitat connectivity between the subject site and surrounding bushland remnants. This will be achieved through active weed removal from the riparian zone along with extensive revegetation with local provenance stock of Duffys Forest EEC characteristic species.
	(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,	iii) All areas which support viable patches of Duffys Forest are important however the area proposed for removal (0.09ha) is currently in a low-moderate condition due to the presence of weeds and historical clearing. The corresponding landscape plan landscape plan (Arterra 2019a) proposes that an area of 0.59ha is to be rehabilitated and revegetated with native vegetation representative of the Duffys Forest vegetation community.

<table>
<tr><td colspan="3">Environmental Planning and Assessment Act 1979 and Biodiversity Conservation Act 2016– Assessment of Significance (5-part Test)
for
Duffys Forest ecological community in the Sydney Basin Bioregion</td></tr>
<tr><td colspan="3">BC Act Status: Endangered Ecological Community</td></tr>
<tr><td></td><td></td><td>The proposed development will see an increase in Duffys Forest representative vegetation throughout the site, in the long-term.</td></tr>
<tr><td>(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),</td><td colspan="2">The development proposed is not likely to have an adverse effect on any declared area of outstanding biodiversity value, directly or indirectly.</td></tr>
<tr><td>(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.</td><td colspan="2">The following Key Threatening Processes (KTPs) are documented to impact upon the survival of Duffys Forest EEC:-
▪ Clearing of native vegetation
▪ Loss of hollow-bearing trees
▪ Invasion and establishment of exotic vines and scramblers
▪ High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition
To facilitate the proposed development, a small area of native vegetation representative of this community will require removal (0.09ha). An area of 0.59ha is proposed to be revegetated with locally indigenous, native vegetation representative of this community surrounding the proposed development. Woody debris from removed locally-indigenous trees will be relocated to the north-west of the site to provide ground-dwelling habitat. The proposed development should see a net gain in the occurrence of Duffys Forest EEC within the Subject Site.</td></tr>
<tr><td colspan="3">Conclusion
There will be no significant effect on Duffys Forest Ecological Community in the Sydney Basin Bioregion therefore the proposed development requires no further impact assessment.</td></tr>
<tr><td colspan="3">References:
NSW Office of Environment and Heritage (2015) Duffys Forest Ecological Community in the Sydney Basin Bioregion – Conservation Projects and Species Profile: http://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10254
NSW Government (2016) Threatened Species Conservation Act 1995 101- Schedule 3: Key Threatening Processes, NSW Legislation http://www.legislation.nsw.gov.au/#/view/act/1995/101/full
Arterra Design (Arterra) (2018a) Landscape Design Concept Plan</td></tr>
</table>

Appendix D: Landscape Plan (Arterra 2019a)

NARLA

environmental

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