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Biodiversity Development Assessment Report

for

New Dwellings

at

143-145 McCarrs Creek Road, Church Point

October 2019

Document Information

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Table of Contents

Table of Figures

Table of Tables

Table of Appendices

Context

A. Background

This report describes the ecological values and constraints at the Development Site which is the southern part of Lot 12 and 13 DP 28236, known as 143-145 McCarrs Creek Road. The residual impact was then assessed, the offsetting calculated and recommendations for amelioration and ongoing mitigation were made. The importance of the land to the conservation of Threatened flora and fauna species, and ecological communities and the likely impacts of the proposed development on terrestrial biodiversity are assessed as required by Federal, State and Local Government legislation.

An accurate description of the flora and fauna and an assessment of the ecological impact of the proposed development is required when submitting development applications to allow assessment of the application in relation to the following legislation; the NSW Environmental Planning and Assessment Act 1979, the Biodiversity Conservation Act 2016. In addition, the information in this report is likely to be needed to assess this development with respect to other acts, SEPPs, local government plans (LEPs, DCPs) regulations, orders and policies

B. Aims of this Report

The aims of this Biodiversity Development Assessment Report are to:

- Determine the site context including native vegetation in the locality and landscape features on the Development Site.
- Record the findings of an ecological survey (flora, fauna and ecological communities and their habitats and the vegetation integrity) of the area likely to be impacted by the proposal;
- Provide ecological information and assessment regarding the importance of the habitat on the site to the conservation of native flora and fauna.
- Determine the ecological constraints of the site and provide advice to the applicant on ways the impact can be avoided and minimised before finalising the proposal plans as required by the mitigation hierarchy in the Biodiversity Conservation Act regulation 2017;
- To Assess the likely impact of the proposal on the ecological values of the site in particular the significance of the impact to Threatened species, populations and ecological communities and their habitats in accordance with the requirements of; the Environment Planning and Assessment Act 1979 (EP&A Act) Sections 4.15 (1) a, b and c and the Biodiversity Conservation Act 2016 and determination of compliance with other relevant NSW legislation including; Acts, regulations SEPPs, LEP and DCPs;
- Determine if the proposal needs referral to the Federal government for assessment under the EPBC Act;
- Assess if potential Serious and Irreversible Impacts (SAII) may result from the proposal.
- Determine the extent and condition of areas that require offsetting under the Biodiversity Conservation Act and calculate the number of offsetting credits that will be required and the corresponding cost.
- Recommend ways the ecological impacts can be further ameliorated and prescribe appropriate ecological management actions during construction and for the life of the development.
- This report addresses Council legislation (LEP, DCP), the “heads of consideration” in section 4.15 (1) a, b, c of the EP&A Act, SEPPs, other NSW environmental Acts and the Federal EPBC Act.

C. Legislation Addressed by the Report

I. Environment Planning and Assessment Act 1979

The NSW Environment Planning and Assessment Act 1979 is the framework for approval of development in NSW. The proposed development will be assessed under Part 4 of the NSW Environmental Planning and Assessment Act 1979. Section 4.15 (a)(formerly 79C(a)) of the Act requires that consent authorities must take into consideration any environmental planning instruments, LEP, DCP, SEPPs and regulations. Section 4.15 (c) requires assessment of the suitability of the land for development.

Section 4.15 (b) (formerly 79C (b)) requires the assessment of the likely impacts of a development, including environmental impacts on both the natural and built environments including the BC Act threshold test and if necessary a BAM assessment and any required offsetting.

II. Biodiversity Conservation Act 2016

The primary requirement of the BC Act is that ecological impacts are to be Avoided and Minimised during the planning of a proposal and then any remaining impact are to be offset according to the Biodiversity Offset Scheme (BOS).

The Schedules of the BC Act list Threatened flora and fauna species and define Endangered ecological communities.

Section 7.2 of the BC Act states that a development is likely to have a significant and will require assessment and offsetting effect if any of the following triggers are met;

- The area of native vegetation (any plant native to NSW, as defined in the LLS Act) to be disturbed (including bushfire APZ and other disturbance) is about the clearing threshold for the minimum lot size (defined in the LEP) (section 7.2 of the BC Act regulation), or
- The proposal will have a direct or indirect impact on Biodiversity Value mapped on the Biodiversity values map.
- a Test of Significance (5 part test) for potential threatened species or ecological communities is positive (see below for details), or
- an Area of Outstanding Biodiversity Value is affected by the proposal.

The Test of Significance (section 7.3 of the BC Act) is used to determine if a proposed development or activity is likely to significantly affect Threatened species or ecological communities, or their habitats. Section 7.3 (2) of the BC Act provides guidance on the assessment of the Test of Significance in a guideline document (2018). https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Threatened-species/threatened-species-test-significance-guidelines-170634.pdf

If any of the triggers are met then the Biodiversity Assessment Method (BAM) must be applied, = then the residual impact of the proposal must be offset in accordance with the Biodiversity Offset Scheme (BOS) using the Biodiversity Assessment Method (BAM). There are two mechanisms to determine the amount of offsets credits required 1. The Biodiversity calculator is applied to determine the offsets required for the loss of native vegetation and the Threatened species habitat that the native vegetation provides. 2. Assessment of Prescribed Impacts (impact to habitat that is not native vegetation) relevant to the site and proposal to determine the number of additional credits needed due to Prescribed Impacts.

Proposals also needs to be assessed to determine if they may cause a Serious And Irreversible Impacts (SAII).

If a Development Application does not meet the threshold or any other triggers, then a smaller ecological report is still required to address the ecologically relevant "heads of consideration" in the section 4.15 (formerly 79C) of the EP&A Act, SEPPs and LEP/DCP requirements. Other Acts such as Federal EPBC Act, Fisheries Management Act 1994, Water Management Act 2000 and Local Land Service's Act 2013 requirements may also require an ecological assessment report.

III. Council LEP and DCP

Both the LEP and the DCP must be considered when a determining authority assesses development. The relevant parts of the LEP and DCP are addressed in this report.

IV. Federal Environment Protection and Biodiversity Conservation Act 1999

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

significance". In determining whether a "significant impact" will occur, consideration is given to the EPBC Act Administrative guidelines on significance (DEH 2006)

Should the assessment in this report determine that a "significant impact" will occur or is likely to occur on "matters of national environmental significance" the proposed development will need to be referred to the Minister (Cwlth) to determine as to whether or not the proposed development is a "controlled action".

Assessment of a Development Application with respect to the EPBC Act 1999 is not a Council issue but is the responsibility of the proponent. Proponents should be advised by their ecological consultant whether a referral is necessary.

This report addresses the requirements of this legislation.

D. Definitions and Acronyms

5-Part Test of Significance (5-Part Test) – Assessment under Section 7.3 of the BC Act to determine whether a proposed development or activity is likely to significantly affect threatened species or ecological communities, or their habitats.

AOBV- An Area of Outstanding Biodiversity Significance defined in the Biodiversity Conservation Act 2016. Proposals that impact declared AOBVs are required to enter in the BOS.

APZ – Bushfire hazard, fuel reduction, Asset Protection Zone, defined in the document 'Planning for Bushfire Protection 2018' by the NSW Rural Fire Service.

BAM – Biodiversity Assessment Method is the ecological survey and assessment techniques that are required to be used for the BOS assessment (including BAM calculation for impact to native vegetation and Prescribed Impacts assessment for additional offsets). The BAM is described in a document by Office of Environment and Heritage, OEH (August 2017) and required by the BC Act and Regulation.
BAR – Biodiversity Assessment Report. The types of Biodiversity Assessment Reports that the BAM method requires are a Biodiversity Development Assessment Report (BDAR), Biodiversity Stewardship Site Assessment Report (BSSAR) and a Biodiversity Certification Assessment Report (BCAR) as described in the BAM and BC Act and Regulation.

BC Act – NSW Biodiversity Conservation Act 2016 contains the lists of threatened species, the definitions of the threatened ecological communities, the 5-part Test of Significance, AOBV, SAII and the BOS. There is an associated Biodiversity Conservation regulation which in turn refers to the BAM.

Biodiversity Credits – An estimated measurement of the value of a threatened ecological community or threatened species habitat to be impacted. Including Ecosystem credits and Species Credits. Biodiversity credits are used to measure the loss in biodiversity values at a development site and the gain in biodiversity values at a biodiversity stewardship site. Credits are calculated using the BAM calculator plus assessment of Prescribed Impacts.

BDAR – Biodiversity Development Assessment Report as outlined in Division 3 of the BC Act. It is prepared by an accredited person in relation to proposed development in the assessment of impacts on threatened species and threatened ecological communities, and their habitats.

BOS – Biodiversity Offset Scheme the system of trading biodiversity offset credits or paying for offsets to the Biodiversity Trust.

Biodiversity Trust – The NSW Government established the Biodiversity Conservation Trust of New South Wales (BCT) on 25 August 2017 under the Biodiversity Conservation Act 2016 (the Act), as part of its land management and biodiversity conservation reforms. Part 10 of the BC Act establishes the status, powers and functions of the BCT, and sets out its object and principal purpose.

DCP – Development Control Plan, a local planning guideline for each Local Government Area.

The Development Site - The Development Site includes the development footprint and any area affected by the DA, including; building envelopes (maybe indicative), establishment (and long-term maintenance) of a bushfire hazard reduction APZ area, environment management areas and areas impacted by indirect impacts (weed spread, noise, pollution, light spill, sediment, bushfire outer protection zones, spreading of disease ect and other impacts that are not part of the DA description (or plans) but may or are likely to occur as a result of the construction or occupation (operation) or change in use as a result of the DA).

The Development Site is larger than the Development Footprint when there is an onsite conservation area (i.e. positive impact that is not a formal offset) or when there are indirect impacts beyond the development footprint.

The term Development Site is generally used in the stage 1 (planning) part of this BDAR and the term Development Footprint is used in the assessment stage 2 when the constraints of the site have been taken into consideration and the proposal has been designed and there is no conservation area or clear indirect impacts.

Development Footprint- Development Footprint (also the Clearing Footprint Operational Footprint and Construction Footprint) – the area of land that is directly impacted by a proposed development, including; the construction footprint (may be indicative), operational footprint, location of the activity access roads, bushfire Asset Protection Zones and areas used to store construction materials.

Direct Impacts - are impacts that directly affect habitat, ecosystems and individuals. Direct impacts that do not impact native vegetation are categorised as Prescribed Impacts. When a Determining Authority is assessing a DA, consideration must be given to all the likely impacts of the proposed activity or development.

DPI – NSW government of Department of Primary Industries

EPA Act (EP&A Act) – NSW Environment Planning and Assessment Act 1979, legislation that controls development in NSW.

EPBC Act – Federal Environment Protection and Biodiversity Conservation Act 1999

IBRA region – a bioregion identified under the Interim Biogeographic Regionalisation for Australia (IBRA), which divides Australia into bioregions on the basis of their dominant landscape-scale attributes.

Indirect Impacts - occur when project-related activities affect species or ecological communities in a manner other than direct loss. When a Determining Authority is assessing a DA, consideration must be given to all the likely impacts of the proposed activity or development. Impacts that are not part of the DA description (or plans) but may or are likely to occur as a result of the construction or occupation (operation) or change in use as a result of the DA). Indirect Impacts may require addition of offset credits as determined by the Determining Authority

Impact (Biodiversity Impacts) to be assessed

This BDAR assessment report and the BC Act, the BAM, BOS only assess impact to biodiversity.

More general environmental impact is assessed by the EP&A Act, other Acts, SEPPs and the LEP/DCP.

In accordance with section 9.1 of the BAM a Biodiversity Impact (BDAR assessment Stage 1 and 2 of this report) only assess:

LEP – Local Environment Plan, a local planning instrument for each LGA.

LGA – Local Government Area.

OEH – NSW Government Office of Environment and Heritage, formerly part of NPWS, DEC, DECC and DECCW. The department responsible for the conservation of native flora and fauna.

Native Vegetation - any plant native to NSW, as defined in the LLS Act

Prescribed Impacts – Impacts that do not impact native vegetation, such as impacts to rocks, waterbodies, non-native vegetation, human-made structures, karsts, caves, cliffs and connectivity. Prescribed Impacts may result in additional biodiversity credits.

Property - Adjacent or nearby lot(s) that have the same ownership.

Protected Fauna – all native birds, reptiles, amphibians and mammals (except the dingo) are protected in NSW under the BC Act.

SAII – Serious and Irreversible Impacts to Threatened species or communities that fit the principles in the "Guideline to Assist a Decision-Maker to Determine a Serious and Irreversible Impact" (OEH 2017).

TBDC – Threatened Biodiversity Data Collection, OEH online database within Bionet.

Threatened Species or Ecological Community - refers to those biotas listed in the schedules of the Biodiversity Conservation Act 2016 as "Critically Endangered ", "Endangered" or "Vulnerable".

E. Assumptions and Limitations

- This report only addresses the impacts of the proposal described in this report and shown in the maps in this report. If there are changes to the DA plans that alter the ecological impact of the proposal, then this report is likely to require recalculating and updating.

- This report describes the habitat and species in the Development Site at the time of the field survey. Vegetation and habitat will change over time, as does legislation. Therefore, the findings of this report are likely to be out of date in 12 months.
- There may be flora and/or fauna species present within the study area that may not have been recorded because they are seasonal, cryptic and/or have large home ranges. Some threatened species may only use the study area as habitat at some time. Assessment of habitat potential is used to address this uncertainty. The conclusions drawn in this report are a result of testing, observation and experience.
- This report assesses only the current proposal and does not consider the cumulative impact of other developments on this property or on adjacent land or the potential edge effects or impacts caused by the occupation of the land.
- This report should be read in its entirety and no part should be taken out of context.
- No responsibility is accepted for the use of any part of this report in any other context or for any other purpose or by third parties.
- This report makes recommendations for protection of bushland habitat, weed control, re-establishment of the bushland in part of the site, planting local native species and applying erosion and nutrient control measures. This report assumes these initial and on-going works will be carried out during and on-going for the life of the development.
- It is assumed that there will be no sediment, nutrients or weeds spreading into the adjacent bushland habitat.
- This report assumes that there will be no direct and indirect impact beyond the development footprint.

F. Qualifications and Experience of the Field Ecologist and Authors

Nicholas Skelton's formal qualifications include a Bachelor of Science with Honours (B. Sc. (Hons) USyd) and a Masters in Applied Science (M. App. Sc. in Vegetation Management UNSW). Nick has been an environmental scientist for 25 years, including a university lecturer, research ecologist and a bush regenerator for 8 years. His work is focused on the Sydney bioregion and he has published many papers in independently reviewed journals on the ecology of NSW. He has expert knowledge of the local soils, the climate of this area and the local indigenous plants and animals as a result of over 900 ecological surveys. Nick is a member of the relevant professional organisations including a practising member of the Ecological Consultants Association of NSW and Royal Zoological Society. He is licensed by NSW OEH and NSW Department of Primary Industries to carry out surveys on threatened plants and animals and he is a qualified Biodiversity Assessor under the BC Act. Nick was the principal ecologist on all field surveys and was responsible for map making and report editing. Further details can be found at www.ecology.net.au.

Sophia Mueller Sewell has a Bachelor of Science (Environmental Biology UTS). Sophia has been working with GIS Environmental Consultants for over 2 years and has assisted with many ecological surveys and written over 50 reports. Sophia was responsible for project management, assisting with fauna survey, application of the BAM method, recording data for field surveys and report writing.

Stage 1: Biodiversity Assessment

1 Introduction

1.1 Description of Existing Development Site

The Development Site (Site) (shown with a blue outline on the maps on Figures 1.4, 3.1, 4.2 and 6.1) is the combined area of; both properties, Lot 12 and 13 in DP 28236 known as 143-145 McCarrs Creek Road, Church Point and part of the adjacent Road Reserve to the west of the properties, as this area will be location of a proposed driveway. The properties have a combined area of 0.46ha. The Development Site has a total area of 0.49ha and is located in the Northern Beaches LGA. The Development Site currently is steep vacant bushland block covered with native vegetation that has had disturbance to the shrub layer for Lantana removal and access. A 2018 aerial photograph of the Development Site is provided on the map on Figure 1.1.

1.1.1 Location Geographic Co-ordinates

The latitude and longitude of the Study Area is -33.65298° S and 151.282917°E. Geographic coordinates are GDA94 MGA56 340784 E and 6274839 S.

1.1.2 Topography

The Site slopes steeply to the west. There are several rock ledges and bush rock across the slope that are 1.5-2m high and are shown in brown on the maps if Figures 3.1, 4.1 and 6.1. 2m contours of the site are shown in Figure 1.4 and 3.1 and 10m contours are shown on the map in Figure 1.3.

1.1.3 Drainage

There is a 1st order unnamed creek 5m south and parallel to the southern boundary of the site and flowing to the west. The creek is a tributary to McCarrs Creek /Cicada Glenn Creek which joins with Pittwater 1.4km north of the site. Drainage in the locality and on the site is shown in light blue on all the Figures.

1.1.4 Geology and Soils

The soils in the locality are shown in thick light brown outline on Figure 2.1. The lower, western part of the site is mapped as Watagan soil type and the higher eastern part of the site is mapped as Gymea.

Watagan is derived from interbedded laminate and shale resulting in heavy higher nutrient clay soils and Gymea is shallow, low nutrient, erosional soil derived from Hawkesbury sandstone (Soil Landscapes Sydney, Chapman and Murphy 1989).

1.1.5 Fire History

The site is within a bushland/residential area and is not likely to have been burnt since 1994. Recorded fire history in the locality is shown on the map in Figure 1.2.

1.1.6 Disturbance History

The bushland on the site is in good condition. There has been recent disturbance to vegetation at the site to remove Lantana weeds and for access. The disturbance has been to the shrub layer and a small area of soil at the north-western corner. There are small amounts of scattered weeds throughout the site, these are bird dispersed species that do not indicate physical or nutrient disturbance.

Landscape features on the Site and Locality are identified and describe in detail in Section 2 of this Report and assessed in Table 16 (Prescribed Impacts) and on Figures 1.2, 3.1, 4.2 and 6.1.

Legend

143 - 145 Mc Carrs Creek Road

Lot

Figure 1.1
Aerial Photograph of the Site

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Date: 31/10/2019
Drawn by Nicholas Skelton
Version: 1
Projection: GDA 94 MGA 56

1:560 at A4

0 4.5 9 18 Meters

N

Figure 1.2
Locality, Aerial Photograph

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0 0.4 0.8 km

Figure 1.3
Locality, Topography and Features

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0 0.4 0.8 km

- 400 m^2 plot (20 m x 20 m), used to assess the composition and structure;
- 1000 m^2 (20 m x 50 m) plot was used to assess functional attributes of the site; and
- 1 m^2 subplots (x5) nested within the 1000m^2 plot used to assess the average percentage leaf litter cover.

1.6.2.2 Composition and Structure

The floristic composition and relative cover were surveyed in the 20m x 20m plot. Information for each plant species within the plots was recorded including species name and the percent projected foliage cover across the plot for each species rooted in or overhanging the plot.

This information was then used to assist in determining the most likely Plant Community Types (PCTs) present and the presence of any endangered ecological communities (EECs) listed in schedule 2 of the BC Act and the condition of the vegetation at the site.

1.6.2.3 Function

The number of large trees, the presence of tree stem size class, tree regeneration and total fallen log length were recorded in the 20m x 50m plot. The DBH of live trees was measured and trees were assigned to a tree stem size classes from <5, 5-9, 10-19, 20-29, 30-49, 50-79, and 80+cm until all stem size classes were present or all tree measured. Where a tree had multiple stems, the largest stem was measured.

The number of large trees was recorded within the 20m x 50m plot. The definition of a "large tree" varies depending on the PCT that occurs within the plot.

The length of all fallen logs greater than 10 cm in diameter was measured. Only logs that were dead, on the ground, either in part or entirely were measured, and only the part of the log that was inside the plot was measured if the log extended out of the plot.

The percentage litter cover was measured within five 1m x 1m plots. The percentage litter cover includes dead leaves, seeds, twigs, branchlets and branches (<10 cm diameter).

1.6.2.4 Vegetation Integrity Score

The plot and transect survey data were then used to determine the composition score, the structure score and function score, which are used to determine the overall vegetation integrity score.

See section 4 for targeted field survey method and field survey effort for Threatened Flora and Fauna species and Section 3 for field survey effort for the vegetation survey.

1.6.3 Targeted Threatened Species Surveys

During the field surveys, all sections of the study area and some of the surrounding land were traversed on foot. The study area was searched for the presence of the Candidate Threatened flora and fauna species and their habitats using the published OEH guidelines.

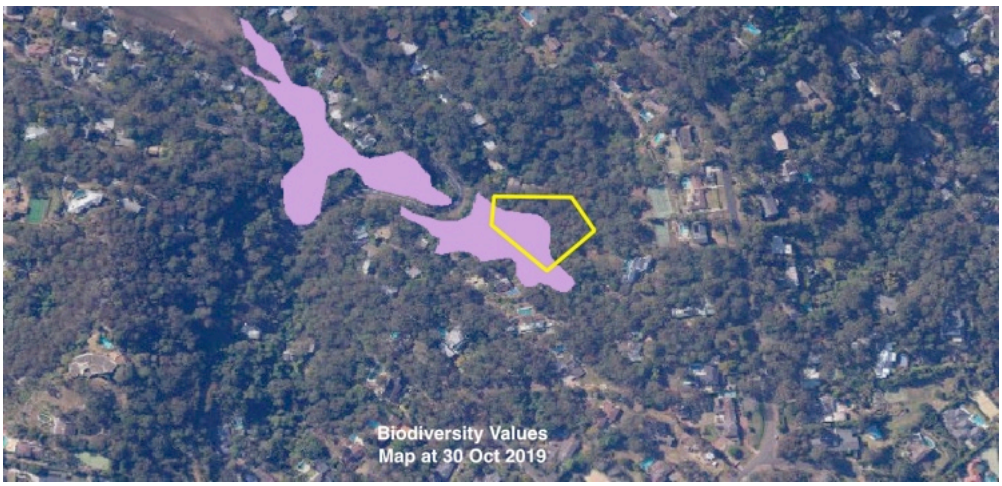
- Bat Survey Guidelines, 'Species credit' Threatened bats and their habitats NSW survey guide for the Biodiversity Assessment Method OEH 2018
- Plant Survey Guidelines, NSW Guide to Surveying Threatened Plants OEH 2016
- Amphibian and Reptile Survey Guidelines, Threatened species survey and assessment guidelines: field survey methods for fauna, Amphibians DECC 2009
- Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities Working Draft DEC 2004

The Threatened species survey effort are described in section 4 of this report and Appendix B.

1.7 BAM Assessment Type

There are two types of BAM assessment that can be used for Part 4 assessments (local developments or DA's); the General Module and the Streamlined Module (which includes Small Area and Paddock Trees sub types).

The general Assessment Module had to be used for this proposal as the site is mapped on the Biodiversity Values Map (see figure below).



2 Landscape Features

2.1 Regional Landscape Features

IBRA Bioregion	Sydney Basin
IBRA Subregion	Pittwater
Mitchel Landscape Region	Belrose Coastal Slopes

2.2 Landscape Features in the Locality

The site is part of a valley that continues downslope to the west. The creek within the valley enters into a shallow bay (Brown's Bay) to the west that is part of McCarrs Creek/Cicada Glenn Creek. The ridgetop to the east of the site has mostly been cleared for residential properties. Pittwater Harbour is 1.4km north of the site.

The proximity of the site to National Parks, waterbodies development and nearby bushland is shown in Figures 1.1, 1.2 and 1.3.

2.2.1 Native Vegetation Extent in Locality

In accordance with 4.3.2. of the BAM (OEH, Aug 17) the percentage cover of native woody and non-woody vegetation within the 1.5km buffer area (approx. 780ha) around the site was determined. The percent native vegetation cover is classified by using the most up to date native vegetation mapping in combination with recent aerial photograph imagery.

The Native Vegetation of the Sydney Metropolitan Area V3.1 (OEH 2016) is currently the best vegetation mapping for this area. It is a compilation of the best available vegetation maps by various authors. The boundaries of many of the vegetation patches were mostly determined between 2 and 15 years ago. Figure 2.1 shows the vegetation types (ecological communities) in the locality that have been mapped at the regional scale. The Figure legend lists the vegetation types and the map shows their distribution in the locality and in relation to the site. Table 1 summarises the proportion of each vegetation type.

The total amount of mapped native woody and non-woody vegetation within the buffer area is approximately 55% of the 776ha buffer area.

2.3 Landscape Features at the Development Site

Native Vegetation Mapped in Buffer

2.3.1 Cleared Areas and Man-made Structures

The site is comprised of two bushland lots, with no man-made structures. There has been recent disturbance at the site including removing understorey and disturbing the soil along the northern boundary. There are scattered weeds throughout the site indicating some past disturbance.

2.3.2 Rivers and Streams

There are no river or creeks on the Development Site. There is a 1st order creek 5-10m from the southern boundary of the site. The creek is not permanently running. It runs west down the steep slope. The creek is very shallow, has a rocky base and the water quality was good at the time of the survey.

Waterbodies and hydrological processes are a type of Prescribed Impact and need to be specifically addressed in accordance with the BAM.

2.3.3 Wetlands

There is no wetland on or immediately adjacent to the property.

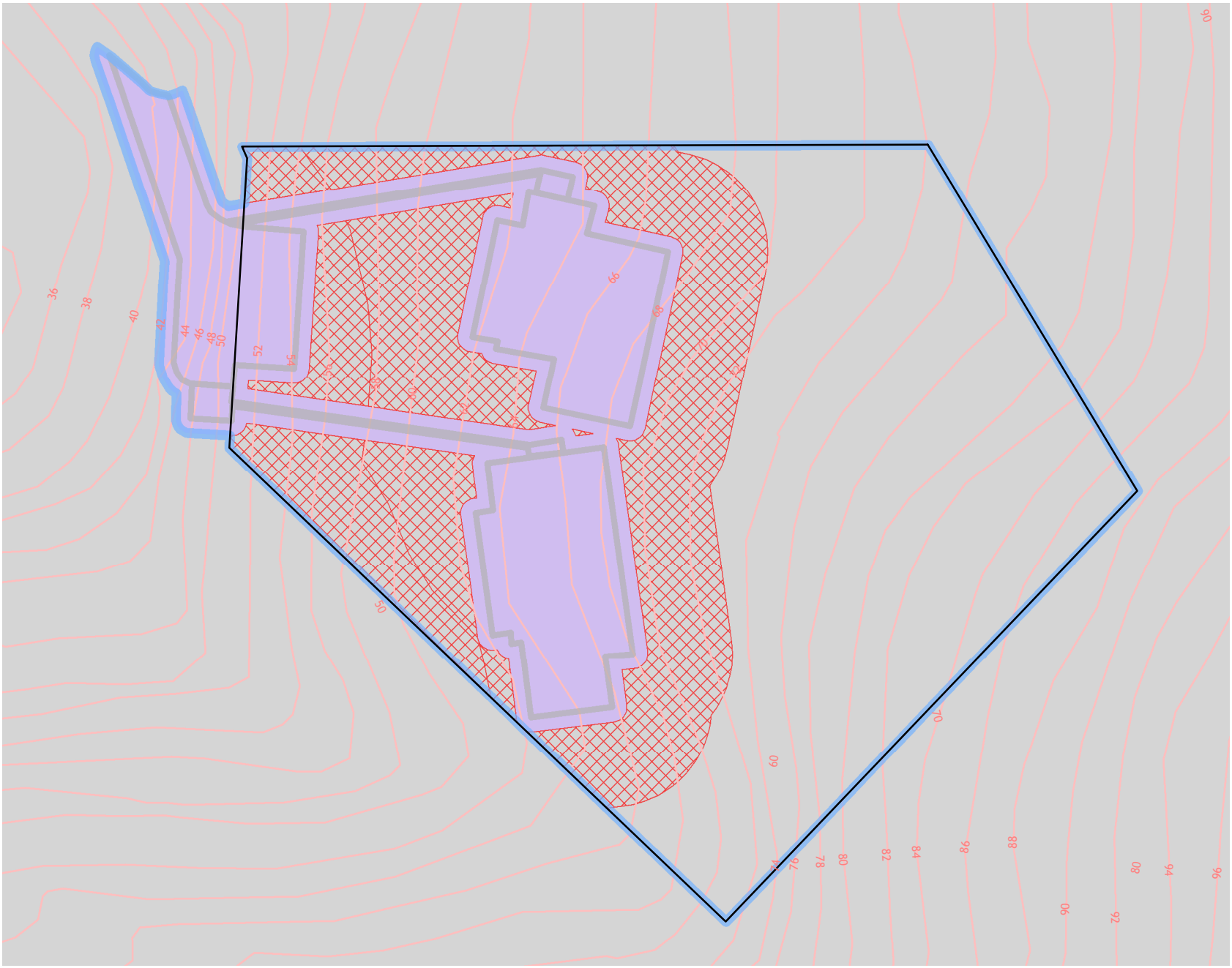


Figure 1.4 Development Site, Footprint and Proposal

Location of retaining walls, utilities, sewage disposal and stormwater connections are not shown or assessed. Landscaping is not considered appropriate for this bushland site. No landscaping is proposed or assessed. Bushland to be retained and managed as a bushfire APZ will require longterm management. Tree loss is described in the arborist report.

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0 4.5 9 18 Meters

2.3.4 Connectivity Features

The vegetation at the Development Site is connected to the remnant patches within residential properties to the north, east and south and the corridor in the Road Reserve along McCarrs Creek Road to the south. The Development Site has good wildlife corridor value. The site is part of corridor running along the eastern side of McCarrs Creek Road that links the bushland reserves to the north (Kennedy Park and Minkara Reserve) and Ku-ring-gai Chase National Park to the south.

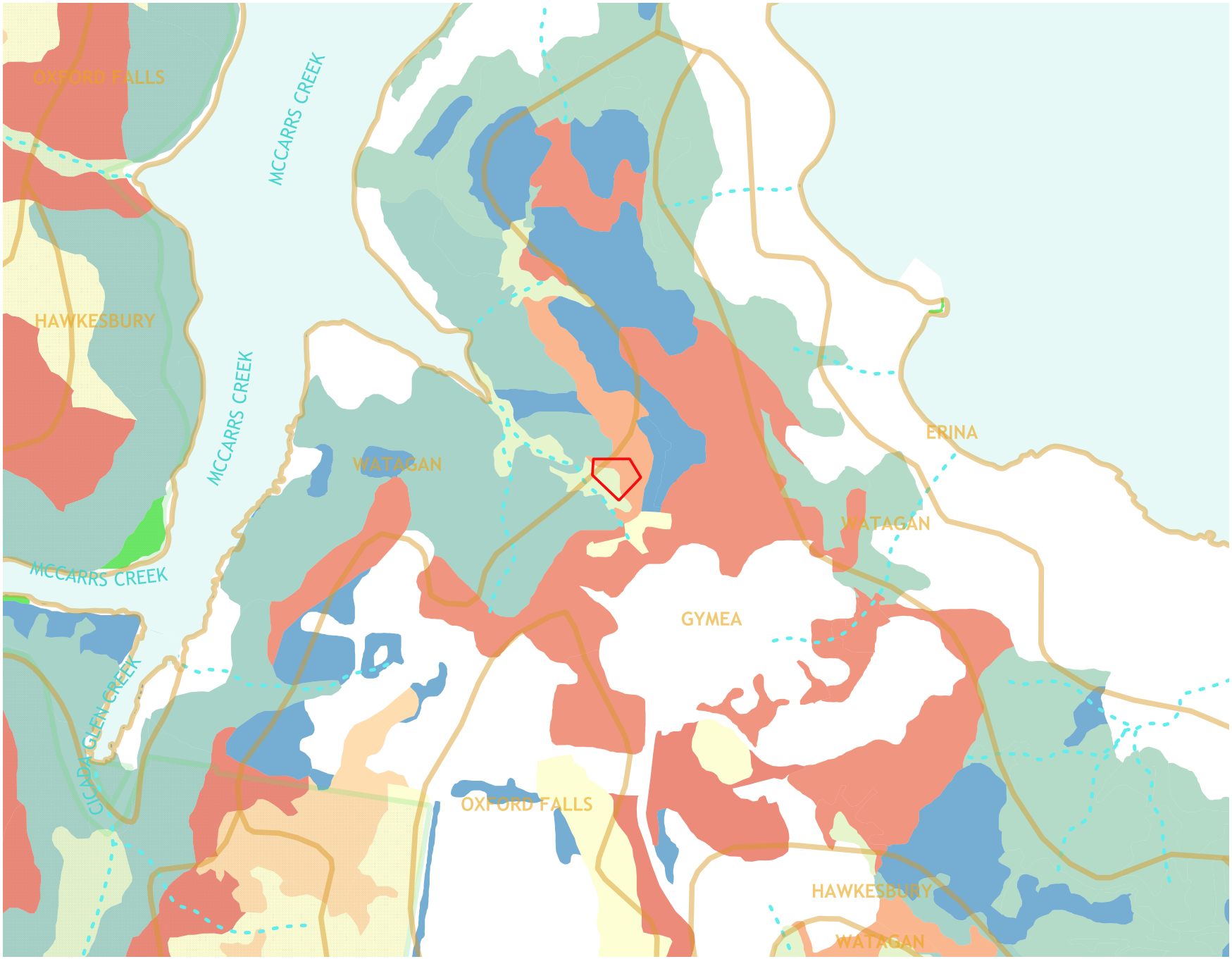
The proximity to National Parks, Reserves and remnant vegetation in the locality is shown on Figure 1.2.

2.3.5 Areas of Geological Significance

The Development Site contains a large amount exposed sandstone rock and sandstone boulders particularly the higher eastern parts. There are several rock ledges that are approximately 1.5-2m high. The largest runs north-south across the property and occurs approximately halfway up the slope of the property. There are multiple cervices within the rock ledges.

No soil hazard features were identified at the site.

The impact to Landscape Features are assessed in the Prescribed Impact section of this report in Table 16.



Legend

- 143 - 145 Mc Carrs Creek Road
- Buffer 1500m
- Soils
- Water Body

Watercourse

- Watercourse Centreline Non Perennial
- Watercourse Centreline Perennial
- National Park

Vegetation_of_Sydney_v3_2016_Nth_Beaches copy

- Aquatic PCT Number: 1913 S_SW03: Seagrass Meadows
- Forest/Open Woodland PCT Number: 920 S_SW01: Estuarine Mangrove Forest
- Forest PCT Number: 1250 S_DSF09: Coastal Sandstone Gully Forest
- Forest PCT Number: 1776 S_DSF04: Coastal Enriched Sandstone Dry Forest
- Forest PCT Number: 1841 S_WSF02: Coastal Enriched Sandstone Moist Forest
- Heath/Tall Scrub PCT Number: 1824 S_HL08: Coastal Sandstone Heath-Mallee
- Low Open Woodland PCT Number: 1783 S_DSF11: Sydney North Exposed Sandstone Woodland
- Rainforest PCT Number: 1833 S_RF07: Coastal Escarpment Littoral Rainforest
- Rainforest PCT Number: 905 S_RF03: Coastal Warm Temperate Rainforest
- Tall Forest PCT Number: 1214 S_WSF11: Pittwater Spotted Gum Forest
- Tall Forest PCT Number: 1565 S_WSF33: Central Coast Escarpment Moist Forest

Figure 2.1
Mapped Vegetation Types

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Date: 31/10/2019
Drawn by: Nicholas Skelton
Version 1
Projection: GDA 94 MGA 56

0 0.2 0.4 km

3 Native Vegetation

3.1 Native Vegetation Type Classification Method

A 4-step process was used to determine the Plant (vegetation) Community Types (PCT) on the Site.

Step 1. Application of the DPIE/EES Vegetation Information System (VIS)

https://www.environment.nsw.gov.au/NSWVCA20PRapp/LoginPR.aspx

Classification using IBRA region, Keith (2004) vegetation formation and/or class, vegetative structure and dominant species to make a short list. Then refining this list using the following methods.

Step 2. Spatial (GIS) analysis

Spatial analysis using the best available mapped data including but not limited to: vegetation mapping, topography, hydraulic features and soils. See Maps 3 and 4. The field verified vegetation boundaries were extrapolated using spatial patterns of environmental features. Map 2 shows the distribution and the amount of the vegetation types that have been mapped (Vegetation of the Sydney Metropolitan Area, 2016) in the locality. Environmental habitat features such as soil type, topography and drainage are also shown on Map 3. Vegetation mapping has inherent errors such as classification accuracy which is limited due to the amount of field verification that was carried out when they were made, the spatial accuracy of the mapping and how old the mapping is. There are often different classification interpretations and the newest is not necessarily the best. Vegetation maps do not provide a sufficient level of spatial accuracy for the assessment of the impact at the scale of this proposal but are useful in determining the ecological communities that are likely to occur in the vicinity. These maps are based on aerial photography and normally little local field verification. They were produced for regional planning and are often not of an appropriate scale to be relied on for a DA proposal. Fieldwork is necessary to determine the Site-specific accurate vegetation mapping. The SMCMA mapping was also used to determine the amount of Endangered Ecological Communities within the 100ha and 1000ha localities around the site.

Step 3. Classification using 'Vegetation of the Sydney Metropolitan Area' 2016

Classification using: positive diagnostic plant species, description of the environmental requirements and the recognised distribution.

Step 4. Correlation and Comparison to EEC determinations

The similarity of the vegetation on the site to the description of the Threatened Ecological communities in the Determinations was assessed by correlation with the listed characteristic species and comparison to the environmental descriptors in the relevant determinations. The NSW BC Act lists Threatened Ecological Communities (TECs) that are likely to become extinct in nature unless the circumstances and factors threatening their survival cease to operate. The Threatened communities that have been mapped in the locality are shown on Map 4. These factors were used to determine Threatened Ecological Communities and species to target during the field survey.

Correlation: Correlations between the species that occur in the Study Area and the listed characteristic species for the Endangered Ecological Community listed in the Final Determinations for the TEC.

Comparison: Comparison of the ecological features on the Site to the environmental description in the legal definition of the Threatened Ecological Community in the Final Determination in BC Act and the EPBC Act (1999). This comparison is essential when determining if the type of ecological community that occurs within a study area is an endangered community. Not all the sections of the determinations need to apply to the Study Area the earlier sections are more important and should be given more weight (Preston and Adams).

3.2 Plant Species List

The plant species that occur on the site are listed in the following table.

Table 1. Plant Species on the Site

143 - 145 Mc Carrs Creek Rd, Church Point
20 Sept 2019
by Nicholas Skelton, GIS Environmental Consultants

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Vegetation Zone and Plot

Plot	Vegetation Type	PCT	Easting	Northing
Plot 1	Littoral Rainforest	1833	340745	6274849
Plot 2	Central Coastal Escarpment Moist Forest	1565	340733	6274863

Number of Species Summaried by Growth Form and Status

Count of Genus and Species

	Plot 1 Local Native	Plot 1 Weed	Plot 1 Outside Local Native	Plot 1 Outside Weed	Plot 2 Local Native	Plot 2 Outside Local Native	Plot 2 Outside Weed
Fern	5	1			1		
Grass				1	2	1	
Grass Tree					1		
Herb	5		1	1	5	2	
Palm	1		1		1		
Sedge			1		1	2	
Shrub	5	1	3		4	3	3
Tree	7		3		6	2	
Vine	7		3		4		
Total	30	2	12	2	25	10	3

Sum of % Cover, Local Native

	Plot 1 Local Native	Plot 2 Local Native
Fern	6.3	0.1
Grass		0.2
Grass Tree		4
Herb	0.5	0.9
Palm	15	0.5
Sedge		0.1
Shrub	6.6	0.8
Tree	91.5	65.5
Vine	10.6	3.3
Total	130.5	75.4

Part of Site	% Cover	Genus and Species	Family	Growth Form	Order	Common Name	Status
Plot 1	0.1	Adiantum hispidulum	ADIANTACEAE	Fern	FERN	Five Finger Jack	Local Native
Plot 1	30	Allocasuarina torulosa	CASUARINACEAE	Tree	DICOTYLEDON	Forest She-oak	Local Native
Plot 1	1	Blechnum cartilagineum	BLECHNACEAE	Fern	FERN	Cartilage Fern	Local Native
Plot 1	5	Ceratopetalum apetalum	CUNONIACEAE	Tree	DICOTYLEDON	Coachwood	Local Native
Plot 1	0.5	Clerodendrum tomentosum	VERBENACEAE	Shrub	DICOTYLEDON	Hairy Clerodendrum	Local Native
Plot 1	0.1	Cyathea cooperi	CYATHEACEAE	Fern	FERN	Straw Tree Fern	Local Native
Plot 1	0.1	Doodia aspera	BLECHNACEAE	Fern	FERN	Rasp Fern	Local Native
Plot 1	1	Elaeocarpus reticulatus	ELAEOCARPACEAE	Tree	DICOTYLEDON	Blueberry Ash	Local Native
Plot 1	4	Eupomatia laurina	EUPOMATIACEAE	Shrub	DICOTYLEDON	Bolwarra	Local Native
Plot 1	0.1	Geitonoplesium cymosum	LUZURIAGACEAE	Vine	MONOCOTYLEDON	Scrambling Lily	Local Native
Plot 1	10	Glochidion ferdinandi var. ferd	EUPHORBIACEAE	Tree	DICOTYLEDON	Cheese Tree	Local Native
Plot 1	0.1	Hibbertia dentata	DILLENIACEAE	Shrub	DICOTYLEDON	Twining Guinea Flowe	Local Native
Plot 1	0.1	Hydrocotyle peduncularis	APIACEAE	Herb	DICOTYLEDON		Local Native
Plot 1	5	Hypolepis muelleri	DENNSTAEDTIACEAE	Fern	FERN	Harsh Ground Fern	Local Native
Plot 1	0.1	Lantana camara	VERBENACEAE	Shrub	DICOTYLEDON	Lantana	Weed
Plot 1	15	Livistona australis	ARECACEAE	Palm	MONOCOTYLEDON	Cabbage Tree Palm	Local Native
Plot 1	0.1	Lomandra brevis	LOMANDRACEAE	Herb	MONOCOTYLEDON	Tuft Mat-rush	Local Native
Plot 1	0.1	Lomandra longifolia	LOMANDRACEAE	Herb	MONOCOTYLEDON	Spiny-headed Mat-rush	Local Native
Plot 1	0.1	Lomandra multiflora	LOMANDRACEAE	Herb	MONOCOTYLEDON	Many-flowered Mat-rus	Local Native
Plot 1	0.1	Nephrolepis cordifolia	DAVALLIACEAE	Fern	FERN	Fishbone Fern	Weed
Plot 1	1	Notelaea ovata	OLEACEAE	Shrub	DICOTYLEDON	Mock Olive	Local Native
Plot 1	10	Pandorea pandorana	BIGNONIACEAE	Vine	DICOTYLEDON	Wonga Wonga Vine	Local Native
Plot 1	0.1	Parsonsia straminea	APOCYNACEAE	Vine	DICOTYLEDON	Monkey Rope	Local Native
Plot 1	0.1	Passiflora herbertiana subsp. he	PASSIFLORACEAE	Vine	DICOTYLEDON		Local Native
Plot 1	0.1	Piper novae-hollandiae	PIPERACEAE	Vine	DICOTYLEDON	Native Pepper	Local Native
Plot 1	0.1	Pseuderanthemum variabile	ACANTHACEAE	Herb	DICOTYLEDON	Pastel Flower	Local Native

Plot 1	0.5	Rapanea howittiana	MYRSINACEAE	Tree	DICOTYLEDON	Brush Muttonwood	Local Native
Plot 1	0.1	Sarcopetalum harveyanum	MENISPERMACEAE	Vine	DICOTYLEDON	Pearl Vine	Local Native
Plot 1	0.1	Smilax glyciphylla	SMILACACEAE	Vine	MONOCOTYLEDON	Native Sarsaparilla	Local Native
Plot 1	40	Syncarpia glomulifera	MYRTACEAE	Tree	DICOTYLEDON	Turpentine	Local Native
Plot 1	5	Synoum glandulosum	MELIACEAE	Tree	DICOTYLEDON	Scentless Rosewood	Local Native
Plot 1	1	Wilkiea huegeliana	MONIMIACEAE	Shrub	DICOTYLEDON	Wilkiea	Local Native
Plot 1 Outside		Acmena smithii	MYRTACEAE	Tree	DICOTYLEDON	Lily Pilly	Local Native
Plot 1 Outside		Archontophoenix cunningham	ARECACEAE	Palm	MONOCOTYLEDON	Bangalow Palm	Local Native
Plot 1 Outside		Brachychiton acerifolius	STERCULIACEAE	Tree	DICOTYLEDON	Flame Tree	Local Native
Plot 1 Outside		Carex appressa	CYPERACEAE	Sedge	MONOCOTYLEDON		Local Native
Plot 1 Outside		Cissus hypoglauca	VITACEAE	Vine	DICOTYLEDON	Native Grape	Local Native
Plot 1 Outside		Ficus coronata	MORACEAE	Tree	DICOTYLEDON	Sandpaper Fig	Local Native
Plot 1 Outside		Homalanthus populifolius	EUPHORBIACEAE	Shrub	DICOTYLEDON	Bleeding Heart	Local Native
Plot 1 Outside		Marsdenia suaveolens	ASCLEPIADACEAE	Vine	DICOTYLEDON	Sweet-scented Doubat	Local Native
Plot 1 Outside		Notelaea longifolia	OLEACEAE	Shrub	DICOTYLEDON	Nettle	Local Native
Plot 1 Outside		Phyllostachys sp.	POACEAE	Grass	MONOCOTYLEDON	Rhizomatous Bamboo	Weed
Plot 1 Outside		Schelhammera undulata	UVULARIACEAE	Herb	MONOCOTYLEDON	Lilac Lily	Local Native
Plot 1 Outside		Stephania japonica var. discolo	MENISPERMACEAE	Vine	DICOTYLEDON	Snake Vine	Local Native
Plot 1 Outside		Tradescantia albiflora	COMMELINACEAE	Herb	MONOCOTYLEDON	Wandering Jew	Weed
Plot 1 Outside		Trochocarpa laurina	ERICACEAE	Shrub	DICOTYLEDON	Tree Heath	Local Native
Plot 2	20	Allocasuarina torulosa	CASUARINACEAE	Tree	DICOTYLEDON	Forest She-oak	Local Native
Plot 2	0.1	Astrotricha latifolia	ARALIACEAE	Shrub	DICOTYLEDON		Local Native
Plot 2	0.1	Cayratia clematidea	VITACEAE	Vine	DICOTYLEDON	Slender Grape	Local Native
Plot 2	0.1	Commelina cyanea	COMMELINACEAE	Herb	MONOCOTYLEDON	Creeping Christian	Local Native
Plot 2	0.1	Dianella caerulea var. producta	PHORMIACEAE	Herb	MONOCOTYLEDON	Blue Flax Lily	Local Native
Plot 2	0.1	Entolasia marginata	POACEAE	Grass	MONOCOTYLEDON		Local Native
Plot 2	0.1	Entolasia stricta	POACEAE	Grass	MONOCOTYLEDON	Wiry Panic	Local Native
Plot 2	15	Eucalyptus botryoides	MYRTACEAE	Tree	DICOTYLEDON	Bangalay	Local Native
Plot 2	5	Eucalyptus paniculata	MYRTACEAE	Tree	DICOTYLEDON	Grey Ironbark	Local Native
Plot 2	10	Eucalyptus scias ssp. scias	MYRTACEAE	Tree	DICOTYLEDON	Large Fruited Red Mah	Local Native
Plot 2	0.1	Eustrephus latifolius	LUZURIAGACEAE	Vine	MONOCOTYLEDON	Wombat Berry	Local Native
Plot 2	0.1	Hibbertia dentata	DILLENIACEAE	Shrub	DICOTYLEDON	Twining Guinea Flowe	Local Native
Plot 2	0.1	Hypolepis muelleri	DENNSTAEDTIACEAE	Fern	FERN	Harsh Ground Fern	Local Native
Plot 2	0.1	Lepidosperma elatius	CYPERACEAE	Sedge	MONOCOTYLEDON	Sword-sedge	Local Native
Plot 2	0.5	Livistona australis	ARECACEAE	Palm	MONOCOTYLEDON	Cabbage Tree Palm	Local Native
Plot 2	0.1	Lomandra glauca	LOMANDRACEAE	Herb	MONOCOTYLEDON	Pale Mat-rush	Local Native
Plot 2	0.5	Lomandra longifolia	LOMANDRACEAE	Herb	MONOCOTYLEDON	Spiny-headed Mat-rush	Local Native
Plot 2	0.1	Notelaea ovata	OLEACEAE	Shrub	DICOTYLEDON	Mock Olive	Local Native
Plot 2	3	Pandorea pandorana	BIGNONIACEAE	Vine	DICOTYLEDON	Wonga Wonga Vine	Local Native
Plot 2	0.1	Pratia purpurascens	LOBELIACEAE	Herb	DICOTYLEDON	White Root	Local Native
Plot 2	0.5	Prostanthera denticulata	LAMIACEAE	Shrub	DICOTYLEDON	Rough Mint Bush	Local Native
Plot 2	0.1	Smilax glyciphylla	SMILACACEAE	Vine	MONOCOTYLEDON	Native Sarsaparilla	Local Native
Plot 2	15	Syncarpia glomulifera	MYRTACEAE	Tree	DICOTYLEDON	Turpentine	Local Native
Plot 2	0.5	Synoum glandulosum	MELIACEAE	Tree	DICOTYLEDON	Scentless Rosewood	Local Native
Plot 2	4	Xanthorrhoea arborea	XANTHORRHOEACEAI	Grass Tree	MONOCOTYLEDON	Broad-leaved Grass Tre	Local Native
Plot 2 Outside		Angophora costata	MYRTACEAE	Tree	DICOTYLEDON	Smooth-barked Apple	Local Native
Plot 2 Outside		Cymbidium suave	ORCHIDACEAE	Herb	MONOCOTYLEDON		Local Native
Plot 2 Outside		Entolasia stricta	POACEAE	Grass	MONOCOTYLEDON	Wiry Panic	Local Native
Plot 2 Outside		Eucalyptus punctata	MYRTACEAE	Tree	DICOTYLEDON	Grey Gum	Local Native
Plot 2 Outside		Gahnia melanocarpa	CYPERACEAE	Sedge	MONOCOTYLEDON	Cut Grass	Local Native
Plot 2 Outside		Lantana camara	VERBENACEAE	Shrub	DICOTYLEDON	Lantana	Weed
Plot 2 Outside		Lasiopetalum ferrugineum var.	STERCULIACEAE	Shrub	DICOTYLEDON	Rusty Petals	Local Native
Plot 2 Outside		Lepidosperma laterale	CYPERACEAE	Sedge	MONOCOTYLEDON	Variable Sword Edge	Local Native
Plot 2 Outside		Maytenus silvestris	CELASTRACEAE	Shrub	DICOTYLEDON		Local Native
Plot 2 Outside		Ochna serrulata	OCHNACEAE	Shrub	DICOTYLEDON	Ochna, Mickey Mouse	Weed
Plot 2 Outside		Persoonia linearis	PROTEACEAE	Shrub	DICOTYLEDON	Narrow-leaved Geebur	Local Native
Plot 2 Outside		Pittosporum revolutum	PITTOSPORACEAE	Tree	DICOTYLEDON	Rough-fruit Pittosporun	Local Native
Plot 2 Outside		Senna pendula	CAESALPINIOIDEAE	Shrub	DICOTYLEDON	Cassia	Weed
Plot 2 Outside		Solanum pungetium	SOLANACEAE	Herb	DICOTYLEDON		Local Native

3.3 Justification for PCT (Vegetation Classification)

3.3.1 Candidate Vegetation Communities

Figure 2.1 shows the location and abundance of vegetation communities mapped at a regional scale (NVSMA OEH 2016 mapping).

Using the VIS Database tool and best available vegetation mapping the following vegetation communities may potentially occur at the site:

PCT Number	PCT Name	Common Name	EEC	Vegetation Class
Plot 1				
905	Lilly-Pilly-Coachwood Warm Temperate Rainforest on Moist Sheltered Slopes and Gullies, Sydney Basin Bioregion	Coastal Warm Temperate Rainforest		Northern Warm Temperate Rainforests
1833	Lilly-Pilly- Cabbage Tree Palm Littoral Rainforest on escarpment slopes and gullies in the Sydney Basin	Costal Escarpment Littoral Rainforest NVSMA OEH V3 2016)	Littoral Rainforest	Littoral Rainforests
1841	Smooth-barked Apple-Turpentine-Blackbutt tall open forest on enriched sandstone slopes and gullies of the Sydney Region.	Coastal Enriched Sandstone Moist Forest (NVSMA OEH V3 2016)		North Coast Wet Sclerophyll Forests
Plot 2				
1565	Turpentine-Rough-barked Apple-forest Oak Moist Shrubby tall open forest of the Central Coast	Central Coast Escarpment Moist Forest (NVSMA OEH V3 2016)		Northern Hinterland Wet Sclerophyll Forests
1841	Smooth-barked Apple-Turpentine-Blackbutt tall open forest on enriched sandstone slopes and gullies of the Sydney Region.	Coastal Enriched Sandstone Moist Forest (NVSMA OEH V3 2016)		North Coast Wet Sclerophyll Forests
1281	Turpentine-grey Ironbark Open Forest on Shale in the Sydney Basin Bioregion	Sydney Turpentine-Ironbark Forest	Sydney Turpentine Ironbark Forest	Northern Hinterland Wet Sclerophyll Forests

3.3.2 Comparison to the NVSMA 2016 Classification

Positive Diagnostic Test

	PCT	Number of Native Species Required	Number of Positive Diagnostic Species Required	Number of Natives in Plot	Number of Positive Diagnostic in Plot	Result
Plot 1	905	27	17	30	13	Not positive
	1833	24	14	30	16	Positive
	1841	33	17	30	15	Uninformative
Plot 2	1565	34	18	25	16	Uninformative
	1841	33	17	25	15	Uninformative
	1281	35	20	25	10	Uninformative

Due the recent disturbance and the lack of fire the number of native species is lower than expected, therefore the majority of the positive diagnostic tests are uninformative. The positive diagnostic tests did produce a positive score for PCT 1833 (Littoral Rainforest) and a non-positive score for PCT 905 Coastal Warm Temperate Rainforest.

3.3.3 Description of the vegetation on the site

The lower part of the site (See map on Figure 3.1) (Plot 1) contains closed rainforest vegetation with a few tall *Allocasuarina torulosa*. The tree layer is dominated by *Syncarpia glomulifera, livistonia australis* and *Allocasurina torulosa*. The *Allocasurina* are most likely part of a intergrade with the adjacent vegetation community. The shrub layer is dominated by *Eupomatia laurina* and *Synoum glandulosum* and there are fern such as *Blechnum cartilagineum* in the understorey. There is also a high cover of vines such as *Pandorea pandorana* This description most closely fits Littoral Rainforest (PCT 1833). This vegetation type occurs adjacent to the creek in the lower south-western corner of the site and extends below the site to the west.

The upper part of the site (See map on Figure 3.1) (Plot 2) contains a more open forest dominated by *Allocasuraina torulosa, Syncarpia glomulifera* and *Eucalyptus botryoides*. The shrub layer has been mostly disturbed however, the midstorey is characterised by *Xanthorea aborea*. The ground layer is dominated *Lomandra longifolia*. This description most closely fits Central Coast Escarpment Moist Forest. The vegetation community descriptions for Central Coast Escarpment Moist Forest and Coastal Enriched Sandstone Moist Forest are very similar. The site was not considered to contain Coastal Enriched Sandstone Moist Forest due to the lack of *Angophora costata* present.

3.3.4 Comparison to NSW Scientific Committee determination for Threatened Ecological Communities

Littoral Rainforest

The NSW Scientific Committee final determination for Littoral Rainforest in the NSW North Coast, Sydney Basin and South East Corner bioregions has 9 sections, of which, sections 1, 2, 3 are the most useful to determine the likely presence at the site.

1. The vegetation in the lower, south-western corner of the site is a closed forest, with many rainforest species including *Livistonia australis* and vines in the upper canopy and ferns in the understorey. The vegetation is influenced by the adjacent vegetation leading to a high canopy cover of *Syncarpia glomulifera* and *Allocasuarina torulosa*. The structure of the vegetation generally fits the description of Littoral Rainforest.

2. The site is within 1km of the sea and is on soil derived from the underlying Hawkesbury sandstone with a clay influence.
3. Section 3 of the determination lists 117 characteristic species of Littoral Rainforest of which 38 are usually only found in the Littoral Rainforest north of Sydney. A total of 18 Littoral Rainforest characteristic species were found at the site, this is 22% of the list of widespread characteristic species. The number of native species at the site has been recent due to recent disturbances.

3.3.5 Conclusion regarding presence of Littoral Rainforest EEC at the site.

The lower south-western corner of the site is considered to contains Littoral Rainforest Endangered Ecological Community.

3.4 Conclusion Regarding the Vegetation Community Types Present

When the methods were applied it was determined that the site contains 2 PCTs, Lilly-Pilly- Cabbage Tree Palm Littoral Rainforest on escarpment slopes and gullies in the Sydney Basin (Littoral Rainforest Endangered Ecological Community PCT 1833), and Turpentine-Rough-barked Apple-forest Oak Moist Shrubby tall open forest of the Central Coast (Central Coast Escarpment Moist Forest PCT 1565).

The boundary between the vegetation types is not correct on the regional scale mapping (see Figure 2.1). The change from the Littoral Rainforest to the Central Coast Escarpment Moist forest was determined onsite as were the vegetation became drier, more open and the understorey became less dominated by ferns.

3.5 Area of Each Vegetation Type

Table 2. The Area of Each Native Vegetation Type (See map on Figure 3.1)

Vegetation Community	PCT Number	Area on Development Site m^2	Percent Cleared
Littoral Rainforest	1833	793	68%
Central Coast Escarpment Moist Forest	1565	4109	16%

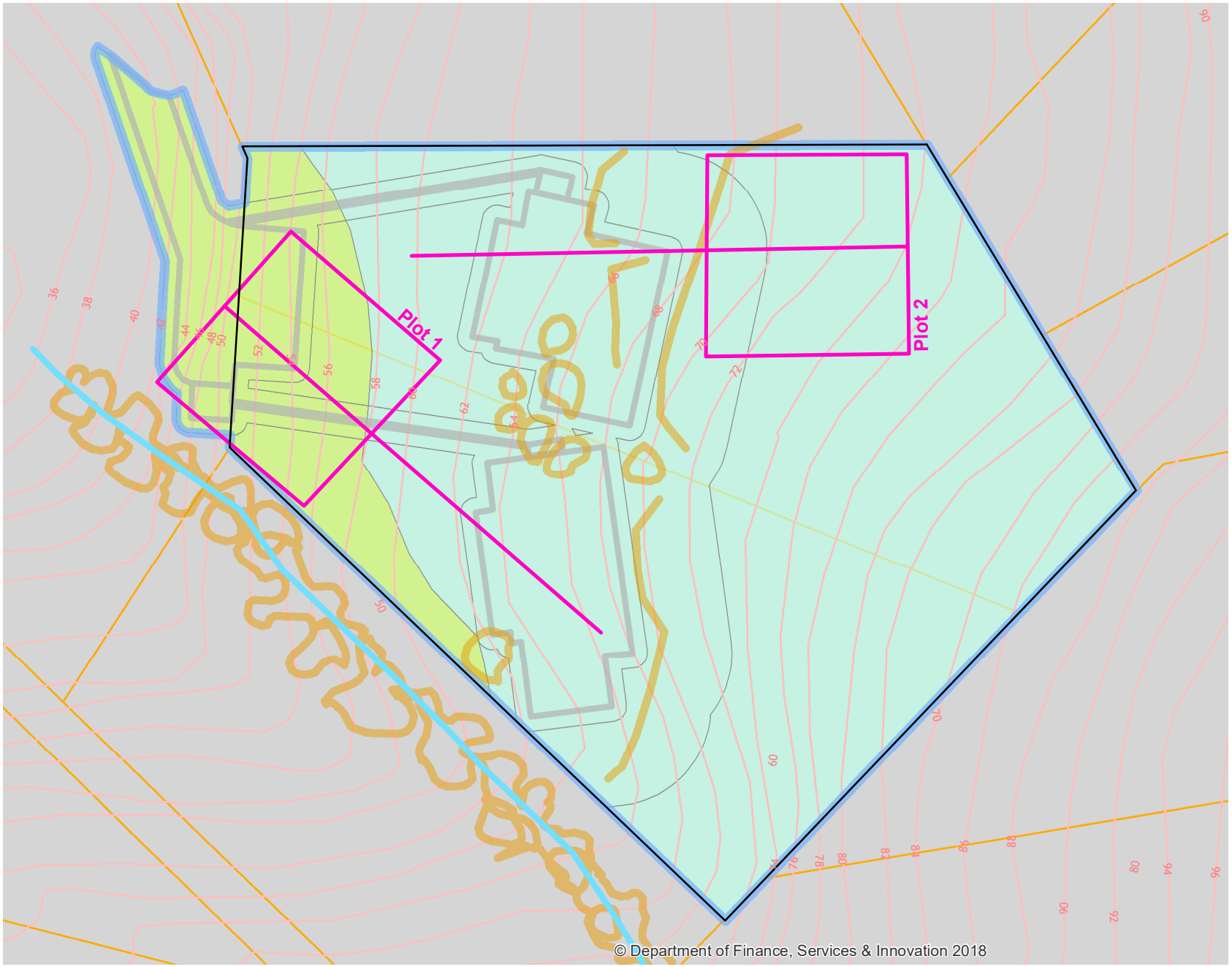
Photo Page 1. Plot Photos

Plot 1. Origin looking east

Plot 1. South-western corner

Plot 2. Origin looking west

Plot 2. North-eastern corner



Legend

- 143 - 145 Mc Carrs Creek Road
- BAM Survey Plot
- Creek
- Rock Ledge and Bushrocks
- Development Site
- Proposed Building Outline

Type

- 2 metre Contour

Vegetation and Zones

- Littoral Rainforest PCT1833 VZ1 793 sqm
- Moist Forest PCT1565 VZ2 4109 sqm
- Lot

Figure 3.1
Vegetation Type, Zones and Plot Survey

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Date: 31/10/2019
Drawn by Nicholas Skelton
Version: 1
Projection: GDA 94 MGA 56

1:560 at A4

0 4.5 9 18 Meters

N

3.6 Vegetation Integrity Assessment

There is only one condition type within each vegetation type.

Table 3. Vegetation Zones and Patch Size

Vegetation Zone	PCT	Area of Zone (m^2)	Area of Zone in Development Footprint (m^2)	Patch Size (ha)
Zone 1- LRF	1833	793	793	<1ha
Zone 2-MF	1565	4109	2094	17ha

Table 4. Vegetation Survey Effort

Date	Person Hours	Weather	Type	Location
20/09/2018	1	fine 20°C Recent Rain	Random Meander (Cropper (1993) across each vegetation type	Across the whole of the Development Footprint.
20/09/2018	2	fine 20°C Recent Rain	Plot 1 (Zone 1)	See Figure 5
20/09/2018	2	fine 20°C Recent Rain	Plot 2 (Zone 2)	See Figure 5

3.6.1 Composition and Structure

A total of 32 plant species were recorded in Plot 1 including 30 local native species and 2 weed species. The low number weed species reflects the lack of disturbance at the site in the past. Similarly Plot 2 had 25 local native species and 3 weed species. The overall number of native species recorded within the plots is likely due to the long time since fire at the site, which has influence the structure of the vegetation and has made it become more mesic.

The percentage cover of native species reflects the vegetation type present. The canopy cover is very dense in the rainforest and there is a higher percentage of ferns, palms and vines. The higher percentage of shrubs in Plot 1 reflects the recent disturbance of the shrub layer in the upper part of the site at the location of Plot 2.

The Development Site contain several locally rare species including *Lepidosperma elatious, Prostanthera denticulate* and *Eucalyptus scias*.

The summary of the floristics and structure of the 20x20m plots are given in Table 1.

3.6.2 Function-Habitat Value

The results for tree width diversity, log length and ground cover for the 20m x 50m plot are recorded in the table below.

Fauna Habitat Function Summary for Plots

Plot 1 (Zone 1) Function Results		
Tree Stem Size Class		Log Length Total (m)
Width Class (cm)		41.8
<5	present	
5 to 9	present	Number of large trees (50cm+)
10 to 19	present	3
20 to 29	present	
30 to 49	present	Av Leaf Litter % Cover (1m^2 plots)
50 to 79	present	87
80+	absent	

Plot 2 (Zone 2) Function Results		
Tree Stem Size Class		Log Length Total (m)
Width Class (cm)		45
<5	present	
5 to 9	present	Number of large trees (50cm+)
10 to 19	present	1
20 to 29	present	
30 to 49	present	Av Leaf Litter % Cover (1m^2 plots)
50 to 79	present	89
80+	present	

Table 5. Vegetation Integrity Score

Vegetation Zone	Composition Score	Structure Score	Function Score	Integrity Score
Zone 1	70.3	63.4	84.9	72.3
Zone 2	50.6	46	94	60.3

4 Threatened Species

Assessment of Historic Threatened Species Records as candidate threatened species

When the Wildlife Atlas data base of historic records was queried, the threatened species that have been recorded near the Development Site were assessed and were added in table 6, 7 and 8 as potential candidate species. These species and their proximity to the site are shown in Map 2.1.

4.1 Requirement for Ecosystem and Species Credit Species

Extract from Section 6.4.1.3 of the BAM (Aug 17)

The assessor must first use the following criteria to predict the threatened species that require assessment at the site:

(a) the distribution of the species includes the IBRA subregion which the subject land is, in the opinion of the assessor, mostly located within, and

(b) the subject land is within any geographic constraints of the distribution of the species within the IBRA subregion, and

(c) the species is associated with any of the PCTs identified by the assessor under Chapter 5 as occurring within the subject land, and

(d) the native vegetation cover within an assessment area 1500m wide surrounding the boundary of the subject site as determined by the assessor in accordance with Subsection 4.3.2 is equal to or greater than the minimum class that is required for the species (unless the development is, or is part of, a linear shaped development), and

(e) the patch size which the vegetation zone is part of, as identified in Subsection 5.3.2 is equal to or greater than the minimum specified for that species, and

(f) the species is identified as an ecosystem or species credit species in the Threatened Biodiversity Data Collection.

A threatened species is predicted as requiring assessment if that species meets all of the criteria a) – f) that are relevant to the species. A criterion is not relevant to a species if the species' profile in the Threatened Biodiversity Data Collection does not contain information for that criterion

If any past surveys undertaken on the subject land, regardless of whether or not the data is within BioNet, have recorded the presence of a threatened species, this species must be identified as being a species that requires assessment at the subject land.

4.2 Ecosystem Candidate Species Assessment & Justification

The list of ecosystem credit species derived (predicted) from the BAM calculator for this proposal are listed below in Table 6. Additional Threatened ecosystem credit species are to be added where they occur on the site, or have been recorded previously at the site or when listed criteria are met.

Ecosystem credit species are those where their likely occurrence can be predicted by habitat surrogates (such as PCT) and landscape features, or for which a targeted survey has a low probability of detection. A targeted survey is not required for ecosystem species.

The listed Threatened species are assessed in accordance with section 6.4 (Steps 1 and 2) of the BAM, to identify any species that should be excluded from the BAM calculation and subsequent ecosystem (PCT, vegetation type) credit generation. The reasons for any exclusions or additions are given in the final column of Table 6.

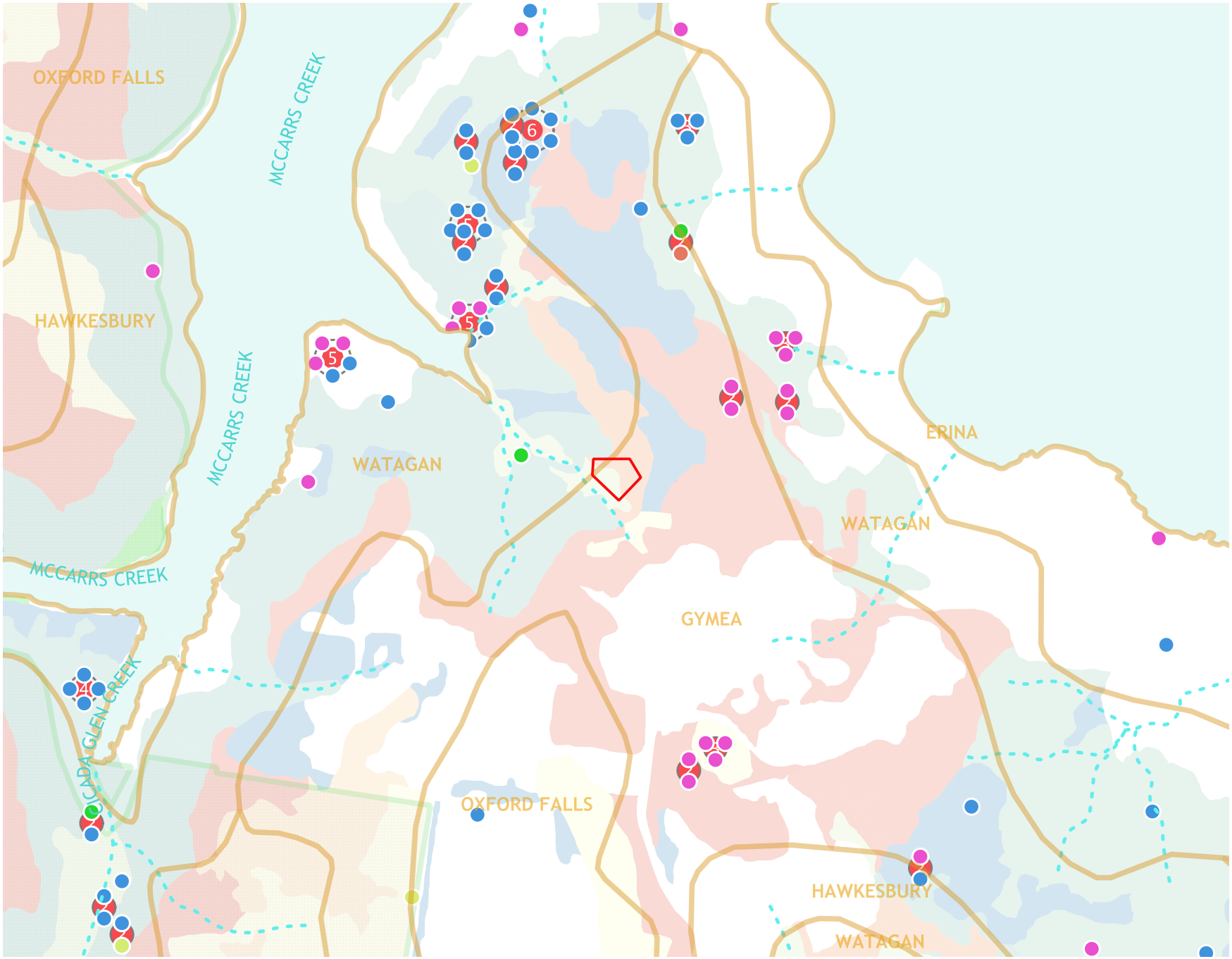

Figure 4.1
Threatened Species Records

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Date: 31/10/2019
Drawn by: Nicholas Skelton
Version 1
Projection: GDA 94 MGA 56

0 0.2 0.4 km

Photo Page 1. Plot Photos

Plot 1. Origin looking east

Plot 1. South-western corner

Plot 2. Origin looking west

Plot 2. North-eastern corner

Table 6. Ecosystem Species Assessment

143-145 McCarrs Creek Road, Church Point

Threatened species reliably predicted to utilise the site. No surveys are required for these species. Ecosystem credits apply to these species.

Common Name	Scientific Name	Vegetation Zone	Exclude as Ecosystem Credit Species	Justification for Exclusion
Dusky Woodswallow	*Artamus cyanopterus cyanopterus*	Zone 1 & 2	No change	
Eastern False Pipistrelle	*Falsistrellus tasmaniensis*	Zone 2	No change	
Eastern Coastal Freetail-bat	*Mormopterus norfolkensis*	Zone 1	No change	
Gang-gang Cockatoo	*Callocephalon fimbriatum*	Zone 2	No change	
Glossy Black-Cockatoo	*Calyptorhynchus lathami*	Zone 1 & 2	No change	
Golden-tipped Bat	*Phoniscus papuensis*	Zone 2	No change	
Greater Broad-nosed Bat	*Scoteanax rueppellii*	Zone 2	No change	
Grey-headed Flying-fox	*Pteropus poliocephalus*	Zone 1 & 2	No change	
Koala	*Phascolarctos cinereus*	Zone 1 & 2	No change	
Large Bent-winged Bat	*Miniopterus oriane oceanensis*	Zone 1 & 2	No change	
Little Bent-winged Bat	*Miniopterus australis*	Zone 1 & 2	No change	
Little Lorikeet	*Glossopsitta pusilla*	Zone 1 & 2	No change	
Long-nosed Potoroo	*Potorous tridactylus*	Zone 2	No change	
Masked Owl	*Tyto novaehollandiae*	Zone 1 & 2	No change	
Powerful Owl	*Ninox strenua*	Zone 1 & 2	No change	
Regent Honeyeater	*Anthochaera phrygia*	Zone 1	No change	
Spotted-tailed Quoll	*Dasyurus maculatus*	Zone 2	No change	
Sqaure-tailed Kite	*Lophoictinia isura*	Zone 2	No change	
Superb Fruit-Dove	*Ptilinopus superbus*	Zone 1		
Swift Parrot	*Lathamus discolor*	Zone 1 & 2	No change	
White-bellied Sea-eagle	*Haliaeetus leucogaster*	Zone 1	Excluded	Not suitable fotaging habitat at the site
Varied Sittella	*Daphoenositta chrysoptera*	Zone 1 & 2	No change	
Yellow-bellied Sheathtail Bat	*Saccolaimus flaviventris*	Zone 2	No change	

4.3 Species Candidate Assessment & Justification

The predicted (potential) candidate Threatened flora and fauna credit species derived from the BAM calculator for this proposal, are listed below in Tables 7 and 8 respectively. Additional Threatened species are to be added where they are likely to occur on the site or when the site contains suitable habitat.

The habitat suitability and geographic constraints for potential candidate flora and fauna species credit species are assessed in the Tables 7 and 8 below. The criteria for identifying the Threatened species that should be added or excluded from further assessment are described in Sections 6.4 of the BAM. The reasons for any exclusions or additions are given in the final column.

The BAM calculator takes into consideration the location of the site and the vegetation community, to create the predicted candidate Threatened Species Credit Species list which is the basis of the table below.

Section 6.4 of the BAM method (OEH 2017) requires 4 steps to be taken to confirm which of these species are Candidate species credit species to target for further assessment. The table below summarises the habitat preferences and requirements for each species, based on information from the Threatened Species Database Collection and other scientific references. The table applies the 4 steps by assessing the suitability of the habitat on the Site based on the findings of the field survey, then provides a justification for including or excluding each species as a Candidate species credit species.

Figure 4.1 shows the location, distribution and abundance of historical records for each predicted Threatened candidate species.

4.3.1 Threatened Flora Species

Table 7 below assesses the candidate flora species credits species.

Table 9. Candidate Credit Species Assessment, Flora

143-145 McCarrs Creek Road, Church Point

BAM Step 4 6.4.1.pg 20-25		Pittwater IBRA Sub Region	Habitat Suitability from TBDC, literature or calculator tick boxes			Proximity of Historic Records from past reports and databases			
		Determining Factor -ve	May be a Determining Factor		May be a -ve Determining Factor			Determining Factor +ve	
Derived (Predicted) Potential Candidate Species	**Habitat Requirements and Preferences (constraints) from species profile and literature**	**Geographic Restrictions (from TBDC)**	**Habitat Requirements (constraints) within Development Site**	**Habitat Preferences within Development Site**	**Disturbance, Habitat Degradation existing within Development Site**	**Historic Occurrence within 5km**	**Historic Occurrence in locality (date, location and vegetation type)**	**Historic Occurrence on or immediately adjacent to Development Site**	**Candidate Species Conclusion & Justification**
Cryptostylis hunteriana Leafless Tongue Orchid *Vulnerable*	**Habitat Requirements:** The larger populations typically occur in woodland dominated by Scribbly Gum (Eucalyptus sclerophylla), Silvertop Ash (E. sieberi), Red Bloodwood (Corymbia gummifera) and Black She Oak (Allocasuarina littoralis). It appears to prefer open areas in the understorey and is often found in association with the Large Tongue Orchid (C. subulata) and the Tartan Tongue Orchid (C. erecta). **Habitat Preferences:** Does not appear to have well defined habitat preferences and is known from a range of communities, including swamp-heath and woodland (Benson & McDougall, 1993). **Disturbance Factors:** None documented.	None	Site does contain suitable vegetation	Site does contain suitable vegetation.	None documented	1 record	None nearby	None	**Yes a Candidate species credit species:** This species is known to occur in general location, and suitable habitat occurs on the site, and the site is not too disturbed. A targeted field survey is required or this species can be assumed to occur
Camarophyllopsis kearneyi Fungus *Endangered*	**Geographic Restrictions within Subregion:** Only know to occur in Lane Cove Bushland Park **Habitat Requirements:** An agaric fungus limited to Lane Cove Bushland Park. Part of Critically Endangered Ecological Community Hygrocybeae community of Lane Cove Bushland Park. The community is found in gullies, in rainforest or wet sclerophyll vegetation with a dense, closed canopy.	Site not within Lane Cove Bushland Park.							**Not a Candidate Species:** The site is not within the geographic restriction and the species is unlikely to occur. No further assessment is required for this species.

Table 9. Candidate Credit Species Assessment, Flora

143-145 McCarrs Creek Road, Church Point

BAM Step 4 6.4.1.pg 20-25

Derived (Predicted) Potential Candidate Species	Habitat Requirements and Preferences (constraints) from species profile and literature	**Pittwater** IBRA Sub Region Determining Factor -ve **Geographic Restrictions (from TBDC)**	Habitat Suitability from TBDC, literature or calculator tick boxes May be a Determining Factor **Habitat Requirements (constraints) within Development Site**	**Habitat Preferences within Development Site**	May be a -ve Determining Factor **Disturbance, Habitat Degradation existing within Development Site**	Proximity of Historic Records from past reports and databases **Historic Occurrence within 5km**	**Historic Occurrence in locality (date, location and vegetation type)**	Determining Factor +ve **Historic Occurrence on or immediately adjacent to Development Site**	Candidate Species Conclusion & Justification
Grammitis stenophylla Narrow-leafed Finger Fern *Endangered*	**Habitat Requirements:** It occurs in moist places, usually near streams, on rocks or in trees, in rainforest and moist eucalypt forest. **Habitat Preferences:** Occurs in eastern Queensland and eastern NSW. In NSW it has been found on the south, central and north coast and as far west as Mount Kaputar National Park near Narrabrai. **Disturbance Factors:** None	None	The site contains rainforest, there is a creek adjacent to the site.	The site occurs in known distribution	None documented	No records	No nearby records	None on or directly adjacent to the site	**Yes a Candidate species credit species:** This species is known to occur in general location, and suitable habitat occurs on the site, and the site is not too disturbed. A targeted field survey is required or this species can be assumed to occur
Hygrocybe anomala var. ianthinomarginata Fungus *Vulnerable*	**Geographic Restrictions within Subregion: O**nly know to occur in Lane Cove Bushland Park**: Habitat Requirements:** Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes with naturally low fertility and erodible. Part of Critically Endangered Ecological Community Hygrocybeae community of Lane Cove Bushland Park. Recorded in Land Cove Bushland Park, Royal and Blue Mountains NPs **Habitat Preferences:** Occurs in gallery warm temperate forests. **Disturbance**	Site not within Lane Cove Bushland Park.							**Not a Candidate Species:** The site is not within the geographic restriction and the species is unlikely to occur. No further assessment is required for this species.

Table 9. Candidate Credit Species Assessment, Flora

143-145 McCarrs Creek Road, Church Point

BAM Step 4 6.4.1.pg 20-25		Pittwater IBRA Sub Region	Habitat Suitability from TBDC, literature or calculator tick boxes			Proximity of Historic Records from past reports and databases			
		Determining Factor -ve	May be a Determining Factor		May be a -ve Determining Factor			Determining Factor +ve	
Derived (Predicted) Potential Candidate Species	**Habitat Requirements and Preferences (constraints) from species profile and literature**	**Geographic Restrictions (from TBDC)**	**Habitat Requirements (constraints) within Development Site**	**Habitat Preferences within Development Site**	**Disturbance, Habitat Degradation existing within Development Site**	**Historic Occurrence within 5km**	**Historic Occurrence in locality (date, location and vegetation type)**	**Historic Occurrence on or immediately adjacent to Development Site**	**Candidate Species Conclusion & Justification**
Hygrocybe aurantipes Fungus *Vulnerable*	Geographic Restrictions within Subregion: Only know to occur in Lane Cove Bushland Park. Habitat Preferences: Occurs in gallery warm temperate forests. Grows on soil, hummus, moss or rarely on rotten wood. Known from Lane Cove National Park and Blue Mountains National Park (Mt Wilson) and Hazelbrook. Part of Critically Endangered Ecological Community Hygrocybeae community of Lane Cove Bushland Park Disturbance Factors: None documented.	Site not within Lane Cove Bushland Park.							**Not a Candidate Species:** The site is not within the geographic restriction and the species is unlikely to occur. No further assessment is required for this species.
Hygrocybe austropratensis Fungus *Endangered*	**Geographic Restrictions within Subregion:** Only know to occur in Lane Cove Bushland Park **Habitat Requirements:** Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes with naturally low fertility and erodible. Part of Critically Endangered Ecological Community Hygrocybeae community of Lane Cove Bushland Park **Habitat Preferences:** Occurs in gallery warm temperate forests. **Disturbance Factors:** None documented.	Site not within Lane Cove Bushland Park.							**Not a Candidate Species:** The site is not within the geographic restriction and the species is unlikely to occur. No further assessment is required for this species.
Hygrocybe collucera Fungus *Endangered*	**Geographic Restrictions within Subregion:** Only know to occur in Lane Cove Bushland Park **Habitat Requirements:** Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes with naturally low fertility and erodible. Part of Critically Endangered Ecological Community Hygrocybeae community of Lane Cove Bushland Park **Habitat Preferences:** Occurs in gallery warm temperate forests. **Disturbance Factors:** None documented	Site not within Lane Cove Bushland Park.							**Not a Candidate Species:** The site is not within the geographic restriction and the species is unlikely to occur. No further assessment is required for this species.

Table 9. Candidate Credit Species Assessment, Flora

143-145 McCarrs Creek Road, Church Point

BAM Step 4 6.4.1.pg 20-25		Pittwater IBRA Sub Region	Habitat Suitability from TBDC, literature or calculator tick boxes			Proximity of Historic Records from past reports and databases			
		Determining Factor -ve	May be a Determining Factor		May be a -ve Determining Factor			Determining Factor +ve	
Derived (Predicted) Potential Candidate Species	**Habitat Requirements and Preferences (constraints) from species profile and literature**	**Geographic Restrictions (from TBDC)**	**Habitat Requirements (constraints) within Development Site**	**Habitat Preferences within Development Site**	**Disturbance, Habitat Degradation existing within Development Site**	**Historic Occurrence within 5km**	**Historic Occurrence in locality (date, location and vegetation type)**	**Historic Occurrence on or immediately adjacent to Development Site**	**Candidate Species Conclusion & Justification**
Hygrocybe griseoramosa Fungus *Endangered*	**Geographic Restrictions within Subregion:** Only know to occur in Lane Cove Bushland Park **Habitat Requirements:** Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes with naturally low fertility and erodible. **P**art of Critically Endangered Ecological Community Hygrocybeae community of Lane Cove Bushland Park **Habitat Preferences:** Occurs in gallery warm temperate forests. **Disturbance Factors:** None documented.	Site not within Lane Cove Bushland Park.							**Not a Candidate Species:** The site is not within the geographic restriction and the species is unlikely to occur. No further assessment is required for this species.
Hygrocybe lanecovensis Fungus *Endangered*	**Geographic Restrictions within Subregion: O**nly know to occur in Lane Cove Bushland Park **Habitat Requirements:** Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes with naturally low fertility and erodible. Part of Critically Endangered Ecological Community Hygrocybeae community of Lane Cove Bushland Park **Habitat Preferences:** Occurs in gallery warm temperate forests. **Disturbance Factors:** None	Site not within Lane Cove Bushland Park.							**Not a Candidate Species:** The site is not within the geographic restriction and the species is unlikely to occur. No further assessment is required for this species.
Hygrocybe reesiae. Fungus *Vulnerable*	**Geographic Restrictions within Subregion:** Only know to occur in Lane Cove Bushland Park **Habitat Requirements:** Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes with naturally low fertility and erodible. Part of Critically Endangered Ecological Community Hygrocybeae community of Lane Cove Bushland Park **Habitat Preferences:** Occurs in gallery warm temperate forests. **Disturbance Factors:** None	Site not within Lane Cove Bushland Park.							**Not a Candidate Species:** The site is not within the geographic restriction and the species is unlikely to occur. No further assessment is required for this species.

Table 9. Candidate Credit Species Assessment, Flora

143-145 McCarrs Creek Road, Church Point

BAM Step 4 6.4.1.pg 20-25

		Pittwater IBRA Sub Region	Habitat Suitability from TBDC, literature or calculator tick boxes			Proximity of Historic Records from past reports and databases			
		Determining Factor -ve	May be a Determining Factor		May be a -ve Determining Factor			Determining Factor +ve	
Derived (Predicted) Potential Candidate Species	**Habitat Requirements and Preferences (constraints) from species profile and literature**	**Geographic Restrictions (from TBDC)**	**Habitat Requirements (constraints) within Development Site**	**Habitat Preferences within Development Site**	**Disturbance, Habitat Degradation existing within Development Site**	**Historic Occurrence within 5km**	**Historic Occurrence in locality (date, location and vegetation type)**	**Historic Occurrence on or immediately adjacent to Development Site**	**Candidate Species Conclusion & Justification**
Hygrocybe rubronivea Fungus *Vulnerable*	**Geographic Restrictions within Subregion:** Only know to occur in Lane Cove Bushland Park **Habitat Requirements:** Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes with naturally low fertility and erodible. Part of Critically Endangered Ecological Community Hygrocybeae community of Lane Cove Bushland Park **Habitat Preferences:** Occurs in gallery warm temperate forests. **Disturbance Factors:** None documented	Site not within Lane Cove Bushland Park.							**Not a Candidate Species:** The site is not within the geographic restriction and the species is unlikely to occur. No further assessment is required for this species.
Melaleuca groveana Grove's Paperbark *Vulnerable*	**Habitat Requirements:** Widespread, scattered populations in coastal districts north of Yengo National Park to southeast Queensland. **Habitat Preferences:** Grove's Paperbark grows in heath and shrubland, often in exposed sites, in low coastal hills, escarpment ranges and tablelands on outcropping granite, rhyolite and sandstone on rocky outcrops and cliffs. It also occurs in dry scrubby open forest and woodlands. **Disturbance Factors:** None documented.	None	Site not in known distribution.	Suitable habitat occurs on site.	None documented	No nearby records	None nearby	None on or directly adjacent to the site	**Not a Candidate Species:** The site is not within the geographic restriction and the species is unlikely to occur. No further assessment is required for this species.
Rhodamnia rubescens Scrub Turpentine *Critically Endangered*	**Habitat Requirements:** Occurs north of Batemans Bay. Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest. Extremely susceptible to infection from Myrtle Rust **Habitat Preference:** usually found on volcanic and sedimentary soils. Occurs mostly in coastal areas	None	Site contains an area of Littoral Rainforest	Site does not contain volcanic or sedimentary soils	None documented	15 records	One record (1984) 1.2km south-west and group of recent records (2019) 1.7km south	None on or directly adjacent to the site	**Yes a Candidate species credit species:** This species is known to occur in general location, and suitable habitat occurs on the site, and the site is not too disturbed. A targeted field survey is required or this species can be

Table 9. Candidate Credit Species Assessment, Flora

143-145 McCarrs Creek Road, Church Point

BAM Step 4 6.4.1.pg 20-25		**Pittwater** IBRA Sub Region	Habitat Suitability from TBDC, literature or calculator tick boxes			Proximity of Historic Records from past reports and databases			
		Determining Factor -ve	May be a Determining Factor		May be a -ve Determining Factor			Determining Factor +ve	
Derived (Predicted) Potential Candidate Species	**Habitat Requirements and Preferences (constraints) from species profile and literature**	**Geographic Restrictions (from TBDC)**	**Habitat Requirements (constraints) within Development Site**	**Habitat Preferences within Development Site**	**Disturbance, Habitat Degradation existing within Development Site**	**Historic Occurrence within 5km**	**Historic Occurrence in locality (date, location and vegetation type)**	**Historic Occurrence on or immediately adjacent to Development Site**	**Candidate Species Conclusion & Justification**
Syzygium paniculatum Magenta Lilli Pilly *Endangered*	**Habitat Requirements:** Grows on gravels, sands, silts and clays in riverside gallery rainforests, as well as remnant littoral and subtropical rainforest communities. **Habitat Preferences:** Found only in NSW, in a narrow, linear coastal strip from Upper Lansdowne to Conjola State Forest. **Disturbance Factors:** None documented.	None	Suitable habitat occurs in the lower part of the site	Suitable habitat.	None documented	16 records	1 record less than 100m west in same valley	1 record less than 100m west in same valley	**Yes a Candidate species credit species:** This species is known to occur in general location, and suitable habitat occurs on the site, and the site is not too disturbed. A targeted field survey is required or this species can be

4.3.2 Threatened Fauna Species

4.3.2.1 Existing Fauna Habitat at Development Site

The native trees on the site provide habitat for a range of native and Threatened fauna. There is roosting habitat along the creekline for large owls that occur on the locality including the Powerful Owl. The flowering trees provide foraging habitat for birds, possums, gliders and fruit bats. The Turpentine trees were in flower at the time of the survey providing an abundance of food. Therefore it would be difficult to detect any gliders at the site, at the time of the survey, using bait. The abundance of *Allocasuarina torulosa* provide foraging habitat for Glossy Black-cockatoos. No chewed nuts were found during the survey, however they are considered likely to occur.

Several small to medium sized hollows were observed within the trees at the site. The hollows were mostly located high in the trees. The hollows are potential habitat for gliders, microbats and small birds. There were no large hollows suitable for large owls or cockatoos (see below for a detailed description of hollows at the site).

The multiple cervices within the rock ledge provide sheltering habitat for reptiles and small mammals such as echidna. The crevices were too low to the ground and assessable to predators to be suitable for microbats. there are also several wood piles that provide sheltering habitat for snakes.

The creekline adjacent to the site is suitable for frogs. Spotted Pardalote were observed nesting in the banks of the creek. Microbats are also likely to forage over the creek.

The Site and the locality are shown on the maps in Figures 1.2 and 1.3.

4.3.2.2 Habitat Trees

A total of 8 hollows bearing trees were observed during the survey. The approximate location of the hollows are shown on Figure 4.1. The hollows were recorded before the trees were numbered and therefore approximate location were marked on the survey only.

Hollow Number (see Figure 4.2	Description
H1	*Allocasuarina torulosa*, 2m high 10cm diameter
H2	Off property. 2X hollows in *Allocasuarina torulosa* 15m high, a. 25 & b. 30cm chimney hollow
H3	*Angophora costata*. 10m high, 5cm in diameter
H4	a. 4m high , 20cm diameter, b. 10m,15cm, c.13m, 5cm
H5	Off property. Hollow in base of trunk
H6	*Eucalyptus scias*. Hollow at base and 10m high, 20cm diameter.
H7	*Eucalyptus botryoides*, 10m high 10cm diameter
H8	Dead tree, 20m high 8-10cm diameter

The northern bushland part of the Development Site also contains many small to medium sized hollows that are potential nesting or roosting habitat for small-medium sized birds, possums and some species of microbats. The hollows are not likely to be large enough for Threatened owls.

Table 8. Candidate Credit Species Assessment, Fauna

143-145 McCarrs Creek Road, Church Point

BAM Step 4 6.4.1. pg 20-25

		Pittwater IBRA Sub Region	Habitat Suitability within Development Site, from TBDC, literature or BAM calculator tick boxes			Proximity of Historic Records from past reports and databases			
		Determining Factor -ve	May be a Determining Factor		May be a -ve Determining Factor			Determining Factor +ve	
Derived (Predicted) Potential Candidate Species	**Habitat Requirements and Preferences (constraints) from DPIE, species profile, TBDC, and literature**	**Geographic Restrictions (from TBDC)**	**Habitat Requirements (constraints) within Development Site**	**Habitat Preferences within Development Site**	**Disturbance, Habitat Degradation existing within Development Site**	**Historic Occurrence within 5km**	**Historic Occurrence in Locality (date, location and vegetation type)**	**Historic Occurrence on or immediately adjacent to Development Site**	**Candidate Species Conclusion & Justification**
Anthochaera Phrygia Regent Honey Eater **(Breeding only)** *Critically Endangered*	**Habitat Requirements:** Main breeding sites in NSW are in Capertee Valley and Bundarra-Barraba Regions. **Habitat Preferences:** Inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. Mainly feeds on the nectar from a wide range of eucalypts and mistletoes. When nectar is scarce lerp, honeydew and insects comprise a large proportion of the diet. Every few years non-breeding flocks are seen foraging in flowering coastal Swamp Mahogany and Spotted Gum forests. **Disturbance Factors:** None documented. **Breeding:** Main breeding sites in NSW are in Capertee Valley and Bundarra-Barraba Regions. A shrubby understorey is an important source of insects and nesting material.	None	The site does not fall within the two known breeding areas.						**Not a Candidate species credit species:** This species requirements (constraints) do not occur on this site and the species is unlikely to breed within or adjacent to the site. No further assessment is required for this species.
Callocephalon fimbriatum Gang-Gang Cockatoo **(Breeding only)** *Vulnerable*	**Habitat Requirements:** The only known breeding areas in the Sydney region are within the Hornsby and Ku-ring-gai LGAs which is also an endangered population. **Habitat Preferences:** Occurs in tall mountain forests and woodlands during spring and summer. In autumn and winter it moves to lower altitudes in drier more open eucalypt forests or in coastal areas. Often found in urban areas. **Disturbance Factors**: None documented. **Breeding:** Nests are located in hollows that are 10 cm in diameter or larger and at least 9 m above the ground in eucalypts.	The site does not occur within known breeding areas in the Sydney region.							**Not a Candidate species credit species:** This species requirements (constraints) do not occur on this site and the species is unlikely to breed on or adjacent to the site. No further assessment is required for this species.
Calyptorhynchus lathami Glossy Black-Cockatoo **(Breeding only)** *Vulnerable*	**Habitat Requirements:** Dependent on large hollow-bearing eucalypts for nest sites. **Habitat Preferences:** Feeds almost exclusively on the seeds of several species of she-oak (Casuarina and Allocasuarina species), shredding the cones with its massive bill. **Disturbance Factors:** None documented. **Breeding:** Nests in large hollow-bearing eucalypts close to food trees (Mooney & Pedler, 2005). A single egg is laid between March and May.	None	The Site does not contain any large hollows that are suitable for breeding	Many Allocasuarina food trees occur at the site	None documented	60 records	records 1994-2011 500m north and 700m south 2002	None on or directly adjacent to the site	**Not a Candidate species credit species:** This species requirements (constraints) do not occur on this site and the species is unlikely to breed on or adjacent to the site. No further assessment is required for this species.

Table 8. Candidate Credit Species Assessment, Fauna

143-145 McCarrs Creek Road, Church Point

BAM Step 4 6.4.1. pg 20-25

		Pittwater IBRA Sub Region	Habitat Suitability within Development Site, from TBDC, literature or BAM calculator tick boxes			Proximity of Historic Records from past reports and databases			
		Determining Factor -ve	May be a Determining Factor		May be a -ve Determining Factor			Determining Factor +ve	
Derived (Predicted) Potential Candidate Species	**Habitat Requirements and Preferences (constraints) from DPIE, species profile, TBDC, and literature**	**Geographic Restrictions (from TBDC)**	**Habitat Requirements (constraints) within Development Site**	**Habitat Preferences within Development Site**	**Disturbance, Habitat Degradation existing within Development Site**	**Historic Occurrence within 5km**	**Historic Occurrence in Locality (date, location and vegetation type)**	**Historic Occurrence on or immediately adjacent to Development Site**	**Candidate Species Conclusion & Justification**
Cercartetus nanus Eastern Pygmy-possum *Vulnerable*	**Habitat Requirements:** Nesting sites. **Habitat Preferences:** Found in dense rainforests, wet and dry sclerophyll forests, woodlands, mallee scrub and coastal heathlands, but in most areas woodlands and heath appear to be preferred. Large foraging range and feeds largely on nectar and pollen collected from Banksias, Eucalypts and Bottlebrushes. Can be difficult to detect. **Disturbance Factors:** Disturbance to the midstorey. **Breeding:** Tree hollows are favoured for nesting but spherical nests have been found under the bark of eucalypts and in shredded bark in tree forks. Most births occur between late spring and early autumn.	None	Suitable nesting habitat occurs on the Site	Suitable food and breeding habitat present	recent disturbance to the midstorey	200 records	records 800m north 1969 and 500m south 2016-17	None on or directly adjacent to the site	**Yes a Candidate species credit species:** This species is known to occur in general location, and suitable habitat occurs on the site, and the site is not too disturbed. A targeted field survey is required or this species can be assumed to occur.
Chalinolobus dwyeri Large-eared Pied Bat *Vulnerable*	**Habitat Requirements:** Cliffs, within 2km of rocky areas containing caves, overhangs, escarpments, outcrops, crevices and old mines or tunnels. **Habitat Preferences:** It is generally rare with a very patchy distribution in NSW. Found in well-timbered areas containing gullies. Probably forages for small, flying insects below the forest canopy. **Disturbance Factors:** None documented. **Breeding:** Roosts in caves, crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (Hirundo ariel).	None	Cliffs. Within 2km of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices or within 2km of old mines or tunnels.	A forest canopy occurs on Site which would be suitable for foraging.	None documented	11 records	record 1.3km south (2016)	None on or directly adjacent to the site	**Yes a Candidate species credit species:** This species is known to occur in general location, and suitable habitat occurs on the site, and the site is not too disturbed. A targeted field survey is required or this species can be assumed to occur.
Eudyptula minor - Endangered population Little Penguin	**Habitat Requirements:** They often set up their colonies in sand-dune vegetation, but they can also be found among rocks, in sea caves, and on headlands. In rocky areas and in sea caves, the burrow may be a collection of twigs or a nest between large rocks. Sometimes even man-made structures, such as the cavities under raised houses, are used. **Habitat Preferences:** Close to the oceas as they generally spend the day at sea and return to their colonies after dark. **Disturbance factors:** Pollution and predatory animals such as foxes, dogs and cats.	None	Not within known distribution for this population						**Not a Candidate species credit species:** This species requirements (constraints) do not occur on this site and the species is unlikely to occur. No further assessment is required for this species.

Table 8. Candidate Credit Species Assessment, Fauna

143-145 McCarrs Creek Road, Church Point

BAM Step 4 6.4.1. pg 20-25

		Pittwater IBRA Sub Region	Habitat Suitability within Development Site, from TBDC, literature or BAM calculator tick boxes			Proximity of Historic Records from past reports and databases			
		Determining Factor -ve	May be a Determining Factor		May be a -ve Determining Factor			Determining Factor +ve	
Derived (Predicted) Potential Candidate Species	**Habitat Requirements and Preferences (constraints) from DPIE, species profile, TBDC, and literature**	**Geographic Restrictions (from TBDC)**	**Habitat Requirements (constraints) within Development Site**	**Habitat Preferences within Development Site**	**Disturbance, Habitat Degradation existing within Development Site**	**Historic Occurrence within 5km**	**Historic Occurrence in Locality (date, location and vegetation type)**	**Historic Occurrence on or immediately adjacent to Development Site**	**Candidate Species Conclusion & Justification**
Haliaeetus leucogaster White-bellied Sea-Eagle **(Breeding only)** Vulnerable	**Habitat Requirements:** Large emergent eucalypts. Breeds in mature tall open forest, open forest, tall woodland, and swamp sclerophyll forest close to foraging habitat. **Habitat Preferences:** Occurs at sites near the sea or sea-shore, such as around bays and inlets, beaches, reefs, lagoons, estuaries and mangroves; and at, or in the vicinity of freshwater swamps, lakes, reservoirs, billabongs and saltmarsh. **Disturbance Factors:** None documented. **Breeding:** Nest trees are typically large emergent eucalypts and often have emergent dead branches or large dead trees nearby which are used as 'guard roosts'.	None	No suitable nesting trees at the site		None documented	41 records	No nearby records	None on or directly adjacent to the site	**Not a Candidate species credit species:** This species requirements (constraints) do not occur on this site and the species is unlikely to breed on or adjacent to the site. No further assessment is required for this species.
Mixophyes iteratus Giant Barred Frog *Endangered*	**Habitat Requirements:** Occurs along shallow rocky streams in rainforest, wet sclerophyll forest and farmland between 100 and 1000m or deep, slow moving streams with steep banks in lowland areas. Declines appear to have occurred at the margins of the species' range, with no recent records south of the Hawkesbury River and disappearances from a number of streams in QLD. **Habitat Preferences:** Generally found buried under leaf litter or sheltering under vegetation. **Breeding:** Tadpoles are present throughout the year and probably over-winter. The Giant Barred Frog is distributed along the coast and ranges from Eumundi in south-east Queensland to Warrimoo in the Blue Mountains. **Disturbance Factors:** None	None	The site occurs south of the Hawkesbury River. No local population.						**Not a Candidate species credit species:** This species requirements (constraints) do not occur on this site and the species is unlikely to occur. No further assessment is required for this species.
Myotis macropus Southern Myotis *Vulnerable*	**Habitat Requirements:** Within 200m of suitable waterbody that is at least 3m wide and can be a river, creek, billabong, lagoon, dam, estuary or coastal lake. It does not include ocean, beach or marine harbour. Hollow bearing trees, caves, bridges or artificial structures within 200m of suitable water body. **Habitat Preferences:** Forage over streams and pools, catching insects and small fish on the water surface. **Disturbance Factors:** None documented. **Breeding:** 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.	None	The site is within 200m of suitable waterbody. Hollows occur at the site.	The Site contains suitable foraging habitat	None documented	17 records	2 records within the same valley 300 and 600m west (2016)	None on or directly adjacent to the site	**Yes a Candidate species credit species:** This species is known to occur in general location, and suitable habitat occurs on the site, and the site is not too disturbed. A targeted field survey is required or this species can be assumed to occur.

Table 8. Candidate Credit Species Assessment, Fauna

143-145 McCarrs Creek Road, Church Point

BAM Step 4 6.4.1. pg 20-25

		Pittwater IBRA Sub Region	Habitat Suitability within Development Site, from TBDC, literature or BAM calculator tick boxes			Proximity of Historic Records from past reports and databases			
		Determining Factor -ve	May be a Determining Factor		May be a -ve Determining Factor			Determining Factor +ve	
Derived (Predicted) Potential Candidate Species	**Habitat Requirements and Preferences (constraints) from DPIE, species profile, TBDC, and literature**	**Geographic Restrictions (from TBDC)**	**Habitat Requirements (constraints) within Development Site**	**Habitat Preferences within Development Site**	**Disturbance, Habitat Degradation existing within Development Site**	**Historic Occurrence within 5km**	**Historic Occurrence in Locality (date, location and vegetation type)**	**Historic Occurrence on or immediately adjacent to Development Site**	**Candidate Species Conclusion & Justification**
Hoplocephalus bitorquatus Pale-headed Snake *Vulnerable*	**Habitat Requirements:** Highly cryptic species that can spend weeks at a time hidden in tree hollows. No records south of Gosford **Habitat Preferences:** Shelter during the day between loose bark and tree-trunks, or in hollow trunks and limbs of dead trees. In drier environments, it appears to favour habitats close to riparian areas. **Disturbance Factors:** None documented.	None	Site occurs south of Gosford.						**Not a Candidate species credit species:** This species requirements (constraints) do not occur on this site and the species is unlikely to occur. No further assessment is required for this species.
Lathamus discolor Swift Parrot **(Breeding only)** *Vulnerable*	**Habitat Requirements:** Breeds in Tasmania. **Habitat Preferences:** On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as Swamp Mahogany Eucalyptus robusta, Spotted Gum Corymbia maculata, Red Bloodwood C. gummifera, Mugga Ironbark E. sideroxylon, and White Box E. albens. **Disturbance Factors:** Feed trees. **Breeding:** Breeds in Tasmania during spring and summer.	None	The site does not fall within the two known breeding areas.						**Not a Candidate species credit species:** This species requirements (constraints) do not occur on this site and the species is unlikely to breed at or adjcent to the site. No further assessment is required for this species.
Litoria brevipalmata Green-thighed Frog *Vulnerable*	**Habitat Requirements:** Temporary or permanent water bodies. No records south of Hawkesbury River **Habitat Preferences:** Occurs in rainforest, moist eucalypt forest, dry eucalypt forest and heath where water gathers after rain. The frogs are thought to forage in leaf-litter. **Disturbance Factors:** Leaf litter and water quality. **Breeding:** Occurs following heavy rainfall from spring to autumn, with larger temporary pools and flooded areas preferred.	None	The site occurs south of the Hawkesbury River. No local population.						**Not a Candidate species credit species:** This species requirements (constraints) do not occur on this site and the species is unlikely to occur. No further assessment is required for this species.
Lophoictinia isura Square-tailed Kite **(Breeding only)** *Vulnerable*	**Habitat Requirements:** Large trees for breeding. **Habitat Preferences:** Inhabits dry woodlands and open forest, in particular timbered watercourses. Feeds on passerines, insects in tree canopy. **Disturbance Factors:** None documented. **Breeding:** The Square-tailed Kite builds a large stick platform in a living tree, in open forest or woodland or near edges or openings in forest. Nests are predominantly sticks lined with green eucalyptus leaves. Usually nests nearby water. A clutch of one or two eggs is laid in winter, with a single attempt per season.	None	No suitable tall nesting trees occur on the Site						**Not a Candidate species credit species:** This species requirements (constraints) do not occur on this site and the species is unlikely to breed at or adjcent to the site. No further assessment is required for this species.

Table 8. Candidate Credit Species Assessment, Fauna

143-145 McCarrs Creek Road, Church Point

BAM Step 4 6.4.1. pg 20-25

		Pittwater IBRA Sub Region	Habitat Suitability within Development Site, from TBDC, literature or BAM calculator tick boxes			Proximity of Historic Records from past reports and databases			
		Determining Factor -ve	May be a Determining Factor		May be a -ve Determining Factor			Determining Factor +ve	
Derived (Predicted) Potential Candidate Species	**Habitat Requirements and Preferences (constraints) from DPIE, species profile, TBDC, and literature**	**Geographic Restrictions (from TBDC)**	**Habitat Requirements (constraints) within Development Site**	**Habitat Preferences within Development Site**	**Disturbance, Habitat Degradation existing within Development Site**	**Historic Occurrence within 5km**	**Historic Occurrence in Locality (date, location and vegetation type)**	**Historic Occurrence on or immediately adjacent to Development Site**	**Candidate Species Conclusion & Justification**
Macropus parma Parma Wallaby *Vulnerable*	**Habitat requirements:** confined to central and northern NSW. **Habitat preferences:** Preferred habitat is moist eucalypt forest with thick, shrubby understorey, often with nearby grassy areas, rainforest margins and occasionally drier eucalypt forest.		Site is not within the known distribution.			No records	No nearby records	None on or directly adjacent to the site	**Not a Candidate species credit species:** This species requirements (constraints) do not occur on this site and the species is unlikely to occur. No further assessment is required for this species.
Miniopterus australis Little Bent-winged Bat **(Breeding only)** *Vulnerable*	**Habitat Requirements:** Caves. **Habitat Preferences:** Moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub. Generally found in well-timbered areas. **Disturbance Factors:** None documented. **Breeding:** Breeds in caves in large maternity colonies, often along side eastern bent wing bats.	None	No Caves occur or were likely to have occurred on site.						**Not a Candidate species credit species:** This species requirements (constraints) do not occur on this site and the species is unlikely to breed on or adjcent to the site. No further assessment is required for this species.
Miniopterus oriane oceanensis Large Bent-winged Bat **(Breeding only)** *Vulnerable*	**Habitat Requirements:** Caves. **Habitat Preferences:** Hunt in forested areas, catching moths and other flying insects above the tree tops. **Disturbance Factors:** None documented. **Breeding:** Caves are the primary maternity roosts but derelict mines, storm-water tunnels, buildings and other man-made structures will be used.	None	No caves or other breeding habitat occurs or was likely to have occurred on site.						**Not a Candidate species credit species:** This species requirements (constraints) do not occur on this site and the species is unlikely to breed on or adjcent to the site. No further assessment is required for this species.

Table 8. Candidate Credit Species Assessment, Fauna

143-145 McCarrs Creek Road, Church Point

BAM Step 4 6.4.1. pg 20-25

		Pittwater IBRA Sub Region	Habitat Suitability within Development Site, from TBDC, literature or BAM calculator tick boxes			Proximity of Historic Records from past reports and databases			
		Determining Factor -ve	May be a Determining Factor		May be a -ve Determining Factor			Determining Factor +ve	
Derived (Predicted) Potential Candidate Species	**Habitat Requirements and Preferences (constraints) from DPIE, species profile, TBDC, and literature**	**Geographic Restrictions (from TBDC)**	**Habitat Requirements (constraints) within Development Site**	**Habitat Preferences within Development Site**	**Disturbance, Habitat Degradation existing within Development Site**	**Historic Occurrence within 5km**	**Historic Occurrence in Locality (date, location and vegetation type)**	**Historic Occurrence on or immediately adjacent to Development Site**	**Candidate Species Conclusion & Justification**
Heleioporus australiacus Giant Burrowing Frog *Vulnerable*	**Habitat Requirements:** Found in heath, woodland and open forest with sandy soils. **Habitat Preferences:** Burrows into deep leaf litter or loose soil, emerging to feed or breed after rain. Spends more than 95% of its time in non-breeding habitat in areas up to 300 m from breeding sites. Home ranges are approximately 0.04 ha in size. Diet includes ground-dwelling invertebrates such as ants, beetles and spiders. It occurs in semi-permanent to ephemeral sand or rock based streams, and infrequently in semi-permanent to permanent constructed dams with a sandy silt or clay base (DEE, 2018). Giant Burrowing Frogs are not restricted to watercourses. Can be difficult to detect. **Disturbance Factors:** Leaf litter. **Breeding:** Generally travels several hundred metres to creeks to breed. Commonly recorded from 'hanging swamp' seepage lines and where small pools form from the collected water.	None	There is an adjacent creekline 5-10m south of the site. Suitable PCT occurs in the upper part of the site.	The site has suitable habitat for foraging and burrowing in the upper part of the site. Suitable breeding habitat adjacent to the site.	The leaf litter is not to disturbed along the creekline. Understorey disturbed onsite	46 records	No records near the site	None	**Yes a Candidate species credit species:** This species is known to occur in general location, and suitable habitat occurs on the site, and the site is not too disturbed. A targeted field survey is required or this species can be assumed to occur**.**
Ninox strenua Powerful Owl **(Breeding only)** Vulnerable	**Habitat Requirements:** Tree hollows within 100m of a creekline. **Habitat Preferences:** Inhabits large tracts (but can occur in fragmented landscapes) of forest in a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. **Disturbance Factors:** Most prey species require hollows and a shrub layer. **Breeding:** Nests in large tree hollows along creeks.	None	No large hollows at the site.	The Site may contains suitable foraging and roosting habitat	No large hollows on the Site	61 records	records within the same valley 300m west of the site (2004-17). Likely to breed somewhere in the valley.	None on or directly adjacent to the site	**Not a Candidate species credit species:** This species requirements (constraints) do not occur on this site and the species is unlikely to breed on or adjcent to the site. No further assessment is required for this species.
Pandion cristatus Eastern Osprey **(Breeding only)** *Vulnerable*	**Habitat Requirements:** Stick nests in living and dead trees (<15m) or artificial structures within 100m of a floodplain . **Habitat Preferences:** Favour coastal areas, especially the mouths of large rivers, lagoons and lakes. Feed on fish over clear, open water. **Disturbance Factors:** None documented. **Breeding:** Breed from July to September in NSW. Nests are made high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea.	None	The Site does not contain large trees with stick nests.						**Not a Candidate species credit species:** This species requirements (constraints) do not occur on this site and the species is unlikely to breed on or adjcent to the site. No further assessment is required

Table 8. Candidate Credit Species Assessment, Fauna

143-145 McCarrs Creek Road, Church Point

BAM Step 4 6.4.1. pg 20-25

		Pittwater IBRA Sub Region	Habitat Suitability within Development Site, from TBDC, literature or BAM calculator tick boxes			Proximity of Historic Records from past reports and databases			
		Determining Factor -ve	May be a Determining Factor		May be a -ve Determining Factor			Determining Factor +ve	
Derived (Predicted) Potential Candidate Species	**Habitat Requirements and Preferences (constraints) from DPIE, species profile, TBDC, and literature**	**Geographic Restrictions (from TBDC)**	**Habitat Requirements (constraints) within Development Site**	**Habitat Preferences within Development Site**	**Disturbance, Habitat Degradation existing within Development Site**	**Historic Occurrence within 5km**	**Historic Occurrence in Locality (date, location and vegetation type)**	**Historic Occurrence on or immediately adjacent to Development Site**	**Candidate Species Conclusion & Justification**
Perameles nasuta* - *Endangered population Long-nosed Bandicoot	**Habitat Requirements:** Restricted to North Head in the Manly Local Government Area. **Habitat Preferences:** Shelters during the day in a well-concealed nest based on a shallow hole lined with leaves and grass, sometimes under debris, sometimes hidden with soil and with the entrance closed for greater concealment. **Disturbance Factors:** None documented.	None	The site does not occur within 1km of North Head.						**Not a Candidate species credit species:** This species requirements (constraints) do not occur on this site and the species is unlikely to occur. No further assessment is required for this species.
Petaurus norfolcensis Squirrel Glider on Barrenjoey Peninsula, north of Bushrangers Hill ***Endangered Population***	**Habitat Requirements:** Occurs on the Barrenjoey Peninsula, north of Bushrangers Hill. **Habitat Preferences**: Occurs on the coast in a range of habitats including low scrubby eucalypt woodlands and banksia thickets to tall, wet eucalypt forests bordering on rainforest. In Pittwater, important food sources are likely to be the winter flowering Coast Banksia (Banksia integrifolia) and Spotted Gum (Corymbia maculata) and the summer flowering Old Man Banksia (B. serrata) and Grey Ironbark (Eucalyptus paniculata). Other likely food sources include Angophora costata, Banksia spinulosa, Corymbia gummifera, Eucalyptus botryoides, E. punctata, E. robusta, Melaleuca quinquernervia, mistletoes and Xanthorrhoea	None	Site is not within the known distribution for this population.						**Not a Candidate species credit species:** This species requirements (constraints) do not occur on this site and the species is unlikely to occur. No further assessment is required for this species.
Petaurus norfolcensis Squirrel Glider *Vulnerable*	**Habitat Requirements:** Tree hollows. **Habitat Preferences:** Inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas. Prefers mixed species stands with a shrub or Acacia midstorey. Diet varies seasonally and consists of Acacia gum, Eucalypt sap, nectar, honeydew and manna, with invertebrates and pollen providing protein. Can be difficult to detect. **Disturbance Factors:** None documented. **Breeding:** Require abundant tree hollows for refuge and nest sites.	None	Several hollows and medium suitable foraging habitat are present.	No Acacia at the site	None documented	8 records	2 records 350m east (2006)	None on or directly adjacent to the site	**Yes a Candidate species credit species:** This species is known to occur in general location, and suitable habitat occurs on the site, and the site is not too disturbed. Further assessment is required for this species.
Phascolarctos cinereus Koala **(Breeding only)** *Vulnerable*	**Habitat Requirements:** There needs to be a breeding colony. **Habitat Preferences:** Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, in larger areas it will select preferred browse species. Home range size varies with quality of habitat, ranging from less than 2ha to several hundred hectares in size. Females breed at two years of age and produce one young per year. **Disturbance Factors:** None documented. **Breeding:** Breeding relies on good quality suitable habitat.	None	No known breeding colony in locality within the last 20 years.	The Site does not contain suitable foraging habitat	N/A	75 records	No nearby records	None on or directly adjacent to the site	**Not a Candidate species credit species:** This species requirements (constraints) do not occur on this site and the species is unlikely to occur. No further assessment is required for this species.

Table 8. Candidate Credit Species Assessment, Fauna

143-145 McCarrs Creek Road, Church Point

BAM Step 4 6.4.1. pg 20-25

		Pittwater IBRA Sub Region	Habitat Suitability within Development Site, from TBDC, literature or BAM calculator tick boxes			Proximity of Historic Records from past reports and databases			
		Determining Factor -ve	May be a Determining Factor		May be a -ve Determining Factor			Determining Factor +ve	
Derived (Predicted) Potential Candidate Species	**Habitat Requirements and Preferences (constraints) from DPIE, species profile, TBDC, and literature**	**Geographic Restrictions (from TBDC)**	**Habitat Requirements (constraints) within Development Site**	**Habitat Preferences within Development Site**	**Disturbance, Habitat Degradation existing within Development Site**	**Historic Occurrence within 5km**	**Historic Occurrence in Locality (date, location and vegetation type)**	**Historic Occurrence on or immediately adjacent to Development Site**	**Candidate Species Conclusion & Justification**
Pseudophryne australis Red-crowned Toadlet *Vulnerable*	**Habitat Requirements:** Periodically wet drainage line. **Habitat Preferences:** Occurs in open forests. Inhabits periodically wet drainage lines below sandstone ridges that often have shale lenses or capping's. Shelters under rocks and amongst masses of dense vegetation or thick piles of leaf litter. **Disturbance Factors:** Water quality. **Breeding:** Breeding congregations occur in dense vegetation and debris beside ephemeral creeks and gutters. Eggs are laid in moist leaf litter, from where they are washed by heavy rain.	None	There are no drainage lines or areas of seepage at the site. The adjacent creek is not continuously flowing.	Site is in a valley and is not suitable habitat	The creek water quality is good	45 records	1 record 400m north-east (2004)	None on or directly adjacent to the site	**Not a Candidate species credit species:** This species requirements (constraints) do not occur on this site and the species is unlikely to occur. No further assessment is required for this species.
Pteropus poliocephalus Grey-headed Flying-fox **(Breeding only)** *Vulnerable*	**Habitat Requirements:** Breeds close to fresh water body. **Habitat Preferences:** Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. **Disturbance Factors:** None documented. **Breeding:** Site fidelity to camps is high. Individual camps may have tens of thousands of animals and are used for mating, and for giving birth and rearing young.	None	No breeding or roosting habitat close to or on a water body within site.	Suitable foraging habitat on the Site	None documented	130 records	2 records 600m east (2002- 03) two records 350 and 600m west (2016)	None on or directly adjacent to the site	**Not a Candidate species credit species:** This species requirements (constraints) do not occur on this site and the species is unlikely to occur. No further assessment is required
Tyto novaehollandiae Masked Owl **(Breeding only)** *Vulnerable*	**Habitat Requirements:** Tree hollows greater than 40cm wide and 100cm deep and more than 3m above the ground, in Eucalypt trees at least 90cm (DEC 2006) or caves. **Habitat Preference:** Lives in dry eucalypt forests and woodlands from sea level to 1100 m. Hunts tree-dwelling and ground mammals, especially rats along the edges of forests, including roadsides. **Disturbance Factors:** None documented. **Breeding:** Roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting.	None	No suitable large tree hollows occur on site.						**Not a Candidate species credit species:** This species requirements (constraints) do not occur on this site and the species is unlikely to occur. No further assessment is required for this species.

4.4 Threatened Species Field Survey Effort

This section only describes the survey effort used to survey for Threatened species. The field survey method and effort for classifying the vegetation into types is described in Section 3 and the General Field Survey is described in Section 1. The detailed method for the fauna survey types including motion detecting cameras, hair tubes and bat detection are described in Appendix B.

4.4.1 Threatened Flora Field Survey Effort

Date	Person Hours	Weather	Type	Location	Targeted species
20/09/2018	2	fine 20ºC Recent Rain	Threatened flora and habitat searches	Across the whole of the Development Footprint.	All threatened flora that has suitable habitat.
02/10/19	2	Fine 25-28˚C	Threatened flora and habitat searches	Across the whole development Site	All threatened flora that has suitable habitat.

4.4.2 Threatened Fauna Field Survey Effort

Dates	Time of day	Effort	Weather	Survey Type	Location	Targeted Species
20/09/2018	Day	4 person hours	fine 20ºC Recent Rain	Threatened fauna habitat searches	Across the whole development Site	All threatened fauna that has suitable habitat.
20/09/19-03/09/19	24 hours	13 trap nights	Mostly fine, some rain 10-28˚C	Motion Detecting Cameras 2, 3 and 4 See Appendix ? for details.	See Figure 4.2	Nocturnal and Diurnal Threatened Fauna Squirrel Glider
20/09/19	Day	1 person hour	fine 20ºC Recent Rain	Diurnal Frog Survey after rain	Along the creekline, see Figure 4.2	Red-crowned Toadlet
20/09/19-03/09/19	24 hours	13 trap nights	Mostly fine, some rain 10-28˚C	Ultrasonic bat detector	See Figure 4.2	Microbats
02/10/19	Day	2 hour	Fine 25-28˚C	Threatened fauna habitat searches	Across the whole development Site	All Threatened fauna that has suitable habitat.
03/10/19	Day	1 person hours	Fine 24-28˚C	Threatened fauna habitat searches	Across the whole development Site	All Threatened fauna that has suitable habitat.

4.5 Candidate Species Presence

Step 5 of Section 6.4 determines if each species is present (or assumed present) on the site. A map of the location or a count of the number of individuals is also given.

Table 9. Candidate Species Presence

143-145 McCarrs Creek Road

Step 5, 6.4.1.26-34 and Step 6. 6.4.1.35-37 of the Biodiversity Assessment Method document.
See Figure 4.2 for species polygons and habitat onsite

							Only in Impact Area	
Derived (Predicted) Potential Candidate Species	Biodiversity Risk Weighting	Suitability of the Time of Year Surveyed and Justification	Survey Effort	Presence On Site or Assumed Presence or Expert Report and Justification	Vegetation Zone(s)	Habitat Component Present	Step 5: Area of Habitat or Count for impact including parts of buffers of features outside impact area	Step 6: Habitat Condition in Species Polygon (Integrity Score for
Cryptostylis hunteriana ***Leafless Tongue Orchid*** ***Vulnerable***	1.5	Not surveyed in suitable time of year	Cannot be surveyed outside of Nov-Jan	Assumed present due to suitable habitat and lack of suitable survey	Zone 2	Suitable habitat occurs in the upper part of the site (Zone 2).	0.4	Good, recently disturbed shrub layer.
Cercartetus nanus Eastern Pygmy-possum Vulnerable	2	Surveyed in suitable time of year.	26 camera trap nights	Assumed Present due to difficultly to detect	Zone 1 and 2	Suitable hollows and foraging habitat.	0.6	Good, recently disturbed shrub layer.
Chalinolobus dwyeri Large-eared Pied Bat *Vulnerable*	3	Surveyed outside of the BAM-calc survey period. **Justification:** EPBC Act bat survey guidelines for Large-eared Pied-bat states that suitable survey time is Oct-Mar	3at detector for 13 nights.	Not present. It is considered there has been adequate survey to detect this species at the site.	N/A	N/A	N/A	N/A
Grammatis stenophylla Narrow-leafed Finger Fern *Endangered*	2	Surveyed at suitable time of year	targeted daytime habitat searches	Not present. It is considered there has been adequate survey to detect this species at the site.	N/A	N/A	N/A	N/A
Myotis macropus Southern Myotis *Vulnerable*	2	Surveyed at suitable time of year	Bat detector for 13 night	Not present. It is considered there has been adequate survey to detect this species at the site.	N/A	N/A	N/A	N/A
Heleioporus australiacus Giant Burrowing Frog *Vulnerable*	1.5	Surveyed at suitable time of year	Assumed present	Assumed present	Zone 2	Suitable habitat in zone 2 adjacent to the creek line	0.4	Good.
Petaurus norfolcensis Squirrel Glider *Vulnerable*	2	Surveyed at suitable time of year	Assumed present	Assumed Present due to difficultly to detect due to high level of flowering trees in the locality	Zone 1 and 2	Suitable hollows and foraging habitat provided by flowering trees and Xanthorea.	0.6	Good, recently disturbed shrub layer.
Rhodamnia rubescens Scrub Turpentine *Critically Endangered*	3	Surveyed at suitable time of year	Targeted daytime habitat searches	Not present. It is considered there has been adequate survey to detect this species at the site.	N/A	N/A	N/A	N/A

143-145 McCarrs Creek Road

Step 5, 6.4.1.26-34 and Step 6. 6.4.1.35-37 of the Biodiversity Assessment Method document.
See Figure 4.2 for species polygons and habitat onsite

							Only in Impact Area	
Derived (Predicted) Potential Candidate Species	Biodiversity Risk Weighting	Suitability of the Time of Year Surveyed and Justification	Survey Effort	Presence On Site or Assumed Presence or Expert Report and Justification	Vegetation Zone(s)	Habitat Component Present	Step 5: Area of Habitat or Count for impact including parts of buffers of features outside impact area	Step 6: Habitat Condition in Species Polygon (Integrity Score for
Syzygium paniculatum Magenta Lilli Pilly Endangered	2	surveyed outside of the BAM-calc survey period. Justification: There is a local population. Senior botanist has 25 years experience identifying this species and similar species in the local area. Extensive herbarium species of this genus to which we can compare conformed species to species at the	Targeted daytime habitat searches	Not present. It is considered there has been adequate survey to detect this species at the site.	N/A	N/A	N/A	N/A

Table 10. Summary of Fauna Found

See Appendix C for motion detecting camera and bat detection data. See Figure 4.2 for trap locations.

Common Name	Scientific Name	Evidence	Dates
Birds			
Australian Brush-turkey	*Alectura lathami*	O,C	20/09/19-02/10/19
Galah	*Eolophus roseicapilla*	O	20/09/19
Laughing Kookaburra	*Dacelo novaeguineae*	O	20/09/19
Channel-billed Cuckoo	*Cythrops novaehollandiae*	O	02/10/19
Eastern Whipbird	*Psophodes olivaceus*	O,H	20/09/19
Little Wattlebird	*Anthochaera chrysoptera*	O	20/09/19
Noisy Miner	*Manorina melanocephala*	O	20/09/19
Rainbow Lorikeet	*Trichoglossus haematodus*	O	20/09/19
Spotted Pardalote	*Pardalotus punctatus*	O	02/09/19
Sulphur-crested Cockatoo	*Cacatua galerita*	H	20/09/19
Superb Lyrebird	*Menura novaehollandiae*	H	20/09/19
Mammals			
Brush-tailed Possum	*Trichosurus vulpecula*	MDC	28/09/19,23/09/19
Fox*	*Vulpes vulpes*	MDC	24/09/19
Swamp Wallaby	*Wallabia bicolor*	O,MDC	20/09/19-2/10/19
Gould's Wattled Bat	*Chalinolobus gouldii?*	BD	20/09/19-03/10/19
Chocolate Wattled Bat	*Chalinolobus morio*	BD	20/09/19-03/10/19
Little Bent-winged Bat+	*Miniopterus australis*	BD	20/09/19-03/10/19
Long-eared Microbat	*Nyctophilus sp.*	BD	20/09/19-03/10/19
Yellow-bellied Sheath-tailed Bat+	*Saccolaimus flaviventris?*	BD	20/09/19-03/10/19
Eastern Horseshoe Bat	*Rhinolophus megaphyllus?*	BD	20/09/19-03/10/19
Little Forest Bat	*Vespadelus vulturnus*	BD	20/09/19-03/10/19
Reptiles			
Lace Monitor	*Varanus varius*	O,MDC	20/09/19,25/09/19
Pale-flecked Garden Sunskink	*Lamphropholis guichenoti*	O	20/09/19

Key

*Introduced species

+Listed as Threatened Species under the NSW Biodiversity Conservation Act 2016

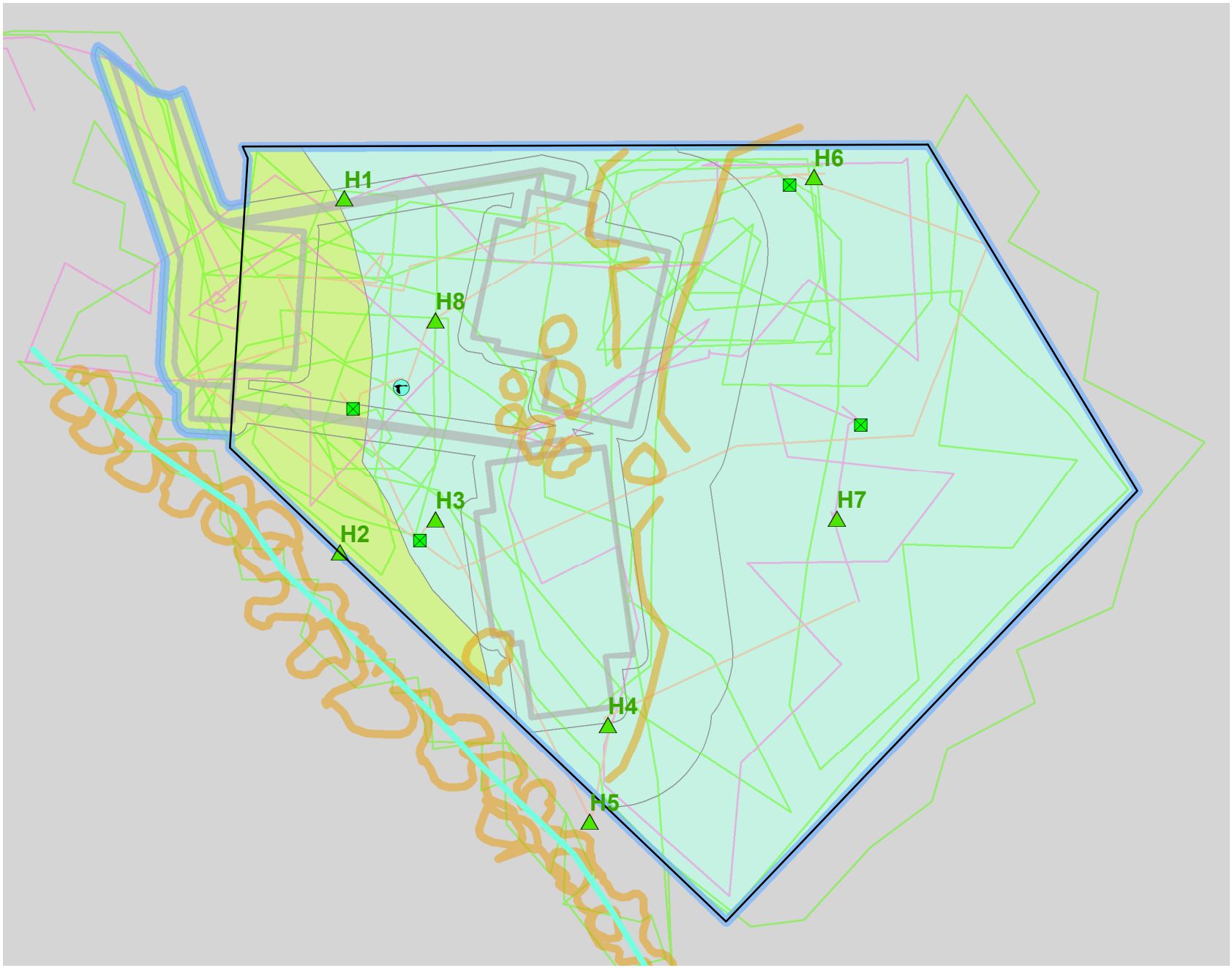
? Species presence uncertain

O- observed during the onsite field survey

H- heard during the onsite field survey

MDC- recorded on the motion detecting infrared camera

BD- recorded on the Wildlife Acoustics ultrasonic bat detector



Legend

- 143 - 145 Mc Carrs Creek Road
- Bat Detector
- Motion Camera
- Hollows
- Creek
- Rock Ledge and Bushrocks
- Development Site
- Proposed Building Outline

Survey Track

- 20 Sep 2019
- 2 Oct 2019
- 3 Oct 2019

Vegetation and Zones

- Littoral Rainforest PCT1833 VZ1 793 sqm
- Moist Forest PCT1565 VZ2 4109 sqm

Figure 4.2
Threatened Species Survey, Habitat and Prescribed Impact Features

Threatened Species Credit Species habitat see Table 9
VZ2 area - Leafless Tongue Orchid, Eastern Pygmy Possum, Giant Burrowing Frog
VZ1 and VZ2 areas - Squirrel Glider

Prescribed Impacts see Table 13
Rock Ledge - Spotted Tailed Quoll, Microbats
Hydrological Processes - Giant Burrowing Frog and Powerful Owl
Connectivity - Squirrel Glider, Eastern Pygmy Possum, Spotted Tailed Quoll, Giant Burrowing Frog

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Stage 2: Impact Assessment

5 Avoidance and Minimisation of Impacts

5.1 Steps Taken to Avoid and Minimise Ecological Impact

The need to Avoid and Minimise is a consideration the consent authority needs to take into consideration when assessing Site Suitability in s79C (now s 4.15).

The BC Act and Biodiversity Conservation Regulation (2017) require that all developments "Avoid" then "Minimise" ecological impacts.

Chapter 8 of the BAM requires that the measures that were taken to Avoid and Minimise are documented.

The BC Act (s 7.13(6)) allows the consent authority discretion over what measures are required in relation to avoiding and minimising impacts.

Once all possible impact minimisation and avoidance has been undertaken, then offsetting can be used to mitigate the residual impacts of the proposal on the environment. This report describes ecological constraints on this site that were provided to the planning team for the use in planning and to avoid and minimise the impacts.

The main ecological constraints that have been identified at the site are the

- The Endangered Ecological Community Littoral Rainforest
- The adjacent Creek line
- The hollow bearing trees and roosting habitat along the creekline
- The sandstone rock ledge
- The native vegetation in the northern part of the site that is habitat to a range on Threatened and non-threatened fauna.

The site is very steep and narrow with, several rock ledges therefore there are limited suitable locations for new dwellings at the site.

The new dwellings are in line with the adjacent houses to the north and south. This reduces impacts to the wildlife corridors provided at the site.

The Asset Protection Zone does extend to the eastern boundary, therefore the vegetation in the eastern part of the site can be maintained as intact bushland. There is no landscaping proposed in any parts of the site, allowing for retention of native vegetation within the APZ.

Table 11. Steps Taken to Avoid and Minimise Impact

Avoid and Minimise	Outcome	Timing	Participants
Avoid impacts to the rock ledges at the site	Maintain habitat provided by the rock ledges and reduce exaction of the slope.	DA Design	Architect/Planner
Maintain corridor value by retaining some of the bushland at the eastern upper part of the site	Maintain corridors at the site and in the locality	DA Design	Architect/Planner
No landscaping proposed	Maintain native vegetation within the APZ and bushland in the eastern part of the Development Site	DA Design	Planner

Recommendations have been made in Part 3 of this report to ameliorate the proposed ecological impact of the proposal during and after construction.

6 Residual Direct and Indirect Impacts

6.1 Proposal Description

- Construction of two new dwellings
- Construction of a new driveway off the existing concrete driveway to the north in the Council Road Reserve. The proposed driveway will be in the Council Road Reserve.
- New attached garages at the western boundary of the property
- Inclinator lifts (approximately 30m long) from the garages to each of the proposed dwellings
- Bushfire Asset Protection Zone to the north, western and southern boundaries and 10m from the proposed dwelling to the east managed to Inner Protection Area standards.
- The location of utilities and stormwater connections and retaining wall are not shown on the maps or assessed.
- There is no landscaping proposed or assessed.
- The bushland to be retained and managed as an APZ will require long-term management.

The location and extent of these features and the adjacent context are shown on Figure 1.4.

Table 12. Summary of Residual Direct and Indirect Impacts

Type	Frequency	Intensity	Duration	Consequence
Construction of two new dwellings	Once, during construction	Total Removal	Impact permanent	Will remove 39 native trees include 10 trees with hollows see section 5.2.1
Asset Protection Zone across part of the Development Site	During Construction and Managed in the long term	Med	To be established during construction and managed as fuel reduced in the long-term.	Likely removal of additional native trees and shrubs from the site. see section 5.2.1

6.2 Vegetation Loss

There is approximately 4109m^2 of Central Coast Escarpment Moist Forest (PCT 1565) and 793m^2 of Littoral Rainforest Endangered Ecological Community (EEC) (PCT 1833) on the site.

The footprint of the proposed new dwellings, driveway, garages and inclinator lifts (including 1.5m construction disturbance footprint around each structure, shown in purple on Figure 1.4) will remove 971m^2 of the Central Coast Escarpment Moist Forest (CCEMF) and 466m^2 of the Littoral Rainforest (LRF) EEC (See Figure 6.1).

The Asset Protection Zone (shown in red hatch pattern on Figure 1.4) will permanently disturbed an additional 1123m^2 of the CCEMF and 327m^2 of the LRF EEC. This could include impact to the shrub layer, leaf litter and trees canopy.

The eastern 2015m^2 of the site contains good quality CCEMF, that will not be impacted by the proposal.

See section 5.2.2 below for tree loss.

6.2.1 Tree Loss

The Arborist (Hugh Millington) identified 100 trees in the Development Site, all of which are local native species.

The Arborist identified total of 37 trees are proposed to be removed by the proposed buildings, driveway, garaged and inclinator lifts or due to poor health (Arborists table 3 and 4 *Summary of the impact to trees during development*). The trees to be removed include 18 *Allocasuarina torulosa,* 5 Cabbage Palms, 11 Turpentines, 1 *Eucalyptus scias,* 1 *Angophora costata* and 1 *Eucalyptus resinifera.*

There is a possibility for some of the Cabbage Tree Palms to be translocated.

6.2.2 Hollows

A total of 8 hollow bearing trees were observed during the field survey (see section 4.3.2.2 for details. There may be many more hollows not visible from the ground. The hollows were recorded before the

trees were numbered and therefore only the approximate location were marked on the survey. Based on the approximate locations it is likely that hollow bearing trees H1 and H4 will be removed by the proposed development. These contain hollows suitable for birds, gliders, possums or microbats. There may be other hollow bearing trees removed by the proposed development. It is recommended that all hollows bearing trees that are not directly impacted by the proposed buildings, driveway, garages or inclinators be retained as they have high habitat value.

6.3 Impact to Threatened Species and their Habitat

The vegetation to be removed is suitable foraging, roosting or breeding habitat for several Threatened fauna species (ecosystem credit species). The Ecosystem Credits species and Species Credit Species (flora and fauna) are listed in Table 6, 7 and 8. The Impacts to the candidate Threatened Species that are likely to occur at the site are described in Table 9.

6.4 Prescribed Biodiversity Impacts

Prescribed Biodiversity Impacts are impacts in addition to native vegetation clearing, and their assessment in the BDAR provides the determining authority information to determining the application, writing Condition of Consent and/or adding species credits.

Prescribed Biodiversity Impacts are described in section 6.7 and 8.2.1.1 of the BAM and Division 6.1 2(b) of the Biodiversity Conservation Regulations. Prescribed Biodiversity Impacts include impacts to cliffs, Karsts, caves, rocks, humanmade structures, non-native vegetation, waterbodies & hydrological processes, connectivity features, wind turbine strikes, vehicle strikes and other impacts. Table 13 below assesses Prescribed Impacts relevant to this site. Prescribed Impacts are shown of Figure 5.1

Table 13. Identification and Assessment of Prescribed Impacts

143-145 McCarrs Creek Road, Church Point

This table addresses division 6.1 of the Biodiversity Conservation Regulation 2017, section 9.2 of the Biodiversity Assessment Method and the Biodiversity Assessment Method Operational Manual

OEH species profiles, the TBDC and other sources were used to assess the impact of this proposal on the Threatened species (BC Act).

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Potential Prescribed Impact	Prescribed Impact Feature on this Site	Threatened Species Potentially using this Habitat	Importance of the Habitat	Nature, Extent and Duration of Impacts	Prediction of Consequences of Impact	Conclusion and Recommendation regarding Prescribed Impact
Impact to Karst, caves, crevices, cliffs, rock platform or other geologically significant features	Cliffs, crevices and rock platform.	Microbats, Rosenberg's Goanna, Spotted-tail Quoll	**Microbats:** The site contains several rock ledges that are approximately 2m high. The rock ledges contain some crevices. These crevices are not considered to be suitable roosting habitat for microbats as they are easily accessible by predators. **Rosenberg Goanna:** The crevices in the rock provides potential sheltering habitat for the Rosenberg's Goanna. The crevices were inspected for signs of use. Many Lace Monitors were observed at the site, but not Heath Monitors were observed. The vegetation on the site is not the preferred habitat for the Rosenberg Goanna. **Spotted-tail Quoll:** The rock cervices on the site provide potential sheltering and den habitat for the Spotted-tail Quoll.	The houses are located between the rock ledges at the site and therefore will not remove the crevices within the rock. The inclinator lifts may have a minor impact to the rocks at the upper part of the site.	Due to the positioning of the new dwellings, the proposal will have a minor impact to the rock crevices at the site.	This proposal will not result in this Prescribed Impact. No additional credits are recommended for this Prescribed Impact. Recommendations to ameliorate impacts are made at the end of this report.
Rocks; Impact to Scattered Rocks and Rock Outcrops	Scattered rocks.	N/A	There are scattered bush rock at the site that provide habitat for a range of native species.	The proposed dwelling will remove some of the bush rocks.	The removal of the bush rocks will unlikely impact any Threatened species. Recommendations have been made to retain bush rocks onsite as habitat within the APZ.	This proposal will not result in this Prescribed Impact. No additional credits are recommended for this Prescribed Impact. Recommendations to ameliorate impacts are made at the end of this report.
Impact to Human-made structures	There are no human-made structures at the site.	N/A	N/A	N/A	N/A	N/A
Impact to Non-native vegetation	There is scattered weeds on the property.	N/A	The scattered weeds are not likely to proved any significant habitat to any Threatened species.	N/A	N/A	The weeds at the site is not suitable habitat for Threatened species.
Changes to Hydrological processes sustaining/interacting with rivers, streams or wetlands	There is a intermittently flowing creek adjacent to the site	Giant Burrowing Frog, Powerful Owl	**Giant Burrowing Frog:** The banks of the creek are suitable habitat for the Green-thighed Frog and Giant Burrowing Frog. **Powerful Owl:** The vegetation along the creek line is good quality roosting habitat for the Powerful Owl.	The proposal will not remove the creek, creek banks or vegetation along the creek line	N/A	This proposal will not result in this Prescribed Impact. No additional credits are recommended for this Prescribed Impact. Recommendations to ameliorate impacts are made at the end of this report.
Impact to Water bodies and water quality	There is a intermittently flowing creek adjacent to the site	Giant Burrowing Frog	The water quality in the creek is currently good and the creek provides potential habitat for the Giant Burrowing Frog.	Due to close proximity of the creek to the site, it is likely that sediment and other runoff from the site would pollute the creek . Impact to he adjacent creek can be avoided and minimised through ameliorative measures.	Impact to the adjacent creek can be avoided and minimised through ameliorative measures	This proposal may result in pollution to the adjacent creek. Recommendations to prevent impacts are made at the end of this report. If the recommendations are followed then no additional credits are recommended for this Prescribed Impact.

Potential Prescribed Impact	Prescribed Impact Feature on this Site	Threatened Species Potentially using this Habitat	Importance of the Habitat	Nature, Extent and Duration of Impacts	Prediction of Consequences of Impact	Conclusion and Recommendation regarding Prescribed Impact
Impact to Connectivity	Connectivity into and through the site.	Squirrel Glider, Giant Burrowing Frog, Spotted-tail Quoll and Eastern Pygmy Possum	The vegetation at the Development Site is connected to the remnant patches within residential properties to the north, east and south and the corridor in the Road Reserve along McCarrs Creek Road to the south. The Development Site has good wildlife corridor value. The site is part of corridor running along the eastern side of McCarrs Creek Road that link the bushland reserves to the north (Kennedy Park and Minkara Reserve) and Ku-ring-gai Chase National park to the south	The proposed house will reduce corridor width and the proposed APZ will reduce corridor value. A wildlife corridor within the site and connection with adjacent areas of habitat will be maintained along the eastern and southern parts of the property.	Access for Squirrel Gliders will likely be maintained.	This proposal will reduce access and corridor value but access to all areas of habitat will be maintained. The extent of the impact is not considered sufficient to warrant additional credits. Recommendations to ameliorate impacts are made at the end of this report.
Movement of Threatened Species that maintains their life cycle e.g. Migration Interruption	The site is not likely to be important habitat for any migratory species.	N/A	N/A	N/A	N/A	N/A
Wind farm development	N/A	N/A	N/A	N/A	N/A	N/A
Vehicle strikes (Road Proposals)	Vehicle strikes due to cars and construction vehicles.	Squirrel Glider	Construction will occur during the day, therefore the chance of Squirrel Glider being hit by vehicles during construction will be unlikely. The proposal will unlikely significantly increase the level of traffic in the long-term.	N/A	N/A	This proposal will not result in this Prescribed Impact. No additional credits are recommended for this Prescribed Impact. Recommendations to ameliorate impacts are made at the end of this report.
Other - There are no other presence impacts that are considered relevant to this site or proposal.						

7 Impact Summary

7.1 Impacts Requiring Offset by the BAM Calculator

7.1.1 Date of BAM Calculation Finalisation

The BAM Calculator assessment was finalised on the 21st October 2019. This report is to be submitted to Council within 14 days of this date, in accordance with section 6.15 of the BC Act. The offset cost in the table below was calculated in the BAM-Calc on the date of finalisation. Offset costs may change as the pricing model is updated.

Table 14. Impacts to Vegetation and Ecosystem Credits

PCT	Vegetation Zone	Existing Integrity Score	Management Zone	Area of Impact (ha)	Future Integrity Score	Credits Required	Current Ecosystem Offset Cost (ex GST)
1833	1-LRFEEC	72.3	MZ1 (Remove)	0.04	0	2	$4955
			MZ2 (APZ)	0.03	40.3		
1565	1-CCEMF	60.3	MZ1 (Remove)	0.09	0	3	$3303
			MZ2 (APZ)	0.11	34.5		
					Total	**5**	**$8259**

7.1.2 Justification for future integrity scores

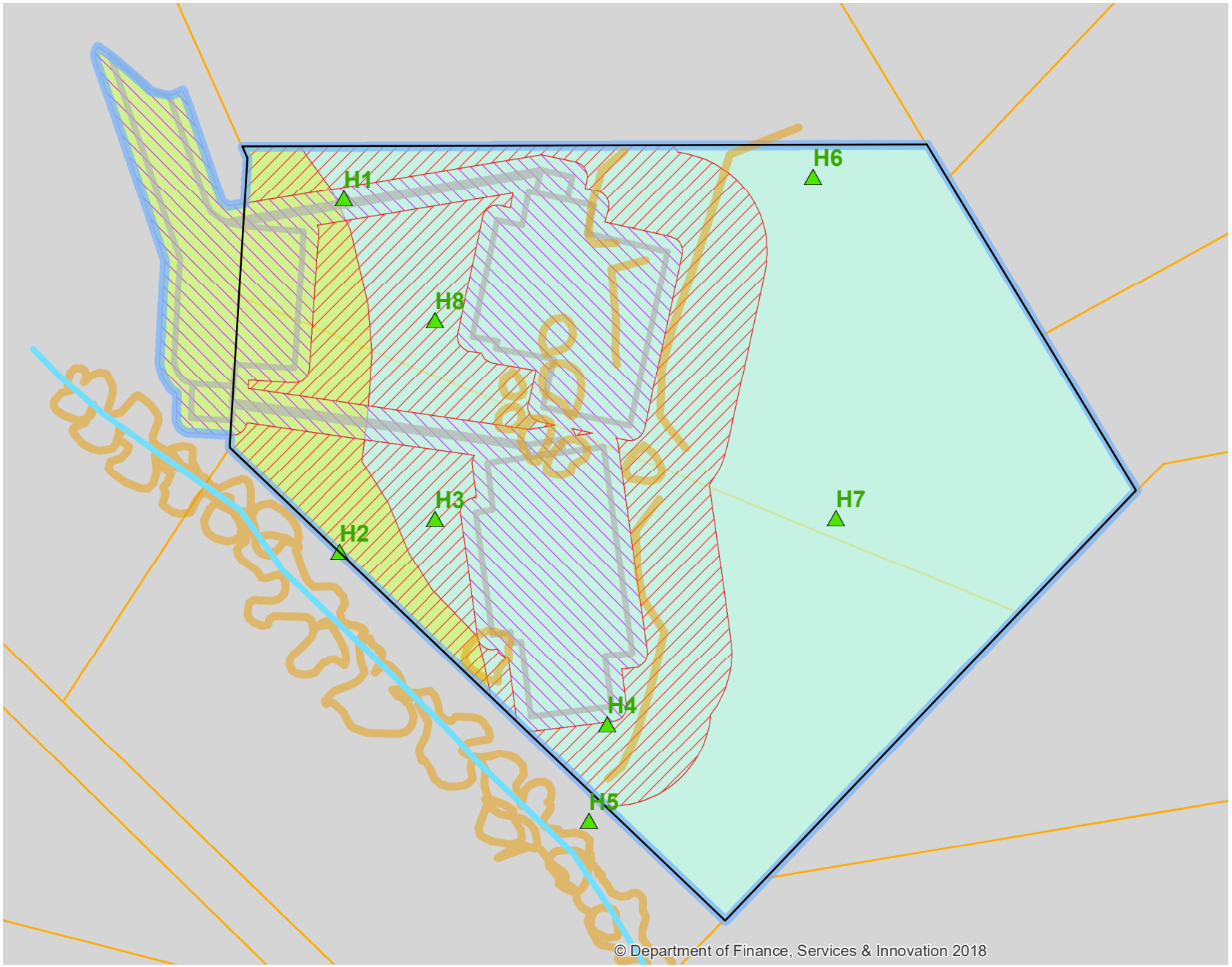
Management Zone 2- Asset Protection Zone

The future integrity score for, Management Zone 2 is based on partial removal of the native vegetation for the establishment and ongoing maintenance of the bushfire APZ. No parts of Management Zone 2 will be completely removed. The future integrity score was calculated using the specifications in the RFS Planning for Bushfire Protection (Standards for Asset Protection Zones) by reducing the shrub cover to 0 and the tree canopy cover to 20%. The leaflitter cover was reduced to 10%. The groundcover and logs was not reduced. There is to be temporary environment protection fencing along the southern extent of Management Zone 2 to protect the bushland during construction.

The adjustment of integrity scores was done by an ecologist with 25 years of experience with experience in this vegetation type and this type of development.

Table 15. Impacts to Species Credit Species

Species Credit Species	Associated Vegetation Zone	Total Area of Impact or Count	Credits Required	Current Species Offset Cost ex GST
Leafless Tongue Orchid	Zone 2	0.2ha	3	$599
Eastern Pygmy Possum	Zone 2	0.2ha	4	$2,165
Squirrel Glider	Zone 1 and 2	0.27ha	6	$3,247
Giant Burrowing Frog	Zone 2	0.2ha	4	$2,165
		Total	**17**	**$8,178**



Legend

- 143 - 145 Mc Carrs Creek Road
- Hollows
- Creek
- Rock Ledge and Bushrocks
- Development Site
- Proposed Building Outline

Management Zones

- Removal MZ1 1437 sqm
- Disturbance MZ2 1450 sqm
- No Impact 2015 sqm

Vegetation

- Littoral Rainforest PCT1833 VZ1 793 sqm
- Moist Forest PCT1565 VZ2 4109 sqm
- Lot

Figure 6.1
Impact to be Offset

Threatened Species Credit Species habitat see Table 9
VZ2 area - Leafless Tongue Orchid, Eastern Pygmy Possum, Giant Burrowing Frog
VZ1 and VZ2 areas - Squirrel Glider

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Biodiversity Development Assessment Report

143 - 145 MC CARRS CREEK ROAD, CHURCH POINT

7.2 Impacts Not Requiring Offsetting by the BAM Calculator

Impacts that do not require offsetting include parts of the site that have native vegetation but the integrity score is less than the following minimum requirements;

- An integrity score of 15 where the PCT is representative of an Endangered or Critically Endangered Ecological Community
- An integrity score of 17 if the PCT is associated with Threatened species habitat (for ecosystem credit species) or is representative of a Vulnerable Ecological Community.
- An integrity score of 20 if the PCT is not representative of a TEC or Threatened species habitat.

The Vegetation Zones at the site are above the minimum integrity score requirements and therefore are required to be offset.

7.3 Prescribed Biodiversity Impacts and other Additional Impacts

The southern part of the site is not classified as a native vegetation community and any impacts to this area cannot not offset using the BAM calculator. The assessment of Prescribed Impacts is in Table 13 of this report. It is not recommended that additional credits be added for Prescribed Impacts if the recommendations in Stage 3 of this report are followed.

7.4 Potential SAII Serious And Irreversible Impacts

"A guide to assist a decision-maker to determine a serious and irreversible impact" (OEH Aug 2017) lists 5 steps to determine whether an impact is classified as a potential Serious and Irreversible Impact (SAII).

Step 1. Identify Relevant Potential Entities

Potential SAII entities are species or ecological communities that meet the criteria in Appendix 1 of the Guide. Appendix 2 of the guide lists some potential entities that are considered to meet the criteria.

None of the Threatened species to be impacted by the proposal are considered to meet the principles for a potential SAII entity.

7.5 Pittwater LEP 2014 and DCP 21 2014 Assessment

7.5.1 Part 7.6 Biodiversity of the PLEP

(3)Before determining a development application for development on land to which this clause applies, the consent authority must consider:

(a)whether the development is likely to have:

(i)any adverse impact on the condition, ecological value and significance of the fauna and flora on the land, and

Response: The Development Site contains two vegetation communities Littoral Rainforest EEC in the south-western corner and Central Coast Escarpment Moist Forest the rest of the site. Both communities are relatively intact but have some recent disturbance to the understorey. (see Figure 3.1).

The proposed building footprints, driveway, garages, inclinator lifts and APZ will remove or modify 2887m^2 of native vegetation including 793m^2 of the Littoral Rainforest Endangered Ecological Community and 2094m^2 of Central Coast Escarpment Moist Forest. The tree assessment by Hugh Millington, determined that a total of 37 are to be removed due to construction or poor health. All the trees to be removed are local native species and include mostly *Allocasuarina torulosa* and Turpentines. The proposal will likely remove at least two hollow bearing trees with small to medium sized hollows.

The eastern 2015m^2 of the site will not be impacted by the proposed development and APZ and contains good quality Central Coast Escarpment Moist Forest.

(ii)any adverse impact on the importance of the vegetation on the land to the habitat and survival of native fauna, and

Response: The vegetation to be removed currently provides habitat for a range of fauna, including foraging habitat for microbats and fruit bats, cockatoos, owls and other birds. The trees (including some with hollows) provide potential nesting habitat for gliders, possums and birds and resting habitat for lace monitors. There is suitable roosting habitat for large owls such the Powerful Owl in the turpentine trees near the creekline. The understorey and leaflitter is good habitat for Brush Turkeys.

The proposal permanently remove some of this vegetation habitat. The proposed APZ will prvide modified habitat. It is considered that the survival of the fauna that currently use the site will not be put at risk by this proposal, as connectivity to surrounding habitat on the site and in the locality will be maintained.

(iii)any potential to fragment, disturb or diminish the biodiversity structure, function and composition of the land, and

Response: The vegetation of the site currently has a good cover of native species and a high habitat value. The species richness has been reduced due to lack of fire and recent disturbances. There are very few weeds at the site. The site has good connectivity to surrounding habitat to the south, north and east. There is as road to the west. The vegetation within the footprint of the proposed driveway, garages and new dwellings will be permanently removed. The APZ will reduce percentage over of natives and habitat value. The connectivity of the vegetation at the site and surrounding locality will be maintained.

(iv)any adverse impact on the habitat elements providing connectivity on the land, and

Response: The connectivity of the vegetation at the site and surrounding locality will be maintained. (see Figure 1.5).

(b)any appropriate measures proposed to avoid, minimise or mitigate the impacts of the development.

Response: The site is very steep and narrow with, several rock ledges therefore there are limited suitable locations for new dwellings at the site.

The new dwellings are in line with the adjacent houses to the north and south. This reduces impacts to the wildlife corridors provided at the site.

The Asset Protection Zone does extend to the eastern boundary, therefore the vegetation in the eastern part of the site can be maintained as intact bushland. There is no landscaping proposed in any parts of the site, allowing for retention of native vegetation within the APZ.

(4)Development consent must not be granted to development on land to which this clause applies unless the consent authority is satisfied that:

(a)the development is designed, sited and will be managed to avoid any significant adverse environmental impact, or

Response: See response to (b) above.

(b)if that impact cannot be reasonably avoided by adopting feasible alternatives—the development is designed, sited and will be managed to minimise that impact, or

Response: Management recommendation have been made in this report to minimise impacts during construction and in the long-term.

(c)if that impact cannot be minimised—the development will be managed to mitigate that impact.

Response: Residual impact will be formally offset as required by the Biodiversity Conservation Act 2016.

7.5.2 B4.17 Littoral Rainforest – Endangered Ecological Community

Outcomes

- The conservation of littoral rainforest vegetation in Pittwater. (En)
- The regeneration and /or restoration of littoral rainforest. (En)
- The preservation of littoral rainforest as habitat for fauna. (En)

Controls:

1. Development shall retain, enhance and regenerate areas of Littoral Rainforest and its habitat.
2. Development shall not result in an onsite loss of canopy cover or a net loss in native canopy trees or Littoral Rainforest.
3. Development shall retain and enhance habitat and wildlife corridors for locally native species, threatened species and endangered populations.
4. Caretakers of domestic animals shall prevent them from entering bushland.
5. Fencing, where permitted, shall allow the safe passage of native wildlife.
6. Development shall ensure that at least 80% of any new planting incorporates native vegetation (as per species found on the site or listed in Littoral Rainforest Endangered Ecological Community).
7. Development shall ensure any landscaping works are outside areas of existing Littoral Rainforest Endangered Ecological Community and do not include environmental weeds.

Responses:

1. The proposal will remove or disturb and area of 793m^2 of Littoral Rainforest on Development Site. Recommendations have been made in this report to minimise further impacts to the community and maintain the vegetation condition in the long-term.
2. The proposal will remove 37 canopy trees including trees that are part of the Littoral Rainforest EEC on the Development Site. There is no planting proposed as part of this DA.
3. The site currently provides a corridor for a range of native species and Threatened species. There is a riparian corridor along the creekline to the south of the site that contain Littoral Rainforest EEC. The connectivity of the site to adjacent vegetation will be maintained and access to the vegetation on all parts of the site will be maintained.
4. Recommendations have been made in this report to prevent domestic animal from entering the bushland.
5. There are no permanent fenced proposed.
6. There is no landscaping or other planting proposed as pert of this DA. Recommendations have been made in this report for any planting to be with locally native species from the appropriate vegetation communities.
7. There are no landscaping works proposed.

Stage 3. Ameliorative Conditions & Recommendations

8 Prior to Construction

Action	Outcome	Timing	Responsibility
Sediment controls are to be installed, monitored and only removed when the area has been stabilised	Reduce sediment run off during construction	Installed prior to construction and maintained during construction	Project manager/ owner with assistance from the Ecologist
Install Environment Protection Fence with signage around the Construction Impact area shown on Figure 1.4	Protect native vegetation adjacent to the construction site during construction	Installed prior to construction and maintained during construction	Builder with assistance from the Ecologist
Delineate the eastern extent of the APZ with permanent marker poles every 5m	Protect the native vegetation to be retained outside of the APZ	To be installed prior to construction and retained in perpetuity	Site Ecologist

9 During Construction

Action	Outcome	Timing	Responsibility
Sediment control measures, monitored and only removed when the area has been stabilised	Reduce sediment run off during construction	Installed prior to construction and maintained during construction	Project manager/ owner with assistance from the Ecologist
Monitor and maintain the environment protection fence every 3 months during construction	Protect native vegetation adjacent to the construction site during construction	maintained during construction	Builder, to be monitored by the Ecologist
Site Ecologist to Supervise the removal of hollow bearing trees	To rescue any displaced fauna	During tree removal	Site Ecologist, tree lopper
No soil is to be left bare during and after construction to reduce soil erosion and establishment of weeds	to reduce soil erosion and establishment of weeds	During construction and after construction	Project manager
All weeds are to be removed from the site. There is to be ongoing weed control every 6-months during construction. Weed level control is achieve a percentage foliage cover of less than 5% in the ground layer and 0% in the shrub and tree layers	Weeds reduce habitat value and can cause health problems for humans. There are currently not many weeds at the site. Disturbances can cause weeds to spread. Regular weed control ensures that weeds do not spread in the long-term	During construction	Owner and Bush regeneration contractor
Establishment of the APZ is to remove weeds and exotics first. Hollow bearing trees, logs and rocks are to be retained within the APZ. Excavated rock from the development can be retained onsite as fuel reduced habitat	To maintain habitat value in the APZ	During construction and after construction	Owner with assistance from the Ecologist
There is to be no earthworks during wet weather	Reduce erosion and sediment runoff	During construction	Builder

There is to be no machinery access or dumping fill outside of the environment protection fence.	Protect adjacent habitat values during construction	During construction	Builder
All material brought on site must be certified weed and disease free.	To protect the adjacent bushland and creek against Phytophora infection	During construction	Project manager and builder

10 Ongoing Ecological Management

Action	Outcome	Timing	Responsibility
Weeds are to be effectively controlled on the whole of the property in the long-term using industry standard techniques and qualified bush regenerators	Reduction of weeds on the site	after construction and ongoing management	Owner and Bush regeneration contractor
Any planting on the property is to only use local native species grown from seed stock, tube-stock or cuttings. No environmental weeds are to be planted in any part of the property	Avoid introduction of weeds and exotic species. Maintain native Littoral rainforest community on the site	During construction and after construction	Landscaper and Owner with assistance from the Ecologist
No pesticides or insecticides are to be used on the within the Development Site	Reduce impact to native vegetation and fauna in the site	Before, during and after construction	Owner and bush regeneration contractor
Automatic motion sensing LED lights should be used in outdoor lighting. No direct lights should be faced into adjacent vegetation.	Avoid impact to nocturnal fauna in adjacent bushland	During construction and after construction	Builder and owner
Domestic animals should be kept indoors unless they are restrained such as on a leash.	To prevent domestic animals from entering the bushland and harming native wildlife.	Long-term	Owner
Continued maintenance of the APZ is to be achieved by firstly (logs and rocks are to be retained). The weeds, cut material and flash fuel must be removed from the property. It is recommended that fuel reduction maintenance occurs every September.	Avoid impact to native vegetation and habitat on the site	After construction	Bush regeneration contractor and owner

11 References

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12 Appendices

Appendix A: BAM Calculator Reports

Appendix B: Fauna Survey Methods

Appendix C: Fauna Survey Data Summary

locations are shown in Figure 4.2

IR Motion Detection Camera Method

Cam	Bait	Dates Onsite	Num. of Days	Positioning notes
2	Honey	20 Sep - 3 Oct 2019	13	Attached to tree trunk, looking at adjcent tree
3	Oats, Peanut butter, honey	20 Sep - 3 Oct 2019	13	Attached to tree, looking at the ground
4	Oats, Peanut butter, honey	20 Sep - 3 Oct 2019	13	Attached to tree, looking at the ground

Appendix C, Fauna Survey Data Summary

143-145 McCarrs Creek Rd

Date 21/10/2019

Motion Detecting Camera Summary

Camera	Number of recordin	Number of fauna photos	Numbe r of Speceis
2	10	0	0
3	286	46	3
4	288	54	5

Motion detection Camera Results

Species	Dates	Camera Numbe	Photos
Brushtail Possum	21/9/19	4	1
Brushtail Possum	23/9/19	4	1
Brushtail Possum	28/9/19	3	1
Brushtail Possum	2/10/19	4	1
Bush Turkey	20/9/19	4	10
Bush Turkey	21/9/19	3	1
Bush Turkey	21/9/19	4	1
Bush Turkey	23/9/19	3	1
Bush Turkey	24/9/19	4	1
Bush Turkey	25/9/19	4	2
Bush Turkey	26/9/19	4	1
Bush Turkey	27/9/19	4	2
Bush Turkey	28/9/19	4	1
Bush Turkey	30/9/19	3	1
Bush Turkey	30/9/19	4	1
Bush Turkey	2/10/19	4	2
Fox	24/9/19	4	1
Lace Monitor	25/9/19	4	1
Swamp Wallaby	20/9/19	3	31
Swamp Wallaby	20/9/19	4	16
Swamp Wallaby	21/9/19	3	2
Swamp Wallaby	22/9/19	3	2
Swamp Wallaby	22/9/19	4	6
Swamp Wallaby	24/9/19	3	1
Swamp Wallaby	26/9/19	3	2
Swamp Wallaby	27/9/19	4	2
Swamp Wallaby	28/9/19	4	1
Swamp Wallaby	29/9/19	3	4
Swamp Wallaby	30/9/19	4	1
Swamp Wallaby	2/10/19	4	2

Ultrasonic bat dectector Results

Bat Call Summary by Date

Scientific Name	20-Sep	21-Sep	22-Sep	23-Sep	24-Sep	25-Sep	26-Sep	27-Sep	28-Sep	29-Sep	30-Sep	1-Oct	2-Oct	3-Oct	Total
Chalinolobus gouldii?	6	4	4		1							1			**16**
Chalinolobus morio						2	2								**4**
Miniopterus australis		1									2				**3**
Nyctophilus sp.	5	7						3		1	2				**18**
lophus megaphyllus?		2													**2**
ccolaimus flaviventris?		51	38	6	2	4		1	88	70	16	10	3		**289**
Vespadelus regulus		5	6	1	5	17	3	3	2	5		3	14		**64**
Vespadelus vulturnus			5					6	3	6			10	1	**31**
Total	**11**	**70**	**53**	**7**	**8**	**23**	**5**	**13**	**93**	**82**	**20**	**14**	**27**	**1**	**427**
(Fragment recordings)	23	408	78	6	7	9	6	3	3	12	4	1	6		**566**
Noise	42	404	513	137	88	125	98	99	249	379	298	85	105	13	**2635**
														Total	**3628**