Greenwich Hospital Redevelopment
Biodiversity Development Assessment Report

Greenwich Hospital HammondCare

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Template 2.8.1

Executive Summary

Eco Logical Australia Pty Ltd was engaged by HammondCare to prepare a Biodiversity Development Assessment Report for a proposed redevelopment of Greenwich Hospital (the development site) in the Lane Cove Council local government area. This report describes the biodiversity values within the development site and outlines the measures to be taken to avoid, minimise and mitigate impacts to the vegetation and species habitat present within the development site.

This report has followed the Biodiversity Assessment Method 2017 (BAM) established under Section 6.7 of the NSW *Biodiversity Conservation Act 2016.* Whilst this method is typically applied at a development application stage, the method has been used for this concept planning stage to ensure that the biodiversity values and potential offset measures are understood, and avoided where possible, early in the project.

This report has therefore been prepared to assess the impacts of the concept proposal, noting this will be subject to refinements and updates to impact areas during the detailed design phase.

The report gives an indication of the number of biodiversity credits that would need to be retired if the development proceeds as described. The offset requirements would be applicable at the development application stage and are therefore indicative only and subject to change during the detailed design phase.

The concept plan is State Significant Development and is therefore subject to Secretary's Environmental Assessment Requirements (SEARs), issued on 22 November 2017. The concept plan involves direct impacts to the site and these potential unavoidable direct impacts of the concept plan were calculated in accordance with the BAM by utilising the Biodiversity Assessment Method Credit Calculator. Requirements of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999,* applicable State Environmental Planning Policies and the *Lane Cove Local Environment Plan 2009* and *Development Control Plan 2010* have also been addressed in this report.

The proposed development site is approximately 3.39 ha in size. This is defined as the assessable area which includes the area of land defined by land title boundaries of Lot 3 and Lot 4 DP 584287, 95 – 97 River Road, Greenwich. The development site is located on private land bordered by River Road to the north, St Vincents Road to the east and north east, private residential allotments to the west and south and bushland of Gore Creek Reserve to the south west. The development site has been subject to considerable vegetation disturbance as a result of historical development, comprising carparks, mown areas, managed landscaped gardens, disturbed remnant bushland areas, roads, and hospital infrastructure. The heritage listed Pallister House is also located in the development site.

Remnant native trees, shrubs and ground cover species are present within parts of the development site. These remnants also contain horticultural plantings and weeds and in some areas are subject to regular mowing, mulching and garden maintenance activities. The remnant vegetation in the south west corner forms a contiguous link with the bushland in Gore Creek Reserve. The bulk of the development site is substantially degraded and modified, with dense areas of weeds and horticultural plantings.

Three Plant Community Types (PCTs), comprising four vegetation zones are present within the development site:

- Vegetation Zone 1: PCT 1776 *Smooth-barked Apple - Red Bloodwood open forest on enriched sandstone slopes around Sydney and the Central Coast* **moderate condition**
- Vegetation Zone 2: PCT 1776 *Smooth-barked Apple - Red Bloodwood open forest on enriched sandstone slopes around Sydney and the Central Coast* **managed understorey**
- Vegetation Zone 3: PCT 1778 *Smooth-barked Apple - Coast Banksia / Cheese Tree open forest on sandstone slopes on the foreshores of the drowned river valleys of Sydney*
- Vegetation Zone 4: PCT 1828 *Coachwood - Lilly Pilly - Water Gum gallery rainforest in sandstone gullies of the Sydney basin*

Theses PCTs do not conform to any threatened ecological communities listed under the NSW *Biodiversity Conservation Act 2016* or Commonwealth *Environment Protection and Biodiversity Conservation Act 1999.*

It is understood that approximately 0.02 ha of Vegetation Zone 1 PCT 1776 moderate condition and 0.24 ha of Vegetation Zone 2 PCT 1776 managed understorey within the development site will be directly impacted by the concept plan. PCT 1788 and PCT 1828 will not be impacted by the proposed development and it is understood this bushland will be retained as a conservation area.

A total of three (3) ecosystem credits are required to offset 0.26 ha of unavoidable impacts to PCT 1776 on the development site.

Offsets are not required for PCT 1788 and PCT 1828 as these PCTs will not be impacted by the proposal and will be protected and conserved within a proposed conservation area.

No other threatened flora or fauna species were recorded during the survey within the study area.

Habitat for candidate species credit species was recorded in the greater study area, therefore, species credits will be required to offset the proposed development. Please note targeted survey was not undertaken due to season limitations. Therefore, presence was assumed based on the presence of suitable habitat features.

The subject species credit species is *Chalinolobus dwyeri* (Large-eared Pied Bat), listed as Vulnerable under the NSW *Biodiversity Conservation Act 2016* and Commonwealth *Environment Protection and Biodiversity Conservation Act 1999.* A total of 5 (five) species credits are required to offset unavoidable impacts to the Large-eared Pied Bat.

It should be noted that this assessment has taken a worst case scenario approach, assuming full clearance in these impact areas. It should also be noted that these impact areas may increase or decrease during the detailed design stage. At the detailed design stage the development site should be re-assessed for presence or absence of ecosystem and species credit species. This is deemed necessary due to potential changes in species habitat distribution, changes and updates to the BAM assessment requirements and changes in the design.

It should also be noted that within these impact areas, the level of impact may change. Particular trees may remain, for example, such as selected high retention values trees. If this is the case, the assessment will be updated, and credits recalculated, if required, to reflect any changes.

Serious and Irreversible Impact (SAII) values have also been considered in this assessment. The Large - eared Pied Bat is listed as a SAII in the BioNet Threatened Biodiversity Data Collection. According to the Threatened Biodiversity Data Collection, the SAII threshold for this species is '*potential breeding habitat and presence of breeding individuals. Potential breeding habitat is PCTs associated with the species within 100m of rocky areas containing caves, or overhangs or crevices, cliffs or escarpments, or old mines, tunnels, culverts, derelict concrete buildings'* Given the PCTs to be impacted are not within 100m of *rocky areas containing caves, or overhangs or crevices, cliffs or escarpments,* it is considered unlikely that the proposed would result in a SAII to the Large-eared Pied Bat.

Two Matters of National Environmental Significance were identified as having potential to be adversely affected by the proposed works. *Pteropus poliocephalus* (Grey-headed Flying-fox) and Large-eared Pied Bat are both listed as Vulnerable under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* and it is considered that these species are likely to use some of the development site for seasonal foraging. An assessment of the Commonwealth Significant Impact Criteria was undertaken for the Grey-headed Flying-fox and Large-eared Pied Bat and concluded that the concept plan would not result in a significant impact to this species.

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Abbreviations

Abbreviation	Description
BAM	Biodiversity Assessment Method
BAMC	Biodiversity Assessment Method Credit Calculator
BC Act	NSW Biodiversity Conservation Act 2016
BDAR	Biodiversity Development Assessment Report
BSSAR	Biodiversity Stewardship Site Assessment Report
CEEC	Critically Endangered Ecological Community
DNG	Derived Native Grassland
DoEE	Commonwealth Department of Environment and Energy
DPE	NSW Department of Planning and Environment
EEC	Endangered Ecological Community
ELA	Eco Logical Australia Pty Ltd
EP&A Act	NSW Environmental Planning and Assessment Act 1979
EPBC Act	Commonwealth Environment Protection and Biodiversity Conservation Act 1999
FM Act	NSW Fisheries Management Act 1994
GIS	Geographic Information System
GPS	Global Positioning System
IBRA	Interim Biogeographic Regionalisation for Australia
LGA	Local Government Area
LLS	Local Land Service

Abbreviation	Description
NSW	New South Wales
NOW	NSW Office of Water
OEH	NSW Office of Environment and Heritage
PCT	Plant Community Type
SEPP	State Environmental Planning Policy
SSD	State Significant Development
SSI	State Significant Infrastructure
TEC	Threatened Ecological Community
VIS	Vegetation Information System
WM Act	NSW Water Management Act 2000

1. Stage 1: Biodiversity assessment

1.1 Introduction

This Biodiversity Development Assessment Report has been prepared to meet the requirements of the Biodiversity Assessment Method (BAM) 2016 established under Section 6.7 of the *NSW Biodiversity Conservation Act 2016* (BC Act). This report has been prepared by Nicole McVicar (BAAS18077), who is an Accredited Person under the BC Act. The report has been peer reviewed by Diane Campbell (BAAS 17069) who is also an Accredited Person under the BC Act.

1.1.1 General description of the development site

The proposed development site is 3.39 ha. This is defined as the assessable area which includes the area of land defined by land title boundaries of Lot 3 and Lot 4 DP 584287, 95 – 97 River Road, Greenwich. The development site is located on private land bordered by River Road to the north, St Vincents Road to the east and north east, private residential allotments to the west and south and bushland of Gore Creek Reserve to the south west. The development site has been subject to considerable vegetation disturbance as a result of historical development, comprising carparks, mown areas, managed landscaped gardens, disturbed remnant bushland areas, roads and hospital infrastructure. The heritage listed Pallister House is also located in the development site.

Remnant native trees, shrubs and ground cover species are present within part of the development site. These remnants also contain horticultural planting and weeds and in some areas are subject to regular mowing, mulching and garden maintenance activities. The remnant vegetation in the south west corner forms a contiguous link with the bushland in Gore Creek Reserve. The bulk of the development site is substantially degraded and modified, with dense areas of weeds and horticultural plantings.

The general description of the development site is displayed on the following maps:

- Development Footprint Map and Concept Masterplan (Figure 1 and Figure 2)
- Site Map (Figure 3)
- Location Map (Figure 4)

1.1.2 Development site footprint

The concept plan is State Significant Development (SSD) and is therefore subject to Secretary's Environmental Assessment Requirements (SEARs), issued on 22 November 2017. The concept masterplan proposes to expand the current hospital facilities with the staged construction of a hospital, serviced seniors living apartments and respite and basement car parking infrastructure. Landscaping and bushland enhancement is also proposed as part of this concept masterplan.

This report has been prepared to assess the impacts of the concept masterplan, noting this will be subject to refinements and changes during the detailed design phase.

It should be noted that this assessment has taken a worst case scenario approach, assuming full clearance in these impact areas. At the detailed design stage the development site should be re-assessed for presence or absence of ecosystem and species credit species. This is deemed necessary due to potential changes in species habitat distribution, changes and updates to the BAM assessment requirements and changes in the design.

It should also be noted that that during the detailed design stage it may be determined that particular trees will remain, for example selected high retention values trees may be retained. If this is the case, the assessment will be updated, and credits recalculated, if required, to reflect any changes.

It is understood that the operational and construction footprint will be contained wholly within the development site. The development site footprint is shown in Figure 1 and Figure 2.

1.1.3 Sources of information used

The following data sources were reviewed as part of this report:

- BioNet Vegetation Classification database
- BioNet Atlas in NSW Wildlife
- *Environment Protection and Biodiversity Conservation Act 1999* EPBC Act Protected Matters Search Tool 5 km database search (DotEE 2019)
- Threatened Biodiversity Data Collection
- NSW Government Biodiversity Values Map (accessed on 2 July 2019)
- The Native Vegetation of the Sydney Metropolitan Area (OEH 2016)
- National Flying-fox monitor viewer (DotEE 2019)
- Additional GIS datasets including soil, topography, geology and drainage
- Keystone Ecological Pty Ltd March 2019 *Impact Assessment Commonwealth and Local Control – Greenwich Hospital Redevelopment*
- Redgum Horticultural February 2018 *Arboricultural Impact Assessment and Tree Management Plan HammondCare Greenwich Hospital*
- Complete Urban February 2018 *Greenwich Hospital Masterplan Landscape Drawings*
- Bushfire Code and Hazard Solutions Pty Limited March 2018 *Bushfire Hazard Assessment Report Proposed Hospital, Aged Cared and Seniors Living at 95 River Road, Lance Cove*
- *Lane Cove Local Environment Plan 2009*
- *Lane Development Control Plan 2010.*

Figure 1: Development site concept masterplan

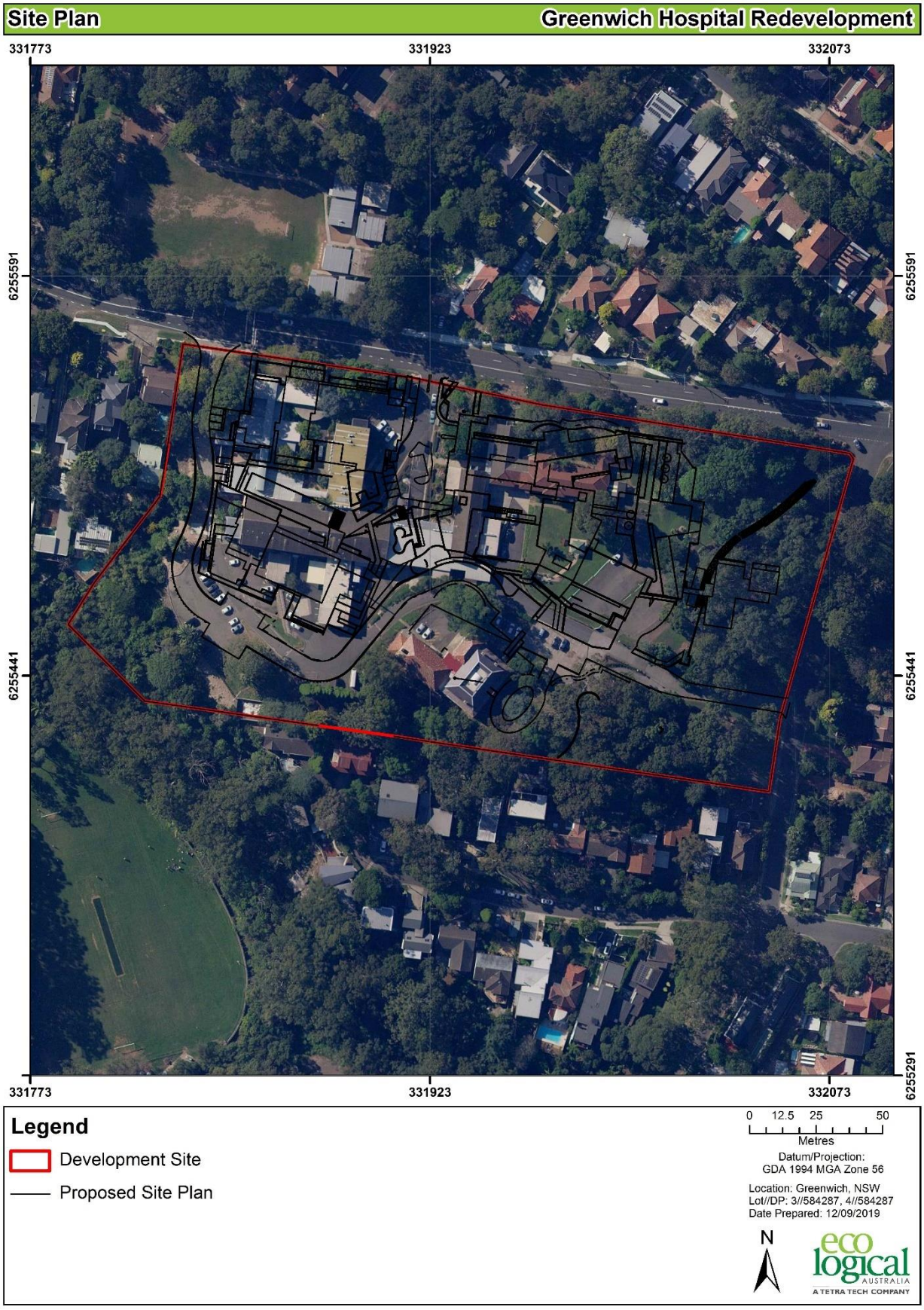

Figure 2: Development site footprint – concept masterplan

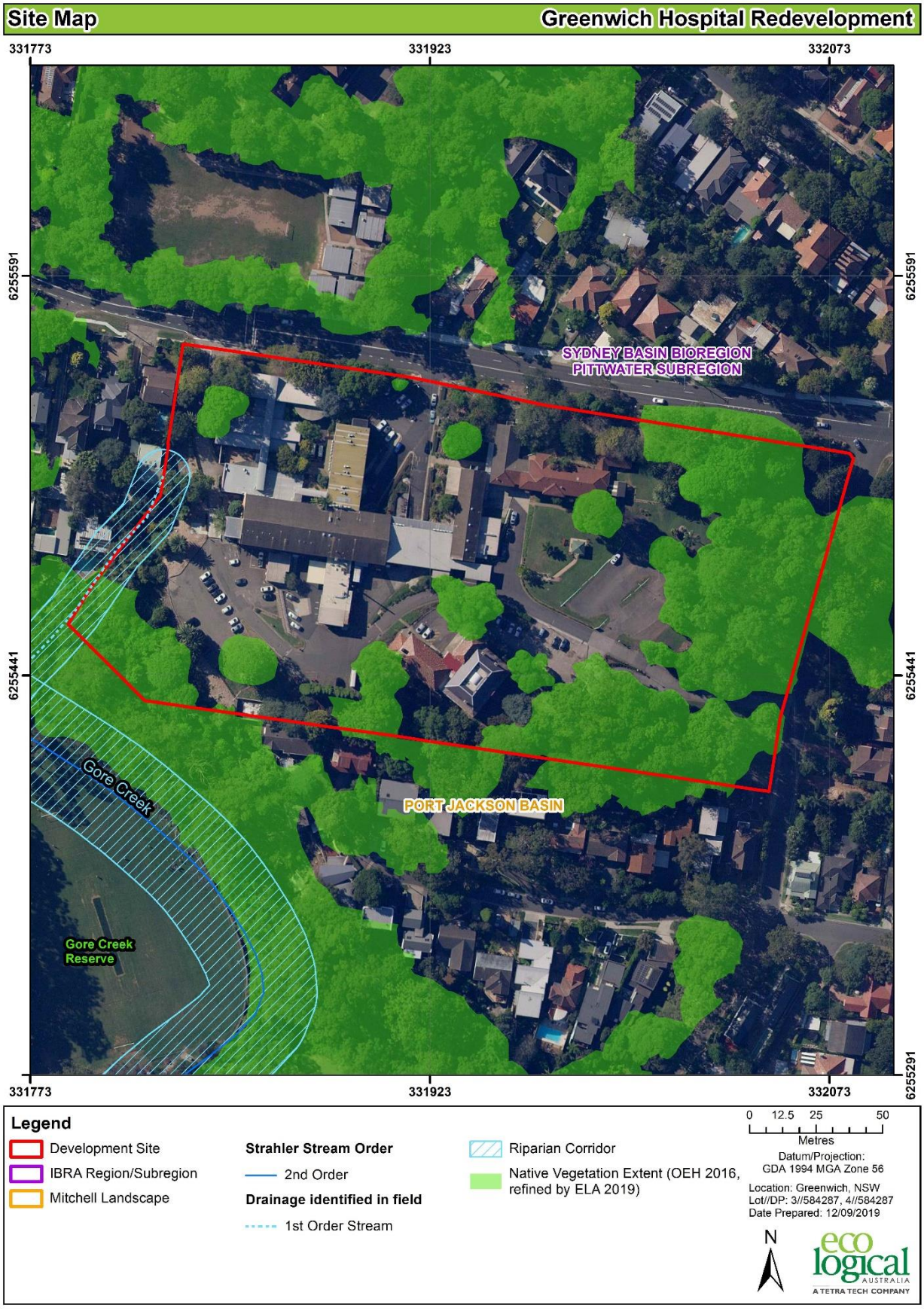

Figure 3: Site Map

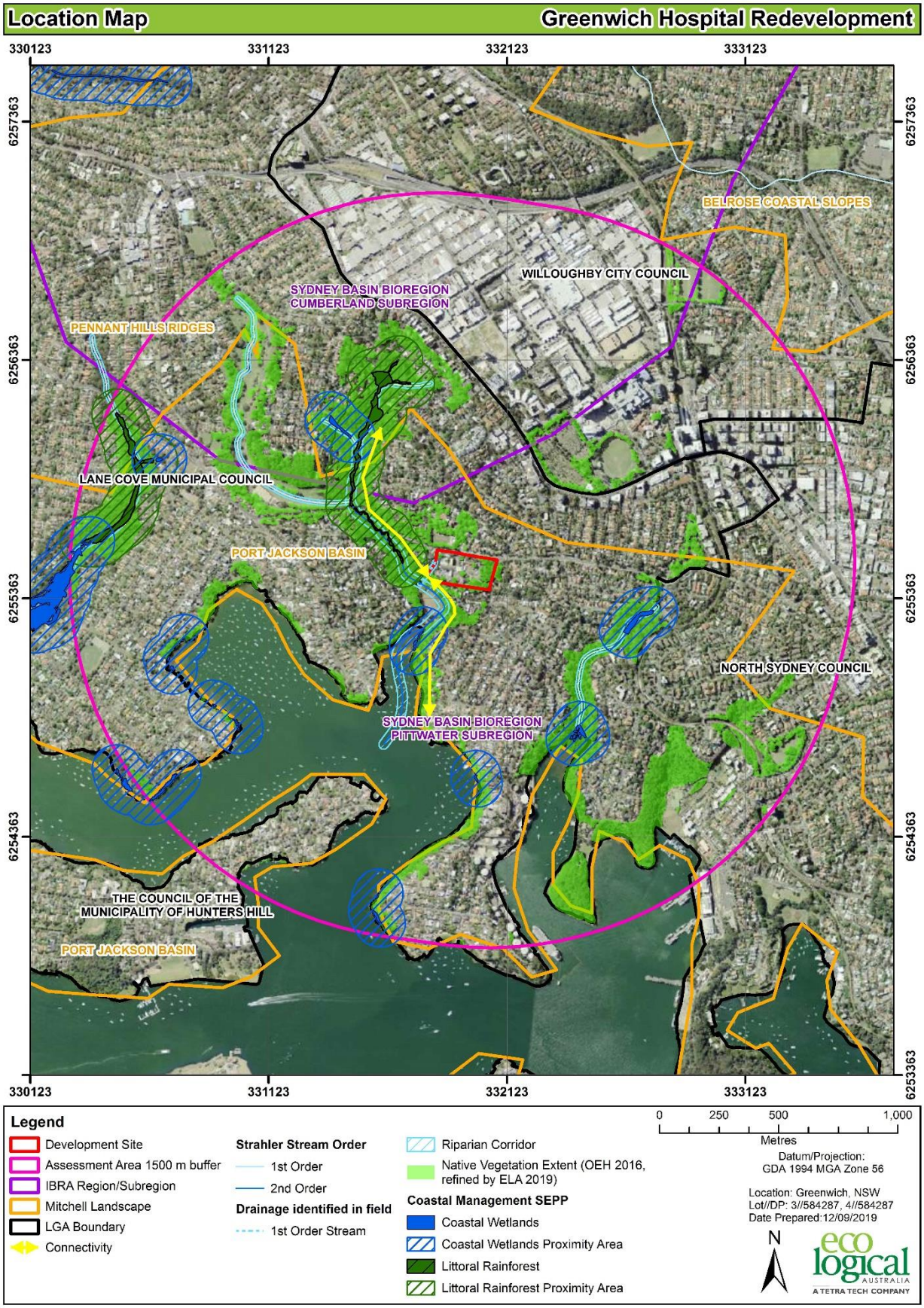

Figure 4: Location Map

1.2 Legislative context

Table 1: Legislative context

Name	Relevance to the project
Commonwealth	
***Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)**	Matters of National Environmental Significance (MNES) have been identified on or near the development site. This report assesses impacts to MNES and concludes that the development is not likely to have a significant impact on MNES. There are seven MNES that are triggers for Commonwealth assessment and approval. These are: 1. World Heritage properties 2. National Heritage places 3. Ramsar wetlands of international importance 4. Nationally threatened species and communities 5. Migratory species 6. Nuclear actions 7. Commonwealth marine environment. Threatened species and ecological communities are listed under Part 13, Division 1, Subdivision A of the EPBC Act. Migratory species are listed under Part 13, Division 2, Subdivision A of the Act. Two MNES have been identified as having potential to occur in the development site: *Pteropus poliocephalus* (Grey-headed Flying-fox) and *Chalinolobus dwyeri* (Large-eared Pied Bat).
State	
***Biodiversity Conservation Act 2016* (BC Act)**	The proposed development requires submission of a Biodiversity Development Assessment Report (BDAR) (this report) as detailed in the SEARs for the SSD. In relation to biodiversity impacts, it is stated in Keystone 2018 that SEARs requests the following: *Biodiversity impacts related to the proposal and the preparation of a Biodiversity Assessment are to be addresses in accordance with the requirements of the Biodiversity Conservation Act 2016."* At the development application stage the BDAR will be to be updated to reflect the detailed design of the proposal.
***Environmental Planning and Assessment Act 1979* (EP&A Act)**	The proposed development requires consent under the EP&A Act.
***Fisheries Management Act 1994* (FM Act)**	The development does not involve impacts to Key Fish Habitat, does not involve harm to marine vegetation, dredging, reclamation or obstruction of fish passage. A permit or consultation under the FM Act is not required.
***Local Land Services Amendment Act 2016* (LLS Act)**	The LLS Act does not apply to areas of the state to which the Vegetation SEPP applies. The Vegetation SEPP applies to the Lane Cove Council local government area. Refer to Vegetation SEPP section below.
***Water Management Act 2000* (WM Act)**	The *Water Management Act 2000* aims to provide sustainable and integrated management of water sources within NSW, chiefly to: • Apply principles of ecologically sustainable development • Protect, enhance and restore water sources, their ecosystems, ecological processes, water quality and biodiversity • Recognise significant social and economic benefits, including the role of the community • Encourage best practice management and use of water. Controlled activities for riparian corridors under the WM Act undertake the following: • set clear, consistent riparian corridor widths for various stream types using the Strahler stream ordering methodology

Name	Relevance to the project
	• allow more controlled activities in riparian corridors • allow other activities to be offset • include a Riparian Corridor Matrix to help streamline the controlled activity approval assessment process by assisting applicants to clearly identify the rules. The SEARs identify the requirement for a 20 metre wide riparian setback along the south-western boundary . this has been documented in Keystone 2018. Specifically, the following is quoted in Keystone 2018: *"In applying the DPI Water Controlled Activity Guidelines (2012) to the creek, a 20m wide riparian setback (measured from top of the highest bank) is recommended. The EIS needs to clarify if any part of the site is located within 20 m from the top of the highest bank of the creek".* The south-western and western boundary of the site is mapped as riparian lands under the LEP as a stormwater outlet and Gore Creek. The riparian lands for the stormwater outlet occupy approximately 40 metres either side of the outlet and the unnamed creek. The south-western boundary is mapped as riparian land for Gore Creek and occupies 7 metres within the site boundary and a further 33 metres to Gore Creek, totalling 40 metres wide. Existing development on site occupies approximately 0.33 hectares of land mapped as riparian corridor under the Lane Cove LEP (Keystone 2018). The proposed development will continue to occupy approximately 0.27 hectares of lands on site mapped as riparian corridor. However, it is understood that 0.06 hectares of this riparian corridor will be revegetated under the Landscape Plan (Keystone 2018). It is understood that proposed development will continue to maintain the minimum riparian corridor distance of 20 metres from the top of bank for Gore Creek with over 60 metres from the top of bank to the proposed development. Furthermore, the proposal will reduce the extent of hardstand within the mapped riparian lands under the LEP by 0.06 hectares (Keystone 2018).
State and Local Planning Instruments	
Vegetation SEPP	The Vegetation SEPP applies to development in urban areas and environmental conservation zones that does not require consent. As this project requires consent under the *Environmental Planning and Assessment 1979* the Vegetation SEPP does not apply
Coastal Management SEPP 2018	SEPP Coastal Management 2018 consolidated SEPP 14 Coastal Wetlands, SEPP 26 Littoral Rainforests and SEPP 71 Coastal Protection. The proposed development is located adjacent to land subject to this SEPP. Gore Creek Reserve and Lane Cove Bushland Park to the north west is mapped as Littoral Rainforest however the proximity buffer does not encroach on the development site. Foreshore land to the south of the development site is mapped as Coastal Wetlands and again, the proximity buffer does not overlap into the development site. This is displayed in Figure 4. This SEPP is therefore not applicable to the development site.
Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005 (SREP)	The SREP applies to land within the Sydney Harbour Catchment. Within the catchment, provisions of the SREP apply to: • the Foreshores and Waterways Area • various strategic foreshore sites, as shown on the Strategic Foreshore Sites Map • various heritage items, as shown on the Heritage Map • the Sydney Opera House buffer zone, as shown on the Sydney Opera House Buffer Zone Map • various wetlands protection areas, as shown on the Wetlands Protection Area Map. The site is within the Foreshores and Waterways area boundary and as such planning controls will reflect the requirements of the SREP (2005).
SEPP 44 – Koala Habitat Protection	The proposed development does not impact on core or potential koala habitat as defined by SEPP 44.

Name	Relevance to the project
SEPP 19 Bushland in Urban Areas	State Environmental Planning Policy No. 19 – Bushland in Urban Areas (SEPP 19) aims to protect and preserve bushland within urban areas that is considered of value, specifically: • to protect the remnants of plant communities which were once characteristic of land now within an urban area • to retain bushland in parcels of a size and configuration which will enable the existing plant and animal communities to survive in the long term • to protect rare and endangered flora and fauna species • to protect habitats for native flora and fauna • to protect wildlife corridors and vegetation links with other nearby bushland • to protect bushland as a natural stabiliser of the soil surface • to protect bushland for its scenic values, and to retain the unique visual identity of the landscape • to protect significant geological features • to protect existing landforms, such as natural drainage lines, watercourses and foreshores • to protect archaeological relics • to protect the recreational potential of bushland • to protect the educational potential of bushland • to maintain bushland in locations which are readily accessible to the community, and • to promote the management of bushland in a manner which protects and enhances the quality of the bushland and facilitates public enjoyment of the bushland compatible with its conservation. The site adjoins lands mapped under SEPP 19 and has been addressed under the Lane Cove Development Control Plan section.
Lane Cove Local Environment Plan (LEP) 2009	The LEP details the overarching planning controls for Lane Cove LGA. The LEP is to be read in conjunction with the *Lane Cove Development Control Plan 2010*. Of relevance to this assessment report are the clauses of the LEP regarding Riparian land, Environmental Protection land and Foreshore Building, and Part H Bushland Protection of the DCP. Land to be assessed under Sections 6.2, 6.3 and 6.4 of the LEP are addressed in the LEP mapping. Land assessed under Part H of the DCP is addressed in mapping within the DCP. The development site is partially mapped as Riparian land (LEP 2009), and land adjacent to SEPP 19 Bushland (DCP 2010). Under Part 6.3 of the LEP, the main objectives of lands mapped as riparian are to ensure development does not adversely impact on riparian lands. The Riparian Lands Map identifies the extent of lands within the Lane Cove LGA containing riparian land, of varying widths to reflect the areas to be managed as such under the LEP. This map shows two riparian lands mapped: one along the south-western boundary of the site and the other along its western boundary, running downslope to the other riparian lands. Parts of the areas designated as Riparian land are already development lands, which includes the existing hospital buildings, driveway and car park; and as dwellings, pools and gardens in adjacent off-site properties.
Lane Cove Development Control Plan (DCP) 2010	The site of Greenwich Hospital at Lot 3 DP 584287 is mapped as a Property Adjacent to Bushland per Part H of the Lane Cove DCP. The bushland to the south-west of the site, along Gore Creek is mapped as Bushland under SEPP 19 Bushland in Urban Areas. Objectives of Part H of the Lane Cove DCP (2010) aim to: • Protect both public and private bushland from adjacent development, which could result in any adverse change to the condition of bushland through altered moisture conditions, increased nutrient levels, soil movement, invasive or inappropriate plant species and proximity to development

Name	Relevance to the project
	• Retain and protect natural topographic features, bushland areas, plant species and communities and native fauna habitat • Maintain and regenerate areas of natural bushland which have been defined as an essential character of Lane Cove • Acknowledge the importance of bushland to the character of the surrounding landscape and value of the locality and its importance to the region and • Encourage innovation and attractive designs which acknowledge the importance of bushland areas through the control of building location, building form, soft and hard landscape elements and engineering controls. The existing development, including hardstand for access roads occurs approximately 30 metres upslope from the edge of bushland protected under SEPP 19. The proposed development will continue to provide a buffer distance of approximately 37 metres from the building area to SEPP 19 bushland, increasing the current buffer by approximately 7 metres. It is also understood that the bushland in this riparian buffer will be conserved, subject to weed management and planting where required (Complete Urban 2018). The proposed development complies with the objectives of Part H of the Lane Cove DCP (2010).

1.3 Landscape features

1.3.1 Interim Biogeographic Regionalisation for Australia (IBRA) regions and subregions

The development site falls within the IBRA region and subregion as outlined in Table 2 and Table 3.

Table 2: IBRA region

IBRA region	Area within development site (ha)
Sydney Basin	3.39

Table 3: IBRA subregion

IBRA subregion	Area within development site (ha)
Pittwater	3.39

1.3.2 Mitchell Landscapes

The development site falls within the Port Jackson Basin Mitchell Landscapes (DECC 2002) as outlined in Table 4.

Table 4: Mitchell Landscapes

Mitchell landscape	Description	Area within Development Site (ha)
Port Jackson Basin	Deep elongated harbour with steep cliffed margins on horizontal Triassic quartz sandstone. Small pocket beaches and more extensive Quaternary estuary fill of muddy sand at the head of most tributary streams. General elevation 0 to 80m, local relief 10 to 50m. Sandstone slopes and cliffs have patches of uniform or gradational sandy soil on narrow benches and within joint crevices that support forest and woodland of Sydney peppermint *(Eucalyptus piperita*), smooth-barked apple (*Angophora costata*), red bloodwood (*Corymbia gummifera*) and blackbutt *(Eucalyptus*	3.39

Mitchell landscape	Description	Area within Development Site (ha)
	pilularis). Sheltered gullies contain some turpentine (*Syncarpia glomulifera*), coachwood (*Ceratopetalum apetalum*) and water gum (*Tristaniopsis laurina*). Estuarine sands were originally dominated by saltmarsh but have been taken over by grey mangrove (*Avicennia marina*) in the past century.	

1.3.3 Native vegetation extent

The extent of native vegetation within the development site and 1,500 m buffer is outlined in Table 5. There are minor differences between the mapped vegetation extent (OEH 2016) and the aerial imagery and this has been refined during a desktop analysis and displayed in Figure 3 and Figure 4.

Table 5: Native vegetation extent

Area within the development site (ha)	Area within the 1,500 m buffer area (ha)
1.18	110.66

1.3.4 Rivers and streams

The development site contains one first order stream. This is an unnamed stream and appeared to carry stormwater to Gore Creek, which is a second order stream, located to the south west of the study area.

1.3.5 Wetlands

The development site does not contain any wetlands.

1.3.6 Connectivity features

The development site contains the connectivity features outlined in Table 6 and shown in Figure 4.

Connectivity to large tracts of habitat is considered suitable for mobile species such as mammals, birds and bats. This includes flyways for migratory birds and bat species moving through the landscape.

Direct connections are present connecting the development site to nearby Gore Creek Reserve to the south west, which connects to the north west to Lane Cove Bushland Park.

Table 6: Connectivity features

Connectivity feature name	Feature type
Gore Creek Reserve	Core bushland, riparian areas, cliffs and caves
Lane Cove Bushland Park	Core bushland and riparian areas

1.3.7 Areas of geological significance and soil hazard features

The development site does not contain areas of geological significance and soil hazard features.

1.3.8 Site context

1.3.8.1 Method applied

The site based method has been applied to this development.

1.3.8.2 Percent native vegetation cover in the landscape

The current percent native vegetation cover in the landscape was assessed in a Geographic Information System (GIS) using aerial imagery sourced from NearMap, using increments of 5%. The percent native vegetation cover within the 1,500 m buffer area is 13.4% (110.66 ha).

1.3.8.3 Patch size

Patch size was calculated using available vegetation mapping for all patches of intact native vegetation on and adjoining the development site. The patch size area was determined to be > 101 ha.

1.4 Native vegetation

1.4.1 Survey effort

Vegetation survey was undertaken within the development site by ecologist Nicole McVicar on 26 June 2019. A total of two (2) full-floristic vegetation plots were undertaken to identify PCTs within the development site (Table 7). Plots were only undertaken in PCT 1776 *Smooth-barked Apple - Red* Bloodwood open forest on enriched sandstone slopes around Sydney and the Central Coast.

No plots were undertaken in PCT 1778 *Smooth-barked Apple - Coast Banksia / Cheese Tree open forest on sandstone slopes on the foreshores of the drowned river valleys of Sydney* and PCT 1828 *Coachwood - Lilly Pilly - Water Gum gallery rainforest in sandstone gullies of the Sydney basin* as this land was largely inaccessible due to the steep terrain and high water levels in Gore Creek preventing access to the south. Further to this, PCT 1778 and PCT 1828 will not be impacted by the proposed development, therefore it was not considered essential to undertake BAM vegetation integrity plots in these PCTs.

A total of two (2) vegetation integrity plots were undertaken on the development site in accordance with the BAM (Table 8). Plot locations are displayed in Figure 6.

The site visit also involved vegetation mapping of the remaining development site, assessment of habitat and mapping of habitat features, namely hollow-bearing trees (HBTs). The location of these trees is displayed in Figure 5.

All field data collected, photos, and full-floristic and vegetation integrity plots are included in Appendix B, C, and D.

Table 7: Full-floristic PCT identification plots

PCT ID	PCT Name	Number of plots surveyed
1776	Smooth-barked Apple - Red Bloodwood open forest on enriched sandstone slopes around Sydney and the Central Coast	2

Table 8: Vegetation integrity plots

Veg Zone	PCT ID	PCT Name	Condition	Area impacted (ha)	Plots required	Plots surveyed
1	1776	Smooth-barked Apple - Red Bloodwood open forest on enriched sandstone slopes around	Moderate condition	0.02	1	1

Veg Zone	PCT ID	PCT Name	Condition	Area impacted (ha)	Plots required	Plots surveyed
		Sydney and the Central Coast				
2	1776	Smooth-barked Apple - Red Bloodwood open forest on enriched sandstone slopes around Sydney and the Central Coast	Managed understorey	0.24	1	1

1.4.2 Plant Community Types present

Three PCTs were identified on the development site (Table 9, Figure 5). These PCTs are not listed under the BC Act and/or EPBC Act. The development site also contains planted native canopy, shrubs and occasionally ground cover species which are native to NSW, however these were not considered locally indigenous to the PCTs. However, under the BAM, planted vegetation native to NSW requires consideration as to the 'best fit' PCT. Based on the soil landscape, elevation, and presence of remnant vegetation within the development site it was determined that planted native vegetation 'best-fit' PCT was PCT 1776 *Smooth-barked Apple - Red Bloodwood open forest on enriched sandstone slopes around Sydney and the Central Coast* **managed understorey.** Justification for the selection of PCTs occurring on the development site is based on a quantitative analysis of full-floristic plot data and a summary is provided in Table 10.

Table 9: Plant Community Types

PCT ID	PCT Name	Vegetation Class	Vegetation Formation	Area (ha)	Percent cleared
1776	Smooth-barked Apple - Red Bloodwood open forest on enriched sandstone slopes around Sydney and the Central Coast	Sydney Coastal Dry Sclerophyll Forests	Dry Sclerophyll Forests (Grassy sub-formation)	1.05	64%
1778	Smooth-barked Apple - Coast Banksia / Cheese Tree open forest on sandstone slopes on the foreshores of the drowned river valleys of Sydney	Sydney Coastal Dry Sclerophyll Forests	Dry Sclerophyll Forests (Grassy sub-formation)	0.1	90%
1828	Coachwood - Lilly Pilly - Water Gum gallery rainforest in sandstone gullies of the Sydney basin	Northern Warm Temperate Rainforests	Rainforests	0.03	6%

Photo 1: PCT 1776 vegetation zone 1 Smooth-barked Apple - Red Bloodwood open forest on enriched sandstone slopes around Sydney and the Central Coast moderate condition

Photo 2: PCT 1776 vegetation zone 2 Smooth-barked Apple - Red Bloodwood open forest on enriched sandstone slopes around Sydney and the Central Coast managed understorey

Photo 3: PCT 1778 vegetation zone 3 Smooth-barked Apple - Coast Banksia / Cheese Tree open forest on sandstone slopes on the foreshores of the drowned river valleys of Sydney

Photo 4: PCT 1828 vegetation zone 4 Coachwood - Lilly Pilly - Water Gum gallery rainforest in sandstone gullies of the Sydney basin

1.4.2.1 PCT selection justification

Justification for the selection of PCT 1776 occurring on the development site is based on a quantitative analysis of full-floristic plot data and a summary is provided below. PCT 1776 was determined through analysis of mapped soil landscapes, elevation and the presence of key diagnostic canopy species namely, *Eucalyptus resinifera, Eucalyptus pilularis* and *Angophora costata*. *Eucalyptus haemastoma* (Scribbly Gum) was also present in the development site, and although not a positive diagnostic species, this species occurs quite commonly in PCT 1776. Justification for PCT 1778 and PCT 1828 occurring in the development site, although not impacted by the development, is also provided below in Table 10**.**

The development site is mapped within both the Gymea and Hawkesbury soil landscapes, both associated with Hawkesbury Sandstone geology and sandstone soils with rocky outcrops. This soil landscape transitions to the north to the Glenorie soil landscape, a landscape associated with Wianamatta Group shales (Chapman and Murphy 1989). The soil landscapes of Gymea and Hawkesbury are consistent with PCT 1776 which occurs on clay enriched sandstone soils, often located downslope from residual shale caps or shale layers with Hawksbury Sandstone (OEH 2016).

Table 10: PCT selection justification

PCT ID	PCT Name	Selection criteria	Species relied upon for identification of vegetation type and relative abundance
1776	Smooth-barked Apple - Red Bloodwood open forest on enriched sandstone slopes around Sydney and the Central Coast	IBRA region, subregion, soil landscape, elevation and results of floristic plot analysis including the presence of positive diagnostic canopy species	Presence of *Eucalyptus. resinifera*, *Eucalyptus. pilularis* and *Angophora costata*. In the midstorey, presence of *Glochidion ferdinandi, Polyscias sambucifolia, Elaeocarpus reticulatus.* In the groundcover presence of *Dianella caerulea, Pratia purpurascens and Microlaena stipoides.*
1778	Smooth-barked Apple - Coast Banksia / Cheese Tree open forest on sandstone slopes on the foreshores of the drowned river valleys of Sydney	IBRA region, subregion, soil landscape, elevation and presence of positive diagnostic canopy species	This area was inaccessible due to steep terrain and high water levels in Gore Creek. However there was a dominance of *Eucalyptus pilularis* and *Angophora costata* observed in the canopy. Due to the position in the landscape, elevation and presence of key species, the community was validated as PCT 1778 (S_DFS06 as per the OEH mapping 2016).

PCT ID	PCT Name	Selection criteria	Species relied upon for identification of vegetation type and relative abundance
1828	Coachwood - Lilly Pilly - Water Gum gallery rainforest in sandstone gullies of the Sydney basin	IBRA region, subregion, soil landscape, elevation and presence of positive diagnostic canopy species	This area was inaccessible due to steep terrain and high water levels in Gore Creek. Validation was based on canopy species and position in landscape i.e. on creekline. Due to the position in the landscape, elevation and presence of key species, the community was validated as PCT 1828 (S_RF02 as per the OEH mapping 2016).

1.4.3 Vegetation integrity assessment

A vegetation integrity assessment using the Biodiversity Assessment Method Credit Calculator (BAMC) was undertaken and the results are outlined in Table 11.

Table 11: Vegetation integrity

Veg Zone	PCT ID	Condition	Area impacted (ha)	Composition Condition Score	Structure Condition Score	Function Condition Score	Current vegetation integrity score
1	1776	Moderate condition	0.02	14.1	32.7	76.9	46.9
2	1776	Managed understorey	0.24	15.4	14	52.2	22.4

1.4.4 Use of local data

The use of local data is not proposed for this assessment.

Figure 5: Plant Community Types

Figure 6: Plot locations

1.5 Threatened species

Habitat assessments were undertaken during the field survey on 26 June 2019 to determine the likelihood of threatened species occurring within the development site on an intermittent or permanent basis. The previous report from Keystone Ecological 2018 was also reviewed extensively to determine the potential habitat within the development site.

Habitat assessments involved a search of all possible hollow-bearing trees within the development site, and a search for evidence of fauna foraging such as chewed cones, sap trees or roosting habitat in the form of white wash/pellets, plus inspection of structures and rocky outcrops to determine if there was suitable roosting/breeding habitat for threatened microbats.

Tree hollow were inspected where accessible, however most hollows were high in the canopy. Binoculars were used when required to inspect hollows identified within high branches in the tree's canopy.

No hollows inspected displayed any apparent visual evidence of microbat occupation. Microbat scats and/or markings were not observed around any of the entrances, nor were any microbats observed when inspecting inside the accessible hollows. A range of urban birds were observed foraging in the study area including the Noisy Miner (*Manorina melanocephala*), Sulphur-crested Cockatoo (*Cacatua galerita*), Rainbow Lorikeet (*Trichoglossus haematodus*) and Laughing Kookaburra (*Dacelo novaeguineae*). One *Pseudocheirus peregrinus* (Common Ring-tail Possum) was also observed utilising one of the larger tree hollows. No hollows were considered to be of a suitable size to accommodate breeding owls. No raptor nest were observed in any of the trees within the development site.

Therefore, it was determined that the trees within the development site may be used as potential seasonal foraging habitat for microbats and birds, and the hollows may be used as temporary roosting habitat. It was considered unlikely that the development site contains suitable breeding habitat for microbats. This is also due to the fact that the development site is located within a highly urbanised environment, exposed and open, and under constant use and disturbance from the local community. The vegetation within the development site is a considerably fragmented and disturbed example of *Smooth-barked Apple - Red Bloodwood open forest on enriched sandstone slopes around Sydney and the Central Coast* mixed in with urban native and exotic plantings. It is more likely that suitable breeding habitat would be present outside the development site within the adjacent core bushland areas of Gore Park Reserve and Lane Cove Bushland Park.

It should be noted that there was one flora species *Eucalyptus scoparia* (Wallangarra White Gum) was identified in the arborist report within the development site, listed as endangered under the BC Act and vulnerable under the EPBC Act. The species has been planted and is a horticultural variety. The species is known from only three locations in NSW near Tenterfield, which is more than 640 km from the development site and is therefore located outside of its normal distribution. It has since been noted that this tree has been removed due to structural and health problems. No further assessment for Wallangarra White Gum under the BC and EPBC Act is therefore required.

1.5.1 Ecosystem credit species

Ecosystem credit species predicted to occur at the development site, their associated habitat constraints, geographic limitations and sensitivity to gain class is included in Table 12.

Ecosystem credit species which have been excluded from the assessment and relevant justification is also included in Table 12.

Table 12: Justification for inclusion or exclusion of predicted ecosystem credit species

Species	Common Name	Habitat constraints/ Geographic limitations	Sensitivity to gain class	NSW listing status	EPBC Listing status	Justification if species excluded
Anthochaera phrygia	Regent Honeyeater (Foraging)	N/A	High	CE	CE	Included Occasional foraging features for this species are present at this site. The development site does comprise plant species that may be utilised for foraging.
Callocephalon fimbriatum	Gang-gang Cockatoo (Foraging)	N/A	Moderate	V	Not Listed	Included Although no BioNet records exist within 5 km of the development site, the Gang-gang Cockatoo favours old growth forest/woodland attributes, of which the development site contains some old remnant trees and there is potential for the species to utilise the remnant bushland of Gore Creek Reserve from time to time.
Calyptorhynchus lathami	Glossy Black-Cockatoo (Foraging)	N/A	High	V	Not Listed	Included There are 20 BioNet records for this species within a 5 km radius of the development site. This species may utilise the flowering species within the development site very occasionally for seasonal foraging. This species was included in this assessment.
Daphoenositta chrysoptera	Varied Sittella	N/A	Moderate	V	Not Listed	Excluded There are no BioNet records for this species within a 5 km radius. Although some habitat features for this species are present, such as rough barked and smooth barked Eucalypts, it is considered that the vegetation within the development site is substantially degraded and fragmented such that the species is unlikely to utilise the development site.

Species	Common Name	Habitat constraints/ Geographic limitations	Sensitivity to gain class	NSW listing status	EPBC Listing status	Justification if species excluded
Dasyurus maculatus	Spotted-tailed Quoll	N/A	High	V	E	Excluded Habitat features for this species are not present at this site. This species requires habitat features such as maternal den sites, an abundance of food (birds and small mammals) and large areas of relatively intact vegetation to forage.
Glossopsitta pusilla	Little Lorikeet	N/A	High	V	Not Listed	Included There are 36 BioNet records for this species within a 5 km radius of the development site. This species may utilise the flowering species within the development site for seasonal foraging. This species was included in this assessment.
Hieraaetus leucogaster	White-bellied Sea-Eagle	N/A	High	V	Not listed	Included There are 48 BioNet records for this species within a 5 km radius of the development site. Foraging habitat features associated with this species were identified within the development site.
Hieraaetus morphnoides	Little Eagle (Foraging)	N/A	Moderate	V	Not Listed	Included Included in this assessment. Foraging habitat features associated with this species were identified within the development site.
Lathamus discolor	Swift Parrot (Foraging)	N/A	Moderate	E	CE	Included There are 14 BioNet records for this species within a 5 km radius of the development site. Foraging habitat features associated with this species were identified within the development site.

Species	Common Name	Habitat constraints/ Geographic limitations	Sensitivity to gain class	NSW listing status	EPBC Listing status	Justification if species excluded
Lophoictinia isura	Square-tailed Kite (Foraging)	N/A	Moderate	V	Not Listed	Excluded Habitat features associated with this species are not present on the development site. This species requires dry woodlands and open forests with a particular preference for timbered watercourses.
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	N/A	Moderate	V	Not Listed	Excluded Habitat features associated with this species are not present in the development site. This species occupies forests or woodlands dominated by box and ironbark eucalypts (especially Mugga Ironbark), which are not dominant on the development site. No individuals have been recorded within 5km of the development site.
Miniopterus australis	Little Bentwing-bat (Foraging)	N/A	High	V	Not Listed	Included Seasonal foraging habitat was identified in this assessment.
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat (Foraging)	N/A	High	V	Not Listed	Included Seasonal foraging habitat was identified in this assessment.
Mormopterus norfolkensis	Eastern Freetail-bat	N/A	High	V	Not Listed	Included Seasonal foraging habitat was identified in this assessment.
Neophema pulchella	Turquoise Parrot	N/A	High	V	Not Listed	Excluded Habitat features associated with this species are not present in the development site. No individuals have been recorded within 5 km of the development site.
Ninox connivens	Barking Owl (Foraging)	N/A	High	V	Not Listed	Included Foraging habitat was identified in this assessment. There are 10 BioNet records for this species within a 5 km of the development site.

Species	Common Name	Habitat constraints/ Geographic limitations	Sensitivity to gain class	NSW listing status	EPBC Listing status	Justification if species excluded
Ninox strenua	Powerful Owl (Foraging)	N/A	High	V	Not Listed	Included Foraging habitat was identified in this assessment. There are 391 BioNet records for this species within a 5 km radius of the development site.
Pandion cristatus	Eastern Osprey (Foraging)	N/A	Moderate	V	Not Listed	Excluded Although there are BioNet records for this species within a 5 km radius of the development site, it is considered that the foraging habitat features (which are primarily coastal and occasionally along rivers) in the development site were highly marginal.
Petroica boodang	Scarlet Robin	N/A	Moderate	V	Not Listed	Excluded Habitat features associated with this species includes an abundance of logs and fallen timber, these features were not present in the development site.
Phascolarctos cinereus	Koala (Foraging)	N/A	High	V	V	Excluded Habitat present is substantially degraded and highly fragmented such that this species is unlikely to utilise the development site. No feed trees were identified within the development site.
Pteropus poliocephalus	Grey-headed Flying-fox (Foraging)	N/A	High	V	V	Included Seasonal foraging habitat was identified in this assessment.
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	N/A	High	V	Not Listed	Included Seasonal foraging habitat was identified in this assessment. This species was identified in the surveys undertaken by Keystone Ecological in 2017.
Tyto novaehollandiae	Masked Owl (Foraging)	N/A	High	V	Not Listed	Included Marginal foraging habitat was identified in this assessment.

Species	Common Name	Habitat constraints/ Geographic limitations	Sensitivity to gain class	NSW listing status	EPBC Listing status	Justification if species excluded
Varanus rosenbergi	Rosenberg's Goanna	To northern and south western margins of the sub region	High	V	Not Listed	Excluded Habitat features for this species are not present in the development site. Critical habitat components such as termite mounds are not present in the development site.

CE = Critically Endangered; E = Endangered; E2 = Endangered Population; V = Vulnerable

1.6 Species credit species

Species credit species predicted to occur at the development site (i.e. candidate species), their associated habitat constraints, geographic limitations and sensitivity to gain class is included in Table 13.

Species credit species which have been excluded from the assessment and relevant justification are also included in Table 13.

Table 13: Candidate species credit species

Species	Common Name	Habitat constraints/ Geographic limitations	Sensitivity to gain class	NSW listing status	EPBC Listing status	Justification if species excluded
Ancistrachne maidenii		N/A	High	V	N	Excluded This species is restricted to northern Sydney near St Albans and therefore it was determined that the habitat features associated with this species are not present within the development site.
Anthochaera phrygia	Regent Honeyeater (Breeding)	N/A	High	CE	CE	Excluded This is a dual credit species, and only a species credit species when specific habitat constraints are present for breeding. The development site is not within an important breeding area for the species (National Recovery Plan).
Caladenia tessellata	Thick Lip Spider Orchid	N/A	Moderate	E	V	Excluded Habitat for this species was not considered suitable in the development site. The site is substantially degraded,

Species	Common Name	Habitat constraints/ Geographic limitations	Sensitivity to gain class	NSW listing status	EPBC Listing status	Justification if species excluded
						and this species occurs in grassy sclerophyll woodlands which were not recorded within the development site. Furthermore, this species is only known from old records in Sydney area.
Callistemon linearifolius	Netted Bottle Brush	N/A	N/A	V	Not Listed	Excluded This species was not detected in the development site and it was determined that habitat was substantially disturbed such that it is unlikely that suitable habitat for this species would be present within the development site.
Callocephalon fimbriatum	Gang-gang Cockatoo (Breeding)	N/A	High	V	Not Listed	Excluded This is a dual credit species, and only a species credit species when specific habitat constraints are present for breeding. Although hollows were detected within the development site, it was determined that the development site is substantially disturbed and urbanised such that the habitat is not deemed suitable for the species to utilise the site for breeding purposes.
Calyptorhynchus lathami	Glossy Black-Cockatoo (Breeding)	N/A	High	V	Not Listed	Excluded This is a dual credit species, and only a species credit species when specific habitat constraints are present for breeding. There are 20 BioNet records for this species within a 5 km radius of the development site. Although hollows were detected within the development site. it was determined that the development site is substantially disturbed and urbanised such that the habitat is not deemed suitable for the species to utilise the site for breeding purposes.
Camarophyllopsis kearneyi	-	Lane Cove Bushland Park	High	E	Not Listed	Excluded The development site located close to Lane Cove Bushland Park it is considered unlikely species that this

Species	Common Name	Habitat constraints/ Geographic limitations	Sensitivity to gain class	NSW listing status	EPBC Listing status	Justification if species excluded
						species will occur within the development site.
Cercartetus nanus	Eastern Pygmy-possum		High	V	Not Listed	Excluded Habitat present is substantially degraded such that this species is unlikely to utilise the development site. There is no nesting habitat present or preferred foraging habitat such as *Banksia* sp. present.
Chalinolobus dwyeri	Large-eared Pied Bat	Cliffs Within 2km of rocky areas containing caves, overhangs, escarpment, outcrops, or crevices, or within 2km of old mines or tunnels	Very High	V	V	**Included** Suitable habitat features associated with this species (rocky areas containing caves, overhangs, escarpments) are located within 2 km of the development site. The likely presence of this species was detected during surveys undertaken by Keystone Ecological in 2017.
Darwinia peduncularis		N/A	High	V	Not Listed	Excluded This species was not detected in the development site and it was determined that habitat was substantially disturbed such that it is unlikely that suitable habitat for this species would be present within the development site
Hibbertia puberula		N/A	High	E	Not Listed	Excluded The presence of this species was not identified, and it was determined that the habitat features associated with this species are not present within the development site. The site is substantially degraded such that this

Species	Common Name	Habitat constraints/ Geographic limitations	Sensitivity to gain class	NSW listing status	EPBC Listing status	Justification if species excluded
						species is unlikely to utilise the development site.
Hibbertia spanantha	Julian's Hibbertia	N/A	N/A	CE	CE	Excluded The presence of this species was not identified, and it was determined that the habitat features associated with this species are not present within the development site. The site is substantially degraded such that this species is unlikely to utilise the development site. The species is also known in a limited area in the upper north shore.
Hieraaetus leucogaster	White-bellied Sea- Eagle (Breeding)	N/A	High	V	Not Listed	Excluded This is a dual credit species, and only a species credit species when specific habitat constraints are present for breeding. It was determined during the site visit that the development site does not contain breeding habitat. No nests were observed during field surveys.
Hieraaetus morphnoides	Little Eagle (Breeding)	N/A	Moderate	V	Not Listed	Excluded This is a dual credit species, and only a species credit species when specific habitat constraints are present for breeding. It was determined during the site visit that the development site does not contain breeding habitat. No nests were observed during field surveys.
Hygrocybe anomala var. *ianthinomargin ata*	-	Lane Cove Bushland Reserve	High	V	Not Listed	Excluded Although the development site is located close to Lane Cove Bushland Park it is considered unlikely that this species will occur within the development site due to the disturbed condition of the vegetation.
Hygrocybe aurantipes	-	Lane Cove Bushland Reserve	High	V	Not Listed	Excluded Although the development site is located close to Lane Cove Bushland Park it is considered unlikely that this species will occur within the development site due to the disturbed condition of the vegetation.

Species	Common Name	Habitat constraints/ Geographic limitations	Sensitivity to gain class	NSW listing status	EPBC Listing status	Justification if species excluded
Hygrocybe austropratensis	-	Lane Cove Bushland Reserve	High	E	Not Listed	Excluded Although the development site is located close to Lane Cove Bushland Park it is considered unlikely that this species will occur within the development site due to the disturbed condition of the vegetation.
Hygrocybe collucera		Lane Cove Bushland Reserve	High	E	Not Listed	Excluded Although the development site is located close to Lane Cove Bushland Park it is considered unlikely that this species will occur within the development site due to the disturbed condition of the vegetation.
Hygrocybe griseoramosa		Lane Cove Bushland Reserve	High	E	Not Listed	Excluded Although the development site is located close to Lane Cove Bushland Park it is considered unlikely that this species will occur within the development site due to the disturbed condition of the vegetation
Hygrocybe lanecovensis		Lane Cove Bushland Reserve	High	E	Not Listed	Excluded Although the development site is located close to Lane Cove Bushland Park it is considered unlikely that this species will occur within the development site due to the disturbed condition of the vegetation.
Hygrocybe reesiae		Lane Cove Bushland Reserve	High	V	Not Listed	Excluded Although the development site is located close to Lane Cove Bushland Park it is considered unlikely that this species will occur within the development site due to the disturbed condition of the vegetation.
Hygrocybe rubronivea		Lane Cove Bushland Reserve	High	V	Not Listed	Excluded Although the development site is located close to Lane Cove Bushland Park it is considered unlikely that this species will occur within the development site due to the disturbed condition of the vegetation.

Species	Common Name	Habitat constraints/ Geographic limitations	Sensitivity to gain class	NSW listing status	EPBC Listing status	Justification if species excluded
Lathamus discolor	Swift Parrot (Important foraging areas)		Moderate	E	CE	Excluded Marginal seasonal foraging habitat features associated with this species were identified within the development site and this has therefore been included as an ecosystem credit species only.
Litoria aurea	Green and Golden Bell Frog	Semi-permanent/ephemeral wet areas Within 1km of wet areas, swamps Within 1km of swamp, waterbodies Within 1km of waterbody	High	E	V	Excluded Habitat features associated with this species are not present on the development site. There are no suitable pools, swamps or fringing vegetation within the development site which may contain suitable habitat for this species
Lophoictinia isura	Square-tailed Kite (Breeding)	N/A	Moderate	V	Not Listed	Excluded This is a dual credit species, and only a species credit species when specific habitat constraints are present for breeding. The development site does not contain breeding habitat that is suitable for the species to utilise the site. No nests were observed during field surveys.
Miniopterus australis	Little Bentwing-bat (Breeding)	N/A	Very High	V	Not Listed	Excluded This is a dual credit species, and only a species credit species when specific habitat constraints are present for breeding. The development site does not contain breeding habitat such as caves that are suitable for the species to utilise the site.

Species	Common Name	Habitat constraints/ Geographic limitations	Sensitivity to gain class	NSW listing status	EPBC Listing status	Justification if species excluded
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat (Breeding)	N/A	Very High	V	Not Listed	Excluded This is a dual credit species, and only a species credit species when specific habitat constraints are present for breeding. The development site does not contain breeding habitat such as caves, tunnels, mines or culverts.
Mixophyes iteratus	Giant Barred Frog	Land within 50m of semi-permanent drainages	Moderate	E	E	Excluded Habitat features associated with this species are not present on the development site.
Myotis macropus	Southern Myotis	Hollow bearing trees Within 200 m of riparian zone, other bridges, caves or artificial structures within 200 m of riparian zone	High	V	Not Listed	Excluded Habitat present is not considered suitable such that this species is likely to utilise the development site. Although hollow bearing trees were identified within the development site, the nearest riparian area with pools/stretches of 3m or wider is approximately 200 m away from the development site. No bridges, caves or artificial structures located within 200m of the riparian zone with pools/stretches of 3m or wider are located on the development site.
Ninox connivens	Barking Owl (Breeding)	N/A	High	V	Not Listed	Excluded This is a dual credit species, and only a species credit species when specific habitat constraints are present for breeding. The development site does not contain suitable breeding habitat.
Ninox strenua	Powerful Owl (Breeding)	N/A	High	V	Not Listed	Excluded This is a dual credit species, and only a species credit species when specific habitat constraints are present for breeding. Although the development site does contain suitable foraging habitat and resource (e.g. ringtail possum was observed in the

Species	Common Name	Habitat constraints/ Geographic limitations	Sensitivity to gain class	NSW listing status	EPBC Listing status	Justification if species excluded
						development site), it is considered that the development site does not contain suitable breeding habitat. Large trees great than 80cm DBH were recorded in the development site, however hollows were relatively small-medium in size, did not contain the required depth and therefore not considered suitable for breeding purposes.
Pandion cristatus	Eastern Osprey	N/A	Moderate	V	Not Listed	Excluded This is a dual credit species, and only a species credit species when specific habitat constraints are present for breeding. The development site does not contain breeding habitat that is suitable for the species to utilise the site. No nests were observed during field surveys.
Petaurus norfolcensis	Squirrel Glider	N/A	High	V	Not Listed	Excluded Habitat present is substantially degraded such that this species is unlikely to utilise the development site. Habitat in the development site is isolated and disturbed with a higher likelihood of this species more suitable habitat within the locality. Additionally, this species has a strong preference for old growth forests which does not include the development site.
Petaurus norfolcensis endangered population		Barrenjoey Peninsula	High	EP	Not Listed	Excluded Habitat present is substantially degraded such that this species is unlikely to utilise the development site. Additionally, this species is geographically located in the Barrenjoey Peninsula.
Phascolarctos cinereus	Koala (Breeding)	N/A	High	V	V	Excluded This is a dual credit species, and only a species credit species when specific habitat constraints are present for breeding. Habitat present is considered unsuitable and substantially degraded

Species	Common Name	Habitat constraints/ Geographic limitations	Sensitivity to gain class	NSW listing status	EPBC Listing status	Justification if species excluded
						such that this species is highly unlikely to utilise the site for breeding.
Phascolarctos cinereus – *endangered population*	Koala (Breeding)	Pittwater	High	EP	Not Listed	Excluded Habitat present is substantially degraded such that this species is unlikely to utilise the development site. Additionally, this species is geographically located in the Pittwater area.
Pimelea curviflora var. *curviflora*	Pimelea curviflora var. curviflora	N/A	High	V	V	Excluded The presence of this species was not identified (conspicuous species) and it was determined that the habitat is substantially degraded such that this species is unlikely to utilise the development site.
Pomaderris prunifolia – endangered population	Endangered population in Parramatta, Auburn, Strathfield and Bankstown LGA	N/A	High	E	V	Excluded The development site is not located within the LGA for this endangered population. Furthermore, the presence of this species was not identified (conspicuous species) and it was determined that the habitat is substantially degraded such that this species is unlikely to utilise the development site.
Pseudophryne australis	Red-crowned Toadlet	N/A	Moderate	V	Not Listed	Excluded Although 80 BioNet records have been recorded within 5 km of the development site, it is considered that habitat features associated with this species are not present on the development site.
Pteropus poliocephalus	Grey-headed Flying-fox (Breeding)	N/A	High	V	V	Excluded This is a dual credit species, and only a species credit species when specific habitat constraints are present for breeding. The development site does not contain any breeding sites that are suitable for the species to utilise.
Tyto novaehollandiae	Masked Owl (Breeding)	N/A	High	V	Not Listed	This is a dual credit species, and only a species credit species when specific habitat constraints are present for

Species	Common Name	Habitat constraints/ Geographic limitations	Sensitivity to gain class	NSW listing status	EPBC Listing status	Justification if species excluded
						breeding. The development site does not contain habitat such as trees with large hollows that are suitable for the species to utilise the site for breeding.

CE = Critically Endangered; E = Endangered; E2 = Endangered Population; V = Vulnerable

1.6.1 Targeted surveys

Due to the high level of modification of vegetation within the development site and lack of potential habitat, targeted surveys were not conducted for species credit species. Justification for the exclusion or inclusion of species credit species is provided above in Table 13.

Some microbat species are dual credit species with only breeding habitat considered for species credits. None of the dual credit species are known to breed in man-made structures such as roof cavities. However, under Section 9.2.1 of the BAM, the assessor must take into consideration Prescribed Biodiversity Impacts including any man-made structures, which may be roosting habitat for the following threatened microbat species:

- *Saccolaimus flaviventris* (Yellow-bellied Sheathtail Bat)
- *Falsistrellus tasmaniensis* (Eastern False Pipistrelle)
- *Miniopterus australis* (Little Bentwing-bat)
- *Miniopterus schreibersii oceanensis* (Eastern Bentwing-bat).

The methodology and results for the microbat surveys are detailed in the Prescribed Biodiversity Impact Assessment Section 2.1.2.

1.6.2 Expert reports

Expert reports have not been prepared as part of this BDAR.

2. Stage 2: Impact assessment (biodiversity values)

2.1 Avoiding impacts

2.1.1 Locating and designing a project to avoid and minimise impacts on vegetation and habitat

The concept masterplan proposes to expand the current hospital facilities with the staged construction of a hospital, serviced seniors living apartments and respite and basement car parking infrastructure. Landscaping and bushland enhancement is also proposed as part of this concept masterplan. The site is located in an urban area which avoids and minimises impacts to better quality vegetation and more important habitat in the locality, as outlined in Table 14.

Table 14: Locating and designing a project to avoid and minimise impacts on vegetation and habitat

Approach	How addressed	Justification
Locating and designing the project in areas where there are no biodiversity values	The concept plan footprint has generally utilised existing development areas, cleared land and planted gardens to minimise impacts on areas with higher biodiversity value.	Areas of higher biodiversity values e.g. the vegetation to the south west of the development site has been retained where possible within the site. In terms of design, it is also understood that landscaping and bushland augmentation is proposed as part of the concept masterplan.
Locating and designing the project in areas where the native vegetation or threatened species habitat is in the poorest condition	The concept plan footprint has been designed and located to utilise areas where native vegetation is in lower condition.	As above, areas of higher biodiversity values e.g. the vegetation to the south west of the development site has been retained where possible within the site. The project has been generally located to utilise existing developed areas.
Locating and designing the project in areas that avoid habitat for species and vegetation in high threat categories (e.g. an EEC or CEEC), indicated by the biodiversity risk weighting for a species	The concept plan footprint has been located to utilise areas where native vegetation and threatened species habitat is in lower condition in the context of the locality.	As above, areas of higher biodiversity values e.g. the vegetation to the south west of the development site has been retained where possible within the site. The project has been primarily located to utilise existing developed areas.
Locating and designing the project such that connectivity enabling movement of species and genetic material between areas of adjacent or nearby habitat is maintained	The vegetation within the planning proposal location is fragmented and thus movement of genetic material between areas of nearly habitat will be maintained as this patch of vegetation is being retained.	As above, areas of higher biodiversity values e.g. the vegetation to the south west of the development site, which forms part of a connected link to core bushland has been retained within the site. The project has been primarily located to utilise existing developed areas.

2.1.2 Prescribed biodiversity impacts

The development site has the prescribed biodiversity impacts as outlined in Table 15.

The list of potential prescribed biodiversity impacts as per the BAM is provided below:

- Occurrences of karst, caves, crevices and cliffs - none occur within the development site
- Occurrences of rock - no rock outcrops or scattered rocks occur within the development site
- Occurrences of human made structures and non-native vegetation – **Yes, see section below**.
- Hydrological processes that sustain and interact with the rivers, streams and wetlands – **Yes one first order creekline is located within the development site and a second order creek located to the south outside the development site**.
- Proposed development for a wind farm and use by species as a flyway or migration route - the project does not involve any wind farm development.

The development site contains human made structures, non-native vegetation and one first order creekline. Additional information regarding consideration of human made structures is provided below. Non-native vegetation was identified and assessed for any potential to provide habitat for threatened flora and fauna species, including presence of hollow bearing trees.

A literature review was conducted to identify if buildings or structures could potentially be utilised as a roosting resource by microbats, including BioNet records within the development site and surrounding landscape. Visual surveys were conducted to visually determine if the buildings within the development site contain potential openings, possibly utilised by microbats. Possible threatened microbats utilising man-made structures include:

- *Saccolaimus flaviventris* (Yellow-bellied Sheathtail Bat)
- *Falsistrellus tasmaniensis* (Eastern False Pipistrelle)
- *Miniopterus australis* (Little Bentwing-bat)
- *Miniopterus schreibersii oceanensis* (Eastern Bentwing-bat)

Existing buildings in the development site were a combination of recently constructed buildings, buildings approximately 30-60 years old, and a well maintained and utilised heritage building. All buildings were well maintained. No potential roost sites were observed in these buildings. It is unlikely that microbat species utilise these dwelling for roosting or breeding habitat. Small hollows were observed in several non-native trees. Non-native vegetation within the development site may contain marginal and seasonal roosting and foraging habitat for microbats.

Table 15: Prescribed biodiversity impacts

Prescribed biodiversity impact	Description in relation to the development site	Threatened species or ecological communities affected
Impacts of development on the habitat of threatened species or ecological communities associated with: • **karst, caves, crevices, cliffs and other geological features of significance, or** • **human made structures, or** • **non-native vegetation**	The development site contains a combination of recently constructed buildings, buildings approximately 30-60 years old, and a well maintained and utilised heritage building. All buildings were well maintained. The buildings do not provide potential microbat roosts. The development site contains nectar producing non-native vegetation canopy, and some small hollows were observed, in formal	Potential roosting habitat for threatened microbat *Saccolaimus flaviventris* (Yellow-bellied Sheath-tail Bat) and *Falsistrellus tasmaniensis* (Eastern False Pipistrelle), *Miniopterus australis* (Little Bentwing-bat) and *Miniopterus schreibersii oceanensis* (Eastern Bentwing-bat).

Prescribed biodiversity impact	Description in relation to the development site	Threatened species or ecological communities affected
	gardens which will be removed as part of the planning proposal. The development site contains non-native vegetation suitable for common urban arboreal mammals (possums) which also provides foraging opportunities for threatened nocturnal bird species. The planning proposal will result in a reduction in the extent of foraging habitat and reduction in availability of their prey items. Roosting habitat for microbats in non-native vegetation is considered to be marginal.	Potential foraging habitat for other threatened microbat species above non-native vegetation canopy. Potential foraging habitat for *Pteropus poliocephalus* (Grey-headed Flying Fox) (GHFF). Potential foraging habitat for *Ninox strenua* (Powerful Owl).
Impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities (including from subsidence or upsidence resulting from underground mining)	The proposed works is located to the east of a 1st order stream.	The 1st order stream is an ephemeral stormwater channel and does not support water dependent threatened species or water dependent ecological communities and threatened species.
Impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range	The proposed development will require the removal of non-native vegetation from within the development site. The development will result in a minor reduction in the extent of existing non-native vegetation within the development site which provides stepping stone habitat between urban fragmented patches of vegetation	Reduction in extent of potential foraging habitat for GHFF. Reduction in extent of potential habitat for Powerful Owl. Reduction in extent of foraging habitat for other threatened microbats.
Impacts of development on movement of threatened species that maintains their lifecycle	The proposed development will result in reduction of vegetation within the development site and marginal loss of connectivity for mobile threatened species.	GHFF, Powerful Owl and microbat species.

2.1.2.1 Locating and designing a project to avoid and minimise prescribed biodiversity impacts

The development has been located and designed in a way which avoids and minimises prescribed biodiversity impacts as outlined in Table 16.

Table 16: Locating and designing a project to avoid and minimise prescribed biodiversity impacts

Approach	How addressed	Justification
Locating and designing the development to avoid direct impacts on the non- native vegetation and human made structures	Although this is a highly modified site, a considerable amount of remnant native and non-native canopy located within the development site will be retained. All of the existing buildings will be removed from the site except	The development has avoided impacts to large tracts of native vegetation in the south west and to the east which includes nectar producing native canopy species for GHFF, foraging habitat for Powerful Owl and microbat

Approach	How addressed	Justification
	for Pallister House. The new building footprints will overlay the old building footprints as much as possible.	species. Existing building footprints will be overlayed by the new building footprints where possible in the site. These buildings are currently well maintained structures and therefore not considered suitable roosting habitat for threatened microbats. It is considered preferable to replace these rather than clear existing native vegetation.
Locating and designing the development to avoid severing or interfering with corridors connecting different areas of habitat, migratory flight paths to important habitat or preferred local movement pathways	The development will involve the removal of some native and exotic vegetation which forms a connective corridor, however the bushland to the south west will be retained, along with scattered trees within the development site.	As above, in the context of the surrounding locality, it is considered that vegetation in the impact area is primarily in a disturbed condition and already highly fragmented. Thus, the footprint is considered to be located in an area where exchange of genetic material between adjacent or nearby habitat is already limited and will not impact corridor connecting different areas of habitat, migratory flight paths or preferred local movement paths.
Optimising project layout to minimise interactions with threatened and protected species and ecological communities, e.g. designing turbine layout to allow buffers around features that attract and support aerial species, such as forest edges, riparian corridors and wetlands, ridgetops and gullies	The footprint has been generally placed to avoid impacts to areas of high biodiversity value.	The footprint has utilised the central portion of the development site which includes cleared lands and existing development footprint and vegetation of generally lower biodiversity value. It has retained areas of high biodiversity values in the south of the subject site which includes an area of core bushland connected with Gore Creek Reserve and also forms part of a riparian buffer.

2.1.3 Direct impacts

The direct impacts of the planning proposal on:

- native vegetation are outlined in Table 17
- threatened species and threatened species habitat is in Table 18
- prescribed biodiversity impacts outlined in Section 2.1.4

Direct impacts including the final project footprint (construction and operation) are shown on Figure 7.

Table 17: Direct impacts to native vegetation

PCT ID	PCT Name	Vegetation Class	Vegetation Formation	Direct impact (ha)
1776	Smooth-barked Apple - Red Bloodwood open forest on enriched sandstone	Sydney Coastal Dry Sclerophyll Forests	Dry Sclerophyll Forests (Grassy sub-formation)	0.26

PCT ID	PCT Name	Vegetation Class	Vegetation Formation	Direct impact (ha)
	slopes around Sydney and the Central Coast			

Table 18: Direct impacts on threatened species and threatened species habitat

Species	Common Name	Direct impact number of individuals / habitat (ha)	NSW listing status	EPBC Listing status
Chalinolobus dwyeri	Large-eared Pied Bat	0.26	Vulnerable	Vulnerable

2.1.4 Change in vegetation integrity

The change in vegetation integrity as a result of the development is outlined in Table 19.

Table 19: Change in vegetation integrity

Veg Zone	PCT ID	Condition	Area (ha)	Current vegetation integrity score	Future vegetation integrity score	Change in vegetation integrity
1	1776	Moderate condition	0.02	46.9	0	-46.9
2	1776	Managed understorey	0.24	22.4	0	-22.4

2.1.5 Indirect impacts

The indirect impacts of the development are outlined in Table 20.

Table 20: Indirect impacts

Indirect impact	Project phase	Nature	Extent	Frequency	Duration	Timing
Sedimentation and contaminated and/or nutrient rich run-off	Construction	Runoff during construction works	Confined to development site with sediment fencing	During heavy rainfall or storm events	During rainfall events	Short-term impacts
Noise, dust or light spill	Construction	Noise and dust created from machinery (no night works proposed therefore no light spill)	Noise and dust likely to carry beyond development site boundary	Daily, during construction works	Sporadic throughout construction period	Short-term impacts
Inadvertent impacts on adjacent habitat or vegetation	Construction	Damage to adjacent habitat or vegetation	Adjacent vegetation	Daily, during construction works	Throughout construction period	Short-term impacts

Indirect impact	Project phase	Nature	Extent	Frequency	Duration	Timing
Transport of weeds and pathogens from the site to adjacent vegetation	Construction	Spread of weed seed or pathogens	Potential for spread into adjacent habitat	Daily, during construction works	Sporadic throughout construction period	Potentially long-term impacts
Vehicle strike	Construction / operation	Potential for native fauna to be struck by working machinery and moving vehicles	Within access road and development site	Daily, during both construction and operational phases.	Throughout life of project	Short-term impacts
Trampling of threatened flora species	Construction / operation	No threatened flora species present	N/A	N/A	N/A	N/A
Rubbish dumping	Construction / operation	Illegal dumping by local residents/ construction crews	Potential for rubbish to spread via wind into adjacent vegetation	Potential to occur at any time throughout construction or operational phases	Throughout life of project	Short-term impacts
Wood collection	Construction / operation	Removal of wood in vegetation located in the southern extent of the development site	In southern and south eastern portion of the development site.	Potential to occur at any time throughout construction or operational phases	Throughout life of project	Short-term impacts
Bush rock removal and disturbance	Construction / operation	Removal of rocks in southern vegetation within the development site	In remnant vegetation in the southern portion and eastern portion of the development site	Potential to occur at any time throughout construction or operational phases	Throughout life of project	Short-term impacts
increase in predatory species populations	Construction / operation	Potential increase in domestic predatory species due to reduction of vegetation	In vegetation in the southern and eastern portion of the site	During operational phase	Potential at any point during operation of development	Short-term impacts
increase in pest animal populations	Construction / operation	Potential to increase if introduced	In vegetation in the southern and eastern	Potential to occur at any time throughout construction or	Throughout life of project	Short-term impacts

Indirect impact	Project phase	Nature	Extent	Frequency	Duration	Timing
			portion of the site	operational phases		
increased risk of fire	Construction / operation	Potential due to presence of vegetation retained in the south of the site	In vegetation in the southern and eastern portion of the site	Potential to occur at any time, although, more likely during dry, windy conditions	Throughout life of project	Short-term and long-term impacts
disturbance to specialist breeding and foraging habitat, e.g. beach nesting for shorebirds.	Construction / operation	Runoff during construction works	Confined to development site with sediment fencing	During heavy rainfall or storm events	During rainfall events	Short-term impacts

2.1.6 Mitigating and managing impacts

Measures proposed to mitigate and manage impacts at the development site before, during and after construction are outlined in Table 21. Note that these measures will be relevant at the development application stage and are therefore provided here as an indication of the types of measures that could be applied.

Table 21: Measures proposed to mitigate and manage impacts

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
Displacement of resident fauna	Minor	Negligible	Pre-clearance survey of trees to be removed and identification/location of habitat trees by a suitably qualified ecologist. Supervision by a qualified ecologist/licensed wildlife handler during tree removal in accordance with best practise methods.	Resident fauna relocated in a sensitive manner	Prior to and during clearing works	Project Manager / Ecologist
Timing works to avoid critical life cycle events such as breeding or nursing	Minor	Negligible	Avoid clearing works in later winter/spring during breeding/nesting period for birds	Impacts to fauna during nesting/nursing avoided	During clearing works	Project Manager
Instigating clearing protocols including pre-clearing surveys, daily surveys and staged clearing, the presence of a trained ecological or licensed wildlife handler during clearing events	Moderate	Minor	Pre-clearance survey of trees to be removed and identification/location of habitat trees by a suitably qualified ecologist. Trees identified for retention should be clearly delineated as a 'No Go' zone with high visibility bunting. Supervision by a qualified ecologist/licensed wildlife handler during tree removal in accordance with best practise methods. Any tree removal is to be undertaken by a suitably qualified and insured arborist.	Any fauna utilising habitat within the development site will be identified and managed to ensure clearing works minimise the likelihood of injuring resident fauna	During clearing works	Project Manager / Ecologist
Installing artificial habitats for fauna in adjacent retained vegetation and habitat or human made structures to replace the habitat resources lost and	Minor	Negligible	Any trees removed that have hollows/hollow trunks/fissures should be retained as ground fauna habitat and/or used as replacement hollows and attached to trees within the within the development site. If it is impractical to use salvaged hollows as replacement tree hollows, compensatory nest boxes should be installed where practical.	Replacement of habitat features removed	Prior to and during clearing works	Project Manager/ Ecologist

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
encourage animals to move from the impacted site, e.g. nest boxes						
Artificial lighting can have a negative impact upon nocturnal and diurnal fauna species. Lighting needs to be designed to minimise impacts to nocturnal and diurnal fauna.	Moderate	Minor	Light pollution can be reduced by limiting the duration of spotlight illumination, reducing the brightness of lights where possible, installing shield fixtures to reduce light scattering, and using narrow-spectrum light sources to reduce the wavelengths likely to interfere with animal behaviour (Gaston et al 2012). High priority areas where the implementation of measures to reduce light pollution should be considered would be located adjacent to important habitat. Wildlife friendly lighting (i.e. filtered yellow-green and amber LEDs wavelength of 590 nm with light shield protection controlling light spill) should be considered in the retained bushland areas.	Lighting impacts on nocturnal and diurnal fauna is minimised.	During clearing works and post construction (i.e. design.	Project Manager/Landscape Designer/Ecologist
Clearing protocols that identify vegetation to be retained, prevent inadvertent damage and reduce soil disturbance; for example, removal of native vegetation by chain-saw, rather than heavy machinery, is preferable in situations where partial clearing is proposed	Moderate	Minor	Vegetation identified for retention should be clearly delineated as a 'No Go' zone with high visibility bunting. No temporary facilities i.e. site offices/toilets/soil stockpiling is to occur within tree protection zone.	Vegetation to be retained outside of the development site boundary will not be disturbed/impacted	Demarcation of vegetation to be set up prior to any works occurring on site and to remain throughout duration of construction works	Project Manager
Sediment barriers or sedimentation ponds to control the quality of water released from the site into the receiving environment	Moderate	Minor	Appropriate controls are to be utilised to manage exposed soil surfaces and stockpiles to prevent sediment discharge into waterways. Soil and erosion measures such as sediment fencing, clean water diversion must be in place prior the commencement of the construction work and must be regularly inspected and maintained throughout the development of the site.	Erosion and sedimentation will be controlled	For the duration of construction works	Project Manager

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
Programming construction activities to avoid impacts; for example, timing construction activities for when migratory species are absent from the site, or when particular species known to or likely to use the habitat on the site are not breeding or nesting	Minor	Negligible	Timing of construction works should be planned to occur outside of the winter/spring breeding season.	Impacts to fauna during nesting/nursing avoided	During clearing works	Project Manager
Hygiene protocols to prevent the spread of weeds or pathogens between infected areas and uninfected areas	High	Minor	Phytophthora control measures must be undertaken from the commencement of the project to minimise the risk of spread and to the site. The following guidelines should be followed: https://www.rbgsyd.nsw.gov.au/science/plants/pests-diseases/phytophthora-dieback/disinfection-procedures http://www.environment.gov.au/biodiversity/invasive-species/publications/management-phytophthora-cinnamomi-biodiversity-conservation Vehicles, machinery and building refuse should remain only within the development site. Weed management to be undertaken where required.	Spread of weeds and pathogens prevented	Post-construction	Project Manager
Staff training and site briefing to communicate environmental features to be protected and measures to be implemented	Minor	Negligible	Construction staff to be briefed prior to work commencing to be made aware of any sensitive biodiversity values present and environmental procedures such as: • Site environmental procedures (vegetation management, sediment and erosion control, exclusion fencing and weeds) • What to do in case of environmental emergency (chemical spills, fire, injured fauna)	All staff entering the development site are fully aware of all the ecological values present within the Lot and environmental aspects relating to the development and know	To occur for all staff entering/working at the development site. Site briefings should be updated based on phase of	Project Manager

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
			• Key contacts in case of environmental emergency	what to do in case of any environmental emergencies	the work and when environmental issues become apparent.	
Making provision for the ecological restoration, rehabilitation and/or ongoing maintenance of retained native vegetation habitat on or adjacent to the development site	Minor	Negligible	Landscaping in the development site is to use locality derived native species and those found within the PCT present.	Areas within the development site will be landscaped using appropriate species	Throughout construction and following completion of construction activities.	Project Manager

Figure 7: Impact footprint

2.2 Impact summary

Following implementation of the BAM and the BAMC, the following impacts have been determined.

2.2.1 Serious and Irreversible Impacts (SAII)

The development has one candidate Serious and Irreversible Impacts (SAII) species as outlined in Table 22. The impact is not in excess of the threshold identified in the Threatened Species Data Collection. Further consideration of whether impacts on candidate species are serious and irreversible is included in Table 23.

Table 22: Serious and Irreversible Impacts Summary

Species	Principle	SAII direct impact individuals/area (ha)	Summary
Chalinolobus dwyeri Large-eared Pied Bat	Principle 4	0 ha	As stated in the Threatened Species Data Collection, the SAII threshold is *potential breeding habitat and presence of breeding individuals. Potential breeding habitat is PCTs associated with the species within 100 m of rocky areas containing caves, or overhangs or crevices, cliffs or escarpments, or old mines, tunnels, culverts, derelict concrete buildings.* The PCTs associated with this species to be impacted by the proposal are not within 100 m of rocky areas containing potential breeding habitat. Therefore the impact is not in excess of the threshold identified in the Threatened Species Data Collection. In accordance with the NSW Government document Guidance to assist a decision-maker to determine a serious and irreversible impact 2017, *'Impacts below this threshold are considered unlikely to result in a serious and irreversible impact'.* Therefore no further assessment has been undertaken.

Table 23: Determining whether impacts are serious and irreversible

Determining whether impacts are serious and irreversible	Assessment
Principle 1	
Does the proposal impact on a species, population or ecological community that is a candidate entity because it is in a rapid rate of decline?	No. The proposal will not impact upon a candidate entity species because it has not been identified as being in a rapid rate of decline.
If yes, is the impact in excess of any threshold identified and therefore likely to be serious and irreversible? Note: where candidate entities have no listed threshold, any impact is considered likely to be serious and irreversible	NA
Principle 2	
Does the proposal impact on a species that is a candidate entity because it has been identified as having a very small population size?	No. The proposal will not impact upon threatened flora/fauna species which are a candidate entity species because it has not been identified as having a small population size.

Determining whether impacts are serious and irreversible	Assessment
If yes, is the impact in excess of any threshold identified and therefore likely to be serious and irreversible? Note: where candidate entities have no listed threshold, any impact is considered likely to be serious and irreversible	NA
Principle 3	
Does the proposal impact on the habitat of a species or an area of an ecological community that is a candidate entity because it has a very limited geographic distribution?	No. The proposal will not impact upon a candidate entity species because it has not been identified as having a very limited geographic distribution.
If yes, is the impact in excess of any threshold identified and therefore likely to be serious and irreversible? Note: where candidate entities have no listed threshold, any impact is considered likely to be serious and irreversible.	NA
Principle 4	
Does the proposal impact on a species, a component of species habitat or an ecological community that is a candidate entity because it is irreplaceable?	Yes. *Chalinolobus dwyeri* is a candidate SAII entity species as it has been identified as having habitat that is irreplaceable. The SAII threshold provided in Threatened Biodiversity Data Collection stage is *Breeding habitat as identified by survey*. Therefore any impact to breeding habitat is considered likely to be serious and irreversible.
If yes, is the impact in excess of any threshold identified and therefore likely to be serious and irreversible? Note: where candidate entities have no listed threshold, any impact is considered likely to be serious and irreversible.	No. As stated in the Threatened Species Data Collection, the SAII threshold is *potential breeding habitat and presence of breeding individuals. Potential breeding habitat is PCTs associated with the species within 100m of rocky areas containing caves, or overhangs or crevices, cliffs or escarpments, or old mines, tunnels, culverts, derelict concrete buildings.* The PCTs associated with this species to be impacted by the proposal are not within 100 m of rocky areas containing potential breeding habitat. Therefore the impact is not in excess of the threshold identified in the Threatened Species Data Collection. In accordance with the NSW Government document Guidance to assist a decision-maker to determine a serious and irreversible impact 2017, *'Impacts below this threshold are considered unlikely to result in a serious and irreversible impact'*. Therefore no further assessment has been undertaken.

2.2.2 Impacts requiring offsets

The impacts of the development requiring offsets for native vegetation are outlined in Table 24 and shown on Figure 9.

Table 24: Impacts to native vegetation that require offsets

PCT ID	PCT Name	Vegetation Class	Vegetation Formation	Direct impact (ha)
1776	Smooth-barked Apple - Red Bloodwood open forest on enriched sandstone slopes around Sydney and the Central Coast	Sydney Coastal Dry Sclerophyll Forests	Dry Sclerophyll Forests (Grassy sub-formation)	0.26

Table 25: Impacts on threatened species and threatened species habitat that require offsets

Species	Common Name	Direct impact number of individuals / habitat (ha)	NSW listing status	EPBC Listing status
Chalinolobus dwyeri	Large-eared Pied Bat	0.26	Vulnerable	Vulnerable

2.2.3 Impacts not requiring offsets

All native vegetation impacted in the study area requires offsets.

2.2.4 Areas not requiring assessment

Areas not requiring assessment include existing buildings, carparks, paths, exotic garden lawn and exotic vegetation. The development site contains built/cleared areas, exotic lawn and exotic vegetation (approximately 2.2 ha) as shown in Figure 5. These areas were not consistent with any listed PCT, nor did they contain any threatened species. An assessment of Prescribed Impacts has been undertaken, hence further assessment under the BAM was not required. Areas not requiring assessment are shown on Figure 10.

2.2.5 Credit summary

The number of ecosystem credits required for the development are outlined in Table 26. A total of 3 (three) ecosystem credits are required for impacts to PCT 1776. The number of species credits required for the development are outlined in Table 27. A total of 5 (five) species credit species are required for impacts to Large-eared Pied Bat. The species credit polygons have been determined as the PCTs impacted within 2km of the habitat feature identified in accordance with the BAM and as detailed in the Threatened Biodiversity Data Collection: *cliffs within 2km of rocky areas containing caves, overhangs, escarpment, outcrops, or crevices, or within 2km of old mines or tunnels*. The biodiversity credit report is included in Appendix E.

Table 26: Ecosystem credits required

PCT ID	PCT Name	Vegetation Formation	Direct impact (ha)	Credits required
1776	Smooth-barked Apple - Red Bloodwood open forest on enriched sandstone slopes around Sydney and the Central Coast	Dry Sclerophyll Forests (Grassy sub-formation)	0.26	3

Table 27: Species credit summary

Species	Common Name	Direct impact number of individuals / habitat (ha)	Credits required
Chalinolobus dwyeri	Large-eared Pied Bat	0.26	5

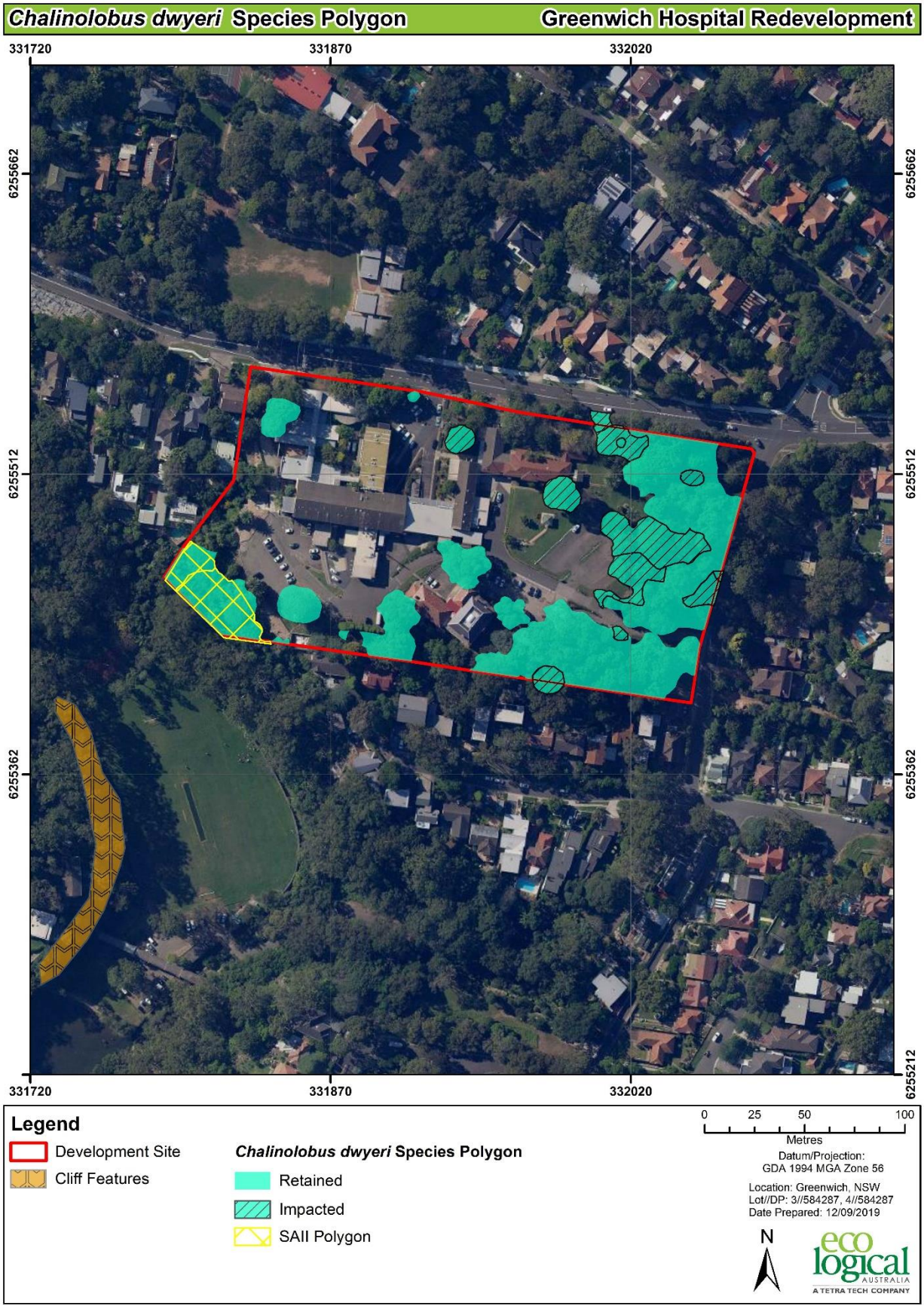

Figure 8: Chalinolobus dwyeri Species Polygon and Serious and Irreversible Impacts

Figure 9: Impacts requiring offset

Figure 10: Areas not requiring assessment

2.3 Consistency with legislation and policy

Additional matters relating to impacts on flora and fauna which are not covered by the BC Act must also be addressed for the proposed development. Potential "Matters of National Environmental Significance" (MNES) in accordance with the EPBC Act have been addressed in Section 2.3.1. Matters relating to Lane Cove Council planning instruments and relevant State planning instruments have been addressed in Section 1.2.

2.3.1 *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)

The EPBC Act establishes a process for assessing the environmental impact of activities and developments where "Matters of National Environmental Significance" (MNES) may be affected. Under the Act, any action which "has, will have, or is likely to have a significant impact on a matter of MNES" is defined as a "controlled action", and requires approval from the Commonwealth Department of the Environment and Energy (DotEE), which is responsible for administering the EPBC Act.

The process includes undertaking an Assessment of Significance for listed threatened species and ecological communities that represent a matter of MNES that will be impacted as a result of the proposed action. Significant impact guidelines that outline a number of criteria have been developed by the Commonwealth, to provide assistance in conducting the Assessment of Significance and help decide whether or not a referral to the Commonwealth is required.

A habitat assessment and Likelihood of Occurrence was completed and two MNES *Pteropus poliocephalus* (Grey-headed Flying-fox) and *Chalinolobus dwyeri* (Large-eared Pied Bat) were assessed under the act (Table 28 and Table 29).

Pteropus poliocephalus (Grey-headed Flying-fox)

The Grey-headed Flying-fox (GHFF) is listed as a Vulnerable species under the EPBC Act.

This species utilises a wide variety of habitats (including disturbed areas) for foraging and have been recorded travelling long distances on feeding forays. Fruits and flowering plants of a wide variety of species are the main food source. The species roosts in large 'camps' of up to 200,000 individuals. Camps are usually formed close to water and along gullies, however, the species has been known to form camps in urban areas (DECCW 2009).

The following camps are located within 10kn of the development site:

- Gordon camp - approximately 9.5 km
- Gladesville camp - is approximately 4.5 km
- Sydney Botanic Gardens camp- approximately 4 km (however it is considered that the GHFF are currently absent from this camp or in low numbers)
- Centennial Park camp - approximately 8.5 km
- Balgowlah camp - is approximately 8.5 km

The vegetation within the development site provides potential seasonal foraging habitat. It is considered likely that this species would use the site on occasion for foraging purposes. According to the National Flying-fox Monitoring Program, no GHFF camps currently occur or have been recorded within the development site (DotEE 2019).

Pteropus poliocephalus Grey-headed Flying-fox have been recorded as feeding on 201 plant species of 50 plant families, with almost half of these in the Myrtaceae (Churchill 2008 in Keystone 2018), but the pollen and nectar of *Eucalyptus, Melaleuca* and *Banksia* (Eby 2000 in Keystone 2018) are their principal foods. Native figs are also important, and they also appear to eat the salt glands from mangrove trees (Churchill 2008).

The availability of native fruits, nectar and pollen varies over time and throughout the range of the species. This species is highly nomadic in response to the uneven distribution of their food plants, sometimes travelling hundreds of kilometres to find suitable resources and / or feeding in domestic gardens, parks and orchards. Such characteristics make it very difficult to define key habitat areas (Eby and Lunney 2002 in Keystone 2018). Also, the areas that offer foraging resources at any time are small and vary in location between years (Eby and Lunney 2002 in Keystone 2018).

The site and immediate surrounds provide such suitable foraging habitat with *Ficus coronata* (Sandpaper Fig), *Ficus rubiginosa* (Port Jackson Fig), *Eucalyptus pilularis* (Blackbutt) and *Glochidion ferdinandi* (Cheese Tree) providing flowers and fruit during the winter months. The remainder of the vegetation on site also provides many foraging resources including *Angophora costata*, *Eucalyptus botryoides Glochidion ferdinandi*, *Acmena smithii* and *Pittosporum undulatum*. In the locality, the majority of suitable foraging habitat for this species occurs within small tributaries and gullies, an within isolated trees in private backyards and as part of street landscaping (Keystone 2018).

Table 28: EPBC Act of Significance for *Pteropus poliocephalus* (Grey-headed Flying-fox)

Criterion	Assessment
Criterion a: lead to a long-term decrease in the size of an important population of a species	The Matters of National Environmental Significance Impact Guidelines 1.1 (Commonwealth of Australia, 2013) defines an important population as a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are: • Key source populations either for breeding or dispersal • Populations that are necessary for maintaining genetic diversity, and/or • Populations that are near the limit of the species range No important populations have been recorded within the development site. The site does not support key source populations for breeding or dispersal, populations necessary for maintaining genetic diversity, or populations near the limit of the species range. According to the National Flying-fox Monitoring Program, no GHFF camps currently occur or have ever been recorded within the development site (DotEE 2019). The nearest active GHFF camp occurs approximately 4.5 km to the west of the development site, within the suburb of Gladesville (DotEE 2019).
Criterion b: reduce the area of occupancy of an important population	No important populations have been recorded within the development site. Therefore, the proposed works would not reduce the area of occupancy of an important population.
Criterion c: fragment an existing important population into two or more populations	According to the National Flying-fox Monitoring Program, no GHFF camps currently occur or have ever been recorded within the development site (DotEE 2019). The nearest active GHFF camp occurs in Gladesville, approximately 4.5 km to the west of the development site (DotEE 2019). Thus, no important population of GHFF occur or have been recorded within the development site. GHFF is a highly mobile species that can exploit widely-separated resources in a single foraging venture. The proposal will result in the removal/modification of 0.26 ha of native vegetation and 0.27 ha of urban exotic vegetation scattered across the site of Greenwich Hospital, however this will not impede movement of this species or significantly fragment its habitat. The potential seasonal foraging habitat to be removed is considered marginal relative to nearby potential

Criterion	Assessment
	habitat within the locality. Whilst the potential foraging habitat may contribute as a 'stepping stone' for this highly mobile species to other more substantial foraging habitat sites, this function is unlikely to be significantly inhibited by the proposed works. Furthermore, this species has been recorded in urban environments and is likely to continue to forage adjacent to the site and across the broader locality. Therefore the proposed works are unlikely to fragment an existing important population into two or more populations.
Criterion d: adversely affect habitat critical to the survival of a species	The individual trees to be removed represent a negligible amount of potential foraging resources in the locality. Potential foraging habitat will persist in close proximity to the development site, and in the Gore Creek Reserve immediately to the south west, and Lane Cove Bushland Park to the north west of the development site. Given that this species is highly mobile (traveling up to 50 km to forage), it is considered unlikely that the works would adversely affect habitat critical to the survival of this species
Criterion e: disrupt the breeding cycle of an important population	According to the National Flying-fox Monitoring Program, no GHFF camps currently occur or have ever been recorded within the development site (DotEE 2019). The nearest active GHFF camp occurs in Gladesville, approximately 4.5 km to the west of the development site (DotEE 2019). Thus, no important population of GHFF occurs within the development site, and the proposed works is unlikely to disrupt the breeding cycle of an important population.
Criterion f: Adversely affect habitat critical to the survival of a species; modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Given the small amount of potential foraging habitat to be removed relative to the amount remaining in the locality, it is considered that potential foraging habitat will persist adjacent to the development site and across the locality. This species is highly mobile, and it is unlikely that the habitat to be removed would cause the species to decline. Furthermore, according to the National Flying-fox Monitoring Program, no GHFF camps currently occur or have ever been recorded within the development site (DotEE 2019). The nearest active GHFF camp occurs in Gladesville, approximately 4.5 km to the west of the development site (DotEE 2019). Therefore, no known GHFF roosting camps for this species will be impacted by the proposed works.
Criterion g: Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	The proposed works will not result in the establishment of an invasive species that is harmful to GHFF.
Criterion h: Introduce disease that may cause the species to decline	The proposed works will not result in the introduction of a disease that is harmful to the GHFF.
Criterion i: Interfere substantially with the recovery of the species	Considering the above factors, the proposed works will not interfere substantially with the recovery of the species.
Conclusion	In consideration of the above, the proposed works are considered unlikely to have a significant impact on the GHFF.

Chalinolobus dwyeri (Large-eared Pied Bat)

The Large-eared Pied Bat is listed as Vulnerable under the EPBC Act. The Large-eared Pied Bat is a wattle bat with glossy black fur and a fringe of white around the body, beneath the wings and tail membrane (Strahan 1995 in Keystone 2018). Its wing geometry indicates that it is capable of very manoeuvrable flight and therefore probably forages for small flying insects below the forest canopy (Hoye and Schulz

2008 in Keystone 2018). Distribution records range from south eastern Queensland to NSW from the coast to the western slopes of the Great Dividing Range (Churchill 1998 in Keystone 2018).

The Large-eared Pied Bat in found in habitat ranging from coastal wet sclerophyll to dry sclerophyll forest and open woodland (Strahan 1995 in Keystone 2018). The largest numbers of records occur in the sandstone escarpment country in the Sydney Basin and Hunter Valley regions (Hoye and Schulz 2008 in Keystone 2018). Recent habitat modelling in the southern Sydney region suggests that it is largely restricted to the interface of the sandstone escarpment (for roost habitat) and relatively fertile valleys (for foraging habitat) (DECC 2007 in Keystone 2018). Small groups have been recorded roosting in caves and mines (Strahan 1995 in Keystone 2018). They are also known to roost in crevices in cliffs and in the disused mud nests of the Fairy Martin (Hoye and Schulz 2008 in Keystone 2018).

Survey undertaken in the development site by Keystone Ecological in 2017 recorded foraging calls identified as *probable* Large-eared Pied Bat (Keystone 2018).

Suitable roosting habitat is considered to be available within the nearby sandstone escarpment to the south west of the development site. This species is known to forage near its roost sites, and therefore the development site is considered to provide suitable foraging habitat.

Table 29: EPBC Act of Significance for *Chalinolobus dwyeri* (Large-eared Pied Bat)

Criterion	Assessment
Criterion a: lead to a long-term decrease in the size of an important population of a species	Large-eared Pied Bat (LEPB) was recorded (potentially) in the development site during the Anabat survey undertaken by Keystone Ecological in 2017. This species had not been previously recorded within 5 km of the study area. The site provides suitable foraging habitat for this highly mobile species. Specifically, the proposal requires the removal/modification of 0.26 ha of native vegetation and 0.27 ha of urban exotic vegetation representing potential foraging habitat for the LEPB. However, the majority of the vegetation proposed for removal degraded and fragmented. LEPB is less likely to utilise more fragmented and disturbed area of vegetation. The proposed works will not result in the removal of roosting habitat. No potential foraging habitat along the south-western boundary of the development site will be removed or modified. The area of habitat to be removed is a small and already disturbed, compared to available habitats in the local area, such as Gore Creek Reserve and Lane Cove Bushland Park. Given the abundance of foraging and roosting habitat in the surrounding landscape, and that breeding habitat will not be impacted, the proposed works are unlikely to affect any populations of this species that would lead to a long-term decrease in the size of an important population of this species.
Criterion b: reduce the area of occupancy of an important population	Under the proposal approximately 0.26 ha of native vegetation and 0.27 ha of urban exotic vegetation, representing potential foraging habitat would be removed, which may cause a disturbance to the LEPB. However, these impacts are unlikely to reduce the area of occupancy for any known individuals or populations given no breeding or roosting habitat will be impacted and large areas of foraging habitat will be retained within the development site and locality.
Criterion c: fragment an existing important population into two or more populations	The LEPB is a highly mobile species with relatively abundant foraging resources in the south west of the development site and locality. The proposed development will result in impacts to predominantly disturbed native vegetation and will remove habitat in an already highly urbanised (and well-lit) location, which will not impede movement of this species or significantly fragment its habitat. This is a highly mobile species that can

Criterion	Assessment
	exploit widely-separated resources in a single foraging venture.. The development will not cause any significant fragmentation of habitat for this mobile species and vegetated corridors will be retained within the development site. Therefore, the proposed action is unlikely to fragment the existing important population into two or more populations.
Criterion d: adversely affect habitat critical to the survival of a species	Habitat critical to the survival of LEPB comprises sandstone cliffs and fertile wooded valley habitat within close proximity of each other. The proposed development will not impact on sandstone cliffs which could contain potential breeding habitat. Vegetation to be removed in the east and north-east of the study area consists of considered fertile wooded valley within proximity to sandstone cliffs, however large areas of suitable habitat adjacent to the impact area will be retained. No roosts or breeding sites are present directly adjacent to proposed impact areas. Therefore no habitat critical to the survival of this species will be adversely affected by the proposal.
Criterion e: disrupt the breeding cycle of an important population	As no breeding habitat would be removed or disturbed, it is unlikely the proposed work would disrupt the breeding cycle of this species.
Criterion f: Adversely affect habitat critical to the survival of a species; modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	No breeding sites would be removed, or disturbed, and large areas of foraging habitat will remain within and immediately adjacent to the development site. The proposed action would therefore be unlikely to modify, destroy, remove, or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
Criterion g: Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	The proposal would not result in invasive species, such as weeds, that would be harmful to LEPB. It is unlikely that the proposed action will result in a large increase in the number of weeds due to the current disturbed nature of the site.
Criterion h: Introduce disease that may cause the species to decline	The proposed development is unlikely to introduce disease that may cause the species to decline.
Criterion i: Interfere substantially with the recovery of the species	As no roosting or breeding habitat would be impacted, the proposed action will only remove a small amount of potential foraging habitat. Foraging habitat will be retained within the development site and large amounts of habitat are available in the wider locality. It is therefore unlikely the proposed action would interfere substantially with the recovery of this species.
Conclusion	The action will not affect known breeding habitat and will only impact on foraging habitat for this species. No important populations would be isolated or fragmented and the life cycle of this species is not likely to be affected. Therefore, the action is not likely to have a significant impact on this species and a Referral is not required.

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Appendix A: Definitions

Terminology	Definition
Biodiversity credit report	The report produced by the Credit Calculator that sets out the number and class of biodiversity credits required to offset the remaining adverse impacts on biodiversity values at a development site, or on land to be biodiversity certified, or that sets out the number and class of biodiversity credits that are created at a biodiversity stewardship site.
BioNet Atlas	The BioNet Atlas (formerly known as the NSW Wildlife Atlas) is the OEH database of flora and fauna records. The Atlas contains records of plants, mammals, birds, reptiles, amphibians, some fungi, some invertebrates (such as insects and snails) and some fish
Broad condition state:	Areas of the same PCT that are in relatively homogenous condition. Broad condition is used for stratifying areas of the same PCT into a vegetation zone for the purpose of determining the vegetation integrity score.
Connectivity	The measure of the degree to which an area(s) of native vegetation is linked with other areas of vegetation.
Credit Calculator	The computer program that provides decision support to assessors and proponents by applying the BAM, and which calculates the number and class of biodiversity credits required to offset the impacts of a development or created at a biodiversity stewardship site.
Development	Has the same meaning as development at section 4 of the EP&A Act, or an activity in Part 5 of the EP&A Act. It also includes development as defined in section 115T of the EP&A Act.
Development footprint	The area of land that is directly impacted on by a proposed development, including access roads, and areas used to store construction materials.
Development site	An area of land that is subject to a proposed development that is under the EP&A Act.
Ecosystem credits	A measurement of the value of EECs, CEECs and threatened species habitat for species that can be reliably predicted to occur with a PCT. Ecosystem credits measure the loss in biodiversity values at a development site and the gain in biodiversity values at a biodiversity stewardship site.
High threat exotic plant cover	Plant cover composed of vascular plants not native to Australia that if not controlled will invade and outcompete native plant species.
Hollow bearing tree	A living or dead tree that has at least one hollow. A tree is considered to contain a hollow if: (a) the entrance can be seen; (b) the minimum entrance width is at least 5 cm; (c) the hollow appears to have depth (i.e. you cannot see solid wood beyond the entrance); (d) the hollow is at least 1 m above the ground. Trees must be examined from all angles.
Important wetland	A wetland that is listed in the Directory of Important Wetlands of Australia (DIWA) and SEPP 14 Coastal Wetlands
Linear shaped development	Development that is generally narrow in width and extends across the landscape for a distance greater than 3.5 kilometres in length
Local population	The population that occurs in the study area. In cases where multiple populations occur in the study area or a population occupies part of the study area, impacts on each subpopulation must be assessed separately.
Local wetland	Any wetland that is not identified as an important wetland (refer to definition of Important wetland).
Mitchell landscape	Landscapes with relatively homogeneous geomorphology, soils and broad vegetation types, mapped at a scale of 1:250,000.

Terminology	Definition
Multiple fragmentation impact development	Developments such as wind farms and coal seam gas extraction that require multiple extraction points (wells) or turbines and a network of associated development including roads, tracks, gathering systems/flow lines, transmission lines
Operational Manual	The Operational Manual published from time to time by OEH, which is a guide to assist assessors when using the BAM
Patch size	An area of intact native vegetation that: a) occurs on the development site or biodiversity stewardship site, and b) includes native vegetation that has a gap of less than 100 m from the next area of native vegetation (or ≤30 m for non-woody ecosystems). Patch size may extend onto adjoining land that is not part of the development site or stewardship site.
Proponent	A person who intends to apply for consent to carry out development or for approval for an activity.
Reference sites	The relatively unmodified sites that are assessed to obtain local benchmark information when benchmarks in the Vegetation Benchmarks Database are too broad or otherwise incorrect for the PCT and/or local situation. Benchmarks can also be obtained from published sources.
Regeneration	The proportion of over-storey species characteristic of the PCT that are naturally regenerating and have a diameter at breast height <5 cm within a vegetation zone.
Remaining impact	An impact on biodiversity values after all reasonable measures have been taken to avoid and minimise the impacts of development. Under the BAM, an offset requirement is calculated for the remaining impacts on biodiversity values.
Retirement of credits	The purchase and retirement of biodiversity credits from an already-established biobank site or a biodiversity stewardship site secured by a biodiversity stewardship agreement.
Riparian buffer	Riparian buffers applied to water bodies in accordance with the BAM
Sensitive biodiversity values land map	Development within an area identified on the map requires assessment using the BAM.
Site attributes	The matters assessed to determine vegetation integrity. They include: native plant species richness, native over-storey cover, native mid-storey cover, native ground cover (grasses), native ground cover (shrubs), native ground cover (other), exotic plant cover (as a percentage of total ground and mid-storey cover), number of trees with hollows, proportion of over-storey species occurring as regeneration, and total length of fallen logs.
Site-based development	a development other than a linear shaped development, or a multiple fragmentation impact development
Species credits	The class of biodiversity credits created or required for the impact on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates. Species that require species credits are listed in the Threatened Biodiversity Data Collection.
Subject land	Is land to which the BAM is applied in Stage 1 to assess the biodiversity values of the land. It includes land that may be a development site, clearing site, proposed for biodiversity certification or land that is proposed for a biodiversity stewardship agreement.
Threatened Biodiversity Data Collection	Part of the BioNet database, published by OEH and accessible from the BioNet website.
Threatened species	Critically Endangered, Endangered or Vulnerable threatened species as defined by Schedule 1 of the BC Act, or any additional threatened species listed under Part 13 of the EPBC Act as Critically Endangered, Endangered or Vulnerable.

Terminology	Definition
Vegetation Benchmarks Database	A database of benchmarks for vegetation classes and some PCTs. The Vegetation Benchmarks Database is published by OEH and is part of the BioNet Vegetation Classification.
Vegetation zone	A relatively homogenous area of native vegetation on a development site, land to be biodiversity certified or a biodiversity stewardship site that is the same PCT and broad condition state.
Wetland	An area of land that is wet by surface water or ground water, or both, for long enough periods that the plants and animals in it are adapted to, and depend on, moist conditions for at least part of their life cycle. Wetlands may exhibit wet and dry phases and may be wet permanently, cyclically or intermittently with fresh, brackish or saline water
Woody native vegetation	Native vegetation that contains an over-storey and/or mid-storey that predominantly consists of trees and/or shrubs

Appendix B: Vegetation plot data

Table 30: Species matrix (species recorded by plot)

Family	Species	Common Name	Exotic	High Threat Weed	Growth Form Group	Plot 1			Plot 2		
						Stratum & Layer	Cover	Abundance	Stratum & Layer	Cover	Abundance
Polygonaceae	*Acetosa sagittata*	Rambling Dock	*	1		g	0.1	10			
Adiantaceae	*Adiantum aethiopicum*	Common Maidenhair			Fern (EG)	g	4	100			
Alliaceae	*Agapanthus praecox*		*			g	30	500			
Agavaceae	*Agave sp.*		*			g	0.1	2			
Myrtaceae	*Angophora costata*	Sydney Red Gum			Tree (TG)	u	35	7	u	0.1	1
Arecaceae	*Archontophoenix cunninghamiana*	Bangalow Palm			Other (OG)	g	0.1	1			
Asparagaceae	*Asparagus aethiopicus*	Asparagus Fern	*	1		m	0.5	20	g	0.1	1
Aspleniaceae	*Asplenium australasicum*	Bird's Nest Fern			Fern (EG)	m	0.1	2			
Proteaceae	*Banksia integrifolia subsp. integrifolia*	Coastal Banksia			Tree (TG)	m	0.1	1			
Dicksoniaceae	*Calochlaena dubia*	Rainbow Fern			Other (OG)	g	2	50			
Ulmaceae	*Celtis sinensis*	Japanese Hackberry	*			g	0.1	1			
Anthericaceae	*Chlorophytum comosum*	Spider Plant	*			g	1	50			
Lauraceae	*Cinnamomum camphora*	Camphor Laurel	*	1		g	0.5	6	g	0.1	5
Phormiaceae	*Dianella caerulea var. caerulea*				Forb (FG)	g	0.1	1			
Sapindaceae	*Dodonaea triquetra*	Large-leaf Hop-bush			Shrub (SG)	m	0.1	2			

Family	Species	Common Name	Exotic	High Threat Weed	Growth Form Group	Plot 1			Plot 2		
						Stratum & Layer	Cover	Abundance	Stratum & Layer	Cover	Abundance
Doryanthaceae	*Doryanthes excelsa*	Gymea Lily			Other (OG)	m	4	20			
Commelinaceae	*Commelina cyanea*	Native Wandering Jew			Forb (FG)				g	0.1	10
Elaeocarpaceae	*Elaeocarpus reticulatus*	Blueberry Ash			Shrub (SG)	m	0.1	1			
Poaceae	*Entolasia marginata*	Bordered Panic			Grass & grasslike (GG)	g	0.1	10			
Poaceae	*Entolasia stricta*	Wiry Panic			Grass & grasslike (GG)	g	0.1	10			
Moraceae	*Ficus rubiginosa*	Port Jackson Fig			Tree (TG)	u	1	5			
Asteraceae	*Conyza bonariensis*	Flaxleaf Fleabane	*						g	0.1	1
Proteaceae	*Grevillea robusta*				Shrub (SG)	g	0.1	5			
Zingiberaceae	*Hedychium gardnerianum*	Ginger Lily	*			m	0.2	5			
Dilleniaceae	*Hibbertia dentata*	Twining Guinea Flower			Other (OG)	g	0.1	10			
Asteraceae	*Hypochaeris radicata*	Catsear	*			g	0.1	20			
Convolvulaceae	*Ipomoea indica*	Morning Glory	*	1		g	0.1	2			
Verbenaceae	*Lantana camara*	Lantana	*	1		m	1	10			
Cyperaceae	*Lepidosperma laterale*	Variable Sword-sedge			Grass & grasslike (GG)	g	0.1	1			
Cyperaceae	*Cyperus gracilis*	Slender Flat-sedge			Grass & grasslike (GG)				g	0.1	20
Poaceae	*Ehrharta erecta*	Panic Veldtgrass	*	1		g	0.1	50	g	0.1	20
Lomandraceae	*Lomandra longifolia*	Spiny-headed Mat-rush			Grass & grasslike (GG)	g	0.1	2			
Fabaceae (Faboideae)	*Erythrina x sykesii*	Coral tree	*	1					u	5	2
Myrtaceae	*Eucalyptus pilularis*	Blackbutt			Tree (TG)				u	15	3
Ochnaceae	*Ochna serrulata*	Mickey Mouse Plant	*	1		m	0.2	20			

Family	Species	Common Name	Exotic	High Threat Weed	Growth Form Group	Plot 1			Plot 2		
						Stratum & Layer	Cover	Abundance	Stratum & Layer	Cover	Abundance
Myrtaceae	*Eucalyptus saligna*	Sydney Blue Gum			Tree (TG)				u	5	2
Euphorbiaceae	*Euphorbia peplus*	Petty Spurge	*						g	0.1	10
Oxalidaceae	*Oxalis spp.*				Forb (FG)	g	0.1	5			
Pittosporaceae	*Pittosporum undulatum*	Sweet Pittosporum			Shrub (SG)	m	10	20			
Araliaceae	*Polyscias sambucifolia*				Shrub (SG)	m	1	20			
Lobeliaceae	*Pratia purpurascens*				Forb (FG)	g	0.1	20			
Dennstaedtiaceae	*Pteridium esculentum*	Bracken			Fern (EG)	g	0.1	10			
Malaceae	*Rhaphiolepis indica*	Indian Hawthorn	*			m	3	20			

g = Ground, m = Midstorey, u = Understorey; TG = Tree, SG = Shrub, GG = Grass & Grasslike, FG = Forb, EG = Fern, OG = Other

Table 31: Vegetation integrity data (Composition, Structure and function)

Plot location data							
Plot no.	PCT	Vegetation Zone	Condition	Zone	Eastings	Northings	Bearing
1	1776	1	Moderate	56	331995	0332041	92
2	1776	2	Managed	56	332035	6255976	68

Composition (number of species)						
Plot no.	Tree	Shrub	Grass	Forb	Fern	Other
1	4	5	6	3	3	6
2	4	0	3	2	0	1

Structure (Total cover %)						
Plot no.	Tree	Shrub	Grass	Forb	Fern	Other
1	37.5	11.3	0.7	0.3	4.2	6.4
2	20.2	0	1	0.2	0	0.1

Function												
Plot no.	Large Trees	Hollow trees	Litter Cover (%)	Length Fallen Logs (m)	Tree Stem 5-9 cm	Tree Stem 10-19 cm	Tree Stem 20-29 cm	Tree Stem 30-49 cm	Tree Stem 50-79 cm	Tree Stem 80+ cm	Tree Regen	High Threat Weed Cover (%)
1	3	1	94	12	0	1	1	1	1	0	1	3
2	7	1	89	0	0	0	0	1	1	1	0	15.5

For stem size classes: 0 = Absence, 1 = Presence.

Appendix C: Photos

Plate 1: Plot 1 Left: Start. Right: End.

Plate 2: Plot 2: Left: Start. Right: End.

Appendix D: Other species recorded

Common Name	Scientific Name	Native/ Exotic
Acer negundo	Box-elder Maple	E
Acetosa sagittata	Rambling Dock	E
Adiantum aethiopicum	Common Maidenhair	N
Agapanthus spp.	-	E
Agave spp.	-	E
Angophora costata	Sydney Red Gum	N
Araujia sericifera	Moth Vine	E
Archontophoenix cunninghamiana	Bangalow Palm	N
Asparagus aethiopicus	Asparagus Fern	E
Asplenium australasicum	Bird's Nest Fern	N
Banksia integrifolia subsp. integrifolia	Coastal Banksia	N
Brachychiton acerifolius	Flame Tree	N
Briza sp.	-	E
Calochlaena dubia	Rainbow Fern	N
Cassytha pubescens	-	N
Celtis sinensis	Japanese Hackberry	E
Chlorophytum spp.	-	E
Ciclospermum	Spider Plant	E
Cinnamomum camphora	Camphor Laurel	E
Commelina cyanea	Native Wandering Jew	N
Conyza bonariensis	Flaxleaf Fleabane	E
Corymbia citriodora	Lemon-scented Gum	N
Cupaniopsis anacardioides	Tuckeroo	N
Cyperus gracilis	Slender Flat-sedge	N
Dianella caerulea var. caerulea	-	N
Dichondra repens	Kidney Weed	N
Dodonaea triquetra	Large-leaf Hop-bush	N
Doryanthes excelsa	Gymea Lily	N
Ehrharta erecta	Panic Veldtgrass	E
Elaeocarpus reticulatus	Blueberry Ash	N
Entolasia marginata	Bordered Panic	N
Entolasia stricta	Wiry Panic	N
Erythrina x sykesii	Coral tree	E
Eucalyptus botryoides	Bangalay	N
Eucalyptus haemastoma	Scribbly Gum	N
Eucalyptus microcorys	Tallowwood	N
Eucalyptus pilularis	Blackbutt	N

Common Name	Scientific Name	Native/ Exotic
Eucalyptus piperita	Sydney Peppermint	N
Eucalyptus saligna	Sydney Blue Gum	N
Eucalyptus sideroxylon	Mugga Ironbark	N
Euphorbia peplus	Petty Spurge	E
Ficus rubiginosa	Port Jackson Fig	N
Fumaria spp.	Fumitory	E
Gamochaeta spp.	-	E
Glochidion ferdinandi var. ferdinandi	Cheese Tree	N
Glycine tabacina	-	N
Grevillea spp.	-	N
Hedera spp.	-	E
Hedychium gardnerianum	Ginger Lily	E
Hibbertia dentata	Twining Guinea Flower	N
Hypochaeris radicata	Catsear	E
Ipomoea indica	Morning Glory	E
Jacaranda mimosifolia	Jacaranda	E
Lagerstroemia indica	Crepe Myrtle	E
Lantana camara	Lantana	E
Lepidosperma laterale	Variable Sword-sedge	N
Ligustrum lucidum	Large-leaved Privet	E
Ligustrum sinense	Small-leaved Privet	E
Lomandra longifolia	Spiny-headed Mat-rush	N
Lonicera japonica	Japanese honeysuckle	E
Lophostemon confertus	Brush Box	N
Macrozamia communis	Burrawang	N
Medicago spp.	A Medic	E
Microlaena stipoides var. stipoides	Weeping Grass	N
Modiola caroliniana	Red-flowered Mallow	E
Monstera deliciosa	Swiss Cheese Plant	E
Ochna serrulata	Mickey Mouse Plant	E
Olea europaea subsp. cuspidata	African Olive	E
Oplismenus aemulus	-	N
Oplismenus aemulus	Australian Basket Grass	N
Oxalis spp.	-	N
Paronychia brasiliana	Chilean Whitlow Wort, Brazilian Whitlow	E
Persoonia linearis	Narrow-leaved Geebung	N
Phoenix canariensis	Canary Island Date Palm	E
Pittosporum undulatum	Sweet Pittosporum	N
Poa annua	Winter Grass	E

Common Name	Scientific Name	Native/ Exotic
Polyscias spp.	-	N
Pratia spp.	-	N
Pteridium esculentum	Bracken	N
Rhaphiolepis indica	Indian Hawthorn	E
Richardia spp.	-	E
Rumex brownii	Swamp Dock	N
Schefflera actinophylla	Umbrella tree	E
Senna pendula var. glabrata	-	E
Sida rhombifolia	Paddy's Lucerne	E
Smilax glyciphylla	Sweet Sarsparilla	N
Solanum nigrum	Black-berry Nightshade	E
Soliva sessilis	Bindyi	E
Sonchus oleraceus	Common Sowthistle	E
Stenotaphrum secundatum	Buffalo Grass	E
Stenotaphrum secundatum	Buffalo grass	E
Strelitzia sp.	Bird of Paradise	E
Strelitzia spp.	-	E
Taraxacum officinale	Dandelion	E
Tecoma capensis	Cape Honeysuckle	E
Tradescantia fluminensis	Wandering Jew	E
Trifolium spp.	A Clover	E

E = Exotic, N = Native

Appendix E: Biodiversity credit report

BAM Credit Summary Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00016559/BAAS18077/19/00016560	Greenwich Hospital Redevelopment Masterplan	30/08/2019
Assessor Name	**Report Created**	**BAM Data version ***
	13/09/2019	13
Assessor Number	**BAM Case Status**	**Date Finalised**
	Open	To be finalised
Assessment Revision	**Assessment Type**	
1	Major Projects	

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetation zone name	Vegetation integrity loss / gain	Area (ha)	Constant	Species sensitivity to gain class (for BRW)	Biodiversity risk weighting	Potential SAII	Ecosystem credits
Smooth-barked Apple - Red Bloodwood open forest on enriched sandstone slopes around Sydney and the Central Coast								
1	1776_Moderate	46.9	0.0	0.25	High Sensitivity to Potential Gain	1.75		1

BAM Credit Summary Report

2	1776_Managed	22.4	0.2	0.25	High Sensitivity to Potential Gain	1.75		2
							Subtotal	**3**
							Total	**3**

Species credits for threatened species

Vegetation zone name	Habitat condition (HC)	Area (ha) / individual (HL)	Constant	Biodiversity risk weighting	Potential SAII	Species credits
Chalinolobus dwyeri / Large-eared Pied Bat (Fauna)						
1776_Moderate	46.9	0.02	0.25	3	True	1
1776_Managed	22.4	0.24	0.25	3	True	4
					Subtotal	**5**

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