Upgrades to Chatswood Public School and Chatswood High School

Appendix 31 - Biodiversity Development Assessment Report

SSD 9483
Prepared by Eco Logical Australia
For School Infrastructure NSW, Department of Education

Artists impression of upgrades to Chatswood Public School

Upgrades to Chatswood Public School and Chatswood High School - Biodiversity Development Assessment Report

Architectus on behalf of Department of Education

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Project Manager	Rebecca Ben-Haim
Prepared by	Belinda Failes
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Template 2.8.1

Executive Summary

Eco Logical Australia Pty Ltd was engaged by Architectus on behalf of Department of Education to prepare a Biodiversity Development Assessment Report (BDAR) for the proposed Upgrades to Chatswood Public School and Chatswood High School project.

The Department of Education (DoE) propose to upgrade the teaching facilities of both Chatswood Public School and Chatswood High School (referred to as 'the development site'). This will include the redevelopment of the Chatswood Public School and Chatswood High School. The proposed redevelopment is a School Infrastructure (SI) project, will be governed by the NSW Government Gateway Review Process, and assessed as State Significant Development (SSD) (application SSD 18_9483) in accordance with both the *State Environmental Planning Policy* (Educational Establishments and Child Care Facilities) 2017 and NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). The Secretary's Environmental Assessment Requirements (SEARs) have been issued and require the preparation of a Biodiversity Development Assessment Report under the NSW *Biodiversity Conservation Act 2016* (BC Act).

The combined area of Chatswood Public School and Chatswood High School (referred to as the 'development site') is 7.31 ha. The proposed development site covers an area of 0.94 ha. The proposed development will result in the removal of 0.14 ha native planted vegetation, 0.006 ha remnant native vegetation.

The development site will impact upon biodiversity values within the development site and as such a BDAR is required to assess the vegetation clearing under the BC Act. This report has been prepared to meet the requirements of the Biodiversity Assessment Method 2016 (BAM) established under Section 6.7 of the NSW BC Act 2016. Requirements of the Willoughby Local Environment Plan 2012 (WLEP) and Development Control Plan (DCP) have also been addressed in this document.

The vegetation within the two sites is highly disturbed with scattered planting of mature native species which have been incorporated into horticultural landscape gardens. A large extent of native vegetation in varying condition is located at the southern portion of the current Chatswood High School site. This area has been zoned as E2 environmental corridor and no works are proposed within this area. This patch of vegetation has been mapped as PCT 1237 Sydney *Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion.* A second patch of PCT 1237 was mapped along the western perimeter and will be upon by the proposed works. This patch is contiguous with the southern patch of PCT 1237. PCT 1237 conforms to Blue Gum High Forest and is listed as part of the critically endangered ecological community listed under the NSW BC Act and Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). This patch of bushland has also been mapped on the Biodiversity Values Map. Blue Gum High Forest is also listed as a Serious and Irreversible Impact (SAII) entity. Consideration of SAII candidates have been assessed as part of this BDAR.

The remaining vegetation within the development site has been planted using native indigenous canopy species. Under the BAM all vegetation native to NSW must be assigned a Plant Community Type (PCT). Where native vegetation has been planted and does not clearly confirm to any PCT, a 'best-fit' PCT must be assigned. Based on the OEH mapping, soil profile and field validation of remnant vegetation retained

within the development site the planted native vegetation conforms to PCT 1237. Although components of this PCT corresponds to Blue Gum High Forest listed under the BC and EPBC Acts, this planted patch of vegetation does not correspond to a threatened ecological community (TEC).

No threatened flora or fauna species were recorded on or within the development site. There is potential that highly mobile threatened species may utilise the vegetation for foraging resources on occasion. Consideration has been given to these highly mobile species during the preparation of this BDAR.

Measures taken to avoid, minimise and mitigate impacts to the vegetation and species habitat present within the development site and methodologies to minimise impacts during construction and operation of the development have been included in this BDAR.

Following consideration of all the above aspects, the residual unavoidable impacts of the project were calculated in accordance with the BAM by utilising the Biodiversity Assessment Method Credit calculator (BAMC). For *PCT 1237_weedy* the BAMC generated a vegetation integrity score of 33.4 and *PCT 1237_native_planted*, generated an integrity score of 25. Under the BAM, 1 ecosystem credit is required to offset the removal of 0.006 ha of *PCT 1237_weedy* (TEC)and 2 ecosystem credits are required to offset 0.14 ha of *PCT 1237_native_planted* (Non-TEC).

One Matter of National Environmental Significance (MNES) was identified as having potential to be adversely affected by the proposed works. *Pteropus poliocephalus* (Grey-headed Flying-fox) is listed as Vulnerable under the EPBC Act and it is considered that this species is likely to use some of the development site for foraging. An assessment of the Commonwealth Significant Impact Criteria was undertaken for the Grey-headed Flying-fox and concluded that the project would not have a significant impact on this species. As such, a referral to the Commonwealth is not required.

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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
BGHF	Blue Gum High Forest
CEEC	Critically Endangered Ecological Community
DCP	Development Control Plan
DoE	Department of Education
DoEE	Commonwealth Department of the Environment and Energy
DPIE	NSW Department of Planning, Industry and Environment (previously known as NSW Department of Planning and Environment DPE)
DPE	NSW Department of Planning and Environment (now DPIE)
EES	NSW Environment, Energy and Science (previously known as NSW Office of Environment and Heritage, OEH)
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
GHFF	Grey-headed Flying-fox
HBT	Hollow-bearing tree
IBRA	Interim Biogeographic Regionalisation for Australia
LEP	Local Environmental Plan
LGA	Local Government Area
MNES	Matter of National Environmental Significance
NSW	New South Wales
NOW	NSW Office of Water
OEH	NSW Office of Environment and Heritage (now EES)
PCT	Plant Community Type
SEARs	Secretary's Environmental Assessment Requirements
SI	School Infrastructure
SAII	Serious and Irreversible Impacts
SSD	State Significant Development
TEC	Threatened Ecological Community

Abbreviation	Description
VIS	Vegetation Information System
WLEP	Willoughby Local Environmental Plan
WM Act	NSW *Water Management Act 2000*

1. Stage 1: Biodiversity assessment

1.1 Introduction

This Biodiversity Development Assessment Report (BDAR) has been prepared by Belinda Failes, is an Accredited Person (BAAS18159) under the NSW *Biodiversity Conservation Act 2016* (BC Act). And peer reviewed by Nicole McVicar (BAAS18077) who is also an accredited person under the BC Act.

1.1.1 General description of the development site

The *Upgrades to Chatswood Public School and Chatswood High School* development site is located at two disconnected locations, Site 1 is located at Chatswood High School (24 Centennial Avenue) and Site 2 is the Chatswood Public School (5 Centennial Avenue corner. Pacific Highway).

The Department of Education (DoE) propose to upgrade teaching facilities at both Chatswood Public School and Chatswood High School (referred to as 'the development site'). This will also include new sport and recreation facilities within Chatswood Public School and Chatswood High School.

The proposed redevelopment is a School Infrastructure (SI) project, will be governed by the NSW Government Gateway Review Process and assessed as State Significant Development (SSD) (application SSD 18_9483) in accordance with both the State Environmental Planning Policy (Educational Establishments and Child Care Facilities) 2017 and *Environmental Protection and Assessment Act 1979* (EP&A Act). The Secretary's Environmental Assessment Requirements (SEARs) have been issued and require the preparation of a Biodiversity Development Assessment Report (BDAR) under the NSW BC Act.

The Chatswood High School (referred to as 'Site 1" in the planning documents) is bound by Centennial Avenue to the north, residential development and Oliver Road to the east, Eddy Road in the south and De Villiers Avenue in the west (Figure 1). It is approximately 5.97 ha in size.

The Chatswood Public School (referred to as 'Site 2" in the planning documents) is the smaller of the two sites and is approximately 1.34 ha in size and bounded by Pacific Highway in the east, Centennial Avenue in the south, Chatswood OSHC Centre to the west and existing residential development in the north (Figure 1).

Both sites are owned by the DoE and are located within the Willoughby Local Government Area (LGA). Chatswood Public School is zoned R2 Low Density Residential which provides opportunities for residential or educational use with consent approval as defined in the Willoughby Local Environmental Plan 2012 (WLEP). The majority of the Chatswood High School is zoned SP2 Education Establishment and the south-western corner is zoned E2 Environmental Conservation. E2 aims to conserve environmental values while providing opportunities for environmental facilities and roads.

The subject site consists of the following lots:

- Site 1 (Chatswood High School) - Lot 1 in DP 725204, Lots 20 -23 DP 2273, Lots 18-21 DP 2273, Lots 16-20 DP2272.
- Site 2 (Chatswood Public School) - Lot 1 in DP 812207 and Lot C DP 346499.

The existing development is concentrated within the centre portion of the Site 1. A large patch of native vegetation is located in the southern and western portion, this is separated from the existing educational buildings by a newly constructed synthetic sporting field. Planted native trees and horticultural gardens are intersperse around the buildings and carpark facilities and a large patch of native planted canopy is present in the northern portion of the site. Site 2 contains patches of landscaped native gardens.

The vegetation along the southern and western boundary of Site 1 has been mapped on the Biodiversity Values Map (accessed 19 December 2019).

This report includes two base maps, the Site Map (Figure 1) and the Location Map (Figure 2).

1.1.2 Development Site footprint

The development site footprint is provided in Figure 1. The proposed development will primarily utilise the existing building footprints and open space where available. The proposed development will involve construction of new buildings. Scattered canopy trees and some landscaping gardens may be impacted or removed to accommodate the new development.

The proposed redevelopment of Building R (shown in grey in Figure 1) within the eastern portion of Site 1, has been assessed under a separate development application and impacts are of Building R are not included in this SSD assessment. Additionally, the SSD application does not include the demolition works, refurbishment works or tree removal or removal of demountable buildings as these works will be assessed under a separate legislative pathway. However, for the purpose of this BDAR, the vegetation within the development site has been assessed as part of the biodiversity values of the development site and included in the impacts.

In summary, upgrades to Site 1 and Site 2 will deliver:

- More than 150 new and refurbished innovative learning and teaching spaces
- Increase quality active space currently allocated to primary school and high school students
- Specialist teaching facilities such as science, art and music rooms
- Dedicated performing arts spaces
- New sports facilities and recreational areas
- New libraries and administration facilities.

Site 1

- 123 new and refurbished classrooms (comprising 21 existing and 102 new spaces)
- New administration and staff facilities;
- New hall
- Associated site works and landscaping.

Site 2

- 53 new and refurbished homebases (comprising 25 existing and 28 new spaces);
- 4 x special program classrooms (music, language etc);
- 3 x special support unit classrooms;
- Increased quality active play spaces;

- Retaining Heritage buildings A and B
- New hall;
- New car parking facilities; and
  Associated site works and landscaping.

1.1.3 Sources of information used

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

- Biodiversity Assessment Methodology Calculator
- BioNet Vegetation Classification System
- BioNet / Atlas of NSW Wildlife 5 km database search (OEH 2019a)
- EPBC Act Protected Matters Search Tool 5 km database search (DotEE 2019a)
- The Native Vegetation of the Sydney Metropolitan Area (OEH 2013)
- Threatened Species Profiles (OEH 2019b)
- Biodiversity values map and threshold tool (online tool) (OEH 2019c)
- Aerial mapping (SIXMaps)
- Additional Geographic Information System (GIS) datasets including soil, topography, geology and drainage
- Request for Secretary's Environmental Assessment Requirements – Upgrades to Chatswood Public School and Chatswood High School (Johnstaff 2018).
- Niche Environment and Heritage Biodiversity constraints report 2018

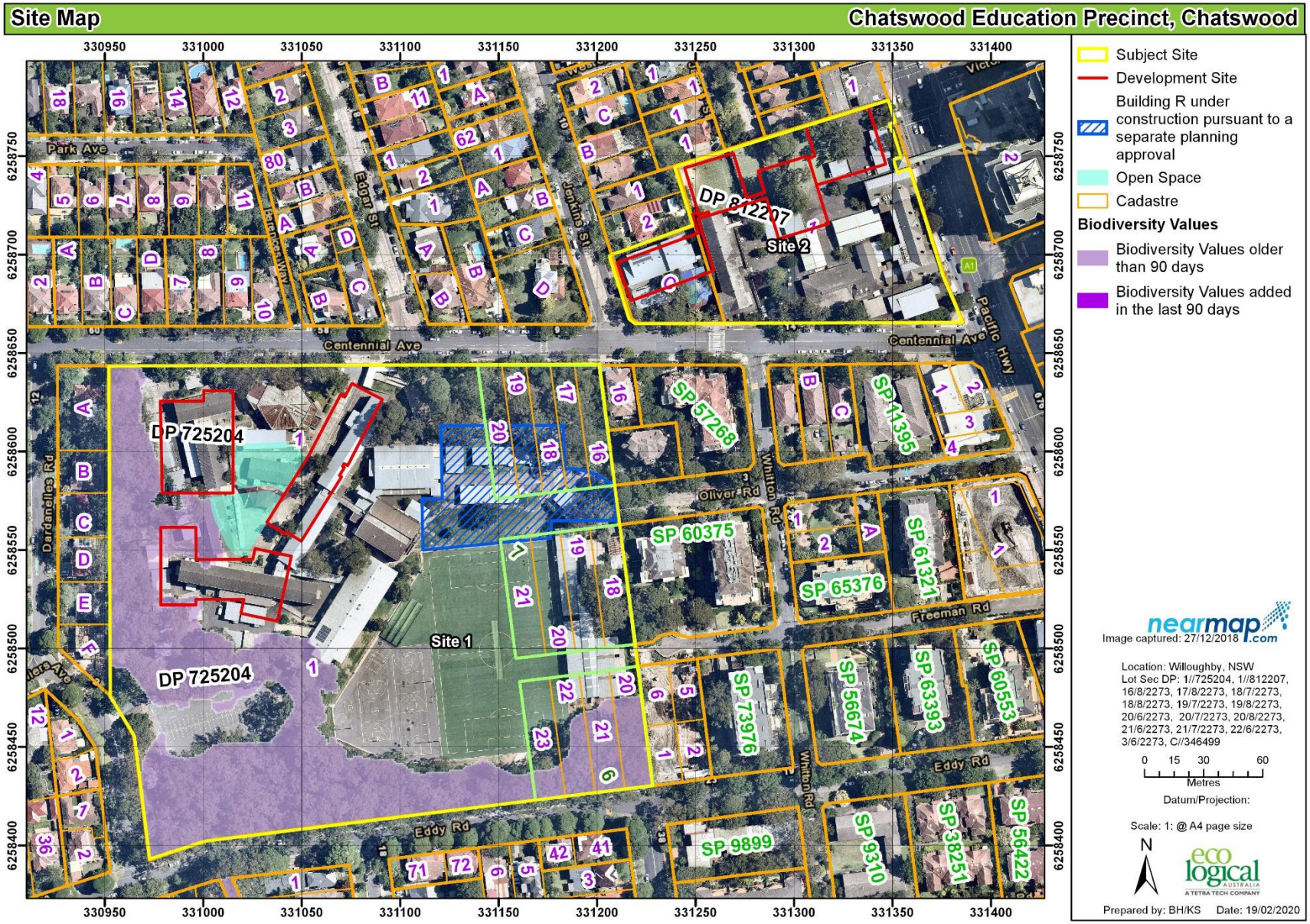

Figure 1: Site Map

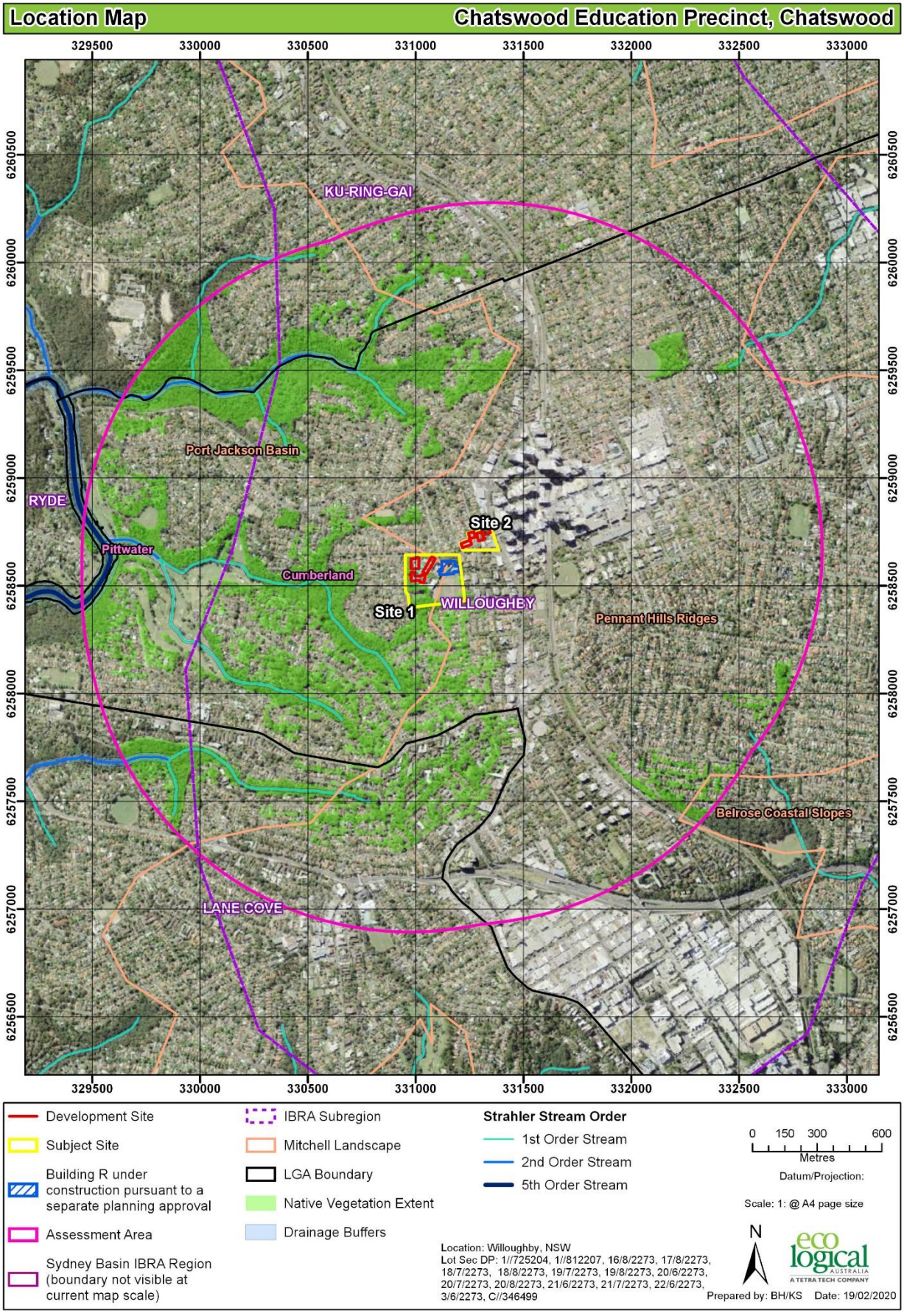

Figure 2: Location Map

1.2 Legislative Context

Table 1: Legislative context

Name	Relevance to the project	Report Section
Commonwealth		
Environmental Protection and Biodiversity Conservation Act 1999	Matters of National Environmental Significance have been identified on or near the development site. An assessment under the Commonwealth Significant Impact Criteria has been undertaken for the *Pteropus poliocephalus* (Grey-headed – Flying-fox). This report does not require further assessment to MNES under the EPBC Act.	2.6.1
State		
Biodiversity Conservation Act 2016	The proposed development requires submission of a BDAR (i.e. this report) under the BC Act.	All
Environmental Planning and Assessment Act 1979 **(EP&A Act)**	The proposed development requires consent under the EP&A Act.	N/A
Fisheries Management Act 1994	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.	N/A
Local Land Services Amendment Act 2016 **(LLS Act)**	The LLS Act does not apply to this development.	N/A
Water Management Act 2000 **(WM Act)**	The project does not involve works on waterfront land. A Controlled Activity Approval under s91 of the WM Act is not required.	N/A
Planning Instruments		
State Environmental Planning Policy (SEPP) 14 – Coastal Wetlands	The proposed development is not located on land subject to SEPP 14.	N/A
SEPP 26 – Littoral Rainforests	The proposed development is not located on land subject to SEPP 26.	N/A
SEPP 44 – Koala Habitat Protection	The proposed development is not located within a Local Government Area to which SEPP 44 applies.	N/A
SEPP (Vegetation in Non-Rural Areas) 2017	This SEPP applies to development that does not require development consent. As this project requires consent under the EP&A Act, the Vegetation SEPP is not relevant.	N/A
Willoughby Local Environment Plan 2012 (WLEP)	Site 1 is zoned SP2 and E2 under the WLEP. Site 2 is zoned R2 Low Density Residential under the WLEP. The proposed works require requires development consent for the educational facilities.	2.6.2
Willoughby Council Development Control Plan (DCP)	The Willoughby DCP has been reviewed for additional biodiversity provisions that may relate to the development site. Clause 9 of the DCP relates to the Preservation of Trees or Vegetation. These matters have been addressed in this report.	2.6.2

Name	Relevance to the project	Report Section
Willoughby City Council Urban Bushland Plan of Management 2014	The Willoughby City Council Urban Bushland Plan of Management 2014 establishes clear and consistent management policies across all bushland areas throughout the Willoughby LGA. It is the overarching plan for all bushland in Willoughby and has been prepared under the requirements of the NSW *Local Government Act 1993*. The bushland present within the study area does not have a specific Reserve Action Plan. The nearest bushland reserve is Ferndale Park.	2.6.2

1.3 Landscape Features

1.3.1 IBRA Regions and Subregions

The development site falls within the Sydney Basin IBRA region and Cumberland subregion.

1.3.2 Mitchell Landscapes

The development site falls within the Pennant Hills Ridges and Port Jackson Basin Mitchell Landscapes as outlined in Table 2 (DECC 2002). The Pennant Hills Ridge Mitchell Landscape has been mapped over site 2 and a portion of site 1 (Figure 2). The majority of site 1 is represented by Port Jackson Basin Mitchell Landscapes.

Table 2: Mitchell Landscapes

Mitchell landscape	Description	Area within Development Site (ha)
Pennant Hills Ridges	Rolling to moderately steep hills on Triassic shales and siltstones. Elevation from 10 to 90m with local relief 60m. Deep red texture-contrast soils on narrow hillcrests, red and brown to yellow texture-contrast soils on slopes becoming slightly harsher in drainage lines. Vegetation typically tall open forest of *Eucalyptus saligna* and *Syncarpia glomulifera*. Rainforest elements in protected moist gully heads are also present.	3.62
Port Jackson Basin	A diverse landscape of steep cliffs on Triassic quartz sandstone to beaches, estuaries and headlands of tributaries. General elevation from 0 to 80m and relieve 10 to 50m. Sandstone slopes and cliffs which supports forests and woodlands dominated by *Eucalyptus piperita* (Sydney Peppermint), *Angophora costata* (Smooth-barked Apple) and sheltered gullies dominated by *Syncarpia glomulifera* (Turpentine).	3.69

1.3.3 Rivers and streams

The development site does not contain any rivers and streams which are recorded on Strahler order stream datasets or other GIS hydroline database resources, however, topographic mapping and field validation identified that during periods of high rainfall events, the vegetated southern boundary and the south-western corner of site 1 may act as an 'overland flow path'.

It is possible that due to topography and urban development the movement of water across the landscape has created an unnatural drainage line which flows from east to west and eventually flows into Swaines Creek, located approximately 250 m to the south-west of site 1.

This water flow is considered an 'overland flow path' and does not meet the definition of a 'river' under the *Water Management Act 2000* (WM Act).

The WM Act defines a river as:

- any watercourse, whether perennial or intermittent and whether comprising a natural channel or a natural channel artificially improved, and
- any tributary, branch or other watercourse into or from which a watercourse referred to in paragraph (a) flows, and
- anything declared by the regulations to be a river.

ELA determined that the unnatural drainage channel along the southern boundary of site 1 does not meet the definition of a 'river' under the WM Act, as it has no defined bed, banks or geomorphic processes. The vegetation is intact and is represented by species which are not considered to be associated with waterways or semi-aquatic in nature.

For the purpose of this report, there are no waterbodies within the development site. However, the proposed works within the development site has potential to alter the hydrological processes of the overland flow path. These potential impacts have been addressed in the impact assessment section of this report (see Section 2.2).

1.3.4 Wetlands

The development site does not contain any wetlands.

1.3.5 Connectivity Features

The development site contains the connectivity features outlined in Table 3 and shown in Figure 2. Contiguous connections are present within the development site with vegetation within site 1 and into adjoining land. The vegetation located in the south of site 1 forms a continuous canopy layer with vegetation to the south-west of the subject site within Ferndale Park and continues along a vegetated overland flow path' until it flows into Swaines Creek in the south-west of the subject site. A vegetated buffer adjoins Swaines Creek which eventually flows west to the Lane Cove River and its National Park.

Site 2 contains limited connectivity features although scattered urban trees provide a 'stepping-stone' corridor for highly mobile species across the urban landscape to a riparian corridor in the north-west.

Connectivity to large tracts of habitat is considered suitable for highly mobile urban species such as birds and bats. This includes flyways for migratory birds and bat species moving through the landscape. Connectivity is present for less mobile species (such as reptiles and mammals), particularly for site 1, provided they cross busy urban roads.

Table 3: Connectivity features

Connectivity feature name	Feature type
Ferndale Park	vegetation corridor
Swaines Creek riparian corridor	riparian corridor
Lane Cove National Park	National Park

1.3.6 Areas of geological significance and soil hazard features

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

1.3.7 Site context

1.3.7.1 Method applied

The site-based method has been applied to this development.

1.3.7.2 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 SIX Maps using increments of 5%. The percent native vegetation cover within the 1,500 m buffer area (916.6ha) is 20% (176 ha).

1.3.7.3 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 is 101 ha.

1.4 Native vegetation

1.4.1 Survey effort

The initial constraints assessment was conducted on 18 January 2018 to identify the vegetation type and condition of the vegetation community in the southern portion of the subject site. A total of two full-floristic and vegetation integrity plots were undertaken in accordance with the BAM (Table 4). No vegetation integrity plots were undertaken for vegetation zone 1. Although this vegetation zone was recorded within the subject site (site 1), the proposed development footprint will not impact upon this vegetation zone (i.e. this vegetation zone was not located within the development footprint). A summary table of the extent of each PCT recorded within site 1 and 2 and the amount of each PCT impacted is provided in Table 5 below.

All field data collected at full-floristic and vegetation integrity plots is included in Appendix B.

Table 4: Full floristic and vegetation integrity plots

Veg Zone	PCT ID	PCT Name	Ancillary code	Condition	Area impacted (ha)	Plots required	Plots surveyed
1	1237	Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion.	Good	Moderate – Good	0	0*	0*
2	1237	Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion.	Weedy	Low	0.006	1	1
3	1237	Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion.	Planted native	Low	0.14	1	1

*THE PROPOSED WORKS WILL NOT IMPACT UPON VEGETATION ZONE 1, THEREFORE PLOT DATA WAS NOT COLLECTED FOR THIS ZONE.

Table 5: Summary of the PCTs in each site and the extent of impacts and vegetation to be retained.

PCT and Veg Zone	Impacted (ha)	Retained (ha)	TOTAL (ha)
PCT1237 Zone 1_Good	0	0.58	**0.58**
PCT1237 Zone 2_Weed	0.006	0.82	**0.82**
PCT1237 Zone 3_Planted native	0.14	1.13	**1.27**
Exotic	0	0.09	**0.09**
Cleared*	0.75	3.34	**4.09**
TOTAL	**0.94**	**5.92**	**6.86**

* CLEARED INCLUDES EXISTING BUILDING AND INFRASTURCTURE AND SPORTING FIELDS

1.4.2 Plant Community Types present

There was one PCT represented in the development site (Table 6, Figure 3). Components of this PCT are listed as a threatened ecological community (TEC) under the BC and EPBC Act. This information is provided below in Table 7 and Figure 5 (see Section 1.4.2.2 for more details).

The development site also contains planted native canopy, shrubs and occasionally ground cover species which are native to NSW, however, not considered locally indigenous to the PCTs. However, under the BAM all vegetation native to NSW requires consideration as to the 'best fit' PCT. Based on the soil landscape, elevation, remnant vegetation and remnant regrowth vegetation within the development site, it was determined that the best fit PCT for the planted native vegetation was PCT 1237. Justifications are provided below.

Table 6: Plant Community Types and vegetation zones within development site

Veg zone	PCT ID	PCT Name	Vegetation Class	Vegetation Formation	Area impacted (ha)	Percent cleared
1	1237	Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion.	Wet Sclerophyll Forests (Shrubby sub-formation)	North Coast Wet Sclerophyll Forest	0	90%
2	1237	Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion.	Wet Sclerophyll Forests (Shrubby sub-formation)	North Coast Wet Sclerophyll Forest	0.006	90%
3	1237	Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion.	Wet Sclerophyll Forests (Shrubby sub-formation)	North Coast Wet Sclerophyll Forest	0.14	90%

Table 7: Threatened Ecological Communities within the development site

PCT ID	BC Act			EPBC Act		
	Listing status*	Name	Area (ha)	Listing status*	Name	Area (ha)
1237	CEEC	Blue Gum High Forest	0.006	CEEC	Blue Gum High Forest	0.006

* CEEC – Critically endangered ecological community

Table 8: PCT selection justification

PCT ID	PCT Name	Selection criteria	Justification
1237	Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion	IBRA region, subregion, soil landscape, elevation and presence of canopy species *Eucalyptus saligna* and *E. pilularis* and Glenorie soil landscape	This PCT has been accepted as the best fit PCT for planted native vegetation located in the development site based on the presence of this PCT within the development site.

1.4.2.1 PCT selection justification

Only one PCT was recorded within the development site; PCT 1237 was recorded within site 1 based on quantitative analysis of floristic data, the soil landscape, elevation and presence of large *Eucalyptus saligna* (Sydney Blue Gum) and other native species recorded in the development site. Previous ecological surveys conducted by Sydney Metro Catchment Management Authority (SMCMA) (OEH 2013) and validated by Niche Environment and Heritage Consulting in 2017 were used to assist in the validation of the vegetation.

The BAM vegetation integrity and floristic data collected in the field was analysed to verify the findings of the site inspection. Two different Microsoft Excel-based tools (Vegetation Analysis Tool Sydney Metro and ELA's internal PCT Quantitative Tool) were used to provide a quantitative assessment of the BAM integrity data and to crossmatch with positive indicator species of established communities as defined by SMCMA (OEH 2013). The Sydney Metro (OEH 2016) vegetation descriptions were then correlated with the relevant PCT in the NSW Vegetation Information System (VIS) database and compared in the source document to ensure that they were appropriate to the region and other factors that limit vegetation types and their distributions. It should be noted that the ELA PCT tool has a limitation in that the species list of the PCTs are an abridged form of the original OEH 2016 list making the comparison less rigorous. For this reason, the VIS and SMCMA (OEH 2013) descriptions was given priority in determining the appropriate PCT.

It should be noted that due to the poor representation of native species recorded within the BAM vegetation integrity plot for *PCT 1237_weedy* and *PCT_native_planted* vegetation zone, the analysis of the floristic data did not provide a strong crossmatch with a PCT. The closest matches were PCT 1237 and PCT 1849 (Sydney Turpentine Ironbark Forest). However, the plot did not achieve the minimal number of diagnostic species for either community. Of the 21 native species entered into the tool, only ten were identified as diagnostic species for BGHF and 11 for Sydney Turpentine Ironbark Forest. Therefore, a list of opportunistic recorded species within the *PCT 1237_good* vegetation zone was also assessed to determine the correct PCT. *PCT 1237_good condition* vegetation zone contained a high

representation of native species including plantings of diagnostic species of BGHF. The results of the quantitative analysis are provided in Appendix C. The results indicated that PCT 1237 was a good fit.

To further validate the vegetation, the VIS description of PCT 1237 and the final determination for BGHF states that the vegetation community contains a dominant canopy of *Eucalyptus saligna* as the key diagnostic species and the vegetation community is typically associated with soils derived from Wianamatta Shale (OEH 2011). Additionally, the Blue Gum Final Determination identifies that this vegetation community occurs in the following LGAs: Willoughby, Lane Cove, Ku-ring-gai, Hornsby, Hills, Ryde and Parramatta. The vegetation within the development fits this description. Additionally, the entire subject land is located on Glenorie soil landscapes which is associated with Wianamatta Group Ashfield Shale (Chapman and Murphy 1989).

The boundaries between PCT 1237 vegetation zones were delineated based on the composition of native to exotic species recorded in the midstorey and ground layers and evidence of disturbance. Areas of high native species diversity were assigned a 'good' ancillary code, patches where vegetation was dominated by woody and herbaceous weed species were assigned 'weedy' ancillary code.

Scattered patches of planted native vegetation within the higher elevations of Site 1 and 2 on the same soil landscape were also mapped as part of this PCT 1237, however, they were not considered part of the TEC (see justification in Section 1.4.2.2 below).

1.4.2.2 Threatened Ecological Communities Justification

The BioNet Vegetation Classification lists PCT 1237 as a component of Blue Gum High Forest which is listed as a critically endangered ecological community (CEEC) under the BC Act. Patches of certain quality Blue Gum High Forest may be listed under the EPBC Act listed provided they satisfy the following criteria (DotEE 2018a):

- Patch size is greater than 1 ha; AND
    - Canopy cover greater than 10% OR
    - Canopy cover less than 10% and occurs in areas of vegetation in excess of 5 ha.

The patch of BGHF represented in the development site is considered one continuous patch, despite the stratification of two different vegetation zones, for the purpose of the BAM integrity plots. The patch of BGHF within the development site is greater than 1 ha in size and contains a canopy cover more than 10%. Therefore, this patch satisfies the criteria for listing under the BC Act and EPBC Act.

The vegetation which has been planted and has been included in the *PCT 1237_native planted* vegetation zone, does not satisfy the listing criteria under the BC and EPBC Act. The vegetation exists as a mix of planted eucalypt and exotic canopy species, the soil profile was disturbed, regeneration of native species was not observed, and it was considered that limited opportunity for pollination and exchange of genetic material was available. Therefore, it is not considered that this vegetation zone forms part of the Blue Gum High Forest TEC listings under the BC or EPBC Acts.

Vegetation integrity assessment

A vegetation integrity assessment using the Credit Calculator (BAMC) was undertaken and the results are outlined in Table 9. Vegetation integrity plots were not required for vegetation zone 1 as it is not impacted by the development footprint.

It should be noted that the BCAM automatically rounds numbers entered into the calculator. Vegetation zone 2 impact area was rounded up to 0.01 ha in the BCAM and vegetation zone 3 rounded up to 0.2 ha in the BCAM.

Table 9: Vegetation integrity

Veg Zone	PCT ID	Ancillary code	Condition	Impact area (ha)	Composition Condition Score	Structure Condition Score	Function Condition Score	Current vegetation integrity score
2	1237	Weedy	Low	0.006	19.7	43.5	43.5	33.4
3	1237	Planted native	Low	0.14	16.5	23.9	39.5	25

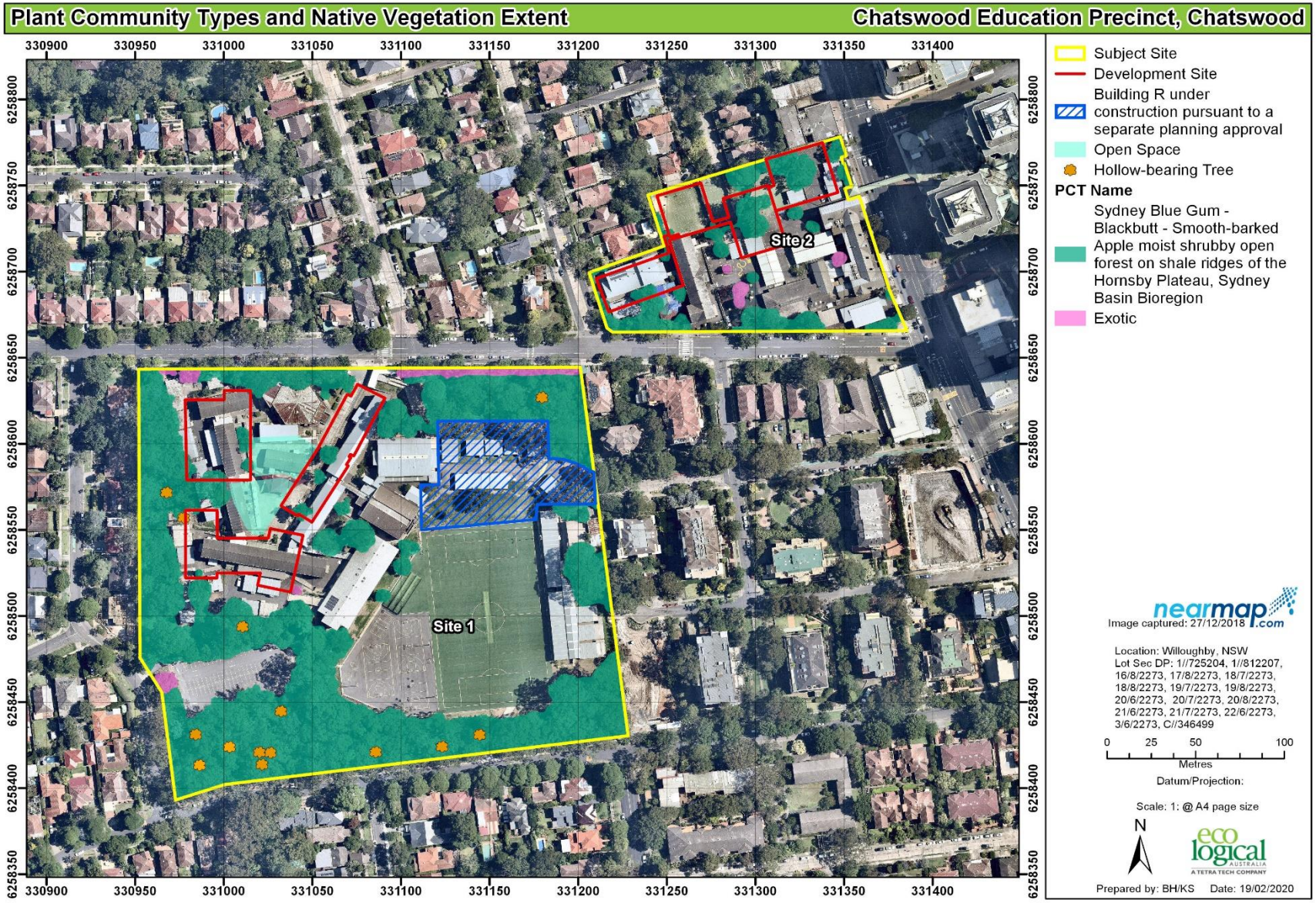

Figure 3: Plant Community Types and native vegetation extent

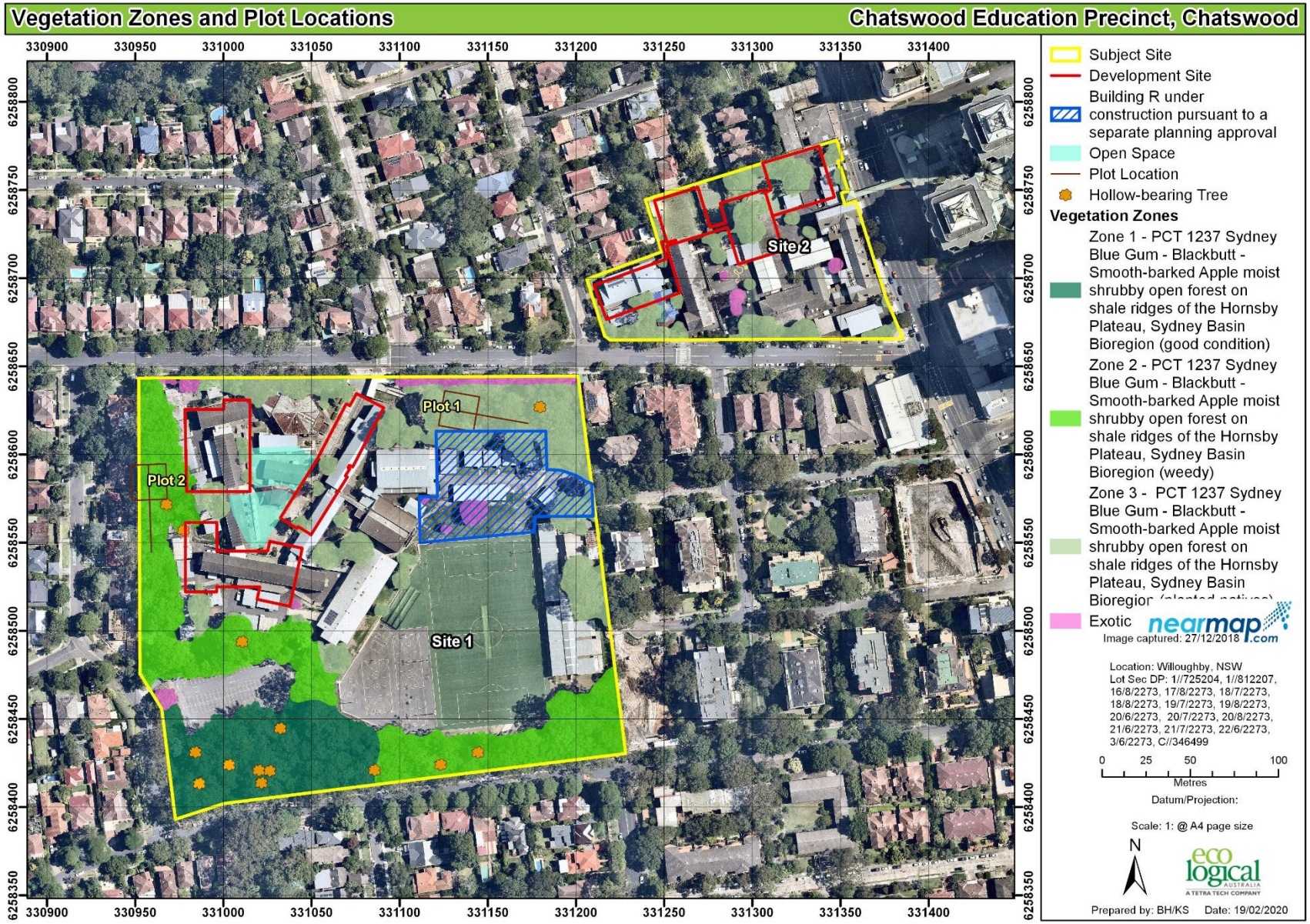

Figure 4: Vegetation zones and plot locations

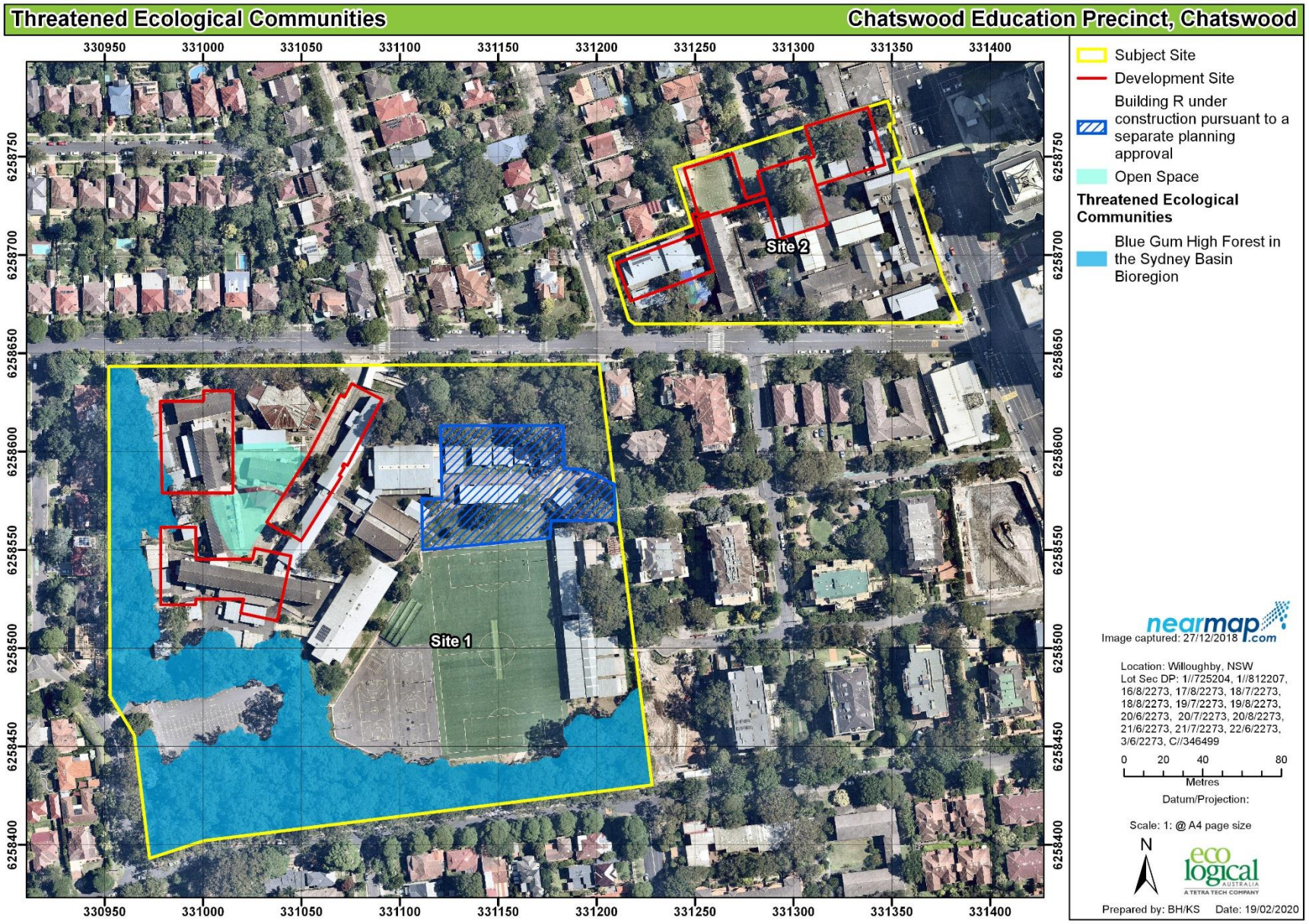

Figure 5: Threatened Ecological Communities

1.5 Threatened Species

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 are included in Table 10.

It should be noted that that a flora species listed under the BC Act and EPBC Act, which has been planted as horticultural variety was present within the subject site and will not be directly impacted upon.

Syzygium paniculatum (Magenta Lilly Pilly) was recorded from BioNet database record and validated within the Site 1. This species is readily available from local nurseries as a horticultural species. This species is listed as endangered under the BC Act and vulnerable under the EPBC Act. The species natural distribution is in littoral coastal rainforest areas along NSW from Upper Lansdowne to Conjola State Forest. The development site does not include littoral coastal rainforest environments. This tree was marked as Tree 161 in the arborist report and will not be impacted by the proposed development.

Given that this species will not be impacted upon and the fact, *Syzygium paniculatum* is located outside of its natural habitat, and the fact these species have been clearly planted due to the landscaped setting, no additional considerations are required for this species under the BC Act or EPBC Act.

Table 10: 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	Habitat features for this species are not present at this site. The development site does not comprise of key plant species required for foraging.
Artamus cyanopterus cyanopterus	Dusky Woodswallow	N/A	Moderate	V	Not listed	No suitable vegetation to provide foraging/shelter/breeding habitat within the development site
Callocephalon fimbriatum	Gang-gang Cockatoo (Foraging)	N/A	Moderate	V	Not Listed	Habitat present is substantially degraded such that this species is unlikely to utilise the development site. Additionally, the Gang-gang Cockatoo favours old growth forest/woodland attributes, of which the development site does not contain.
Calyptorhynchus lathami	Glossy Black-Cockatoo (Foraging)	N/A	High	V	Not Listed	Habitat present is substantially degraded such that this species is unlikely to utilise the development site. The development site was not considered suitable due to disturbance and insufficient presence of foraging habitat.
Daphoenositta chrysoptera	Varied Sittella	N/A	Moderate	V	Not Listed	Habitat present is substantially degraded such that this species is unlikely to utilise the development site. No suitable vegetation to provide foraging/shelter/breeding habitat within the development site
Dasyurus maculatus	Spotted-tailed Quoll	N/A	High	V	E	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 in (DECC 2007).

Species	Common Name	Habitat constraints/ Geographic limitations	Sensitivity to gain class	NSW listing status	EPBC Listing status	Justification if species excluded
Falsistrellus tasmaniensis	Eastern False Pipistrelle	N/A	High	V	Not Listed	**Included in assessment.** This species was entered into the BAMC as a candidate ecosystem species.
Glossopsitta pusilla	Little Lorikeet	N/A	High	V	Not Listed	**Included in assessment.**
Hieraaetus morphnoides	Little Eagle (Foraging)	N/A	Moderate	V	Not Listed	**Included in assessment.**
Lathamus discolor	Swift Parrot (Foraging)	N/A	Moderate	E	CE	Habitat features associated with this species are not present on the development site. There are no habitat features required for this species such as the favoured feed trees or lerp infestations.
Micronomus norfolkensis	Eastern Freetail-bat	N/A	High	V	Not Listed	**Included in assessment.**
Miniopterus australis	Little Bentwing-bat (Foraging)	N/A	High	V	Not Listed	**Included in assessment.**
Miniopterus orianae oceanensis	Large Bent-winged Bat (Foraging)	N/A	High	V	Not Listed	**Included in assessment.**
Ninox connivens	Barking Owl (Foraging)	N/A	High	V	Not Listed	**Included in assessment.**
Ninox strenua	Powerful Owl (Foraging)	N/A	High	V	Not Listed	**Included in assessment.**
Phascolarctos cinereus	Koala (Foraging)	N/A	High	V	V	Habitat present is substantially degraded such that this species is unlikely to utilise the development site. Habitat was not considered suitable due to the high disturbance and limited feed trees.

Species	Common Name	Habitat constraints/ Geographic limitations	Sensitivity to gain class	NSW listing status	EPBC Listing status	Justification if species excluded
Pteropus poliocephalus	Grey-headed Flying-fox (Foraging)	N/A	High	V	V	**Included in assessment.**
Ptilinopus superbus	Superb Fruit-Dove	N/A	Moderate	V	Not Listed	Habitat present is substantially degraded such that this species is unlikely to utilise the development site. Habitat was not considered suitable due to the high disturbance and limited feed trees
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	N/A	High	V	Not Listed	**Included in assessment.**
Tyto novaehollandiae	Masked Owl (Foraging)	N/A	High	V	Not Listed	**Included in assessment.**

1.5.2 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 are shown in Table 11. Habitat assessments were undertaken during the field survey on 18 February 2019 to determine the likelihood of threatened species occurring within the development site on an intermittent or permanent basis.

Habitat assessments involved searches of all possible hollow-bearing trees within the development site, on ground inspection using binoculars of roof cavities for possible entrance for microbats, indirect evidence of fauna foraging such as chew cones or sap trees.

Table 11: 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
Anthochaera phrygia	Regent Honeyeater (Breeding)	Other As per mapped areas	High	CE	CE	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). Vagrant only 1 sighting in Sydney CMA in 20 years (2017 at Homebush of dubious origin). Two records 20 years ago - associated with heavy bushland. Ingleside and Ku-ring-gai Chase National Park. The development site does not support suitable breeding habitat for this species.
Callocephalon fimbriatum	Gang-gang Cockatoo (Breeding)	Hollow bearing trees Eucalyptus tree species with hollows >9cm	High	V	Not Listed	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 Eucalypt trees with hollows >9cm in diameter and shrubs that are suitable for the species to utilise the site.
Calyptorhynchus lathami	Glossy Black-Cockatoo (Breeding)	Hollow bearing trees Living or dead tree with hollows >15cm diameter and >5m above ground	High	V	Not Listed	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 larger patches of intact vegetation or trees with large hollows that are suitable for the species to utilise the site.
Cercartetus nanus	Eastern Pygmy-possum	N/A	High	V	Not Listed	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. are present. Only two individuals have been recorded within 5km of the development site.
Chalinolobus dwyeri	Large-eared Pied Bat	Cliffs Within 2km of rocky areas containing caves, overhangs, escarpment,	Very High	V	V	Habitat features associated with this species are not present on the development site. There is no suitable breeding habitat such as caves, overhangs, mines or culverts present 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
		outcrops, or crevices, or within 2km of old mines or tunnels				
Galium australe	Tangled Bedstraw	N/A	High	E	Not listed	Habitat present is substantially degraded such that this flora species is unlikely to occur the development site. There are no BioNet records for this species within a 5 km radius of the development site.
Grammitis stenophylla	Narrow-leaf Finger Fern	N/A	Moderate	E	Not listed	Habitat present is substantially degraded such that this flora species is unlikely to occur the development site. There are no BioNet records for this species within a 5 km radius of the development site.
Hibbertia spanantha	Julian's Hibbertia	N/A	N/A	CE	CE	Habitat present is substantially degraded such that this flora species is unlikely to occur the development site. There is only 1 BioNet record for this species within a 5 km radius of the development site.
Hieraaetus morphnoides	Little Eagle (Breeding)	Other Nest tree – live (occasionally dead) large tree within vegetation	Moderate	V	Not Listed	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. Little Eagles rarely nest in highly urbanised environments and no nests were observed during field surveys. There are only two BioNet records for this species within 5 km of the development site.
Lathamus discolor	Swift Parrot (Breeding)	Other As per mapped areas	Moderate	E	CE	Mapped important areas have not yet been released. Habitat features associated with this species are not present on the development site. The development site does not contain habitat features required for this species. There are none of the favoured feed trees or lerp infestations.

Species	Common Name	Habitat constraints/ Geographic limitations	Sensitivity to gain class	NSW listing status	EPBC Listing status	Justification if species excluded
Litoria aurea	Green and Golden Bell Frog	Semi-permanent/ephemeral wet areas Within 1km of wet areas, Swamps Within 1km of swamps Waterbodies Within 1km of waterbody	High	E	V	Habitat features associated with this species are not present on the development site. The development site does not contain suitable waterbodies for this species to utilise the site for breeding, wintering, foraging or sheltering. There are no BioNet records for this species within 5 km of the development site.
Miniopterus australis	Little Bentwing-bat (Breeding)	Caves Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding	Very High	V	Not Listed	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 (i.e. caves) that is suitable for the species to utilise the site.
Miniopterus orianae oceanensis	Large Bent-winged Bat (Breeding)	Caves Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding	Very High	V	Not Listed	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.
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	Habitat present is substantially degraded such that this species is unlikely to utilise the development site. Habitat is isolated and disturbed with a higher likelihood of this species using adjoining vegetation in better condition. Additionally, the nearest mapped drainage line is approximately 200m away.

Species	Common Name	Habitat constraints/ Geographic limitations	Sensitivity to gain class	NSW listing status	EPBC Listing status	Justification if species excluded
Ninox connivens	Barking Owl (Breeding)	Hollow bearing trees Living or dead trees with hollows >20cm diameter and > 4m above ground	High	V	Not Listed	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 tree hollows.
Ninox strenua	Powerful Owl (Breeding)	Hollow bearing trees Living or dead trees with hollows >20cm diameter	High	V	Not Listed	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 i.e. large tree hollows.
Phascolarctos cinereus	Koala (Breeding)	Other Areas identified via survey as important habitat	High	V	V	This is a dual credit species, and only a species credit species when specific habitat constraints are present for breeding. Habitat present is substantially degraded such that this species is unlikely to utilise the site for breeding.
Pommerhelix duralensis	Dural Woodland Snail	Other Leaf litter and shed bark or within 50m of litter or bare ground Rocky areas Rocks or within 50m of rocks Fallen/standing dead timber including logs Including logs and bark or within 50m of logs or bark	High	E	E	Habitat present is substantially degraded such that this species is unlikely to utilise the development site. Habitat is isolated and disturbed. There are no BioNet records for this species within a 5 km radius of the development site.
Pseudophryne australis	Red-crowned Toadlet	Margins of Cumberland Plain	Moderate	V	Not Listed	Habitat features associated with this species are not present on the development site. The development site does not contain suitable drainage lines for this 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
		where sandstone outcrops intersect				
Pteropus poliocephalus	Grey-headed Flying-fox (Breeding)	Other Breeding camps	High	V	V	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 (i.e. riparian corridors) that are suitable for the species to utilise.
Rhodamnia rubescens	Scrub Turpentine	N/A	High	CE	Not Listed	Habitat features (i.e. Littoral rainforests) associated with this species are not present on the development site.
Syzygium paniculatum	Magenta Lily Pilly	N/A	Moderate	E	V	Although this species was identified within the development site, this specimen has been planted and is considered horticultural variety. This specimen will not be impacted by the works. No suitable habitat for this species naturally occurring was recorded within the development site.
Tetratheca glandulosa	Tetratheca glandulosa	N/A	High	V	Not Listed	Habitat features (i.e. sandstone ridgetops) associated with this species are not present on the development site.
Tyto novaehollandiae	Masked Owl (Breeding)	Hollow bearing trees Living or dead trees with hollows > 20cm diameter	High	V	Not Listed	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 habitat such as trees with large hollows that are suitable for the species to utilise the site for breeding.

1.5.3 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 of species credit species is provided Table 11.

1.5.4 Use of local data

The use of local data is not proposed.

1.5.5 Expert reports

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

2. Stage 2: Impact assessment (biodiversity values)

2.1 Avoiding impacts

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

The development has been located in a way which avoids and minimises impacts as outlined in Table 12.

Table 12: Locating a project to avoid and minimise impacts on vegetation and habitat

Approach	How addressed	Justification
Locating the project in areas where there are no biodiversity values	The project (i.e. the proposed development footprint) has utilised existing development areas, cleared lands and planted gardens to minimise impacts on areas with the highest biodiversity values. Areas of biodiversity values have been retained where possible within the subject site.	The project has utilised areas with existing development in the subject site to reduce impacts to areas of high biodiversity values. While the project will require the removal of a small amount (0.006 ha) of weedy low condition BGHF, areas of high biodiversity value, (i.e. good condition BGHF) has been retained in the south and west of site 1 for conservation. Additionally, the project has ensured that one hollow-bearing tree (HBT) will be impacted and 13 HBTs will be retained. The project has located the development in areas of low biodiversity and only minor 0.006 ha of weedy condition BGHF will be impacted.
Locating the project in areas where the native vegetation or threatened species habitat is in the poorest condition	The project has been located to utilise areas where native vegetation and threatened species habitat is in the poorest condition.	The project has been located to utilise areas in the north of the development site comprised of existing buildings, cleared lands and lower condition vegetation. This placement minimises removal of vegetation from the south of the development site which contains higher quality remnant vegetation and potential threatened species habitat.
Locating 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 project has been located to avoid removal of vegetation in high threat categories.	The project has concentrated the impacts on vegetation which are not listed as part of a TEC. The majority of the vegetation within the development site (1.36 ha) does not conform to a TEC. The majority of the vegetation retained in the subject site does contain vegetation mapped as part of a TEC. The development site has utilised areas of lower biodiversity value where possible. Areas of lower biodiversity value includes planted native and cleared areas. Only minor amount of vegetation in high threat categories (EEC or CEEC) will be removed. A small amount (0.006 ha) of PCT 1237 (Blue Gum High Forest) in weedy-low condition will be removed. This is part of a larger patch which includes a large portion of PCT 1237 in good condition.

Approach	How addressed	Justification
Locating the project such that connectivity enabling movement of species and genetic material between areas of adjacent or nearby habitat is maintained	The project has been located to enable connectivity across the local area.	The project has been located to maintain all current connectivity between areas of vegetation. This will enable continued connectivity across the landscape for mobile fauna species and movement of genetic material

2.1.2 Designing a project to avoid and minimise impacts on vegetation and habitat

The development has been designed in a way which avoids and minimises impacts as outlined in Table 13.

Table 13: Designing a project to avoid and minimise impacts on vegetation and habitat

Approach	How addressed	Justification
Reducing the clearing footprint of the project	The project has been designed to reduce the clearing footprint of the project.	The placement of the development site footprint has been strategically designed to avoid high biodiversity value areas and utilises mainly cleared or built lands and planted vegetation.
Locating ancillary facilities in areas where there are no biodiversity values	Ancillary features have been located in areas where there are no biodiversity values.	Ancillary features will be located at the northern side of the development site in predominantly cleared areas with limited biodiversity value, avoiding the native vegetation along the southern extent of the subject site. The existing carpark and sporting fields will act as part of the asset protection zone and therefore, removal of vegetation for asset protection is not required. Additionally, temporary ancillary features required during construction (such as stockpiles) will be located in open spaces and will not require the removal of native vegetation and biodiversity values.
Locating ancillary facilities in areas where the native vegetation or threatened species habitat is in the poorest condition (i.e. areas that have a lower vegetation integrity score)	Ancillary features have been located in areas where native vegetation is in the poorest condition.	Ancillary features will be located at the northern portion of the development site in predominantly built or cleared lands or in areas where native vegetation has been planted. Native planted vegetation contains a lower vegetation integrity score than the remnant vegetation located in the south of the subject site.
Locating ancillary facilities in areas that avoid habitat for species and vegetation in high threat status categories (e.g. an EEC or CEEC)	Ancillary features have been located in areas that avoid habitat for species and vegetation in high threat categories.	The majority of the development site contains planted native vegetation which does not support vegetation in high threat categories (e.g. EEC or

Approach	How addressed	Justification
		CEEC). The development site contains substantial amount of cleared lands which will be utilised for temporary ancillary facilities and will not impact upon high threat category vegetation.
Providing structures to enable species and genetic material to move across barriers or hostile gaps	The development has been designed to maintain a vegetated corridor enabling movement of species and genetic material.	The project has been designed to retain quality vegetation in the south and west of the development site. The development site has been designed so that it does not impact on corridors. Existing vegetated corridors will be maintained with connectivity in all directions, allowing for the continued movement of species and genetic material across the landscape. Given that no corridors will be impacted, additional structures are not necessary.
Making provision for the demarcation, ecological restoration, rehabilitation and/or ongoing maintenance of retained native vegetation habitat on the development site.	Vegetation in the east of the subject site will be retained, enhanced and maintained.	Vegetation to be retained in the subject site (to the south and west of the development site), will be enhanced and maintained as part of weed removal works and revegetation with characteristics species of PCT 1237.
Efforts to avoid and minimise impacts through design must be documented and justified	The project has been designed to reduce the clearing footprint of the project.	The placement of the development site footprint has been strategically designed to avoid high biodiversity value areas and utilises mainly cleared lands and degraded vegetation.

2.1.3 Prescribed biodiversity impacts

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 below**.
- Hydrological processes that sustain and interact with the rivers, streams and wetlands - none occur within 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. Vegetation (native and non-native) is located within the subject site, however, the proposed development does not impact upon exotic vegetation. Additional information regarding consideration of human made structures are provided below. Non-native vegetation was identified and assessed for any potential to provide habitat for threatened flora and fauna species, including presence of HBTs.

As the development site is located in a heavily urbanised area almost the entire development site contains human made structures. Consideration was given during the literature review to buildings or structures that could potentially be utilised as a roosting resource by microchiropteran bats (microbats). Most of the buildings are multi-storey with a corrugated iron flat roof which are not particularly suitable for microbats. Additionally, the majority of the buildings have been constructed in the last 20 years with limited opportunities to provide suitable cavities for microbats.

The development site has the prescribed biodiversity impacts as outlined in Table 14.

Table 14: Prescribed biodiversity impacts

Prescribed biodiversity impact	Description in relation to the development site	Threatened species or ecological communities effected
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** • **rocks, or** • **human made structures, or** • **non-native vegetation**	The development site contains a number of existing buildings. A brief visual ground inspection of the roof cavities did not identify potential entrance/exit holes into the cavity of the existing buildings.	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 orianae oceanensis* (Large Bent Winged Bat). There are only two BioNet records for each of the Eastern False-Pipistrelle and Yellow-bellied Sheath-tail Bat, seven records for Little Bentwing-bat and 51 records for Eastern Bentwing-bat).
Impacts of development on the habitat of threatened species or ecological communities associated with non-native vegetation	The development site does not impact upon non-native vegetation The development site contains native vegetation for common urban arboreal mammals (possums) which provides foraging opportunities for threatened nocturnal bird species. The development will result in a reduction in the extent of foraging habitat and reduction in availability of their prey items.	Potential foraging habitat for other threatened microbat species above native vegetation canopy. Potential foraging habitat for *Pteropus poliocephalus* (Grey-headed Flying Fox (GHFF). Potential foraging habitat for Nin*ox strenua* (Powerful Owl). Potential foraging habitat for *Glossopsitta pusilla* (Little Lorikeet).
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 planted native vegetation from within the development site. The development will result in a minor reduction in the extent of existing planted 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 and Little Lorikeet. 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, Little Lorikeet and microbat species.

Prescribed biodiversity impact	Description in relation to the development site	Threatened species or ecological communities effected
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 upslope of the intermittent drainage line and may result in a decline of water quality.	The drainage line does not support water dependent threatened species or water dependent ecological communities. BGHF TEC is located upslope of an intermittent drainage line and is not depend upon hydrological flows.

2.1.3.1 Locating a project to avoid and minimise prescribed biodiversity impacts

The development has been located in a way which avoids and minimises prescribed biodiversity impacts as outlined in Table 15.

Table 15: Locating a project to avoid and minimise prescribed biodiversity impacts

Approach	How addressed	Justification
Locating the envelope of surface works to avoid direct impacts on the habitat features	Habitat features including HBTs, foraging habitat for GHFF, Powerful Owl and threatened microbats within the development site will be removed	The development has avoided impacts to large tracts of vegetation in the south which includes nectar producing native canopy species for GHFF, foraging habitat for Powerful Owl and microbat species. The development has been located in a way to avoid impact to 13 HBTs and result in the removal of only one HBT.
Locating the envelope of sub-surface works, both in the horizontal and vertical plane, to avoid and minimise operations beneath the habitat features, e.g. locating long wall panels away from geological features of significance or water dependent plant communities and their supporting aquifers	The development does not involve deep construction into the soil horizon which may impact upon these geological features or water dependent plant communities.	The works do not involve excavation of deep underground structures. As such the development will not impact upon geological features of significance, water dependent plant communities and their supporting aquifers.
Locating the project 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 vegetation which forms a connective corridor along the northern and eastern perimeter.	Although the development will result in the removal of some native and exotic vegetation along the eastern perimeter, the connectivity will be retained through vegetation along the western and southern boundaries. Additionally, the impacts have utilised areas which contain limited connectivity and retained connectivity within the areas of higher biodiversity values which extends beyond the development site in the south and western boundaries.

Approach	How addressed	Justification
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 development has been strategically placed to avoid impacts to areas of high biodiversity value.	The development has utilised the centre portion of the subject site which includes cleared lands and exiting development footprint and vegetation of low biodiversity values and retained areas of high biodiversity values in the south and west of the development site which includes areas of TEC of high quality BGHF.
Locating the project to avoid direct impacts on water bodies	The development has been strategically placed to avoid impacts to water bodies	There are no defined waterbodies within the development site. A small overland flow path is located along the southern boundary of the subject site and will not be impacted by the proposed works. This drainage line is likely to flow into Swains Creek located 250 m south-west of the subject site.

2.1.3.2 Designing a project to avoid and minimise prescribed biodiversity impacts

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

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

Approach	How addressed	Justification
Engineering solutions, e.g. proven techniques to minimise fracturing of bedrock underlying features of geological significance, water dependent communities and their supporting aquifers; proven engineering solutions to restore connectivity and favoured movement pathways	The development design has utilised the existing cleared, urban and disturbed areas and the works will not involve deep excavations into the bedrock.	The development design has utilised the zoning which allows tall buildings and therefore reduces the need to conduct deep excavation works and thus protect the geological processes and ground water processes.
Design of project elements to minimise interactions with threatened and protected species and ecological communities, e.g. designing turbines to dissuade perching and minimise the diameter of the rotor swept area, Designing fencing to prevent animal entry to transport corridors	The development design has retained TEC within the subject site and utilised areas with minimal impacts to biodiversity values.	The development design has utilised existing disturbed areas to minimise interactions with threatened species and minimised impacts to TECs located in the south and west of the subject site which will be retained under the project.
Design of the project to maintain environmental processes critical to the formation and persistence of habitat features not associated with native vegetation	The formation of habitat features such as tree hollows has been retained within the subject site.	A large number of trees of vary size has been retained within the subject site which will provide suitable habitat features for a wide variety of hollow-dependent fauna species.

Approach	How addressed	Justification
Design of the project to maintain hydrological processes that sustain threatened species and TECs	There are no threatened species and TECS which are depend upon hydrological processes.	The development design is located away from hydrological process and is not anticipated to alter the current hydrological flow regime of the overland flow path located in the southern boundary of the subject site. There are no threatened species and TECs which are dependent upon hydrological processes identified within the subject site or development site.
Design of the project to avoid and minimise downstream impacts on rivers, wetlands and estuaries by control of the quality of water released from the site.	The works are unlikely to alter the current hydrological flow of the unnamed 1st order stream.	The development design has been conducted so that hydrological flows will be captured on the sporting fields prior to entering the native vegetation located into the south-west of the subject site and into any streams.

2.2 Assessment of Impacts

2.2.1 Direct impacts

The direct impacts of the development are provided below:

- native vegetation - Table 17
- threatened ecological communities - Table 18
- threatened species and threatened species habitat -Table 18
- prescribed biodiversity impacts are outlined in Section 2.2.2

Direct impacts including the final project footprint (construction and operation) are shown on Figure 6.

Table 17: Direct impacts to 'native vegetation' as defined under the BAM

PCT ID	PCT Name	Vegetation Class	Vegetation Formation	Total (ha)
1237	*Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion.*	North Coast Wet Sclerophyll Forests	Wet Sclerophyll Forests (Shrubby sub-formation)	**0**.14

Table 18: Direct impacts on threatened ecological communities

PCT ID	BC Act			EPBC Act		
	Listing status	Name	Direct impact (ha)	Listing status	Name	Direct impact (ha)
1237	CEEC	Blue Gum High Forest	0.006	CEEC	Blue Gum High Forest	0.006

2.2.2 Change in vegetation integrity

A vegetation integrity assessment using the Credit Calculator (BAMC) was undertaken and the results are outlined in Table 19. The proposed impacts include the removal of vegetation from all stratum for the proposed development footprint. Under the BAMC the impact area for vegetation zone 2 is too small and therefore, the BAMC automatically increased the impact area to 0.01 ha for the vegetation zone. Additionally, zone 3 is automatically increased to 0.2 ha of impact area.

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
2	1237	Weedy	0.006	33.4	0	-33.4
3	1237	Native planted	0.14	23	0	-23

2.2.3 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
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 subject site	In southern portion of the subject site	Potential to occur at any time throughout construction or operational phases	Throughout life of project	Short-term impacts

Indirect impact	Project phase	Nature	Extent	Frequency	Duration	Timing
Bush rock removal and disturbance	Construction / operation	Removal of rocks in southern vegetation within the subject site	In vegetation in the southern portion of the subject 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 portion of the subject 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 portion of the subject site	Potential to occur at any time throughout construction or operational phases	Throughout life of project	Short-term impacts
Increased risk of fire	Construction / operation	Potential due to presence of vegetation retained in the south of the subject site	In vegetation in the southern portion of the subject 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

2.2.4 Prescribed biodiversity impacts

An assessment of impacts of the development on prescribed biodiversity impacts is outlined in Table 21 in accordance with Section 9.2.1of the BAM.

Table 21: Direct impacts on prescribed biodiversity impacts

BAM Criteria	Justification
9.2.1.3 The assessment of the impacts of the development on the habitat of threatened species or ecological communities associated with human made structures	
a) identify the human made structures with potential to be habitat for threatened species or ecological communities	The development site is located within a highly urbanised area. The proposed Upgrades to Chatswood Public School and Chatswood High School plan will involve the removal of a number of existing educational building for redevelopment under a separate legislative pathway. The SSD involves the construction of the development site. However, for the purpose of this BDAR, a brief ground inspection of the buildings did not detect potential gaps suitable for microbat access into the roof cavities. No other human made structures with potential habitat for threatened species or ecological communities were identified in the development site.
b) identify the species and ecological communities likely to use the habitat	The residential dwelling provides potential roosting habitat for a number of threatened microbat species including: *Saccolaimus flaviventris* (Yellow-bellied Sheathtail Bat) and *Falsistrellus tasmaniensis* (Eastern False Pipistrelle), *Miniopterus australis* (Little Bentwing-bat) and *Miniopterus orianae oceanensis* (Large Bent Winged Bat). These species are known to occasionally roost in buildings. There are BioNet records for these species within a 5 km radius for these species.
c) describe the nature, extent and duration of short and long-term impacts	The SSD application does not involve the permanent removal of several multistorey education facilities as these will be conducted under a separate legislative pathway. The removal of buildings would be considered a long-term impact. The proposed SSD application consists of the construction of new buildings. The construction of new building may result in the production of noise and vibration which is considered a short-term impact. These impacts are likely to be minor considering alternative roost locations which may occur within the subject site are likely to be are used by microbats under these circumstances.
d) describe, with reference to relevant literature the importance within the bioregion of the habitat of these species or ecological communities	According to literature documented in Australian Bat (Churchill 2009) the preferred roosting habitat of the following species includes: • Yellow-bellied Sheathtail Bat – this species will utilise tree hollows or buildings in small groups. There is potential that this species may utilise the building and tree hollows recorded within the development site and within the subject site.

BAM Criteria	Justification
	• Eastern False Pipistrelle – this species primarily roosts in tree trunks in small groups, however it may occasionally utilise wooden buildings. It is unlikely this species would utilise buildings for maternity roosts due to the presence of hollow-bearing trees within the subject site. • Little Bentwing-bat – this species forms specific maternity roosts in caves. They occasionally utilise buildings in the absence of other alternative roost locations (such as mines, culverts). There is potential that this species may on occasion utilise the residential dwelling as an alternative roost location. • Large Bent Winged Bat – this species primarily roosts in caves, however, it occasionally roosts in human made structures such as buildings. There is potential that this species may on occasion utilise the residential dwelling as an alternative roost location.
e) predict the consequences of the impacts for the local and bioregional persistence of the suite of threatened species and communities likely to use these areas as habitat, with reference to relevant literature and other published sources of information.	While these species of microbats have been known to utilise human structures for roosting, preferred roosting habitat for these species are non-human made structures (tree hollows or caves). Additionally, only one of the species is likely to utilise buildings more regularly including breeding times, this species is the Yellow-bellied Sheathtail Bat. The other species of microbats may utilise the residential dwelling on occasion while traversing through the landscape or if other alternative roosting resources are not present. It should be noted that the development site provides marginal foraging and alternative roosting habitat in the form of buildings for a number of microbat species. The development site does not contain important habitat for these species. There is potential that the removal of the residential building may impact upon the number of available roosting resources for microbats migrating to breeding or non-breeding habitats such as the two Bentwing species. There is no available literature which has considered the impacts of removal of human made structures on microbat species. The Priority Action Statement for the Yellow-bellied Sheathtail-bat lists several recommended actions for help in the recovery of this species, those pertaining to retention of roosting habitat focus on the retention of large hollow-bearing trees and retention of vegetated areas. The Priority Action Statement for the Little Bentwing Bat and Eastern Bentwing Bat include further investigation of the wintering roosts for these species which includes tree hollows and undertaking restoration activities to create habitat and connectivity in the landscape. There is no mention of the use of buildings for Bentwing Bat species. The habitat within the subject site is unlikely to be important for any of these microbat species.
9.2.1.4 The assessment of the impacts of development on the habitat of threatened species or ecological communities associated with non-native vegetation	
a) identify the species and ecological communities likely to use the habitat	Several non-native tree species are present in the development site which have been planted within residential gardens or are invasive weeds. Non-native species which have been identified as potential

BAM Criteria	Justification
	foraging species for Grey-headed Flying fox are *Liquidambar styraciflua*, *Ligustrum lucidum* (Broad-leaved Privet) and *Ligustrum sinense* (Small-leaved Privet). Additionally, non-native vegetation may be utilised by arboreal mammals which comprise prey resources for Powerful Owl. Non-native vegetation will be retained within the development site and will not be impacted upon as part of this SSD application.
(b) describe the nature, extent and duration of short and long-term impact	The proposed development will not result in the permanent removal of non-native trees (listed above). Some native planted and remnant vegetation will be impacted which may provide potential foraging habitat for Grey-headed Flying-fox and marginal foraging habitat for the threatened microbat species and foraging habitat for Powerful Owl prey resources. Additional resources will be retained within the subject site for threatened species.
(c) describe, with reference to relevant literature and other reliable published sources of information, the importance within the bioregion of the habitat to these species or ecological communities	These non-native foraging species will not be impacted by the proposed development. Flowering resources in the form of native planted vegetation, *Eucalyptus, Melaleuca* and *Callistemon* sp. would more likely be utilised for foraging resources by Grey-headed Flying-fox.
(d) predict the consequences of the impacts for the local and bioregional persistence of the suite of threatened species and communities likely to use these areas as habitat, with reference to relevant literature and other published sources of information.	The consequences of the permanent removal of those species listed above for the local and bioregional persistence of the Grey-headed Flying-fox is predicted to be negligible. Several of the non-native species recorded in the subject site should be controlled such as *Ligustrum sinense, Ligustrum lucidum* as they are listed as environmental weeds in the Greater Sydney Regional Strategic Weed Management Plan (2017-2022). There is an abundance of similar habitat within the locality and bioregion, and an abundance of higher quality habitat in the locality and bioregion.
9.2.1.5 The assessment of the impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range must:	
(a) identify the area/s of connectivity joining different areas of habitat that intersect with the subject land and the areas of habitat that are connected according to Paragraph 4.2.1.3	The development site includes predominately disturbed vegetation. To the south and west of the development is a large tract of native vegetation retained within the subject site. This area of vegetation connects to vegetation outside of the subject site (site 1) and connects to Swaines Creek which eventually flows into Lane Cove River and the National Park. The vegetation within the development site is relatively small compared to the native vegetation retained within the subject site and the vegetation connected in the broader landscape. However, due to the presence of major roads, only highly mobile species are likely to utilise the vegetation within the development site.
(b) identify the species and ecological communities likely to benefit from the connectivity	The species most likely to utilise the connectivity would be Grey-headed Flying-fox, microbat species, Little Lorikeet and disbursal of juvenile Powerful Owl.

BAM Criteria	Justification
	BGHF species are likely to benefit from the connectivity within the development site with adjacent vegetation to the south-west of the subject site (site 1).
(c) describe the nature, extent and duration of short and long-term impacts	The proposed development will result in the permanent removal of 0.006 ha of native and 0.14 ha of planted native vegetation which forms connecting habitat for highly mobile species. Connectivity will be retained within the subject site and in the adjacent broader locality.
(d) describe, with reference to relevant literature and other reliable published sources of information, the importance of the area of connectivity within the bioregion	The connectivity is considered limited except for highly mobile species which easily move across disturbed landscapes. The connecting habitat provides potential foraging habitat for the above listed species, which is part of a fragmented network of urban vegetation within the eastern suburbs. Within the Sydney Basin Bioregion, the removal of 0.006 ha of remnant, 0.14 native planted vegetation is considered to provide negligible connectivity on a landscape scale. The removal of connecting habitat would not prevent the highly mobile Grey-headed Flying-fox, Little Lorikeet, Powerful Owls or microbats from moving across the landscape in search of foraging resources. The removal of a small amount of connecting habitat from the development site is unlikely to be of importance to any threatened species within the bioregion considering the availability of connectivity retained within the subject site and immediately adjacent to the subject site.
(e) predict the consequences of the impacts for the bioregional persistence of the suite of threatened species and communities currently benefitting from the connectivity with reference to relevant literature and other published sources of information and taking into consideration mobility, abundance, range and other relevant life history factors.	The habitat to be removed forms part of a network or stepping stone habitat in the form of canopy, shrubs and ground layer garden plantings and native species. The vegetation connectivity flows from the south-west in site 1 and north-west in site 2. Only highly mobile species are likely to utilise the stepping stone vegetation from the development site. Under the proposal, canopy species will be retained within the subject site to provide additional connectivity. The proposed development will not result in a loss of connectivity for the highly mobile species likely to utilise it.

2.2.5 Mitigating and managing impacts

Measures proposed to mitigate and manage impacts at the development site before, during and after construction are outlined in Table 22.

Table 22: Measures proposed to mitigate and manage impacts

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
Protection of resident fauna	Minor	Negligible	Following field assessment of habitat values, no trees within the development site contained suitable hollows for fauna habitation. As such, trees should be removed in accordance with best practise methods. In the event that fauna is injured during tree removal works a qualified ecologist/licensed wildlife handler should be contacted.	Relocation of fauna in a sensitive manner	Prior to and during clearing works	Contractor
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	Contractor / Ecologist
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	Contractor / 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/subject site. If it is impractical to use salvaged hollows as replacement tree	Replacement of habitat features removed	Prior to and during clearing works	Contractor/ Ecologist

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
encourage animals to move from the impacted site, e.g. nest boxes			hollows, compensatory nest boxes should be installed within vegetation to be retained.			
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	Where possible, timing of construction works should be planned to occur outside of the spring breeding season. If vegetation clearance occurs during spring breeding season, a pre-clearance survey is required to ensure no fauna is impacted by removal of vegetation.	impacts to fauna during nesting/nursing avoided	During clearing works	Contractor
Clearing protocols that identify vegetation to be retained, prevent inadvertent damage and reduce soil disturbance	Moderate	Minor	Install tree protection fencing around trees proposed for retention.	Trees to be retained not disturbed/impacted	Tree protection fencing to be set up prior to any works occurring on site and to remain throughout duration of construction works	Contractor
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 sensitive biodiversity values present and environmental procedures such as: • Importance of retained vegetation areas and 'No Go' zones • Site environmental procedures (vegetation management, sediment and erosion control, exclusion fencing and noxious weeds) • What to do in case of environmental emergency (chemical spills, fire, injured fauna) Key contacts in case of environmental emergency	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 what to do in case of any environmental emergencies	To occur for all staff entering/working at the development site. Site briefings should be updated based on phase of the work and when environmental issues become apparent.	Contractor

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
Sediment barriers or sedimentation ponds to control the quality of water released from the site into the receiving environment	Minor	Negligible	Appropriate controls will 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.	Erosion and sedimentation will be controlled	For the duration of construction works	Contractor
Noise barriers or daily/seasonal timing of construction and operational activities to reduce impacts of noise	Minor	Negligible	Considering the highly urbanised nature of the development site, the project is unlikely to result in impacts on wildlife resulting from noise Proposed hours of construction are as follows: Monday – Friday 7am – 6pm. Saturday 7am – 4pm.	Noise impacts associated with the development will be managed in accordance with guidelines	For the duration of construction works	Contractor
Adaptive dust monitoring programs to control air quality	Minor	Negligible	Dust suppression measures will be implemented during construction works to limit dust on site Commence revegetation as soon as practicable to minimise areas likely to create dust	Mitigate dust created during construction activities	For the duration of construction works	Contractor
Hygiene protocols to prevent the spread of weeds or pathogens between infected areas and uninfected areas	Moderate	Minor	Priority weeds present within the development site listed under the NSW *Biosecurity Act 2015* for the Greater Sydney Region will be removed. Weeds present include: 1. *Olea europaea* subsp. *cuspidata* (African Olive) 2. *Asparagus aethiopicus* (Ground Asparagus) 3. *Ligustrum lucidum* and *L. sinensis*	Prevent spread of weeds or pathogens	For the duration of construction works	Contractor
Hygiene protocols to prevent the spread of weeds or pathogens between infected areas and uninfected areas	Moderate	Minor	Vehicles, machinery and building refuse should remain only within the development site and not impinge on the areas of retained native vegetation to be retained in the east. Weed management to be undertaken in retained bushland following construction works.	Spread of weeds prevented	Post-construction	Contractor
Use of indigenous species from locally occurring plant community	Minor	Negligible	No remnant native vegetation is present within the site that would be suitable for restoration and rehabilitation. Native vegetation present consists of street trees and garden plantings and is in general not representative of an	Areas within the development site will	Throughout construction and following completion of	Contractor

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
for landscape plantings in the development site			indigenous PCT. It is recommended that landscape plantings be undertaken as part of the development using a minimum 50% locality derived native species in accordance with Randwick DCP (Part B4 Clause 3.2) increasing the presence of locally indigenous species.	be landscaped using appropriate species	construction activities	
Development control measures to regulate activity in vegetation and habitat adjacent to residential development including controls on rubbish disposal, wood collection, fire management and disturbance to nests and other niche habitats	Minor	Negligible	Strategy to be developed and implemented as part of the residential development may include: • Signage to indicate areas not to be disturbed i.e. No Go zones • Rubbish disposal guidance • Prohibition of wood collection • Prohibition of bush rock removal • Controls on pet ownership such as prohibitions on allowing pets to roam beyond fenced areas	Strategy to protect vegetation and habitat adjacent to development	To be developed to provide awareness to residents of housing development.	Client
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.	Contractor

2.2.6 Serious and Irreversible Impacts (SAII)

The development has one candidate Serious and Irreversible Impacts (SAII) values as outlined in Table 23. Detailed consideration of whether impacts on candidate TECs are serious and irreversible is included in Table 23, Table 24 and Table 25.

Table 23: Candidate Serious and Irreversible Impacts

Species / Community	Common Name	Principle	Direct impact area (ha)	Threshold
Blue Gum High Forest in the Sydney Basin Bioregion	Blue Gum High Forest	Principals 1, 3 & 4	0.006	Listed as 'under development' in BioNet

Table 24: 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?	Yes
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	The Thresholds for BGHF have not been published yet according to the Threatened Biodiversity Data Collection provided in OEH BioNet.
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 been identified as having a small population size.
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	N/A
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?	Yes
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.	The Thresholds for BGHF have not been published yet according to the Threatened Biodiversity Data Collection provided in OEH BioNet.
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
b. 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.	The Thresholds for BGHF have not been published yet according to the Threatened Biodiversity Data Collection provided in OEH BioNet.

Table 25: Evaluation of an impact on a TEC – Blue Gum High Forest

Impact Assessment Provisions	Assessment
1. The area and condition of the TEC to be impacted directly and indirectly by the proposed development	The development will remove 0.006 ha of vegetation identified as *BFHG_weedy* condition. This is likely to occur as trimming of outer branches of canopy trees and slight disturbance to soil profile during construction works.
2. The extent and overall condition of the TEC within an area of 1500 metres, and then 5000 metres, surrounding the proposed development footprint. In the case of strategic biodiversity certification projects, the extent and overall condition of the TEC may be assessed across the IBRA sub region	Within the development site, 0.58 ha of BGHF in good condition and 0.82 ha of BGHF in weedy condition will be retained. In addition to what has been mapped within the development site, there is an estimated 25.18 ha of BGHF within an area of 1,500 m, in varying condition (from large tracts to small patches) (mapped by SMCMA, 2016). The removal of 0.006 ha of BGHF within the development site represents 0.024% of the mapped BGHF extent within the 1,500 m radius. Within 5,000 m radius of the development site, there is an estimated 369.57 ha of BGHF that has been mapped with low disturbance condition. The removal of 0.006 ha of BGHF from within the development site, represents 0.03% of the mapped BGHF extent within the 5,000 m radius.
3. An estimate of the extant area and overall condition of the TEC remaining before and after the impact of the proposed development has been taken into consideration	The development will not result in the overall decline of the condition of BGHF retained in the development site after development. There is approximately 0.58 ha of good condition BGHF to be retained within the development site and an additional 25.18 ha of BGHF recorded in a 1,500 m radius of the site.
4. The development proposal's impact on:	
a. Abiotic factors critical to the long-term survival of the TEC; for example, will the impact lead to a reduction of groundwater levels or substantial alteration of surface water patterns; will it alter natural disturbance regimes that the TEC depends upon, e.g. fire, flooding etc.?	The development will not impact abiotic factors critical to the long-term survival of the TEC.
b. Characteristic and functionally important species through impacts such as, but not limited to, inappropriate fire/flooding regimes, removal of under-storey species or harvesting of plants	The development will not impact characteristic and functionally important species outside of the proposed impact area as only a small amount of BGHF will be impacted and the remaining BGHF impacted (weedy condition) will be retained. Therefore, the vegetation is not considered characteristically / functionally important species. .
c. The quality and integrity of an occurrence of the TEC through threats and indirect impacts including, but not limited to, assisting invasive flora and fauna species to become established or causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants which may harm or inhibit growth of species in the TEC	The development proposal has potential to assist in the spread of invasive species into the patch of BGHF that will be retained within the development site. These potential impacts will be controlled during the construction phase and long-term maintenance of the development site. These works will retain better quality BGHF within the development site.
5. Direct or indirect fragmentation and isolation of an area of the TEC	The development will not result in an increase in the direct or indirect fragmentation or isolation of any areas of BGHF. The development will impact upon weedy condition BGHF, however, much of the canopy will be retained and therefore, connectivity will also be retained.

Impact Assessment Provisions	Assessment
6. The measures proposed to contribute to the recovery of the TEC in the IBRA subregion.	In its current form, the proposed development does not contribute to the recovery of this TEC in the IBRA subregion.

2.3 Risk assessment

A risk assessment has been undertaken for any residual impacts likely to remain after the mitigation measures (Section Table 22) have been applied. Likelihood criteria, consequence criteria and the risk matrix are provided in Table 26, Table 27 and Table 28 respectively.

Table 26: Likelihood criteria

Likelihood criteria	Description
Almost certain (Common)	Will occur, or is of a continuous nature, or the likelihood is unknown. There is likely to be an event at least once a year or greater (up to ten times per year). It often occurs in similar environments. The event is expected to occur in most circumstances.
Likely (Has occurred in recent history)	There is likely to be an event on average every one to five years. Likely to have been a similar incident occurring in similar environments. The event will probably occur in most circumstances.
Possible (Could happen, has occurred in the past, but not common)	The event could occur. There is likely to be an event on average every five to twenty years.
Unlikely (Not likely or uncommon)	The event could occur but is not expected. A rare occurrence (once per one hundred years).
Remote (Rare or practically impossible)	The event may occur only in exceptional circumstances. Very rare occurrence (once per one thousand years). Unlikely that it has occurred elsewhere; and, if it has occurred, it is regarded as unique.

Table 27: Consequence criteria

Consequence category	Description
Critical (Severe, widespread long-term effect)	Destruction of sensitive environmental features. Severe impact on ecosystem. Impacts are irreversible and/or widespread. Regulatory and high-level government intervention/action. Community outrage expected. Prosecution likely.
Major (Wider spread, moderate to long term effect)	Long-term impact of regional significance on sensitive environmental features (e.g. wetlands). Likely to result in regulatory intervention/action. Environmental harm either temporary or permanent, requiring immediate attention. Community outrage possible. Prosecution possible.
Moderate (Localised, short-term to moderate effect)	Short term impact on sensitive environmental features. Triggers regulatory investigation. Significant changes that may be rehabilitated with difficulty. Repeated public concern.
Minor (Localised short-term effect)	Impact on fauna, flora and/or habitat but no negative effects on ecosystem. Easily rehabilitated. Requires immediate regulator notification.
Negligible	Negligible impact on fauna/flora, habitat, aquatic ecosystem or water resources. Impacts are local, temporary and reversible. Incident reporting according to routine protocols.

Consequence category	Description
(Minimal impact or no lasting effect)	

Table 28: Risk matrix

Consequence	Likelihood				
	Almost certain	Likely	Possible	Unlikely	Remote
Critical	Very High	Very High	High	High	Medium
Major	Very High	High	High	Medium	Medium
Moderate	High	Medium	Medium	Medium	Low
Minor	Medium	Medium	Low	Low	Very Low
Negligible	Medium	Low	Low	Very Low	Very Low

Table 29: Risk assessment

Potential impact	Project phase	Risk (pre-mitigation)	Risk (post mitigation)
Vegetation clearing	Construction / operation	Medium	Low
Sedimentation and contaminated and/or nutrient rich run-off	Construction	Medium	Low
Noise, dust or light spill	Construction	Low	Very Low
Inadvertent impacts on adjacent habitat or vegetation	Construction	Medium	Low
Transport of weeds and pathogens from the site to adjacent vegetation	Construction	Medium	Low
Vehicle strike	Construction / operation	Low	Very Low
Trampling of threatened flora species	Construction / operation	Low	Very Low
Rubbish dumping	Construction / operation	Low	Very Low
Wood collection	Construction / operation	Low	Very Low
Bush rock removal and disturbance	Construction / operation	Medium	Low
Increase in predatory species populations	Construction / operation	Low	Very Low
Increase in pest animal populations	Construction	Low	Very low

Potential impact	Project phase	Risk (pre-mitigation)	Risk (post mitigation)
	/ operation		
Increased risk of fire	Construction / operation	Medium	Low
Disturbance to specialist breeding and foraging habitat, e.g. beach nesting for shorebirds.	Construction / operation	Medium	Low
Sedimentation and contaminated and/or nutrient rich run-off	Construction	Low	Very Low

2.4 Adaptive management strategy

This section is required for those impacts that are infrequent, cumulative or difficult to predict. Impacts associated with the proposed development have been considered and addressed in Section 2.5 and no further impacts are required to be addressed. For major projects: details of the adaptive management strategy proposed to monitor and respond to impacts on biodiversity values that are uncertain.

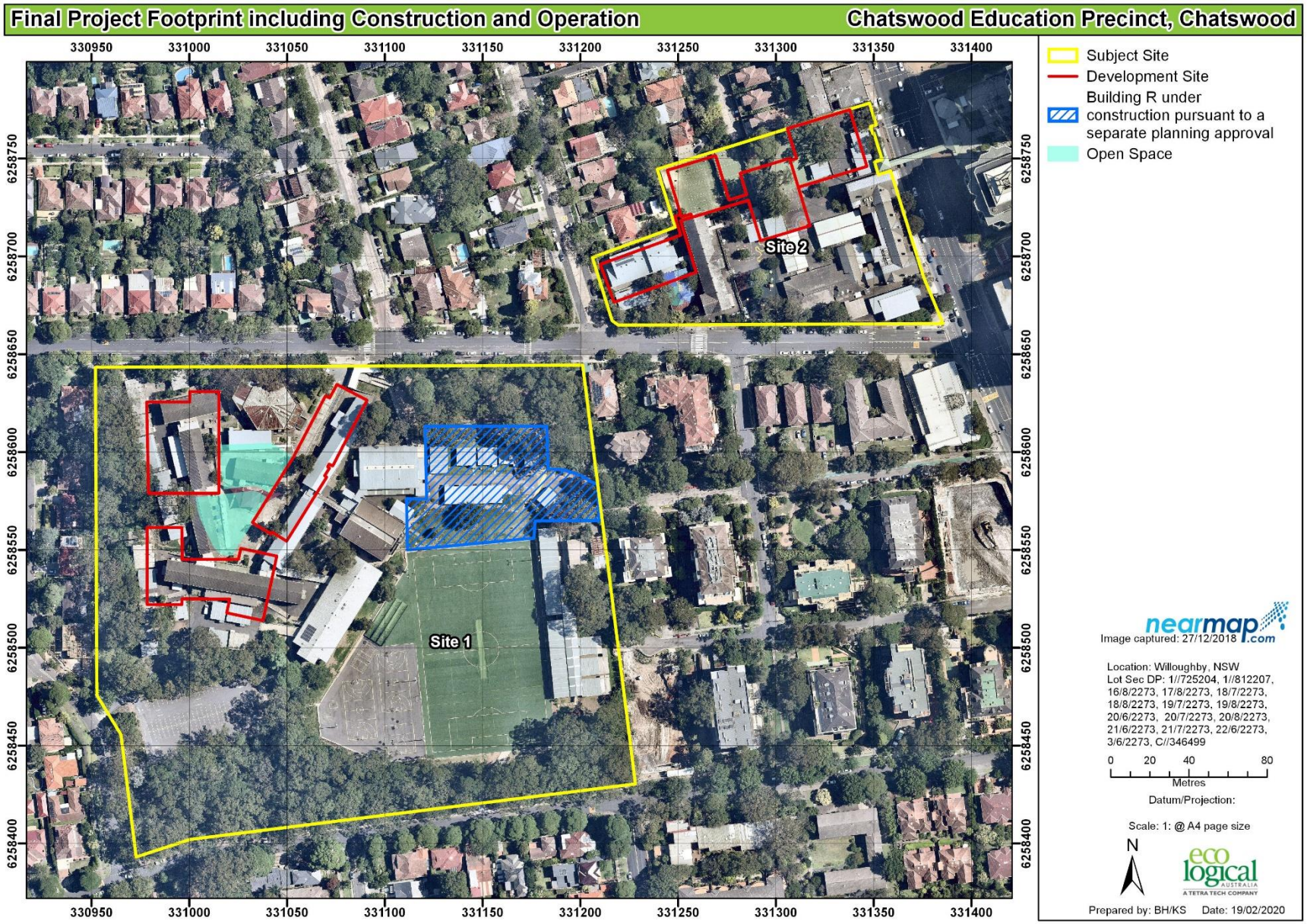

Figure 6: Final project footprint including construction and operation

2.5 Impact summary

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

2.5.1 Serious and Irreversible Impacts (SAII)

The development has candidate Serious and Irreversible Impacts (SAII) values as outlined in Table 23 and shown on Figure 7. Detailed consideration of whether impacts on candidate TEC are serious and irreversible is included in Table 25.

Table 30: Serious and Irreversible Impacts Summary

Species / Community	Common Name	Principle	Direct impact area (ha)	Summary
Blue Gum High Forest (BGHF)	Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion.	Principals 1, 3 & 4	0.006	The thresholds for BGHF have not been published by OEH. It is considered that the proposed development is unlikely to result in a SAII on BGHF

2.5.2 Impacts requiring offsets

The impacts of the development requiring offset for native vegetation are outlined in Table 31 and shown on Figure 8. The impacts of the development requiring offset for threatened species and threatened species habitat are outlined in Figure 8.

Table 31: Impacts to native vegetation that require offsets

Veg zone	PCT ID	PCT Name	Vegetation Class	Vegetation Formation	Direct impact (ha)
2	1237	Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion.	North Coast Wet Sclerophyll Forests	Wet Sclerophyll Forests (Shrubby sub-formation)	0.006
3	1237	Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion.	North Coast Wet Sclerophyll Forests	Wet Sclerophyll Forests (Shrubby sub-formation)	0.14

2.5.3 Areas not requiring assessment

Areas not requiring assessment include existing buildings, recreational areas (sporting fields), carparks, paths and cleared areas. The development site contained cleared areas which are shown in Figure 3 . These areas were not consistent with any listed PCT, nor did they contain any threatened species, hence further assessment under the BAM was not required. Areas not requiring assessment are shown on Figure 9.

2.5.4 Credit summary

The number of ecosystem credits required for the development are outlined in Table 32. The biodiversity credit report is included in Appendix D.

Table 32: Ecosystem credits required

PCT ID	PCT Name	Ancillary	Vegetation Formation	Total impacts (ha)	Credits required
1237	Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion	Weedy	Wet Sclerophyll Forests (Shrubby sub-formation)	0.006	1
1237	Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion	Planted native	Wet Sclerophyll Forests (Shrubby sub-formation)	0.14	2

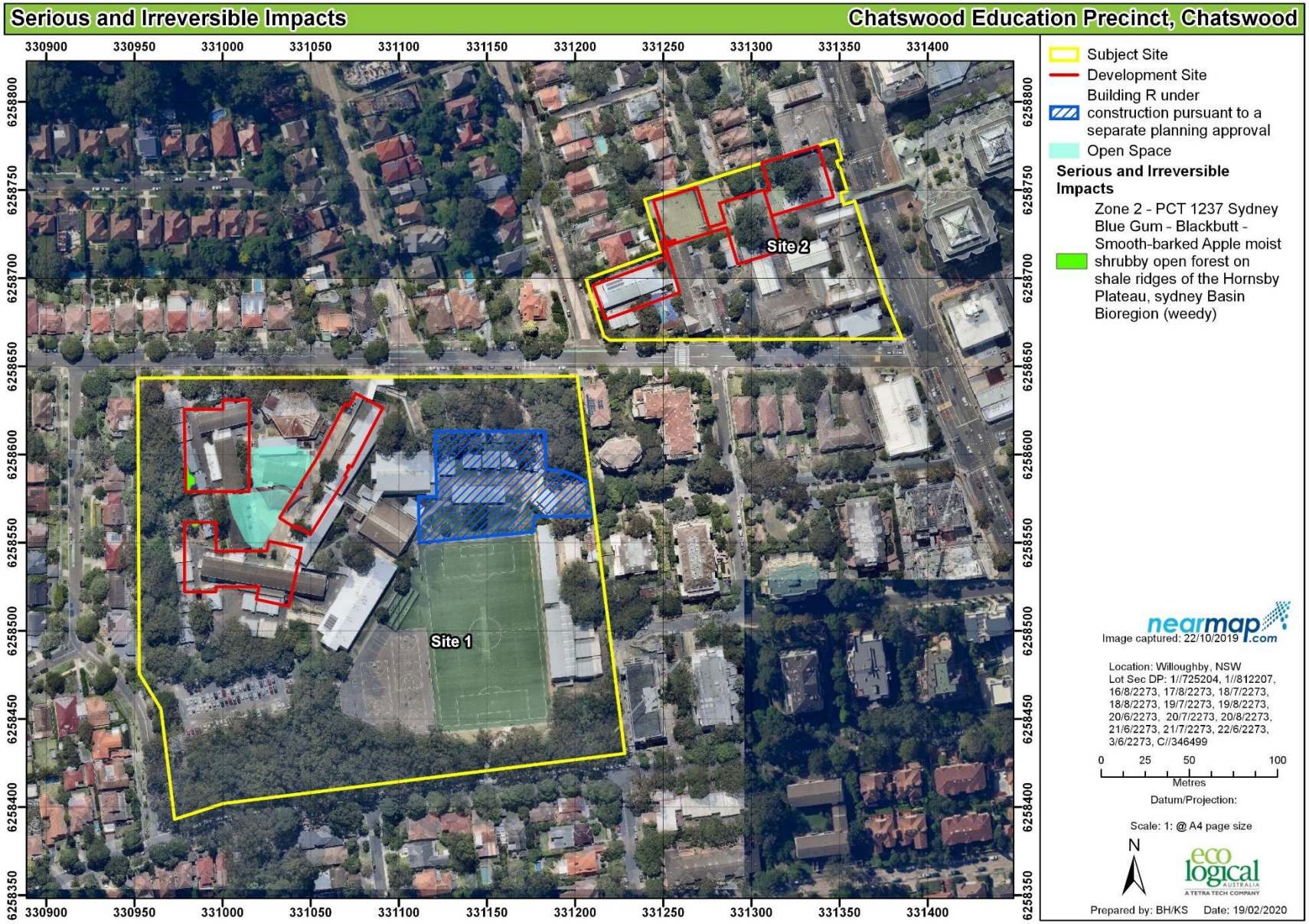

Figure 7: Serious and Irreversible Impacts

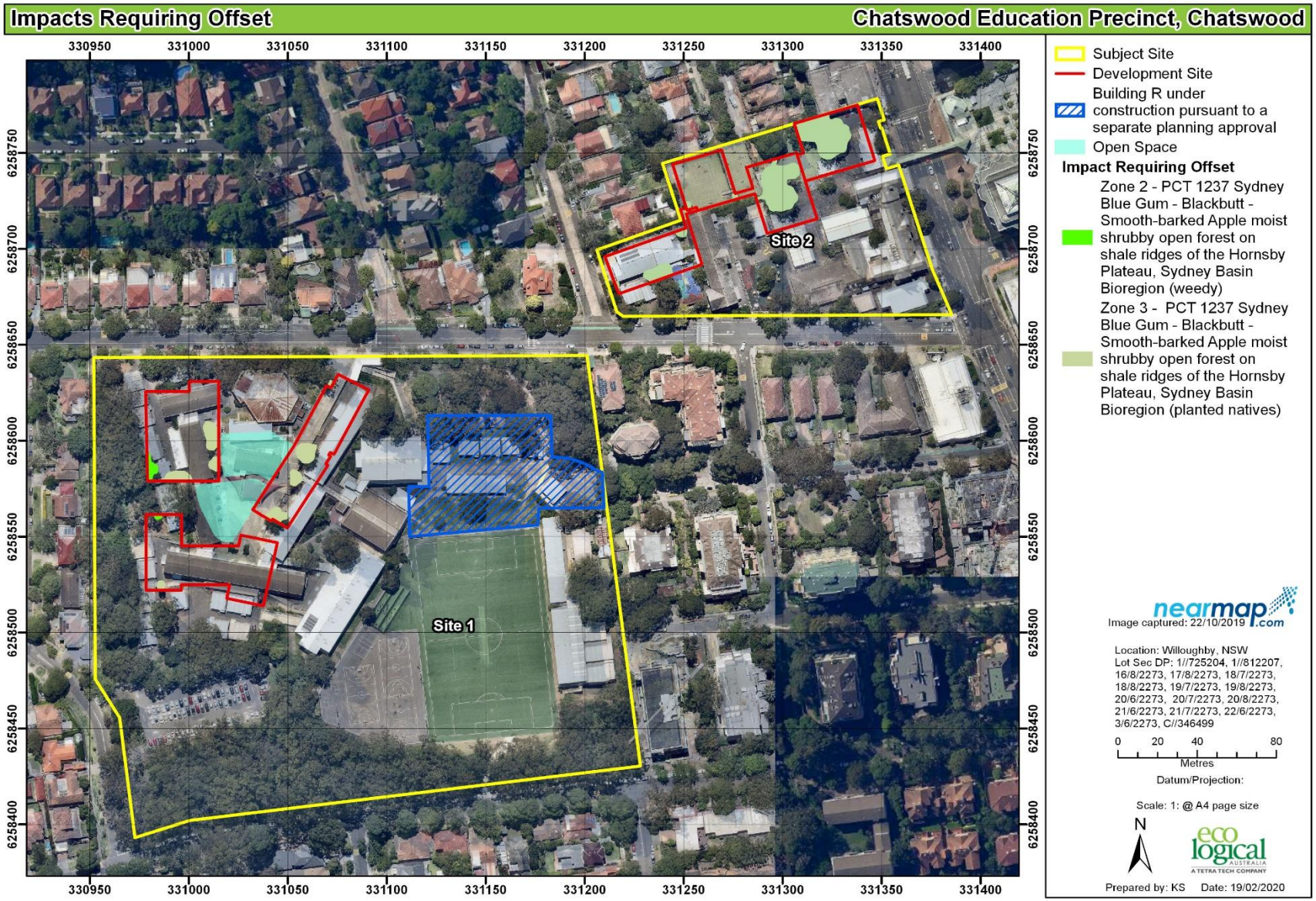

Figure 8: Impacts requiring offset

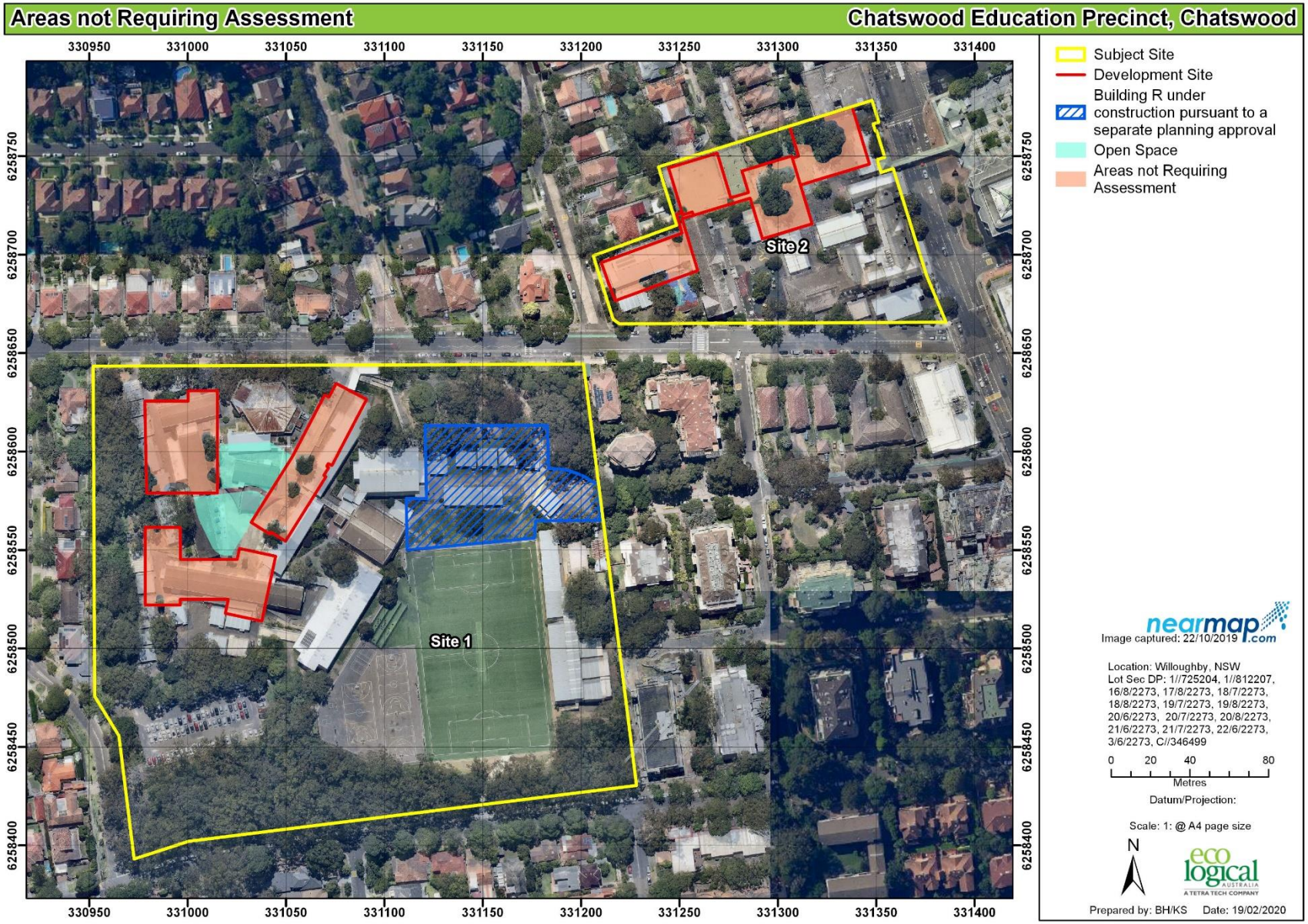

Figure 9: Areas not requiring assessment

2.6 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 2.6.1. Matters relating to Willoughby Council planning instruments have been addressed in Section 2.6.3.

2.6.1 *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 (DotE), which is responsible for administering the EPBC Act (DotE 2014).

The process includes conducting 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 (DotE 2014) 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 one MNES *Pteropus poliocephalus* (Grey-headed Flying-fox) was assessed under the act as there are several BioNet records for this species within the broader landscape of the subject site (see Table 40).

Pteropus poliocephalus (Grey-headed Flying-fox)

The Grey-headed Flying-fox 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 Gordon Grey-headed Flying-fox (GHFF) camp is known from the locality to be within 10 km of the development site (OEH 2017b). The vegetation within the development site provides potential 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 (DotE 2018).

Table 33: 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

Criterion	Assessment
	• 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 (DotE 2018). The nearest active GHFF camp occurs approximately 10 km to the north-west of the development site, within Gordon (DotE 2018).
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	No important populations have been recorded within the development site. The potential foraging habitat to be removed is marginal relative to adjacent potential habitat within the region. 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.
Criterion d: adversely affect habitat critical to the survival of a species	Less than half of the potential foraging habitat in canopy trees within the development site will be removed by the proposal. These individual trees represent a negligible amount of potential foraging resources in the locality. Potential foraging habitat will persist in close proximity to the development site, within the remaining subject land and in large stands of high quality intact native vegetation within Ferndale Park and into Swaines Creek riparian corridor 250 m adjacent to the development site and in the Lane Cove River National Park (approximately 1 km west from 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
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 (DotE 2018). The nearest active GHFF camp occurs approximately 10 km to the north-west of the development site, within Gordon (DotE 2018). Thus, no important population of GHFF occurs within the development site, and the proposed works are 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	The potential foraging habitat to be removed is marginal and of low quality. Given the small amount of potential foraging habitat to be removed, that potential foraging habitat will persist adjacent to the development site and across the locality, and that this species is highly mobile, 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 (DotE 2018). The nearest active GHFF camp occurs approximately 10 km to the north-west of the development site, within Gordon (DotE 2018). 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	Assessment
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.

2.6.2 Willoughby Local Environmental Plan 2012 (WLEP)

The Chatswood High School is currently zone SP2 (Infrastructure – Educational Establishment) and E2 (Environmental Conservation). The Chatswood Public School is currently zoned R2 (Low Density Residential). In accordance with Clause 6.1 of the Willoughby LEP 2012 both sites are mapped as having Class 5 Acid Sulphate Soils. The objective of this clause is to ensure that development does not disturb, expose of drain acid sulphate soils and cause environmental damage.

2.6.3 Willoughby Council Development Control Plan 2006

Clause 9 (Preservation of Trees or Vegetation) of the Willoughby Council Development Control Plan 2006 aims to:

- *promote sustainable vegetation management and conserve and enhance the tree resources, natural systems including bushland, and landscape quality of Willoughby City; and*
- *encourage the use of professional best practice in tree management*

The objectives of this clause are as follows:

- *To minimise unnecessary damage to or removal of trees and bushland;*
- *To conserve trees and bushland of ecological, heritage, aesthetic, botanic and cultural significance;*
- *To encourage the planting of trees that are appropriate for site conditions;*
- *To encourage the planting of local native species where appropriate;*
- *To facilitate the removal of noxious weeds, undesirable trees and inappropriate plantings;*
- *To provide for no net loss over time of tree cover and bushland in Willoughby City.*

The proposed development has, as much as possible, aimed to conserve the majority of the native bushland within the development site and minimise unnecessary damage or removal of trees and bushland. In particularly, no direct impacts to the Blue Gum High Forest to the south of the Centennial Avenue site 1 will be impacted and concept design within the north-east corner has been re-designed to reduce the amount of trees required to be removed.

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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 34: Vegetation integrity data (Composition, Structure and function)

Plot location data							
Plot no.	PCT	Vegetation Zone	Condition	Zone	Eastings	Northings	Bearing
1	1237	3	Planted natives	56	331124	6258626	78
2	1237	2	Weedy	56	330957	6258594	160

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

Structure (Total cover %)						
Plot no.	Tree	Shrub	Grass	Forb	Fern	Other
1	30	0	5	7	0	0
2	62	<1	0	10	0	0

Function											
Plot no.	Large Trees	Hollow trees	Litter Cover	Length Fallen Logs	Tree Stem 5-9	Tree Stem 10-1 9	Tree Stem 20-2 9	Tree Stem 30-49	Tree Stem 50-79	Tree Regen	High Threat Weed Cover
1	1	0	61	0	0	1	1	1	1	0	43
2	1	1	3.6	53	0	1	1	0	1	0	66

Botanic Name	Common Name	Native / Exotic/HTE
Acacia decurrens	Black Wattle	N
Acacia linifolia	White Wattle	N
Acacia parramattensis		N
Acetosa sagittata		HTE
Adiantum aethiopicum	Common Maidenhair	N
Lysimachia arvensis		E
Angophora costata	Sydney Red Gum	N
Anredera cordifolia	Madeira Vine	HTE
Araujia sericifera	Moth vine, Moth plant	E
Aristida vagans	Threeawn Speargrass	B

Botanic Name	Common Name	Native / Exotic/HTE
Asparagus aethiopicus	Asparagus fern	HTE
Bidens pilosa	Cobblers Pegs	E
Blechnum cartilagineum	Gristle Fern	N
Brachycome angustifolia	Flame Tree	N
Breynia oblongifolia	Coffee Bush	N
Bromus catharticus	Prairie Grass	E
Bursaria spinosa	Blackthorn	N
Callicoma serratifolia	Black Wattle	N
Callistemon sp.		N
Cassytha pubescens		N
Casuarina glauca	Swamp Oak	N
Cayratia clematidea	Native Grape	N
Celtis sp.		E
Cenchrus clandestinus	Kikuyu	E
Centella asiatica	Indian Pennywort	N
Ceratopetalum gummiferum	New South Wales Christmas-bush	N
Cinnamomum camphora	Camphor Laurel	E
Cirsium vulgare		E
Clematis aristata	Old Man's Beard	N
Commelina cyanea		N
Conyza bonariensis	Flaxleaf Fleabane	E
Corymbia maculata	Spotted Gum	N
Cyathea australis	Black Tree-fern	N
Cynodon dactylon	Couch	E
Cyperus eragrostis		E
Desmodium brachypodum	Large Tick-trefoil	N
Dianella caerulea		N
Dichondra repens	Kidney Weed	N
Dodonaea triquetra	Large-leaf Hop-bush	N
Doodia aspera	prickly rasp fern	N
Echinopogon caespitosus	Bushy Hedgehog-grass	N
Ehrharta erecta	Panic Veldtgrass	E
Einadia hastata		N
Elaeocarpus reticulatus	Blueberry Ash	N
Entolasia marginata	Bordered Panic	N
Eragrostis curvula	African Lovegrass	E

Botanic Name	Common Name	Native / Exotic/HTE
Eucalyptus pilularis	Blackbutt	N
Eucalyptus saligna	Sydney blue gum	N
Euphorbia peplus		E
Eustrephus latifolius	Wombat Berry	N
Geranium solanderi		N
Glycine tabacina		N
Goodenia ovata	Hop Goodenia	N
Hardenbergia violacea	Purple Coral Pea	N
Homolanthus populifolius	Bleeding Heart	N
Hypochaeris radicata	Catsear	E
Imperata cylindrica	Blady Grass	N
Kunzea ambigua	Tick Bush	N
Lagerstroemia archeriana	Crepe Myrtle	E
Lantana camara	Lantana	HTE
Ligustrum lucidum	Large-leaved Privet	E
Ligustrum sinensis	Small-leaved Privet	E
Liquidambar styraciflua	Liquidambar	E
Lissanthe strigosa	Native Peach	N
Lomandra longifolia	Spiny-headed Mat-rush	N
Lonicera japonica	Japanese Honeysuckle	E
Lophostemon confertus	Brush Box	N
Malva parviflora		E
Microlaena stipoides	Weeping Grass	N
Modiola caroliniana		E
Ochna serrulata	Ochna	E
Olea europaea subsp. cuspidata	African Olive	THE
Oplismenus aemulus	Australian Basket Grass	N
Oplismenus imbecillis	Creeping Beard Grass	N
Oxalis perennans		N
Ozothamnus diosmifolius	White Dogwood	N
Paspalum dilatatum	Paspalum	E
Passiflora sp.		E
Phyllanthus hirtellus	Thyme Spurge	N
Phyllostachys aurea		E
Pittosporum undulatum		N
Plantago lanceolata	Lamb's Tongues	E

Botanic Name	Common Name	Native / Exotic/HTE
Platylobium formosum	Handsome Flat Pea	N
Plectranthus parviflorus	Cockspur Flower	N
Polyscias sambucifolia	Elderberry Panax	N
Pratia purpurascens	Whiteroot	N
Pseuderanthemum variabile	Pastel Flower	N
Pteridium esculentum	Bracken	N
Sida rhombifolia		E
Smilax glyciphylla	Sweet Sarsaparilla	N
Solanum nigrum		E
Sonchus asper		E
Syncarpia glomulifera	Turpentine	N
Syzygium paniculatum	Magenta Cherry	N
Tradescantia fluminensis	Trad	E
Veronica plebeia		N

HTE = HIGH THREAT EXOTIC

Photo 1: Vegetation zone 1: PCT 1237_good (outside development site)

Photo 2: Vegetation zone 2 – PCT 1237_weedy

Photo 3: Vegetation zone 2 – PCT 1237_planted native

Appendix C Floristic analysis results

Plot/vegetation zone	Veg analysis tool (Tozers Metro)	PCT tool (ELA)	Chosen PCT
Plot 1 / Vegetation zone 3	N/A	N/A	This plot was conducted in planted native vegetation and did not contain adequate number of characteristic native species for statistical analysis
Plot 2/ Vegetation zone 2	**PCT 1237** **45% / 3.64** PCT 1281 48% / 3.42	PCT 1281 8 diagnostic species	This vegetation plot did not achieve the required number of diagnostic species for the Tozers analysis. The best fit PCT was PCT 1237.
Opportunistic species list for vegetation zone 1	**PCT 1237** **54% / 7.28** PCT 1281 49% / 5.59	PCT 1281 13 diagnostic species PCT 1237 10 diagnostic species	The opportunistic species list indicated that PCT 1237 was the best fit PCT. The Tozers analysis tool has more quantitative bearing than the ELAs internal tool and should be used as the preferred option.

* INDICATES THE RATIO OF POSITIVE DIAGNOSTIC SPECIES AND A STANDARDISED RATIO COMPARISON (+VE X (REQ/TOTAL): TOTAL NATIVE)
** DENOTES PLOT DATA DID NOT ACHIEVE THE REQUIRED NUMBER OF DIAGNOSTIC SPECIES FOR ANALYSIS
PLOT 1 / VEGETATION ZONE 2 PLANTED VEGETATION DID NOT CONTAIN ADEQUATE NUMBER OF NATIVE SPECIES FOR STATISTIC ANALYSIS

Appendix D Biodiversity credit report

D1 Section 1 Vegetation Zone 2

NSW GOVERNMENT

BAM Credit Summary Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00014503/BAAS18159/19/00014647	Chatswood Education Precinct	26/11/2019
Assessor Name	Report Created	BAM Data version *
Belinda Jane Failes	19/12/2019	22
Assessor Number	BAM Case Status	Date Finalised
BAAS18159	Open	To be finalised
Assessment Revision	Assessment Type	
4	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
Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion								
1	1237_Weedy	33.4	0.0	0.25	High Sensitivity to Potential Gain	2.50	TRUE	1
							Subtotal	**1**
							Total	**1**

NSW GOVERNMENT

BAM Credit Summary Report

Species credits for threatened species

Vegetation zone name	Habitat condition (HC)	Area (ha) / individual (HL)	Constant	Biodiversity risk weighting	Potential SAII	Species credits

D2 Section 2 Vegetation zone 3 PCT 1237 planted natives (non-TEC)

BAM Credit Summary Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00014503/BAAS18159/20/00014640	Upgrades Chatswood Public and High School	26/11/2019
Assessor Name	**Report Created**	**BAM Data version ***
Belinda Jane Failes	17/02/2020	22
Assessor Number	**BAM Case Status**	**Date Finalised**
BAAS18159	Open	To be finalised
Assessment Revision	**Assessment Type**	
0	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

BAM Credit Summary Report

Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion								
1	1237_Planted_native	25.0	0.2	0.25	High Sensitivity to Potential Gain	2.50		2
							Subtotal	2
							Total	2

Species credits for threatened species

Vegetation zone name	Habitat condition (HC)	Area (ha) / individual (HL)	Constant	Biodiversity risk weighting	Potential SAII	Species credits

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