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Biodiversity Assessment Report

Framework for Biodiversity Assessment

Lots 2 and 4 // DP 1151638, University of Technology, Ku-ring-gai Campus, Lindfield

Proposed Learning Village Refurbishment (SSD 8114)

Prepared for DesignInc Sydney Pty Ltd, , on behalf of NSW Dept. of Education

1 June 2018

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PREPARED FOR	DesignInc Sydney Pty Ltd, on behalf of NSW Dept. of Education	
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REVIEW	Lucas McKinnon and Bruce Mullins	
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Glossary and abbreviations

Acronym	Description
APZ	Asset Protection Zone
BAR	Biodiversity Assessment Report
BCF	Biodiversity Conservation Fund
BCT	Biodiversity Conservation Trust
COLA	Covered Outdoor Learning Area
DA	Development Application
DoEE	Department of the Environment and Energy
DPE	NSW Department of Planning and Environment
Subject site	UTS Ku-ring-gai campus, Eton Rd, Lindfield
EEC	Endangered Ecological Community
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
FBA	Framework for Biodiversity Assessment
ha	hectare(s)
IBRA	Interim Bioregionalisation of Australia
IPA	Inner Protection Area
km	kilometre
LGA	Local Government Area
LPI	Land and Property Information
masl	Metres above sea level
NSW	New South Wales
OEH	NSW Office of Environment and Heritage
OPA	Outer Protection Area
PCT	Plant community type, as defined by OEH (2017)
RFEF	River-Flat Eucalypt Forest
SEARs	Secretary's Environmental Assessment Requirements
SSD	State Significant Development
TSC Act	NSW *Threatened Species Conservation Act 1995*

1. Introduction

1.1 Background

This Biodiversity Assessment Report (BAR) has been undertaken to accompany the Response to Submissions for State Significant Development Application (SSDA_8114) relating to the refurbishment of UTS Ku-ring-gai campus, Eton Rd, Lindfield (Lots 2 and 4 DP 1151638). The refurbishment will cater for 2,100 students and 160 staff from kindergarten to Year 12. The building will be organised around six home bases consisting of 350 students in grades kindergarten to year 12. There is a gymnasium, main auditorium, two lecture theatres, science labs, cafeteria, hospitality kitchens, visual arts and wood work areas. The subject site for this BAR covers an area of 4.78 ha.

The proposed development is considered a State Significant Development (SSD), and as such Secretary's Environmental Assessment Requirements (SEARS) were issued by the Department of Planning and Environment (DPE). The SEARs state the following regarding the assessment of biodiversity impacts:

> *Biodiversity impacts related to the proposed development are to be assessed and documented in accordance with the Framework for Biodiversity Assessment, by a person accredited in accordance with section 142B(1)(c) of the Threatened Species Conservation Act 1995.*

This BAR has been prepared by Lucas McKinnon, an Accredited BioBanking Assessor (No. 76) under Part 7A of the TSC Act, and is consistent with the Framework for Biodiversity Assessment (FBA) (OEH 2014). This BAR, therefore, satisfies the requirements of the SEARs.

Two native vegetation types were identified in the subject site. Most native vegetation within the subject site is consistent with the description of Dwarf Apple - Broad-leaved Scribbly Gum - Sydney Peppermint low open woodland on sandstone ridges with subtle enrichment in northern Sydney (PCT1782), with smaller areas of and Smooth-barked Apple - Red Bloodwood open forest on enriched sandstone slopes around Sydney and the Central Coast (PCT1776) also identified. Neither of the two communities are listed as threatened ecological communities (TEC) under the NSW *Threatened Species Conservation Act 1995* (TSC Act) (NSW SC 2014) or the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) (CoA 2010).

Sections of plantings 'exotic and non-indigenous occur in areas of the subject site, particularly surrounding the buildings. This vegetation contains occasional species representative of Red Bloodwood – Scribbly Gum Heathy Woodland, however, occurs in a modified condition.

In order to address bushfire related matters following the exhibition of the Environmental Impact Statement (EIS) and to permit a school for 350 students to be opened for Term 1 2019, the SSDA has been amended as follows:

- Removal of the childcare centre from the SSDA;

- Creation of phases within the construction stages. Phase 1 will include a school of 350 students and accommodate a 100m Asset Protection Zone (APZ) (to be referred to as the "Partial School").

This BAR has been prepared to assess the biodiversity impacts as well as the required mitigation measures for Phase 1 of the development.

Two types of direct impacts to the ecological values of the development site are expected. Complete clearing will be required across a small area of the subject site to allow for the:

- establishment of a 100m APZ around Phase 1;
- installation of a new boundary fence,
- landscaped area to the north of the building for an outdoor play area;
- construction of a small footpath in the north-east of the subject site, and
- construction of a fire trail to the south of the building.

The total area of the proposed complete clearing is 0.74 ha.

Further impacts to the ecological values of the site will occur due to the thinning and ongoing management of a bushfire Asset Protection Zone (APZ) which surrounds the site to the west, south and east (Lot 4 DP 1151638). *The APZ requires areas to be managed as an Outer Protection Area (OPA) (1.00 ha*). Credits have been calculated for these areas based on a reduction in vegetation quality, rather than complete clearing.

The total proposed impact of 1.74 ha has been assessed using the FBA (OEH 2014).

Sources of information for this report included:

- NSW Planning Viewer (NSW Dept. of Planning and Environment 2017)
- BioNet Atlas of NSW Wildlife (NSW Office of Environment and Heritage 2017)
- Protected Matters Search Tool (Commonwealth Dept. of the Environment and Energy 2017)
- Native vegetation of the Sydney Metropolitan Catchment Management Authority (OEH 2016)
- Soil Landscapes of the Sydney 1:100,000 Sheet map and report, Soil Conservation Service of NSW, Sydney (Chapman et al 2009)
- SIX Maps (LPI 2017)
- ABPS (2017). Bushfire Assessment Report. s.100B 'Special Fire Protection Purpose'. Lot 2 & 4 DP 1151638, Lindfield Learning Village, Eton Road, Lindfield NSW. Prepared for Dept. of Education (v 2.1).

Plot based vegetation survey data, which was collected in accordance with FBA (2014), were captured and used for this assessment. Targeted threatened species survey was also conducted.

1.2 Location and site identification

This subject site for this BAR covers a total area of 4.78 ha and consists of lots 2 and 4 // DP 1151638, Eton Road, Lindfield (**Figure 1.1**). The subject site includes the full extent of the planned building refurbishment works (Lot 2 // DP 1151638 - 3.6 ha) and the established APZ

that surrounds the Lindfield Learning Village site (Lot 4 // DP 1151638) (**Figure 1.2)**. **Figure 1.3** contains the footprint of the proposed development.

The subject site is bounded by Lane Cover River National Park to the south, east and west, and existing development to the north. It is situated approximately 50-70 metres above sea level (masl). The highest point of the site occurs on the north-eastern boundary. The majority of the site is mapped as the Hawkesbury soil landscape, which is characterised by rugged, rolling to very steep hills on Hawkesbury Sandstone (Bannerman and Hazelton 1990). The northern part of the subject site is mapped as the Lucas Heights soil landscape, which comprises gently undulating crests and ridges on plateau surfaces of the Mittagong formation (Bannerman and Hazelton 1990).

Regional scale geological mapping by Herbert (1983) shows the site is drawn from Wianamatta Group (Rh) geology, dominated by medium to coarse grained quartz sandstone, very minor shale and laminate lenses.

1.3 Land use history

The subject site consists of native intact bushland, cleared land, exotic/non-indigenous vegetation and various infrastructure (i.e. buildings, roads etc.) on land zoned as B4 – Mixed Use. The south, east and western perimeters of the site contain a mixture of intact and underscrubbed native vegetation. To the south of the subject site is Blue Gum Creek, which is a tributary to the Lane Cove River. The vegetation surrounding the subject site has direct connectivity to Lane Cove National Park, however, is partly dissected by Lady Game Drive.

The native vegetation surrounding the campus buildings has been modified through the installation of various non-indigenous native plants. These areas also contain a higher proportion of exotic species, such as *Senna pendula* var. *glabrata*, Asparagus aethiopicus** (Ground Asparagus) and *Ehrharta erecta** (Panic Veldtgrass) than the remainder of the site. A large portion of the vegetation surrounding the subject site has been underscrubbed and is currently managed within an existing APZ. Several small areas of cleared land are present in the subject site, which are currently unmanaged and consist exclusively of exotic grasses and herbaceous weeds, such as *Cenchrus clandestinus** (Kikuyu Grass).

The land use surrounding the subject site consists of land zoned as R2 – Low Density Residential and R1 – General Residential to the north of the subject site. Directly to the south, west and east of the subject site land is zoned as E1 - National Parks and Nature Reserves (Lane Cove National Park), with land to the north-west and north-east zoned E3 – Environmental Management. Charles Bean Oval is located to the north of the subject site.

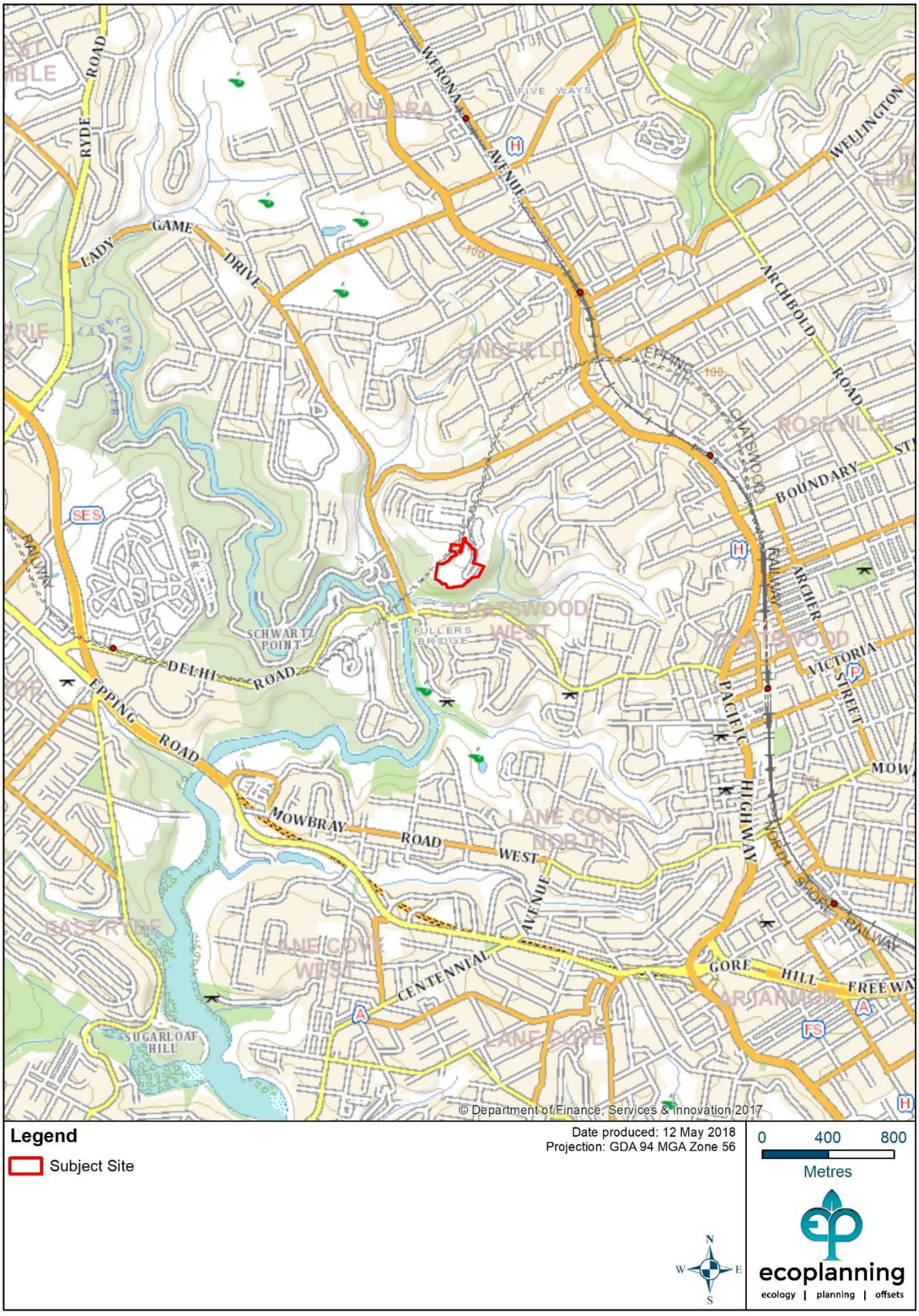

Figure 1.1: Subject site location.

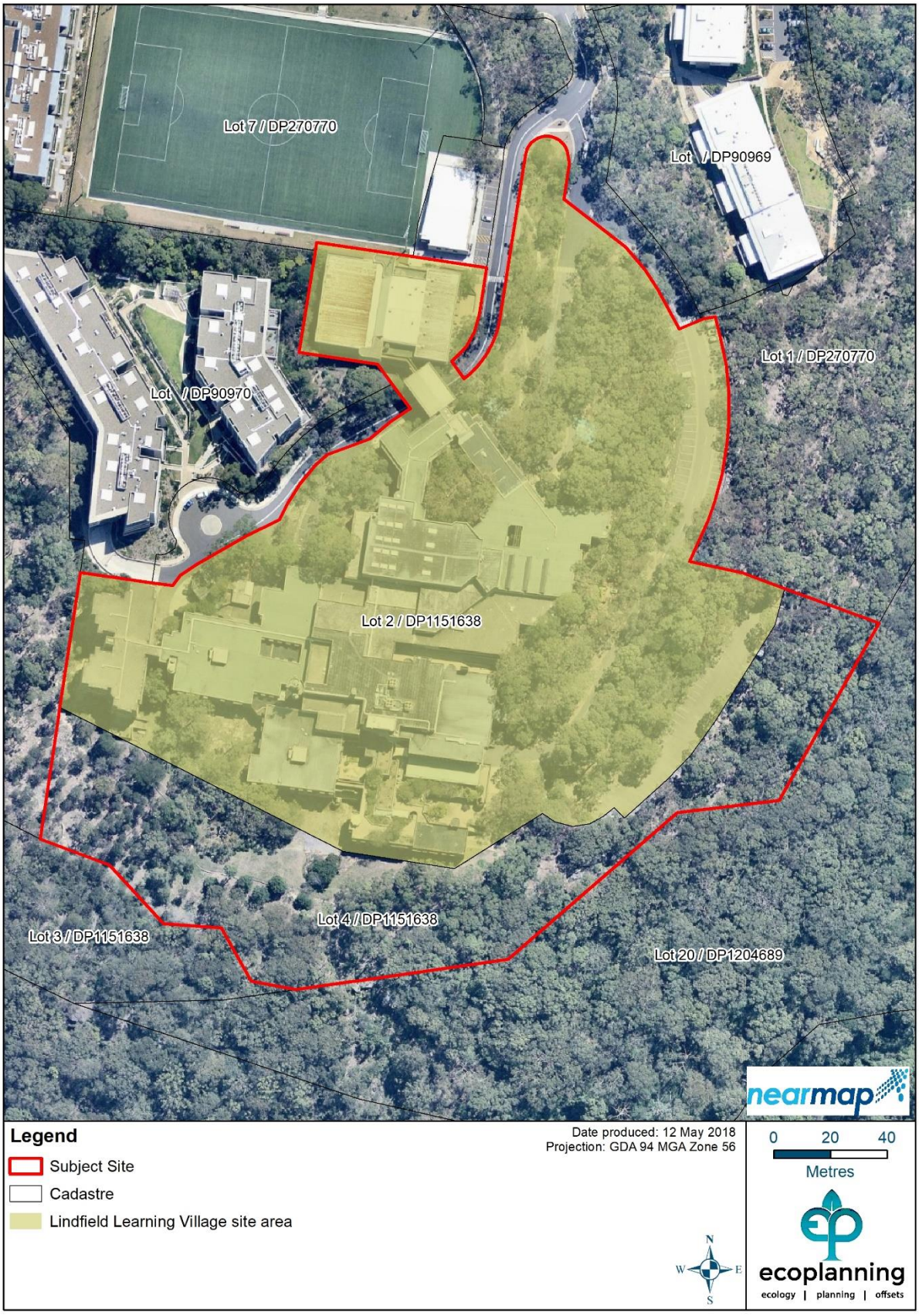

Figure 1.2: Site map.

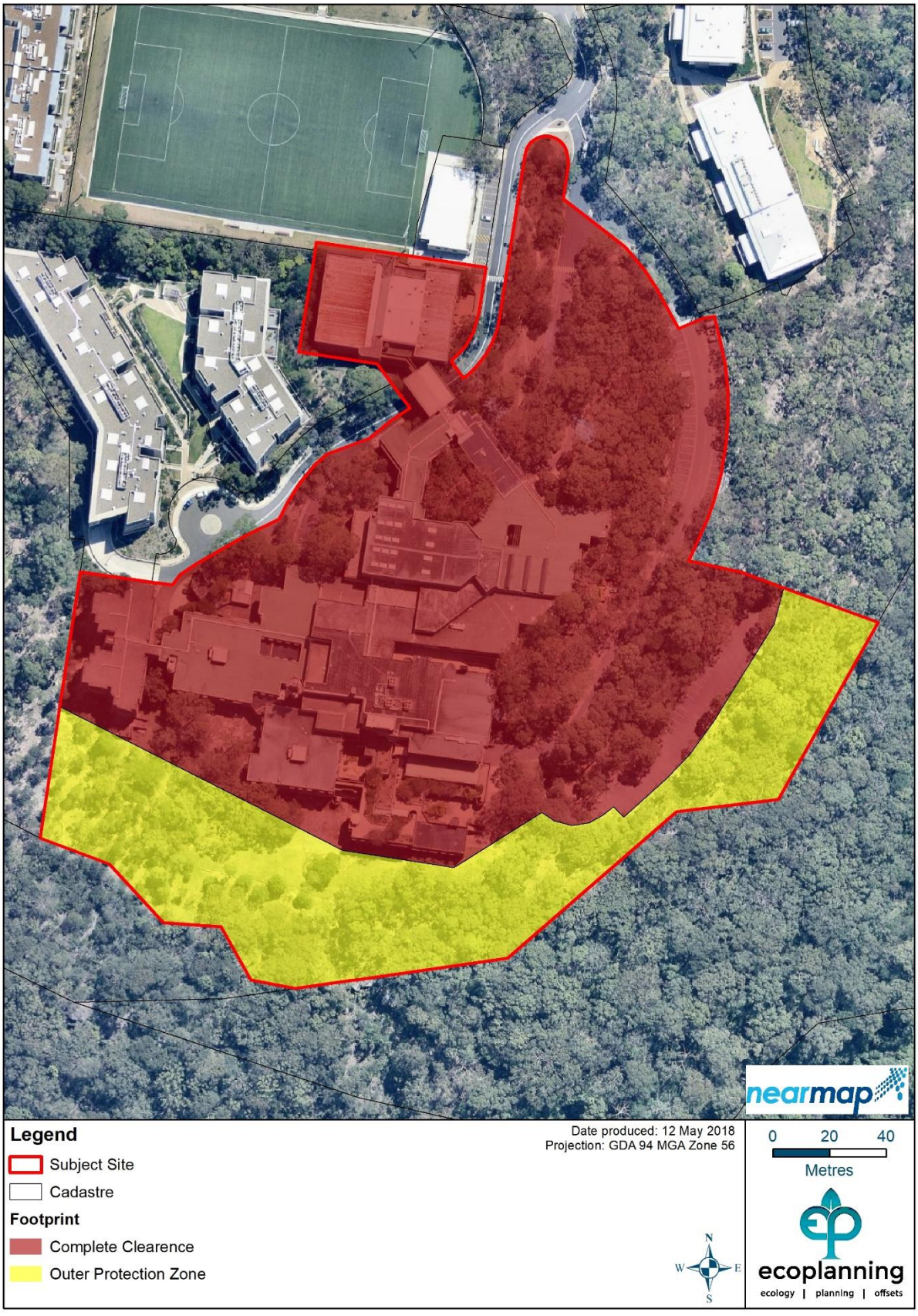

Figure 1.3: Proposed development footprint.

2. Landscape features

In accordance with the FBA, a number of features are assessed within and surrounding the subject site in order to describe the landscape features and to calculate the final landscape score. Provided below are details related to IBRA region and subregion, NSW landscape regions (Mitchell Landscapes), rivers, streams, estuaries and wetlands, surrounding native vegetation extent and the existence of state or regionally significant biodiversity values.

2.1.1 IBRA bioregions and IBRA subregions

The subject site is located entirely within the Pittwater IBRA subregion (Version 7) and within the NSW Sydney Basin IBRA region (version 7). The outer assessment circle crosses partially into the Cumberland IBRA subregion on its eastern side.

The Pittwater IBRA subregion was entered into the credit calculator.

2.1.2 NSW landscape regions (Mitchell Landscapes)

The subject site occurs in only one NSW Mitchell Landscape, being the '*Port Jackson Basin*' landscape (Mitchell Landscapes V3).

The landscapes '*Pennant Hills Ridges*' also occur within the outer assessment circle. This is shown on the Locality Map (**Figure 2.1**) and area calculations for each landscape are shown in **Table 2.1**.

The Port Jackson Basin Mitchell Landscape was entered into the credit calculator due to it being the dominant Mitchell Landscape within the subject site – occupying 100.0% of the subject site.

Table 2.1: Mitchell Landscapes and areas.

Mitchell Landscape (ML)	Area of ML within outer assessment circle (ha)	Area of ML within subject site (ha)	% of subject site
Port Jackson Basin	810	4.78	100
Pennant Hills Ridges	190	0	0
Total	**1000**	**4.78**	**100**

2.1.3 Rivers, streams and estuaries

There are no rivers, streams or estuaries identified within the subject site. A riparian assessment was conducted for the subject site using both desktop and field based methods.

An initial desktop assessment of mapped waterways was conducted for the subject site and surrounding lands. This assessment found that no mapped waterways are present on the subject site. The closest mapped waterway is approximately 110 m to the south of the subject site. This waterway is a tributary of Lane Cover River known as Blue Gum Creek, drains in a westerly direction and is a Strahler Stream Order 2 waterway.

The site inspection identified no waterways or waterbodies within the subject site. A further assessment of waterfront or riparian land is, therefore, not required.

2.1.4 Local and important wetlands

There are no local or important wetlands within the 1,000 ha assessment circle.

2.1.5 Native vegetation extent

A layer of native vegetation cover is required for each assessment circle (100 ha and 1,000 ha) to assess the impact of the development to native vegetation. The extent of native vegetation on the subject site and immediate surrounds was mapped using the Sydney Metropolitan Catchment Management Authority (CMA) Vegetation Map (OEH 2013). Areas of Rock, Cleared Land and Weeds and Exotics were removed from the layer before the vegetation extent was clipped to the outer and inner assessment circles.

The native vegetation cover was mapped for both the 100 ha and 1,000 ha circles (**Figure** 2.1). The proposed footprint of the development will completely clear 0.74 ha, and will manage 1.00 ha as an APZ. The calculations related to future native vegetation cover include this proposed impact.

2.1.6 State, regional and local biodiversity links

The site does not incorporate a state, regional or local biodiversity link.

2.1.7 Other landscape features

There are no other landscape features identified in the SEARs.

2.2 Landscape value score components

2.2.1 Percent native vegetation cover in the landscape

The native vegetation within the inner and outer circles (**Figure 2.1**), and the impact of the development on the extent of this native vegetation, was considered consistent with Table 9 in FBA (OEH 2014) to determine current and future scores for the percent native vegetation cover component of the landscape score. The results of the analysis are shown in **Table 2.2**.

The amount of complete clearing is relatively minor, totalling 0.74 ha. The APZ management of vegetation within the subject site is likely to maintain both overstorey and midstorey within, or close to, benchmark, with the target percent foliage covers provided in the Bushfire Assessment Report (ABPS 2017) being above the minimum benchmark for both PCTs for midstorey and overstorey. Therefore, with only 0.74 ha of complete clearing proposed, no change in future score is recorded for the extent of native vegetation for either assessment circle.

Table 2.2: Estimates of native vegetation and scores in the inner and outer assessment circles.

Assessment circle	Current (ha)	Current (%)	Current (score)	Future (ha)	Future (%)	Future (score)
Inner (100 ha)	56	56 - 60	7.7	56	56 - 60	7.7
Outer (1,000 ha)	493	46 - 50	11.3	492	46 - 50	11.3

Figure 2.1: Location map.

2.2.2 Connectivity value

The subject site is not part of a State or Regionally Significant Biodiversity Link, as identified by the 'connectivity value classes' in Table 10 of Appendix 4 in the FBA.

The subject site is well connected to the south, with other more restricted vegetated links also occurring to both the east and west. The subject site also lies directly adjacent to the Lane Cove River National Park. However, as the Lindfield Learning Village is already constructed, and the refurbishment includes only minor amounts of clearing and the management of the APZ, no impacts to connectivity are expected. This includes no changes to either the minimum width, or the overall condition, of the link.

Based on the above the following was entered into the credit calculator:

- **Connectivity width:** 100 - 500 m before development and after development;
- **Connectivity over storey condition:** PFC at benchmark before development and after development;
- **Connectivity mid storey/ground cover condition:** PFC of mid-storey/ground cover at benchmark before development and after development.

As there is no change in the current or future connectivity scores, no score is recorded for this variable.

2.2.3 Patch size

Patch size as defined by the FBA as *'an area of native vegetation that:*

a) Occurs on the development site or offset site, and
b) Is in moderate to good condition, and
c) Includes native vegetation that has a gap of <100 m from the next area of moderate to good condition native vegetation (or ≤ 30 m for non-woody vegetation)

Patch size may extend onto adjoining land that is not part of the development site.'

Patch size was calculated for the vegetation on the development site using the field validated map of vegetation types identified and the SMCMA (OEH 2013) vegetation map referenced earlier.

As the site is well connected, and lies adjacent to a large amount of contiguous vegetation extending throughout Lane Cove National Park, the total patch size calculated was the maximum required by the FBA (OEH 2014), being 1,001 ha. 1,001 ha was entered into the credit calculator resulting in a total patch size score of 12.

2.3 Landscape value score

Using the above data, the final landscape score was calculated to be **12** (**Table 2.3**).

Table 2.3: Landscape score components.

Landscape score component	Score Awarded
Change in connectivity score	0
Decrease in native vegetation cover (inner assessment circle) score	0
Decrease in native vegetation cover (outer assessment circle) score	0
Patch size area score	12
Total	**12**

3. Native vegetation

3.1 Plant community types (PCTs) and threatened ecological communities

Desktop assessment determined the vegetation in the subject site to be mapped as 'Hornsby Enriched Sandstone Exposed Woodland' (S_DSF10), 'Coastal Enriched Sandstone Dry Forest' (S_DSF04), with areas of 'Coastal Enriched Sandstone Moist Forest' (S_WSF02) occurring in the sheltered gullies surrounding the subject site (OEH 2013). Small fragments of vegetation were not mapped by OEH (2013), particularly to the east and south east of Charles Bean Oval.

Field assessment confirmed the presence of Coastal Enriched Sandstone Dry Forest and Hornsby Enriched Sandstone Exposed Woodland in the subject site. Coastal Enriched Sandstone Moist Forest was identified to the south of the subject site, extending slightly further north than indicated by OEH (2013) mapping, however, will not be subject to direct or indirect impacts of the proposed development. Areas previously mapped as Hornsby Enriched Sandstone Exposed Woodland surrounding the buildings were assessed to contain exotic species and planted non-indigenous native species, including *Eucalyptus grandis** (Flooded Gum). Other non-native vegetation types and features identified included cleared land 'exotics' and infrastructure – 'buildings, road etc.' (**Figure 3.2**).

Hornsby Enriched Sandstone Exposed Woodland is equivalent to the Plant Community Type (PCT), *Dwarf Apple - Broad-leaved Scribbly Gum - Sydney Peppermint low open woodland on sandstone ridges with subtle enrichment in northern Sydney* (ME67, PCT1782) (OEH 2017). The Hornsby Enriched Sandstone Exposed Woodland vegetation in the subject site is not listed as a TEC under the EPBC or TSC Acts. Two distinct condition classes of this community occur in the subject site, including 'intact' and 'underscrubbed'. A large portion of the mapped extent of the community in the south and the west of the site contains vegetation that is managed within the APZ. The intact Hornsby Enriched Sandstone Woodland vegetation occurs as fragments of bushland amongst the buildings within the campus.

Coastal Enriched Sandstone Dry Forest is equivalent to the PCT, *Smooth-barked Apple - Red Bloodwood open forest on enriched sandstone slopes around Sydney and the Central Coast* (ME64; PCT1776) (OEH 2017). The Coastal Enriched Sandstone Dry Forest in the subject site is not listed as a TEC under the EPBC or TSC Acts. Only one vegetation zone/condition class is identified onsite, which occurs in an 'intact' condition. This community transitions into Coastal Enriched Sandstone Moist Forest in the sheltered gullies to the south of the subject site. An increase in mesic species, including *Pittosporum undulatum* (Native Daphne), *Glochidion ferdinandi* (Cheese Tree) and *Elaeocarpus reticulatus* (Blueberry Ash), is typical for Coastal Enriched Sandstone Moist Forest and marks the shift between the two communities.

The total area of each vegetation type is displayed in **Table 3.1**. 'Cleared land exotics and exotic/non-indigenous plantings' constitute 0.66 ha, or 14% of the development site. Native vegetation occupies 36% of the site, with Smooth-barked Apple - Red Bloodwood open forest on enriched sandstone slopes around Sydney and the Central Coast mapped over 0.42 ha (9% of the development site) and Dwarf Apple - Broad-leaved Scribbly Gum - Sydney

Peppermint low open woodland on sandstone ridges with subtle enrichment in northern Sydney mapped over 1.32 ha (28% of the development site). Additional information on both vegetation types on site is provided below.

Table 3.1: Vegetation types and zones, a description and the total area within the development site.

Vegetation type (OEH 2013)	Plant community type (OEH 2016)	Threatened ecological communities	Condition	Area (ha)	Proportion of development site (%)
Hornsby Enriched Sandstone Exposed Woodland	PCT 1782 - Dwarf Apple - Broad-leaved Scribbly Gum - Sydney Peppermint low open woodland on sandstone ridges with subtle enrichment in northern Sydney	N/A	Underscrubbed	0.74	15
			Intact	0.58	12
Coastal Enriched Sandstone Dry Forest	PCT 1776 - Smooth-barked Apple - Red Bloodwood open forest on enriched sandstone slopes around Sydney and the Central Coast	N/A	Intact	0.42	9
Other vegetation	Cleared land exotics and exotic/non-indigenous plantings	N/A	Exotics/non-indigenous	0.66	14
	Cleared land, infrastructure	N/A	Cleared land, infrastructure	2.38	50
			Total	**4.78**	**100.0**

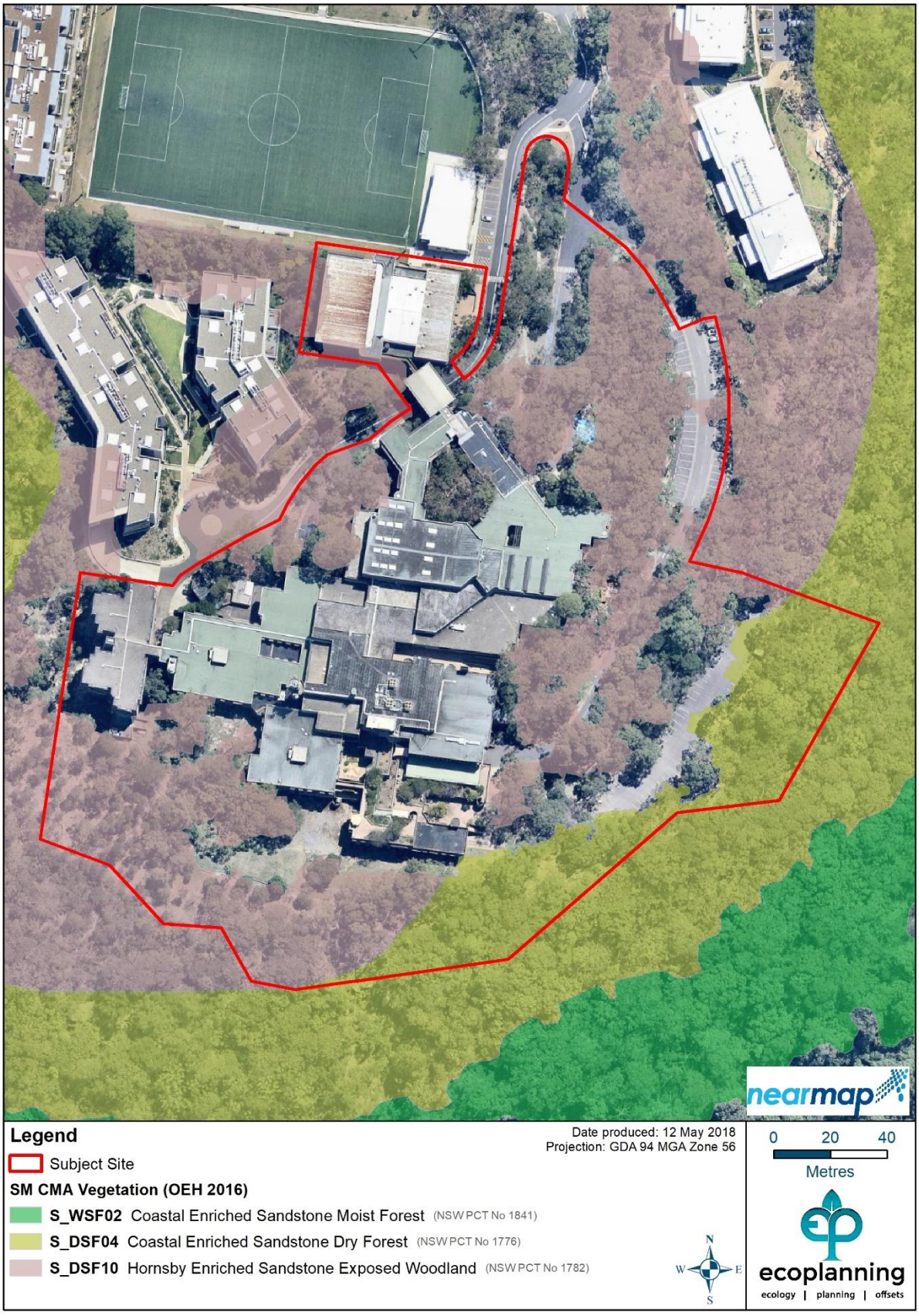

Figure 3.1: Vegetation types (OEH 2016).

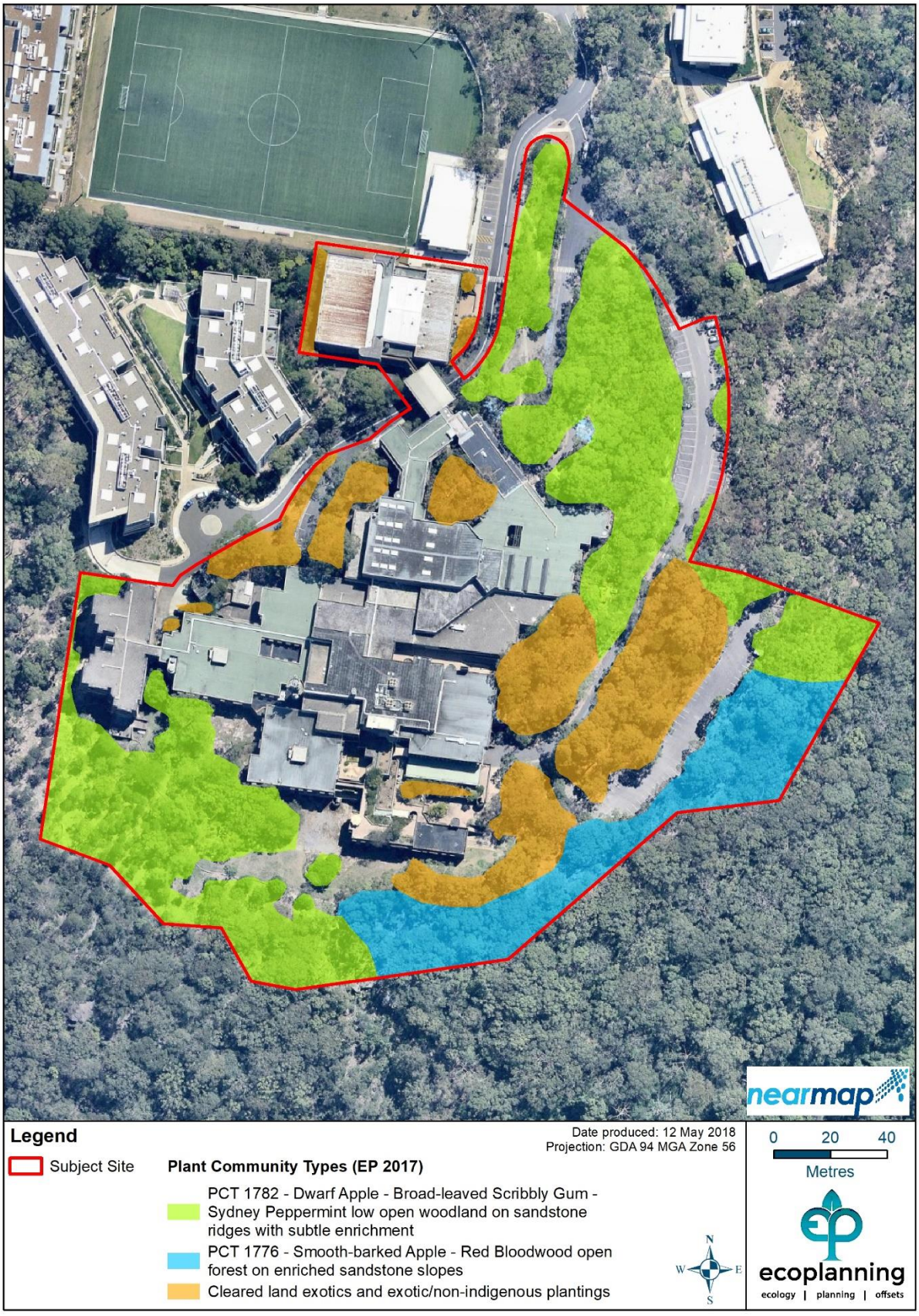

Figure 3.2: Field validated vegetation (Ecoplanning 2017).

3.1.1 Smooth-barked Apple - Red Bloodwood open forest on enriched sandstone slopes around Sydney and the Central Coast (ME64; PCT1776)

This vegetation type is located along the southern and the western boundaries of the development site. It is characterised by intact open forest with an established overstorey of *Eucalyptus piperita* (Sydney Peppermint) and *Angophora costata* (Sydney Red Gum). Some sections of the vegetation type contain a low abundance and cover of herbaceous and woody weeds, which mostly occur in areas with increased soil moisture. This vegetation type has been distinguished from other vegetation types onsite (i.e. Dwarf Apple - Broad-leaved Scribbly Gum - Sydney Peppermint low open woodland) by the presence of *E. piperita* and *A. costata*, and the absence of *Eucalyptus haemastoma* (Scribbly Gum). This vegetation is remnant, and contains several hollow bearing trees (**Figure 3.3**).

The midstorey is dominated by native shrub species, including *Banksia serrata* (Old-man Banksia), *Banksia oblongifolia* (Fern-leaved Banksia) *Persoonia levis* (Broad-leaved Geebung), *Ceratopetalum gummiferum* (Christmas Bush), *Platysace lanceolata* (Shrubby Platysace), *Zieria smithii* (Sandfly Zieria), *Dillwynia retorta*, *Dodonaea triquetra* (Large-leaf Hop-bush) and *Acacia longifolia* subsp. *longifolia* (Sydney Golden Wattle). The groundlayer is dominated by native groundcovers, grasses and ferns, including *Gonocarpus teucrioides* (Raspwort), *Pteridium esculentum* (Bracken Fern), *Lomandra longifolia* (Spiny-headed Mat-rush), *Xanthorrhoea arborea*, *Stylidium productum, Dianella caerulea* var. *producta, Cryptostylis erecta* (Bonnet Orchid) and *Billardiera scandens* (Hairy Apple Berry).

A range of herbaceous and woody weeds are present through the vegetation type in low quantities, including *Senna pendula* var. *glabrata**, *Bidens pilosa** (Cobblers Peg), *Solanum nigrum** (Black-berry Nightshade), *Ligustrum sinense** (Small-leaved Privet), *Asparagus aethiopicus**, *Phyllanthus tenellus** (Hen and Chicken), *Ageratina adenophora** (Crofton Weed), *Nephrolepis cordifolia** (Fishbone Fern), and *Cinnamomum camphora** (Camphor Laurel).

A summary of the PCT profile for this vegetation type in the Vegetation Information System (VIS) (OEH (2017) is provided in **Table 3.3**. Species recorded onsite within this patch are highlighted in **bold text**.

Figure 3.3: Smooth-barked Apple - Red Bloodwood open forest 'intact' in the south of the study area.

Table 3.2: VIS plant community type profile (OEH 2017) – Smooth-barked Apple - Red Bloodwood open forest on enriched sandstone slopes around Sydney and the Central Coast (ME64; PCT1776).

Plant community type (PCT)	Smooth-barked Apple - Red Bloodwood open forest on enriched sandstone slopes around Sydney and the Central Coast
PCT and BioMetric veg type (BVT) ID	PCT 1776 / BVT: ME64 and HN654
Vegetation formation	Dry Sclerophyll Forests (Shrubby sub-formation)
Vegetation class	Sydney Coastal Dry Sclerophyll Forests
Upper stratum	***Angophora costata* (Sydney Red Gum)**, ***Corymbia gummifera* (Red Bloodwood)**, ***Eucalyptus piperita* (Sydney Peppermint)**, *Eucalyptus pilularis* (Blackbutt), *Eucalyptus umbra* (Broad-leaved White Mahogany) and *Syncarpia glomulifera* (Turpentine)
Middle stratum	***Allocasuarina littoralis* (Black She-oak), *Banksia serrata* (Old-man Banksia)**, ***Elaeocarpus reticulatus* (Blueberry Ash)**, ***Pittosporum undulatum* (Sweet Pittosporum)**, ***Ceratopetalum gummiferum* (Christmas Bush)**, ***Acacia* ulicifolia (Prickly Mosses)**, ***Leptospermum trinervium* (Slender Tea-tree)**, *Persoonia levis* (Broad-leaved Geebung) and ***Acacia suaveolens* (Sweet Wattle)**
Ground stratum	***Dianella caerulea* (Blue Flax-lily)**, *Entolasia stricta* (Wiry Panic), ***Lomandra longifolia* (Spiny-headed Mat-rush)**, ***Pteridium esculentum* (Bracken)**, ***Smilax glyciphylla* (Sweet Sarsaparilla)** and *Xanthosia pilosa* (Woolly Xanthosia),
Landscape position	-
Profile source	S_DSO4 (OEH 2013)
Full reference details	OEH (2013) The Native Vegetation of the Sydney Metropolitan Area Version 2.0 NSW Office of Environment and Heritage Sydney.
Estimate remaining pre-European extent rounded to nearest 5%	35
TEC Name (Listing status)	TSC Act: Not listed EPBC Act: Not listed

3.1.1 Dwarf Apple - Broad-leaved Scribbly Gum - Sydney Peppermint low open woodland on sandstone ridges with subtle enrichment in northern Sydney (ME67; PCT1782)

This vegetation type is located along the south and the west boundaries of the development site and scattered amongst the buildings in the north. It is characterised by an intact open woodland (**Figure 3.4**) with an established overstorey of *E. haemastoma* and *Corymbia gummifera* (Red Bloodwood). Some sections of the vegetation type contain a low abundance and cover of herbaceous and woody weeds, which mostly occur in the 'underscrubbed' vegetation and where past soil disturbance has occurred (**Figure 3.5**). This vegetation type has been distinguished from other vegetation types onsite (i.e. Smooth-barked Apple - Red Bloodwood open forest) by the presence of *E. haemastoma* and increased abundance and cover of *C. gummifera* and *Allocasuarina littoralis* (Black She-oak). *E. piperita* and *Angophora costata* occur infrequently, and are mostly present in the ecotone between the two mapped communities.

The midstorey is dominated by native shrub species, including *Banksia serrata, Allocasuarina littoralis, Micrantheum ericoides*, *Acacia suaveolens* (Sweet Wattle), *Persoonia levis*, *Dodonaea triquetra* (Large-leaf Hop-bush), *Pimelea linifolia* (Slender Rice Flower), *Grevillea buxifolia* (Grey Spider Plant) *Isopogon anemonifolius* (Broad-leaf Drumsticks), *Lomatia silaifolia* (Crinkle Bush), *Angophora hispida* (Dwarf Apple), add others. The groundlayer is dominated by native groundcovers, grasses and a diverse sedge layer, including *Actinotus minor* (Lesser Flannel Flower), *Actinotus helianthi* (Flannel Flower), *Anisopogon avenaceus* (Oat Speargrass), *Hibbertia aspera* (Rough Guinea Flower), *Lepidosperma laterale*, *Entolasia marginata* (Bordered Panic), *Patersonia sericea* (Silky Purple-flag), *Ptilothrix deusta, Caustis flexuosa* (Curly Wig) and *Xanthorrhoea media* (Grass Tree).

This vegetation is remnant, however, some sections have been underscrubbed (i.e. the APZ), or modified to such an extent that they have been mapped separately as plantings 'exotics/non-indigenous'. A range of herbaceous and woody weeds are present through the vegetation type in low quantities, including *Bidens pilosa**, *Asparagus asparagoides** and *Andropogon virginicus** (Whisky Grass).

A summary of the PCT profile for this vegetation type in the Vegetation Information System (VIS) (OEH (2017) is provided in **Table 3.3**. Species recorded onsite within this patch are highlighted in **bold text**.

Figure 3.4: Dwarf Apple - Broad-leaved Scribbly Gum - Sydney Peppermint low open woodland 'intact' in the north of the development site.

Figure 3.5: Dwarf Apple - Broad-leaved Scribbly Gum - Sydney Peppermint low open woodland 'underscrubbed' in the south of the development site.

Table 3.3: VIS plant community type profile (OEH 2017) – Dwarf Apple - Broad-leaved Scribbly Gum - Sydney Peppermint low open woodland on sandstone ridges with subtle enrichment in northern Sydney (ME67; PCT1782).

Plant community type (PCT)	Dwarf Apple - Broad-leaved Scribbly Gum - Sydney Peppermint low open woodland on sandstone ridges with subtle enrichment in northern Sydney
PCT and BioMetric veg type (BVT) ID	PCT 1782/ BVT: ME67
Vegetation formation	Dry Sclerophyll Forests (Shrubby sub-formation)
Vegetation class	Sydney Coastal Dry Sclerophyll Forests
Upper stratum	***Angophora hispida*** **(Dwarf Apple)**, ***Eucalyptus haemastoma*** **(Broad-leaved Scribbly Gum)**, ***Corymbia gummifera*** **(Red Bloodwood)** and *Eucalyptus piperita* (Sydney Peppermint)
Middle stratum	***Leptospermum trinervium*** **(Slender Tea-tree)**, ***Allocasuarina littoralis*** **(Black She-oak)**, ***Acacia suaveolens*** **(Sweet Wattle)**, ***Banksia ericifolia*** **subsp. *ericifolia* (Heath-leaved Banksia)**, ***Lambertia formosa*** **(Mountain Devil)**, ***Grevillea buxifolia*** **(Grey Spider Flower)**, ***Banksia serrata*** **(Old-man Banksia)** and ***Woollsia pungens***
Ground stratum	***Entolasia stricta*** **(Wiry Panic)**, ***Actinotus minor*** **(Lesser Flannel Flower)**, ***Cyathochaeta diandra***, ***Dianella caerulea*** **(Blue Flax-lily)**, ***Dampiera stricta***, ***Boronia ledifolia*** **(Sydney Boronia)**, *Austrostipa pubescens* and ***Lomandra glauca*** **(Pale Mat-rush)**
Landscape position	-
Profile source	S_DSF10 (OEH 2013)
Full reference details	OEH (2013) The Native Vegetation of the Sydney Metropolitan Area Version 2.0 NSW Office of Environment and Heritage Sydney.
Estimate remaining pre-European extent rounded to nearest 5%	25%
EEC Name (Listing status)	TSC Act: Not listed EPBC Act: Not listed

3.1.2 Other vegetation

Three other distinct vegetation assemblages are recorded within the development site, but none are remnant native vegetation types. These vegetation assemblages include:

Cleared land exotics and exotic/non-indigenous plantings

This zone consists of cleared land dominated by exotic grasses and herbaceous weeds, such as *Cenchrus clandestinus** (Kikuyu Grass), *Conyza* sp.* and *Sida rhombifolia** (Paddy's Lucerne) (**Figure 3.6**).

Also included in this zone are areas consisting of non-indigenous plantings and exotic species, which are either planted or have self-recruited (**Figure 3.7**). *E.* grandis* is the dominant canopy species in the zone, however, several large planted *Corymbia maculata** (Spotted Gum) are also present in the south of the zone. Occasional native species representative of Dwarf Apple - Broad-leaved Scribbly Gum - Sydney Peppermint low open woodland are found through the zone, including *E. haemastoma* and *Allocasuarina torulosa*. Dominant exotic and non-indigenous native species in the zone include, *Senna pendula* var. *glabrata**, *Asparagus aethiopicus**, *Ehrharta erecta**, *Acacia saligna** (Golden Wreath Wattle) and *Westringia fruticosa** (Coastal Rosemary). The vegetation in this zone is likely to have historically been representative of Dwarf Apple - Broad-leaved Scribbly Gum - Sydney Peppermint low open woodland prior to disturbance and modification.

Infrastructure 'buildings, roads etc.'

All 'hard' surfaces within the development site, including buildings, roads, parking lots and all additional infrastructure associated with the campus (**Figure 3.8**).

Figure 3.6: Cleared land exotics and exotic/non-indigenous plantings in the south of the development site.

Figure 3.7: Cleared land exotics and exotic/non-indigenous plantings in the south of the development site.

Figure 3.8: Infrastructure 'buildings, roads etc.' in the north-west of the development site.

3.2 Vegetation zones

3.2.1 Condition classes, subcategories and areas

The PCTs identified within the development site were classified into vegetation zones for credit calculation purposes. As described above, two vegetation zones were mapped for the *Dwarf Apple - Broad-leaved Scribbly Gum - Sydney Peppermint low open woodland on sandstone ridges with subtle enrichment in northern Sydney*. The two zones included areas of 'intact' vegetation, in the north east corner of the development site, with 'underscrubbed' vegetation distributed along the western and eastern boundary of the development site.

An additional vegetation zone was identified for the *Smooth-barked Apple - Red Bloodwood open forest on enriched sandstone slopes around Sydney and the Central Coast* (intact).

The impacts from the proposal are related to vegetation management for bushfire and include complete clearance of native and planted/exotic vegetation as well as an Asset Protection Zone. The location of these impacts meant all three vegetation zones defined were to be impacted in some way, either through the management of the APZ or complete clearing. The total proposed impact to vegetation (either complete clearing or APZ management) is 2.40 ha, however, 0.74 ha of complete clearing to native vegetation, 1.00 ha due to APZ, and 0.66 ha of complete clearing of planted native/exotic vegetation.

Figure 3.9 shows the spatial arrangement of the vegetation zones within the development site and associated plots and transects. **Table 3.4** describes the zone mapped and total impacts.

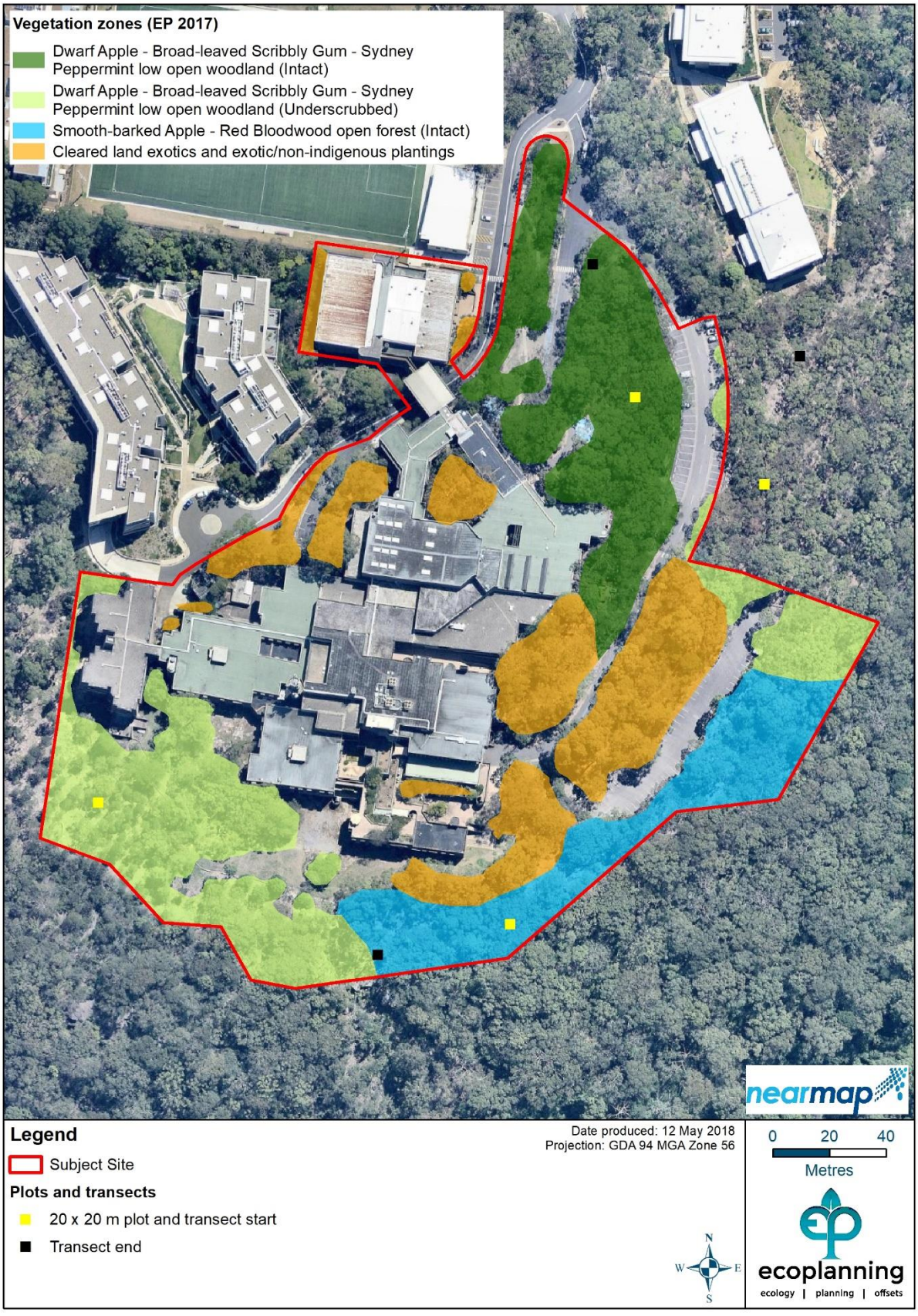

Figure 3.9: Vegetation zones and plot and transect locations.

Table 3.4: Vegetation zones.

Plant community type	Condition	Ancillary code	Impact Type		Total impact (ha)
			Complete clearing	APZ	
PCT 1782 - Dwarf Apple - Broad-leaved Scribbly Gum - Sydney Peppermint low open woodland on sandstone ridges with subtle enrichment in northern Sydney	M/G	Intact	0.58	0.00	0.58
PCT 1782 - Dwarf Apple - Broad-leaved Scribbly Gum - Sydney Peppermint low open woodland on sandstone ridges with subtle enrichment in northern Sydney	M/G	Under-scrubbed	0.16	0.58	0.74
PCT 1776 - Smooth-barked Apple - Red Bloodwood open forest on enriched sandstone slopes around Sydney and the Central Coast	M/G	Intact	0.00	0.42	0.42
Total native vegetation			**0.74**	**1.00**	**1.74**
Cleared land exotics and exotic/non-indigenous plantings	N/A	Exotics/non-indigenous	0.66	NA	0.66
Total			**0.19**	**2.20**	**2.40**

3.2.2 Plots and transects

Four plot and transect surveys were completed on site, with all being used to meet the requirements of the FBA (see **Appendix A** for field data sheet).

One plot and transect was completed in a central patch of *Dwarf Apple - Broad-leaved Scribbly Gum - Sydney Peppermint low open woodland on sandstone ridges with subtle enrichment in northern Sydney* (intact) (BB03), and two plots were completed for the 'underscrubbed' condition class in the far east and west of the subject site (BB01 and BB04) (**Figure 3.9**).

A further plot was also completed for the *Smooth-barked Apple – Red Bloodwood open forest on enriched sandstone slopes around Sydney and the Central Coast* 'intact' zone (BB02). All plots were conducted in accordance with the FBA methodology (**Table 3.5**.).

Table 3.5: Plot and transect results.

Plot ID	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	Easting	Northing
BB01	34	11	12.5	64	8	16	0	0	1	40	329605	6259544
BB02	43	43.5	0.2	14	2	30	0	7	1	25	329751	6259501
BB03	45	24	17.5	40	18	17	0	0	1	15	329795	6259688
BB04	55	26.7	0	16	2	10	0	0	1	18	329841	6259657

3.2.3 Current and future site value scores

Site value scores were calculated based on the plot and transect data collected for each vegetation zone. The results are provided in **Table 3.6**. Current site values were similar between all vegetation zones, ranging from 68.23 – 72.92.

Future site values were allocated to each clearing type. For those areas to be completely cleared the default future site value of 0 was retained. For the area designated as Asset Protection Zone in Black Ash (2108), future site values were adjusted based on the likely level of management intervention required.

For each management zone the current plot data and benchmarks were reviewed. This information was then compared to the advice provided by Lew Short (12 May 2018, pers. comm.), and as follows:

- overstorey and midstorey projected foliage cover to a maximum of 30%
- all ground covers reduced to 20% of the total area

Site attributes were reduced (or maintained at their current level) based on the plot data captured, the benchmark values for the vegetation type and the management intervention levels required above. For some site attributes, such as the total length of fallen logs and overstorey regeneration, standard figures were used based on the likely management of these areas. Further details on the approach are provided in **Appendix B**.

The results are provided in **Table 3.6**. Two zones were reduced for the APZ, with a future site value score ranging from 33.33 to 44.79. Complete clearing was allocated a future site value score of 0.

Table 3.6: Site value scores, before and after development.

Plant community type	Vegetation zone	Area impacted (ha)	Site value score before development	Site value score after development – complete clearing	Site value score after development – APZ (OPA)
PCT 1782 - Dwarf Apple - Broad-leaved Scribbly Gum - Sydney Peppermint low open woodland on sandstone ridges with subtle enrichment in northern Sydney	Intact	0.58	71.35	0	N/A
PCT 1782 - Dwarf Apple - Broad-leaved Scribbly Gum - Sydney Peppermint low open woodland on sandstone ridges with subtle enrichment in northern Sydney	Underscrubbed	0.16	68.23	44.79	N/A
		0.58	68.23	N/A	33.33
PCT 1776 - Smooth-barked Apple - Red Bloodwood open forest on enriched sandstone slopes around Sydney and the Central Coast	Intact	0.42	72.92	0	N/A

4. Threatened species

4.1 Identifying threatened species for assessment

4.1.1 Ecosystem credit species

Ecosystem credit species are predicted based on habitat surrogates, and a number of ecosystem credit species are predicted on site. The ecosystem credit species predicted on site are provided in **Table 4.1**.

Table 4.1: Ecosystem credit species predicted on site.

Common Name	Scientific Name	TSC Act Status*	EPBC Act Status*
Barking Owl	*Ninox connivens*	V	-
Eastern Freetail-bat	*Mormopterus norfolkensis*	V	-
Gang-gang Cockatoo	*Callocephalon fimbriatum*	V	-
Glossy Black-Cockatoo	*Calyptorhynchus lathami*	V	-
Greater Broad-nosed Bat	*Scoteanax rueppellii*	V	-
Little Eagle	*Hieraaetus morphnoides*	V	-
Little Lorikeet	*Glossopsitta pusilla*	V	-
Masked Owl	*Tyto novaehollandiae*	V	-
New Holland Mouse	*Pseudomys novaehollandiae*	-	V
Powerful Owl	*Ninox strenua*	V	-
Scarlet Robin	*Petroica boodang*	V	-
Sooty Owl	*Tyto tenebricosa*	V	-
Spotted-tailed Quoll	*Dasyurus maculatus*	V	E
Swift Parrot	*Lathamus discolor*	E	E
Varied Sittella	*Daphoenositta chrysoptera*	V	-

* E- Endangered, V- Vulnerable

4.1.2 Species credit species

Geographic and habitat features

Species credit species are predicted following assessment of geographic and habitat features in the credit calculator, such as site location (IBRA subregion), PCTs and condition, patch size and the area of surrounding vegetation within the 1,000 ha circle. **Table 4.2** provides the answer to each question for the development site. Where the answer is 'yes', the species is retained in the assessment.

Question: *Do any of the following features occur on the area to be assessed? Tick the box wherever the feature occurs, or is likely to occur in the area to be assessed. Leave blank if the feature does not occur*.

Table 4.2: Assessment of geographic/habitat features.

Common name	Scientific name	Feature	Impact?
Rosenberg's Goanna	*Varanus rosenbergi*	Land within 250 m of termite mounds or rock outcrops	yes
Red-crowned Toadlet	*Pseudophryne australis*	Heath or eucalypt forest on sandstone with a build-up of litter or other debris and containing, or within 40 m of, ephemeral or intermittent drainage lines	yes
Large-eared Pied Bat	*Chalinolobus dwyeri*	Land containing escarpments, cliffs, caves, deep crevices, old mine shafts or tunnels	no
Giant Burrowing Frog	*Heleioporus australiacus*	Land within 40 m of heath, woodland or forest with sandy or friable soils	yes
Broad-headed Snake	*Hoplocephalus bungaroides*	Land within 500 m of sandstone escarpments with hollow-bearing trees, rock crevices or flat sandstone rocks on exposed cliff edges and sandstone outcropping	yes
Eastern Osprey	*Pandion cristatus*	land within 40 m of fresh/brackish/saline waters of larger rivers or creeks; estuaries, coastal lagoons, lakes and/or inshore marine waters	no
Koala population, Pittwater Local Government Area	*Phascolarctos cinereus - endangered population Pittwater*	and within 40 m of eucalypt forests and woodlands	no

Table 4.3 provides the list of species credit species identified by the Tool as 'candidate species'. In accordance with Section 6.5.1.3(a) of the FBA, each species was assessed to determine whether the species is likely to occupy the site based on habitat features and quality.

To do this threatened species, populations and migratory species recorded within 5 km of the development site (the locality) were obtained from a search of the Atlas of NSW Wildlife (OEH 2017) and their likelihood of occurrence was assessed by:

- review of location and date of recent (<5 years) and historical (>5-20 years) records
- review of available habitat within the development site and surrounding areas
- review of the scientific literature pertaining to each species and population
- applying expert knowledge of each species

The potential for each threatened species, population and/or migratory species to occur was then considered following review of available habitat within the development site. The potential for species to utilise the site and to be affected directly or indirectly by the proposed action were considered as either:

- "Recent record" = species has been recorded in the development site within the past 5 years
- "High" = species has previously been recorded in the development site (>5 years ago) or in close proximity (for mobile species), and/or habitat is present that is likely to utilised by a local population
- "Moderate" = suitable habitat for a species is present onsite but no evidence of a species detected and relatively *high* number of recent records (5-20 years) in the locality or species is highly mobile
- "Low" = suitable habitat for a species is present onsite but limited or highly degraded, no evidence of a species detected and relatively *low* number of recent records in the locality
- "Not present" – suitable habitat for the species is not present onsite or adequate survey has determined species does not occur in the development site

The likelihood of occurrence assessment (**Appendix C**) determined some of the candidate species (listed in **Table 4.3**) as "not present" within the development site. This was dependent on several factors, including whether the habitat for the species was absent or substantially modified, whether species were observed a long distance from the development site, occur in relatively low numbers or were not recorded in the locality. This assessment of likelihood corresponds to 6.5.1.4, which states that "*a candidate species that is not considered to be present on the development site in accordance with Paragraph 6.5.1.3 does not require further assessment*". As such, no formal survey was conducted for these candidate species, however, informal survey was opportunistically conducted whilst surveying for other threatened species.

Remaining candidate species were assessed under Step 3 of the FBA (OEH 2014), as detailed in **Table 4.3**. Survey effort within and surrounding the development site is displayed in **Figure 4.1**, which included threatened flora survey in accordance with *NSW Guide to Surveying Threatened Plants* (OEH 2016). A Song Meter (SM3 recording device) was placed onsite over a survey period of two nights, to monitor for microbat activity and determine if additional ecosystem and species credits were present in the subject site, particularly Large-footed Myotis, which is a 'species credit' if breeding habitat is identified. A baited camera trap was installed in the south west of the subject site, which contained a universal bait (oats, peanut butter and tuna). The baited camera trap aimed to determine the presence of *Varanus rosenbergi* (Rosenberg's Goanna), *Dasyurus maculatus* (Spotted-tailed-Quoll) and *Isoodon obesulus obesulus* (Southern Brown Bandicoot (eastern)). Of these three species only Rosenberg's Goanna is a candidate species. However, Southern Brown Bandicoot and Spotted-tailed-Quoll were assessed as having a 'moderate' likelihood of occurring in the subject site prior to field assessment.

Eastern Pygmy Possum

Ten nesting boxes for *Cercartetus nanus* (Eastern Pygmy Possum) were installed along two transects on the southern boundary of the subject site (**Figure 4.1**). Nest boxes were constructed from PVC piping, with the ends sealed by PVC plugs (Ward 1990). An entrance

hole was established in the front of the PVC piping, and a strip of Velcro was inserted, to allow access for the animals. Boxes were left onsite for a period of approximately 46 days, and were checked on two separate occasions on 27 March and 5 May 2017. One remote camera was installed on each of the transects.

Table 4.3: Species credit species requiring further assessment.

Common name	Scientific name	TSC Act Status*	EPBC Act Status*	Threatened Species Profile Database survey period	Surveyed required (Y/N)	Survey effort	Survey result
Angus's Onion Orchid	*Microtis angusii*	E	E	May - October	Y	The species was surveyed in the subject site during flowering time in areas of potential habitat. Survey was conducted in accordance with the *NSW Guide to Surveying Threatened Plants* (OEH 2016).	Not present
Broad-headed Snake	*Hoplocephalus bungaroides*	E	V	March - November	Y	Areas of potential habitat were surveyed, particularly in the south of the subject site. Survey included searches of sheltering sites (under rocks or in crevices) during the day.	Not present
Camfield's Stringybark	*Eucalyptus camfieldii*	V	V	All year	Y	The species was surveyed in the subject site during flowering time in areas of potential habitat. Survey was conducted in accordance with the *NSW Guide to Surveying Threatened Plants* (OEH 2016).	Not present
Eastern Pygmy-possum	*Cercartetus nanus*	V	-	January – April and September – December	Y	10 habitat boxes were installed along two transects (n = 20), for a period of 46 days. Habitat boxes were check on the 27/03/17 and the 5/05/17. One remote camera was installed on each of the transect, pointed at the habitat boxes to monitor any activity.	Low

Common name	Scientific name	TSC Act Status*	EPBC Act Status*	Threatened Species Profile Database survey period	Surveyed required (Y/N)	Survey effort	Survey result
Gang-gang Cockatoo population, Hornsby and Ku-ring-gai Local Government Areas	*Callocephalon fimbriatum* population in the Hornsby and Ku-ring-gai Local Government Areas	E	-	All year	N	-	Not present Lies outside Endangered Population area
Giant Burrowing Frog	*Heleioporus australiacus*	V	V	January – May, September - December	N	-	Not present (see section 6.5.1.3 (a) of the *Framework for Biodiversity Assessment* (OEH 2014) and Appendix C
Hibbertia puberula	*Hibbertia puberula*	E	-	January-February and September to-December	N	-	Not present (see section 6.5.1.3 (a) of the *Framework for Biodiversity Assessment* (OEH 2014) and Appendix C
Koala	*Phascolarctos cinereus*	V	V	All year	N	-	Not present (see section 6.5.1.3 (a) of the *Framework for Biodiversity Assessment* (OEH 2014) and Appendix C
Netted Bottle Brush	*Callistemon linearifolius*	V	-	September - March	Y	The species was surveyed in the subject site during flowering time in areas of potential habitat. Survey was conducted in accordance with the *NSW Guide to Surveying Threatened Plants* (OEH 2016).	Not present

Common name	Scientific name	TSC Act Status*	EPBC Act Status*	Threatened Species Profile Database survey period	Surveyed required (Y/N)	Survey effort	Survey result
Pimelea curviflora subsp. *curviflora*	*Pimelea curviflora subsp. curviflora*	V	V	All year		The species was surveyed in the subject site during flowering time in areas of potential habitat. Survey was conducted in accordance with the *NSW Guide to Surveying Threatened Plants* (OEH 2016).	Not present
Red-crowned Toadlet	*Pseudophryne australis*	V	-	January - December	Y	Call playback was conducted over two survey nights. Daylight survey was conducted in areas of potential habitat, including intermittent drainage lines with a build-up of litter or other debris.	Low
Regent Honeyeater	*Anthochaera phrygia*	CE	CE	All year		BioNet search for this species found no records within the past 30 years within 5N km of the site.	Not present
Rosenberg's Goanna	*Varanus rosenbergi*	V	-	November - February	Y	A baited camera trap was installed for a total of 39 survey days from the 27/03/17 to the 5/05/17	Not present
Seaforth Mintbush	*Prostanthera marifolia*	CE	CE	All year	N	-	Not present Only known from one population at Manly Dam, approx. 7km from the subject site.
Thick Lip Spider Orchid	*Caladenia tessellata*	E	V	September - October		The species was surveyed in the subject site during flowering time in areas of potential habitat. Survey was conducted in accordance with the *NSW Guide to Surveying Threatened Plants* (OEH 2016).	Not present

* CE- Critically Endangered; E- Endangered, Ex- Extinct; V- Vulnerable

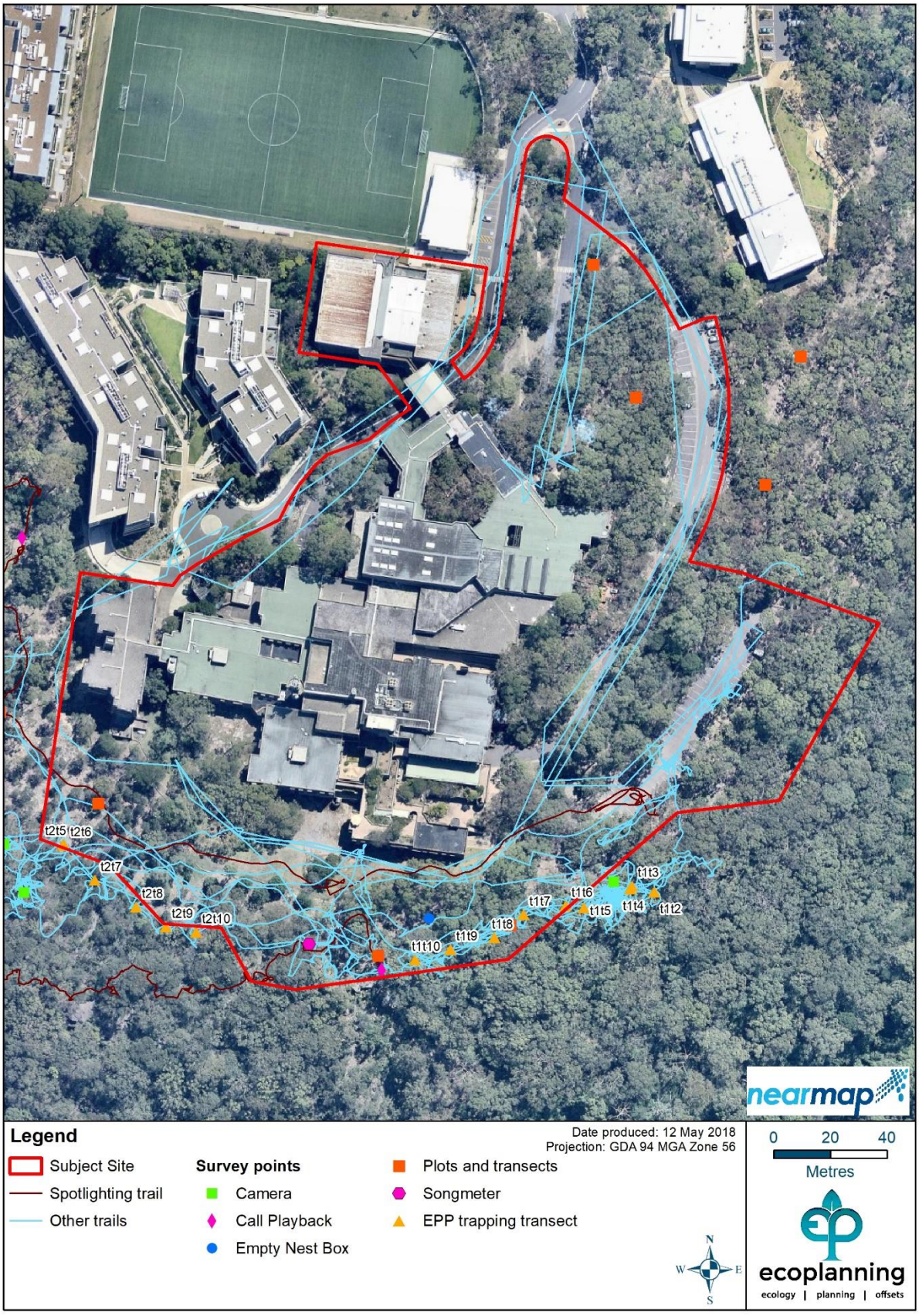

Figure 4.1: Targeted survey effort.

5. Avoid and minimise impacts on biodiversity values

The following section sets out the assessment of direct and indirect impacts on biodiversity values at the development site. This is set out in accordance with Section 8 of the FBA (OEH 2014). The reporting requirements are set out in accordance to Appendix 9 of the FBA (OEH 2014).

5.1 Assessment of direct and indirect impacts

5.1.1 Direct impact – vegetation clearing

The proposed development consists predominantly of a refurbishment of existing buildings and grounds within the subject site. Following a revised development extent (former footprint see Ecoplanning 2017) and associated bushfire assessment (Black Ash 2018), the complete removal of 0.74 ha of native vegetation is required, with 1.00 ha of land to be managed as an Asset Protection Zone (**Table 5.1**; **Figure 5.1** and **Figure 5.2**).

Initial advice related to the previous development footprint indicated that the native vegetation management required for the existing APZ (Lot 4 DP 1151638) did not require assessment within this BAR as the APZ was already in place and was subject to a condition of consent as part of previously approved residential development directly north and west of the subject site (ELA 2012, Alphitonia 2016, RFS 2012a, RFS 2012b). Advice since this time indicates that land within Lot 2 DP 1151638 is also required to be established as an APZ, which was not approved under a previous DA and requires assessment as part of this BAR. An assessment has therefore been conducted related to the management of native vegetation within the existing and proposed APZ.

The APZ assessed is required to ensure the site is protected from bushfire consistent with the diagram shown as **Figure 5.2**, and follows personal communication with Lew Short (Principal, Black Ash) on the extent of management required within the APZ (11 May 2018).

APZ management will be conducted in a way to reduce impacts, with hollow bearing trees maintained, where possible, and limited clearing of over-storey and mid-storey. Areas already adequately managed as an APZ will not be impacted by this proposal.

Table 5.1 Area of each vegetation type directly impacted within the development site.

Vegetation type	Vegetation zone (condition class)	Total area of complete clearing (ha)	Total area of APZ (ha)
PCT 1782 - Dwarf Apple - Broad-leaved Scribbly Gum - Sydney Peppermint low open woodland on sandstone ridges with subtle enrichment in northern Sydney	Intact	0.58	0.0
PCT 1782 - Dwarf Apple - Broad-leaved Scribbly Gum - Sydney Peppermint low open woodland on sandstone ridges with subtle enrichment in northern Sydney	Underscrubbed	0.16	0.58
PCT 1776 - Smooth-barked Apple - Red Bloodwood open forest on enriched sandstone slopes around Sydney and the Central Coast	Intact	0.0	0.42

Vegetation type	Vegetation zone (condition class)	Total area of complete clearing (ha)	Total area of APZ (ha)
	Total	**0.74**	**1.00**

Completely avoiding impacts to native vegetation within the development site is, in this case, not considered feasible. The impacts from the proposal are based solely on the requirement to meet bushfire standards for existing building

The impacts caused through the management of native vegetation within the APZ can also not be avoided. The protection of the facility from bushfire attack is essential, and therefore ongoing management of the native vegetation within the APZ is required. Where possible impacts to important features (such as hollows) will be avoided, and in many cases the cover requirements of the APZ still fall within the benchmarks for the PCTs being impacted.

5.1.2 Direct impact – Loss of fauna habitat

The proposal will remove potential foraging and roosting/sheltering/breeding habitat (small tree hollows and stags) for fauna. The likelihood of threatened fauna utilising the study is generally low based on site assessment, expert opinion and analysis of the likelihood of occurrence from Atlas records over the past 20 years (see **Section 4.1** and **Appendix C**).

5.1.3 Indirect impacts

It is difficult to quantify indirect impacts of the proposed development, but these may include impacts such as noise and/or erosion associated with the construction phase of the project. These impacts will be managed through the development of a Construction Environmental Management Plan.

The site is already predominantly developed with significant areas of buildings, concrete walkways and car parks already in place. As this proposal predominantly involves the refurbishment of existing buildings, indirect impacts are not expected and area considered to be negligible or non-existent.

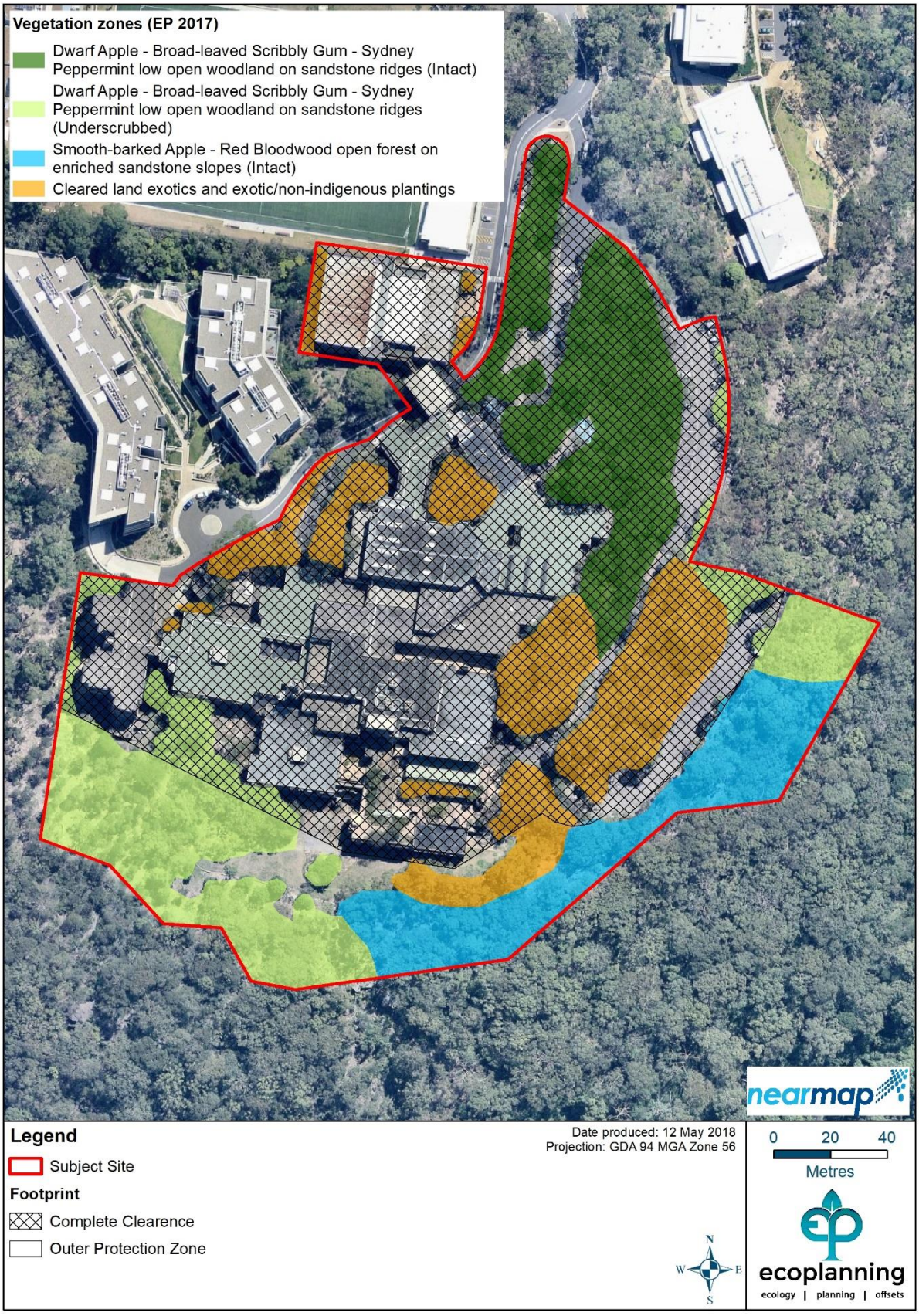

Figure 5.1: Field validated vegetation (Ecoplanning 2017) and proposed footprint.

Figure 5.2: Proposed Asset Protection Zones (source: Black Ash).

5.2 Onsite measure to avoid and minimise direct and indirect impacts

As described above, the complete avoidance of impacts is considered impractical as the infrastructure cannot be placed to completely avoid native vegetation, and very few alternatives exist for the placement of the infrastructure. The APZ must also be put in place. Indirect impacts from the proposal are negligible or non-existent. Several measures will be implemented to reduce impacts where possible. Details are provided below.

5.2.1 Loss of fauna habitat

A number of non-threatened fauna species such as birds, arboreal mammals and amphibians are likely to be present at the development site. Appropriate pre-clearance protocols will be put in place at the time of construction to avoid and mitigate any potential harm or injury to these individuals. These protocols are discussed below, and should be included as a component of the Construction Environmental Management Plan (see **Section 5.2.2**).

5.2.2 Construction Environmental Management Plan (CEMP)

To avoid potential indirect offsite impact during construction, an appropriate erosion and sedimentation control plan should be in place following best practice protocols such as Landcom (2004). It is recommended that this is included in a site specific Construction Environmental Management Plan (CEMP), prior to any construction works taking place.

The CEMP will be required to span the pre, during and post-construction period, and will include the above pre-clearance and fauna management protocols.

6. Impact summary

6.1 Thresholds for assessment and offsetting of unavoidable impacts of development

Section 9 of the FBA (OEH 2014) defines thresholds to be applied by the accredited assessor related to the assessment and offsetting of unavoidable impacts caused by development. A number of thresholds are defined, including:

1. impacts that the assessor is required to identify for further consideration by the consent authority;
2. impacts for which the assessor is required to determine an offset;
3. impacts for which the assessor is not required to determine an offset;
4. impacts that do not require further assessment by the assessor.

Point (2) applies due to the proposed impacts to a PCT associated with threatened species habitat. An offset must, therefore, be determined for the 0.74 ha of complete clearing and 1.00 ha of native vegetation management within an APZ.

6.2 Ecosystem credits and species credits

6.2.1 Change in landscape value score

The loss in landscape score following the proposed development is **12** (**Table 6.1**). See **Section 2** for more information.

Table 6.1: Landscape score components.

Landscape score component	Score Awarded
Change in connectivity score	0
Increase in native vegetation cover (inner assessment circle) score	0
Increase in native vegetation cover (outer assessment circle) score	0
Patch size area score	12
Total	**12**

6.2.2 Current and future site value score

The current and future site value scores were calculated for the proposal. The plot and transect data collected was entered into the credit calculator, the site value scores calculated for the current condition, future cleared, the APZ. Results are provided in **Table 6.2**.

Table 6.2: Site values before and after development, including ecosystem credit requirements.

Plant community type	Vegetation zone	Area impacted (ha)	Site value score before development	Site value score after development – complete clearing	Site value score after development – APZ (OPA)	Ecosystem credit requirement
PCT 1782 - Dwarf Apple - Broad-leaved Scribbly Gum - Sydney Peppermint low open woodland on sandstone ridges with subtle enrichment in northern Sydney	Intact	0.58	71.35	0	N/A	33
PCT 1782 - Dwarf Apple - Broad-leaved Scribbly Gum - Sydney Peppermint low open woodland on sandstone ridges with subtle enrichment in northern Sydney	Underscrubbed	0.16	68.23	44.79	N/A	9
		0.58	68.23	N/A	33.33	12
PCT 1776 - Smooth-barked Apple - Red Bloodwood open forest on enriched sandstone slopes around Sydney and the Central Coast	Intact	0.42	72.92	0	N/A	14

6.2.3 Required ecosystem credits

The total number of ecosystem credits required is **68 credits**.

6.2.4 Required species credits

There are no species credits required for the proposal.

7. Biodiversity Credit Report

7.1 Credit profiles

7.1.1 Ecosystem credits

The ecosystem credits required to offset the proposal are provided in **Table 7.1**. The final credit report produced by the credit calculator is provided in **Appendix E**.

Table 7.1: Ecosystem credits summary and credit profiles.

Plant community type (impact)	Impact area (ha)	Credits required	Plant community type (offset options)	IBRA sub-region
Dwarf Apple - Broad-leaved Scribbly Gum - Sydney Peppermint low open woodland on sandstone ridges with subtle enrichment in northern Sydney	1.32	54	Dwarf Apple - Broad-leaved Scribbly Gum - Sydney Peppermint low open woodland on sandstone ridges with subtle enrichment in northern Sydney	Pittwater (Part B) and any IBRA subregion that adjoins the IBRA subregion in which the development occurs
Smooth-barked Apple - Red Bloodwood open forest on enriched sandstone slopes around Sydney and the Central Coast	0.42	14	Smooth-barked Apple - Red Bloodwood open forest on enriched sandstone slopes around Sydney and the Central Coast	Pittwater (Part B) and any IBRA subregion that adjoins the IBRA subregion in which the development occurs
Total	**1.74**	**68**	**N/A**	**N/A**

7.1.2 Species credits

No species credits were required for this assessment.

7.2 Biodiversity Offset Strategy

As described in **Section 7.1**, 68 credits are required to offset the proposed development, including 0.74 ha of complete clearing and 1.00 ha for APZ management requirements. A number of options exist for the credit requirement to be satisfied, including:

- The purchase of matching credits from the Biobank market;
- The use of residual lands (either within the 100 Eton Road property or alternate locations) as an offset site to generate the required credits, with the land being secured under a Biodiversity Stewardship Agreement (or equivalent);
- Payment into the Biodiversity Conservation Fund (BCF) which is administered by the Biodiversity Conservation Trust (BCT). This option would allow the payment of funds to satisfy the offset obligation, with the BCT required to obtain the biodiversity credits to satisfy the offset requirement.

It is noted that no credits of the type required are currently available in the Biobanking market. The proponent will further investigate the Expression of Interest (EOI) register to determine if credits are likely to be created in the near future, and will also utilise the Credits Wanted register to advertise their credit requirement. The final offset solution to be used will be determined as the development application process proceeds.

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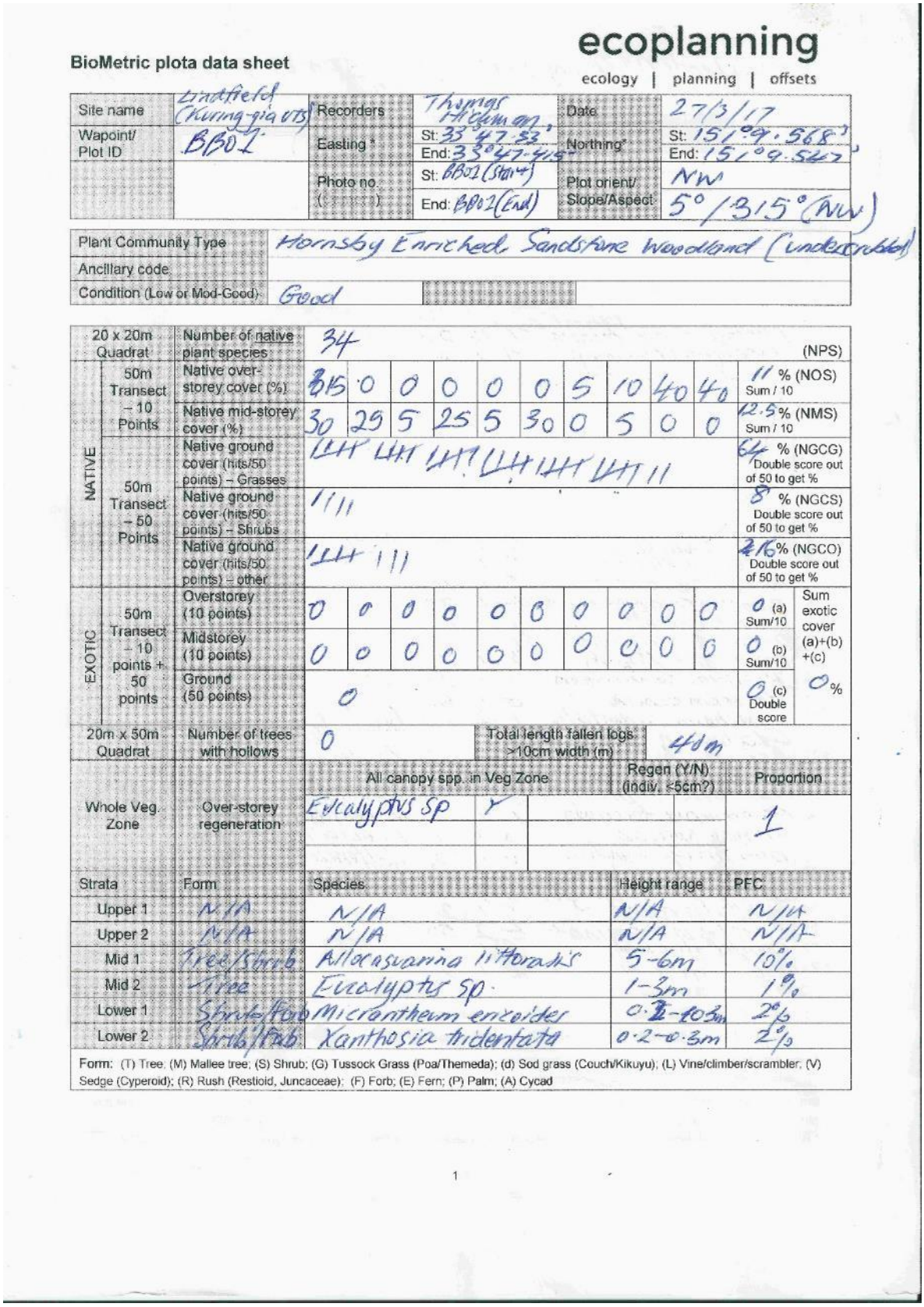
Appendix A: Field Data Sheets



BioMetric plota data sheet

ecoplanning
ecology | planning | offsets

Site name	Lindfield (Ku-ring-gai VT5)	Recorders	Thomas Hickman	Date	27/3/17
Wapoint/ Plot ID	BB01	Easting *	St: 33 47.53	Northing*	St: 151°09.568'
			End: 33°47.415'		End: 151°09.547'
		Photo no.	St: BB01 (Start)	Plot orient/ Slope/Aspect	NW
			End: BB02 (End)		5°/315° (NW)

Plant Community Type	Hornsby Enriched Sandstone Woodland (understorey)
Ancillary code	
Condition (Low or Mod-Good)	Good

20 x 20m Quadrat	Number of native plant species	34										(NPS)	
NATIVE 50m Transect – 10 Points	Native over-storey cover (%)	15	0	0	0	0	0	5	10	40	40	11 % (NOS) Sum / 10	
	Native mid-storey cover (%)	30	25	5	25	5	30	0	5	0	0	12.5 % (NMS) Sum / 10	
NATIVE 50m Transect – 50 Points	Native ground cover (hits/50 points) – Grasses	LHT LHT LHT LHT LHT LHT LHT II										64 % (NGCG) Double score out of 50 to get %	
	Native ground cover (hits/50 points) – Shrubs	IIII										8 % (NGCS) Double score out of 50 to get %	
	Native ground cover (hits/50 points) – other	LHT III										8 % (NGCO) Double score out of 50 to get %	
EXOTIC 50m Transect – 10 points + 50 points	Overstorey (10 points)	0	0	0	0	0	0	0	0	0	0	0 (a) Sum/10	Sum exotic cover (a)+(b)+(c) 0 %
	Midstorey (10 points)	0	0	0	0	0	0	0	0	0	0	0 (b) Sum/10	
	Ground (50 points)	0										0 (c) Double score	
20m x 50m Quadrat	Number of trees with hollows	0										Total length fallen logs >10cm width (m)	40m

		All canopy spp. in Veg Zone		Regen (Y/N) (indiv. <5cm?)	Proportion
Whole Veg. Zone	Over-storey regeneration	Eucalyptus sp	Y		1

Strata	Form	Species	Height range	PFC
Upper 1	N/A	N/A	N/A	N/A
Upper 2	N/A	N/A	N/A	N/A
Mid 1	Tree/Shrub	Allocasuarina littoralis	5-6m	10%
Mid 2	Tree	Eucalyptus sp.	1-3m	1%
Lower 1	Shrub/Forb	Microtheum ericoides	0.2-0.3m	2%
Lower 2	Shrub/Forb	Xanthosia tridentata	0.2-0.3m	2%

Form: (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad

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