79 Cabbage Tree Road, Bayview

Biodiversity Management Plan

Prepared for
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Abbreviations

Abbreviation	Description
APZ	Asset Protection Zone
BMP	Biodiversity Management Plan
CCEMF	Central Coast Escarpment Moist Forest
DA	Development Application
DCP	Development Control Plan
DPI	Department of Primary Industries
ELA	Eco Logical Australia Pty Ltd.
FFA	Flora and Fauna Assessment
HBT	Hollow-bearing tree
LEP	Local Environmental Plan
LGA	Local Government Area
NSW	New South Wales
OEH	Office of Environment and Heritage
PCT	Plant Community Type
SEPP	State Environmental Planning Policy
WM Act	*Water Management Act 2000*

1 Executive Summary

Eco Logical Australia was commissioned by Aveo Pty Ltd to undertake a Biodiversity Management Plan (BMP) to accompany a development application (DA) for 79 Cabbage Tree Road (the study area). The study area is located in Northern Beaches LGA and is part of a large corridor of intact native vegetation which extends from western Mona Vale through to Bayview. The study area contains approximately 4.74 ha of native vegetation. A desktop analysis of vegetation identified approximately 41.57 ha of native vegetation adjacent to the study area. The study area comprises 11 % of the native vegetation within the bushland corridor.

The study area contains an un-named small creek which enters the study area on the western boundary and extends for about 100 m eastwards into the site. The creek is a 1st order stream with a low flow, isolated still ponds, and fringing vegetation.

The native vegetation at 79 Cabbage Tree Road has a heavy infestation of weeds in the north-east of the study area. The remainder of the vegetation is in generally moderate to good condition with small occurrences of *Lantana camara* in the western portion of the site.

The Flora and Fauna Assessment (FFA) prepared in 2018 by ELA for 79 Cabbage Tree Road (ELA 2018) identified six vegetation zones within the study area (**Figure 8, Table 1**):

- Coastal Coast Escarpment Moist Forest (CCEMF)
    - CCEMF - good condition – native understorey
    - CCEMF - low conduction – lantana-dominated understorey
    - CCEMF – exotic understorey
- Coastal Warm Temperate Rainforest (CWTR)
- Weeds and exotics
- Urban native and exotic plantings and groundcover.

The native vegetation provides potential habitat for a number of threatened fauna. Habitat features include two stags located within the development footprint / subject site (to be removed) and seven HBTs within the APZ (to be retained). The native vegetation within the site also includes *Allocasuarina torulosa* (Forest Oak), a primary feed tree for threatened *Calyptorhynchus lathami* (Glossy-black Cockatoo). No threatened fauna or flora were recorded on the site in the Flora and Fauna Report (ELA 2018). Eight weeds recorded on site are listed under the Biosecurity Act 2015.

The proposed works consist of the Development Footprint and the APZ (cumulatively the subject site). A total of 1.10 ha of vegetation will be removed to accommodate the development. This includes 0.89 ha of native vegetation and 0.21 ha of exotic vegetation. An additional 2.75 ha of the remaining vegetation (of which 1.71 ha is native vegetation) will be modified / cleared to establish the APZ. The APZ will be maintained through ongoing trimming of native canopy and thinning of other vegetation to maintain fuel loads.

Specifically, vegetation within the APZ requires under-scrubbing (removal) of midstorey vegetation and the removal of selected trees with canopies touching other tree canopies. The APZ also includes mown grass (part of a mini golf course) and existing buildings. Peterson Bushfire (13 December 2017) stated that preliminary bushfire advice supports '*the retention of the 20 m riparian zone within the APZ, which will retain fully-structured rainforest within that corridor.*

The proposed construction of additional buildings and roads may result in indirect impacts including increased sediment, erosion and nutrient flow, and other edge effects such as possible increase in weeds around the proposed footprint, and soil and vegetation disturbance.

The land manager shall be responsible for all following works in consultation with qualified bush regenerators and the project ecologist.

Impact mitigation pre-clearance:

- Asset Protection Zone
    - The extent of the APZ must be clearly marked
    - 7 HBTs within the APZ must be clearly marked
- Forest Oak trees should be retained wherever possible
- Temporary construction fencing should be erected where appropriate within the study area
- The riparian corridor in the western portion of the study area must be clearly delineated as a 'no-go' zone for machinery and construction workers at the pre-clearing phase.
- Sediment fencing should be erected and inspected frequently
- No chemicals and rubbish should be allowed to escape the construction area

Impact mitigation clearance and post clearance:

- Must be supervised by a qualified ecologist
- Vegetation clearance within the APZ is to be undertaken by qualified bush regenerators using hand-held machinery such as brush-cutters and chainsaws. No vehicles or machines with wheels or tracks are permitted within or to remove fuels from, the APZ
- The APZ must be maintained to the standards outlined by the Rural Fire Service
- Vegetation waste should be contained and removed directly from the study area
- Any landscaping which occurs within the study area and specifically within the development footprint must conform to Section C.1 – Landscaping of the Pittwater 21 DCP

The study area has been delineated into Zones as depicted in Figure 9. Each zone has a number of tasks which must be completed in sequentially (**Section 6**).

The BMP is expected to be implemented over at least five years. The indicative implementation schedule below provides estimated timing of commencement, task duration and completion (**Table 4, Section 7**).

Monitoring will be undertaken with vegetation surveys and photo points and monitoring reports will be prepared. Monitoring must be undertaken once during the preliminary period to establish a baseline then six monthly for the establishment period and annually during the maintenance period. Photo monitoring points (at least 3, one per zone) should be set-up using a permanent reference point to provide a visual reference of changes in the vegetation (**Section 8**).

The performance criteria required for the site have been identified in Table 5 and Table 6.

2 Introduction

Eco Logical Australia (ELA) was commissioned by Aveo Pty Ltd to undertake a Biodiversity Management Plan (BMP) to accompany a Development Application (DA) for 79 Cabbage Tree Road, Bayview (Lot 20 DP 632081; hereafter referred to as the 'study area'). This BMP has been prepared according to the Biodiversity Management Plan Report Guidelines (NBC 2018).

2.1 Site description

The study area (approximately 7.21 ha) is located in Northern Beaches Local Government Area (LGA), and is bound by lots adjacent to Cabbage Tree Road to the north, lots adjacent to Old Samuel Street to the south, and a large area of bushland to the west and south-west (Figure 1). The study area is part of a large corridor of intact native vegetation which extends from western Mona Vale through to Bayview.

A large portion of the land is currently utilized as a retirement village and the proposed works would create additional buildings for this purpose. The entire study area (excluding a small lot in the north-east corner) has been mapped under the Northern Beaches Council's terrestrial biodiversity layer (Pittwater LEP 2014) (Figure 2). This layer covers the vegetated areas of the study area, existing buildings, cleared areas and a small golf course.

2.2 Terminology

The following terminology has been used in this report:

- Study area: the area surveyed for the proposed works (approximately 7.21 ha (**Figure 1**), including those areas likely to be directly or indirectly affected by the proposal (Figure 3)
- Subject site: the area of direct impact (approximately 3.21 ha; Figure 3, which includes both the development footprint, and the indicative APZ
- Zone: an area that corresponds to Figure 9 with various management tasks ascribed to it.

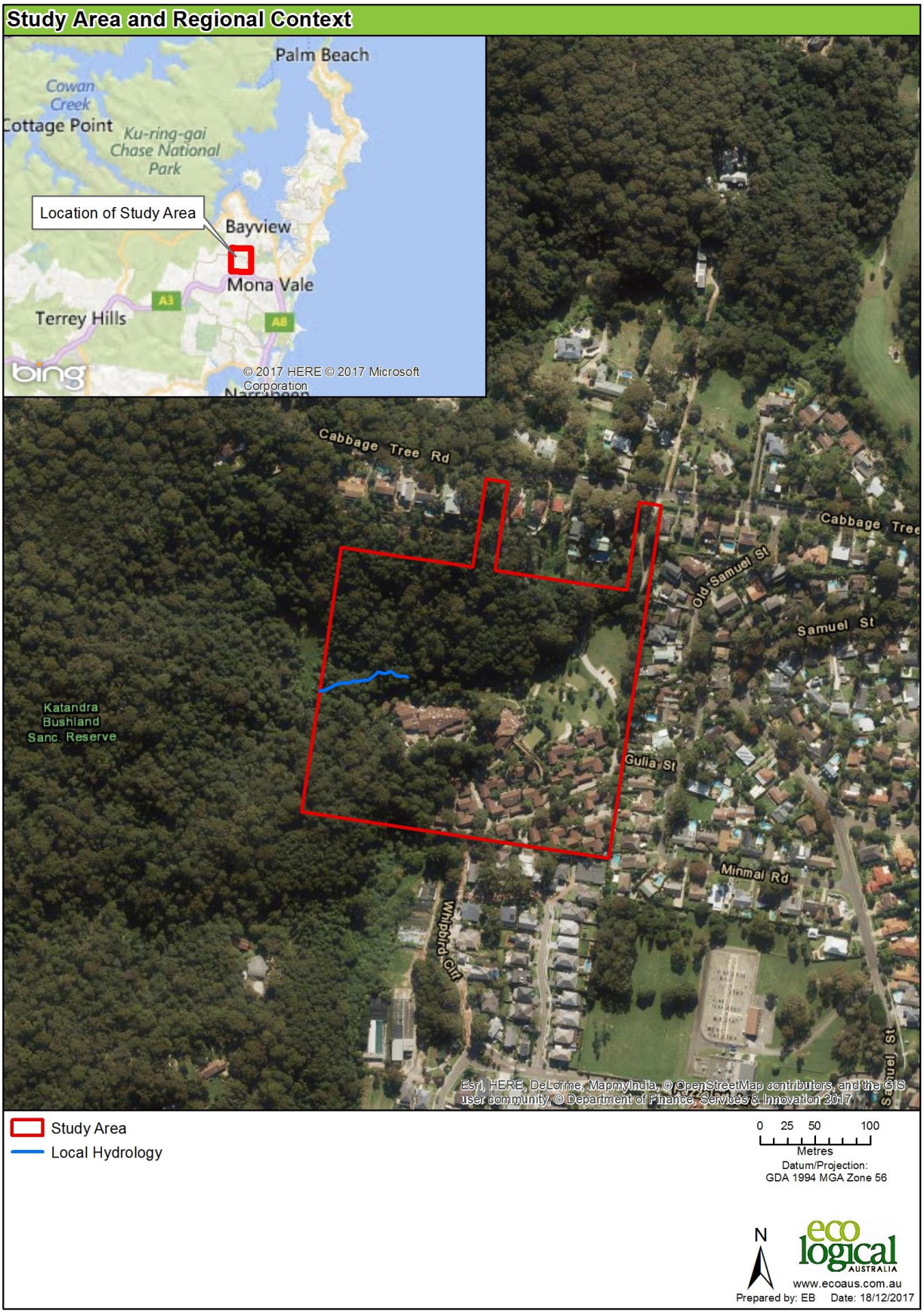

Figure 1: Study area and regional context

Figure 2: Study area, subject site, terrestrial biodiversity layer, and local hydrology

Figure 3: Study area, subject site (includes development footprint, and indicative APZ), local hydrology, and riparian buffer

2.3 Objective of the BMP

The overall objective of the BMP is to enhance retained native vegetation within the study area, specifically within the APZ and in the south-west of the study area. The BMP period covers a minimum of 5 years or until the objectives and performance criteria outlined in this BMP are met.

2.4 Implementation of works

Revegetation and bush regeneration works are to be implemented by experienced bush regeneration contractors with team leaders / site supervisors having a minimum TAFE Certificate III in Conservation and Land Management or equivalent and membership of the Association of Australian Bush Regenerators (or having the necessary prerequisite qualifications and experience for membership).

A project ecologist is to be assigned to the project. This position will provide continuity to the management program and will have a formal role in overseeing the bush regeneration works.

3 Description of the environment

3.1 Soil and topography

The study area is primarily located on 'Erina Erosional' soil profile. This soil profile occurs on '*undulating to rolling rises and low hills on fine-grained sandstones and clay-stones of the Narrabeen Group. Local relief to 60 m, slopes <20%. Rounded narrow crests with moderately inclined slopes.'* (OEH 2017a).

3.2 Drainage and hydrology

An un-named small creek enters the study area on the western boundary and runs for between 50 m and 100 m. The creek is a 1st order stream with a low flow, isolated still ponds, and fringing vegetation. Under the WM Act, if works are carried out within 40 m of a stream, a controlled activity approval will be required by the Department of Primary Industries (DPI) Water. DPI Water guidelines advise that for a 1st order stream, works should not occur within 10 m of the top of bank (DPI Water 2012). The current footprint does not impact within 10 m of the TOB of the stream, as the bushfire report has outlined that the APZ does not need to under-scrub this area (Peterson Bushfire 2017; Figure 3).

3.3 Corridors

The study area is situated within a large bushland corridor of native vegetation. The study area contains approximately 4.74 ha of native vegetation. A desktop analysis of vegetation identified approximate 41.57 ha of native vegetation adjacent to the study area. The study area contributes to approximately 11 % of the native vegetation within the bushland corridor. The native vegetation within the study area is contiguous with the bushland corridor. The majority of the bushland corridor is mapped under the Terrestrial Biodiversity Layer and includes the study area.

3.4 Existing vegetation within the study area

The vegetation at 79 Cabbage Tree Road has a high disturbance of weeds in the north-east of the study area and small occurrences of *Lantana camara* occur throughout the remainder of the western portion of the site.

The Flora and Fauna Assessment (FFA) prepared in 2018 by ELA for 79 Cabbage Tree Road (ELA 2018) identified six vegetation zones within the study area (**Figure 8,** Table 1) which are:

- Coastal Coast Escarpment Moist Forest (CCEMF)
    - CCEMF - good condition – native understorey
    - CCEMF - low conduction – lantana-dominated understorey
    - CCEMF – exotic understorey
- Coastal Warm Temperate Rainforest (CWTR)
- Weeds and exotics
- Urban native and exotic plantings and groundcover.

Table 1: Vegetation zones, their condition and the corresponding PCTs represented within the study area

Mapped Vegetation Community or feature	Condition	Corresponding Plant Type Community and code	Area within study area (ha)
Coastal Coast Escarpment Moist Forest (CCEMF)	good condition – *native understorey*	PCT 1565 - Turpentine - Rough-barked Apple - Forest Oak moist shrubby tall open forest of the Central Coast	2.99
	low conduction – *lantana-dominated understorey*		0.39
	exotic understorey		0.83
Coastal Warm Temperate Rainforest (CWTR)	good condition	PCT1529 - Lilly Pilly - Coachwood gully warm temperate rainforest on sandstone ranges of the Sydney Basin	0.53
Weeds and exotics	-	N/A	0.07
Urban native and exotic plantings and groundcover	-	N/A	1.21
Urban surfaces	-	N/A	1.19
Total			**7.21**

3.4.1 Native vegetation

Central Coast Escarpment Moist Forest (CCEMF) – PCT 1565

A total area of 2.99 ha of good condition CCEMF with a native understorey was validated in the south-western and northern portions of the study area (Figure 4**,** Figure 8**, and** Table 1), with difference in species assemblage between the north and south attributed to aspect.

The canopy was dominated by *Syncarpia glomulifera* (Turpentine), *Eucalyptus paniculata* (Grey Ironbark), *Allocasuarina torulosa* (Forest Oak), and *Elaeocarpus reticulatus* (Blueberry Ash).

The dominant midstorey species included *Pittosporum multiflorum* (Orange Thorn), *Cryptocarya microneura* (Murrogun), *Gymnostachys anceps* (Settlers' Twine), regenerating *Livistona australis* (Cabbage Tree Palm), *Parsonsia straminea* (Common Silkpod), *Calystegia marginata*, *Cissus hypoglauca* (Water Vine)

Dominant species in the ground layer included *Calochlaena dubia* (Soft Bracken), *Blechnum cartilagineum* (Gristle Fern), *Gahnia sieberiana* (Red-fruit saw-sedge), *Geitonoplesium cymosum* (Scrambling Lily), *Hibbertia dentata* (Trailing Guinea Flower), *Lomandra filiformis* (Wattle Mat-rush), *Microlaena stipoides* (Weeping grass), *Entolasia stricta* (Wiry Panic), *Pseuderanthemum variabile* (Pastel Flower), *Lepidosperma laterale*, *Imperata cylindrical* (Blady Grass), *Smilax australis* (Lawyer Vine), *Morinda jasminoides* (Sweet Morinda)

There was a notable sandstone species influence in the north-east of the study area, with the presence of *Angophora costata* (Sydney Red Gum) and a dead *Banksia* sp., although these species were considered to be in a transitional area.

Central Coast Escarpment Moist Forest (CCEMF) – PCT 1565 (low condition – primarily Lantana understorey)

Approximately 0.39 ha of CCEMF in the north-east of the study area has a midstorey largely dominated by *Lantana camara* (Lantana) (Figure 5**,** Figure 8**, and** Table 1). Small patches of Lantana occur throughout the entire study area.

Central Coast Escarpment Moist Forest (CCEMF) – PCT 1565 (exotic understorey)

Approximately 0.83 ha of CCEMF with a planted exotic understorey occurred throughout the south-eastern portion of the study area (**Figure 6, Figure 8, and** Table 1). This area was mapped by the presence of remnant CCEMF canopy species, primarily *Syncarpia glomulifera* (Turpentine) and *Eucalyptus paniculata* (Grey Ironbark), located throughout the existing buildings within the study area. The mid-storey and understorey consisted of planted exotic garden species.

Coastal Warm Temperate Rainforest (CWTR) – PCT 1529

An area 0.53 ha of vegetation in the central west of the study area lining both sides of the creekline was mapped as CWTR (**Figure 7,** Figure 8**, and** Table 1). This vegetation had a narrow linear distribution confined generally to the sheltered watercourse and edges. It is likely that its former distribution occurred in a wider band extending further downstream and included parts of the present mini golf-course prior to clearance for the first stage of the retirement village.

The closed canopy was dominated by *Ceratopetalum apetalum* (Coachwood), *Livistona australis* (Cabbage Tree Palm), *Ficus coronata* (Sandpaper Fig), and *Elaeocarpus reticulatus* (Blueberry Ash). The midstorey included *Acmena smithii* (Lilly Pilly), *Cryptocarya microneura* (Murrogun), *Synoum glandulosum* (Scentless Rosewood) and *Callicoma serratifolia* (Black Wattle). The groundcover was dominated by *Blechnum cartilagineum* (Gristle Fern), *Calochlaena dubia* (Soft Bracken), *Lomandra longifolia* (Spiny-headed Mat-rush), *Morinda jasminoides* (Sweet Morinda), and *Sticherus urceolatus* (Fan Fern). The vegetation was in excellent condition with little weed present except for the southern edge which adjoins the village gardens and includes some weedy and planted exotic groundcover species.

Patches of CWTR may form a component of the endangered ecological community Lowland Rainforest in the North Coast and Sydney Basin Bioregions, however a site by site assessment is required. This assessment has concluded that the CWTR does not conform to the Lowland Rainforest endangered ecological community because it does not adjoin Illawarra Escarpment Subtropical Rainforest (as described in OEH 2013) and it occurs on a sandy soil type enriched by shale derived from a Hawkesbury sandstone and Wianamatta shale geology and not a relatively nutrient-rich soil such as basic volcanic or fine-grained sedimentary substrates as described in the Scientific Determination (OEH 2011a).

Figure 4: CCEMF within Zone 2 of the study area

Figure 5: CCEMF (primarily lantana understorey) within Zone 1 of the study area

Figure 6: CCEMF (exotic understorey) within Zone 4 of the study area

Figure 7: CWTR within Zone 3 of the study area

3.4.2 Exotic Vegetation

An area of approximately 0.07 ha of weeds and exotics occurs along the northern boundary of the study area (Figure 8**,** Table 1). The area primarily consists of *Lantana camara* (Lantana) and Senna pendula, but also includes *Ochna serrulata* (Mickey Mouse Plant), *Tradescantia fluminensis* (Trad), *Solanum mauritianum* (Wild Tobacco Bush), and *Ligustrum sinense* (Small-leaved Privet).

3.4.3 Weeds

Under the *Biosecurity Act 2015* all plants are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.

Of the 8 weeds identified onsite, one has been listed as State level priority weed, and 7 have been listed as Weeds of regional concern. Weed priority listing under the Act, the asset / value at risk and listing as a Weeds of National Significance (WoNS), is presented in **Table 2.**

Table 2: State level determined priority weeds and other weeds of concern present in the study area under the Biosecurity Act 2015

Scientific Name	Common Name	WoNS	Priority Weed Objective
State Priority Weed			
Lantana camara	Lantana	Yes	State priority - Asset protection
Weed of Regional Concern			
Ageratina adenophora	Crofton Weed	No	Environment, Agriculture
Ligustrum sinense	Small-leaved Privet	No	Environment, Human Health
Ochna serrulata	Mickey Mouse Plant	No	Environment
Senna pendula	-	No	Environment
Solanum mauritianum	Wild Tobacco Bush	No	Environment, Human Health

Asset protection: These weeds are widely distributed in some areas of the State. As Weeds of National Significance, their spread must be minimised to protect priority assets

3.5 Threatened flora, fauna, and fauna habitat

No threatened flora or fauna species listed under the TSC Act or EPBC Act were recorded within the study area by the FFA (ELA 2018).

Central Coast Escarpment Moist Forest (CCEMF), and particularly the dominant species *Allocasuarina torulosa,* provides foraging habitat for a range of fauna species, particularly Glossy Black Cockatoo, although this is likely to be marginal relative to the surrounding bushland.

The study area is located within the Central Coast Koala Management Area (DECC 2008). The recovery plan for the Koala (DECC 2008) provides a list of koala food trees categorized as primary, secondary and supplementary for each Koala Management Area.

Vegetation within the subject area includes *Angophora costata* (Smooth-barked Apple), *Eucalyptus paniculata* (Grey Ironbark), *Eucalyptus resinifera* (Red mahogany), and *Eucalyptus umbra* (Broad-leaved White Mahogany). *Eucalyptus resinifera* is a secondary food tree species for Koala. Whilst the other species are not listed as food tree species for Koala within the Recovery Plan (DECC 2008). The study area also contains a high density of *Syncarpia glomulifera* (Turpentine), an important shelter tree for Koala in times of extreme weather (OEH 2017b). Thus, the study area contains potential foraging habitat for Koala.

Four (4) medium to large-sized hollow-bearing trees (HBTs), and 3 small HBTs, occur within the subject site (specifically within the APZ) (Figure 8). Medium to large-sized HBTs provide potential roosting habitat for large avian species, including Glossy-black Cockatoo, and owls, including Barking Owl, Powerful Owl, and Masked Owl.

Small HBTs provide potential roosting habitat for small mammals such as EPP, and microbats. Although potential roosting habitat for EPP occurs within the study area, there is a notable low density of high nectar producing flora species, which are preferred foraging habitat for EPP.

Small waterbodies may be used by microbats as foraging habitat (Churchill 1998). Roosting Southern Myotis require nearby waterways for foraging (Campbell 2009). Although numerous HBTs and stags with

potential cracks and crevices occur within the study area and within 200 m of the riparian zone, the largest pool was 3 m by 6 m, and isolated from the creek. The entire creek line has fringing vegetation present, although sometimes marginal, with a low flow, and no fish were observed. Therefore, due to the low flow of the creek, isolated nature of the pools, and fringing vegetation, it is unlikely that Southern Myotis use HBTs or stags within the study area for roosting habitat.

The small drainage line running in the central west of the study area has a low flow, consists of sand-based beds and banks, and contains small pools. This 1st order stream is potential habitat for amphibians, including Giant Burrowing Frog. GBF breed in burrows along creek banks, and forage up to 200 m from breeding sites (OEH 2017b). Thus the riparian corridor is potential breeding habitat for GBF, and the densely vegetated area of the study area surrounding it is potential foraging habitat for GBF.

Small conical diggings were observed within the study area during the site inspection. These are consistent with the common native *Perameles nasuta* (Long-nosed Bandicoot).

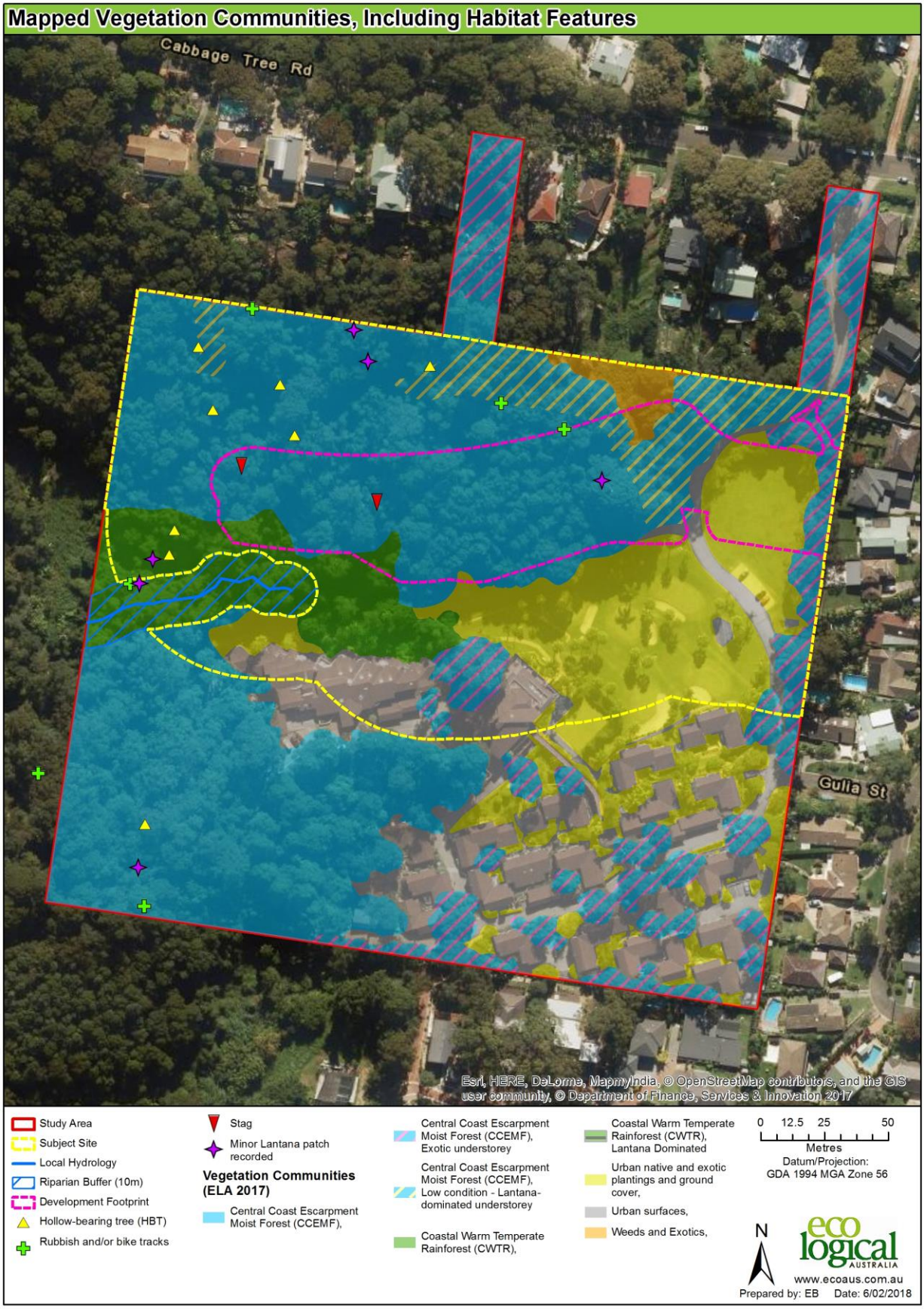

Figure 8: Validated vegetation communities, habitat features, and threatened species records, within the study area

4 Potential Impacts to Biodiversity

4.1 Nature and extent of proposed works

The proposed works would construct an additional nine buildings and new road access, generally in the north-eastern portion of the study area. The impact footprint (subject site) is depicted in Figure 3.

An assessment of likely direct impacts from the proposed subdivision has been included below based on the development footprint provided 14 December 2017 (Jackson Teece 2017) and an Asset Protection Zone (APZ) footprint provided 19 December 2017 (Peterson Bushfire 2017).

A total of 1.10 ha of vegetation will be removed to accommodate the development. This includes 0.89 ha of native vegetation and 0.21 ha of exotic vegetation. An additional 2.75 ha of the remaining vegetation (of which 1.71 ha is native vegetation) will be modified / cleared for the APZ. The APZ will include ongoing trimming of native canopy and thinning of shrubs to maintain fuel loads.

Specifically, vegetation within the APZ requires under-scrubbing (removal) of midstorey vegetation and the removal of selected trees with canopies in contact with other trees. The APZ also includes mown grass (part of a mini golf course) and existing buildings. Peterson Bushfire (13 December 2017) stated that preliminary bushfire advice supports '*the retention of the 20 m riparian zone within the APZ, which will retain fully-structured rainforest within that corridor.'*

A summary of the likely direct impacts is outlined in Table 4**.**

Table 3: Direct impacts to vegetation communities*

Vegetation Community	Area within study area (ha)	Area within subject site (ha)	Area within development footprint (ha)	Area within APZ (ha)
Coastal Coast Escarpment Moist Forest (CCEMF)	2.99	1.66	0.69	0.97
CCEMF (low conduction – lantana-dominated understorey)	0.39	0.39	0.12	0.27
CCEMF (exotic understorey)	0.83	0.22	0.04	0.18
Coastal Warm Temperate Rainforest (CWTR)	0.53	0.33	0.04	0.29
Sub-total native vegetation	**4.74**	**2.60**	**0.89**	**1.71**
Weeds and exotics	0.07	0.07	0.02	0.05
Urban native and exotic plantings and groundcover	1.21	0.85	0.16	0.69
Urban surfaces	1.19	0.32	0.02	0.30
Total	**7.21**	**3.85**	**1.10**	**2.75**

**Figures rounded to two decimal places*

4.2 Potential indirect impacts

The proposed construction of additional buildings and roads may result in indirect impacts. These could include:

- increased sediment, erosion and nutrient flow
- edge effects, such as possible increase in weeds around the proposed footprint
- soil and vegetation disturbance.

5 Impact Mitigation

5.1 Impact mitigation pre-clearing

The land manager will be responsible for all following works in consultation with qualified bush regenerators and the project ecologist.

5.1.1 Requirement for Environmental Site Inductions

This BMP has not identified a requirement for environmental site inductions on the site however induction may be included at the discretion of the work-site manager or project ecologist.

5.1.2 Asset Protection Zone (APZ)

The extent of the APZ must be clearly marked out on the ground including the Inner Protection Areas and Outer Protection Areas to avoid unapproved vegetation clearing and associated habitat disturbance.

The seven hollow-bearing trees (HBTs) within the APZ identified by the FFA (ELA 2018) must be clearly marked for retention.

Forest Oak trees (primary feed tree species for Glossy Black Cockatoo) within the APZ must be retained wherever possible. If a Forest Oak canopy touches a different tree species within the APZ, priority should be given to the retention of the Forest Oak if possible.

5.1.3 Construction fencing

Temporary construction fencing should be erected within the study area as identified by the project ecologist.

5.1.4 'No-go' areas

The riparian corridor in the western portion of the study area must be clearly delineated as a 'no-go' zone, for machinery and construction worker.

5.1.5 Soil and erosion measures

Sediment fencing must be erected across the site as identified by the works manager in consultation with the project ecologist. Fences should be inspected weekly (and more often during rainy periods) to ensure they are working correctly throughout the duration of the construction process and while unconsolidated soil is on site.

5.1.6 Chemical and rubbish

No chemicals and rubbish should be allowed to escape the construction area, especially near the riparian corridor. All chemicals should be stored with bunding to effectively capture leakage and protect waterways.

5.2 Impact mitigation during clearing

5.2.1 Clearance supervision

The clearance of vegetation including the felling of habitat trees and stags must be supervised by a qualified ecologist. ELA staff can supervise works at an hourly rate.

5.2.2 APZ Clearance methodology

All vegetation clearance works within the APZ are to be undertaken by qualified bush regenerators using only hand-held machinery such as brush-cutters and chainsaws. No vehicles or machines with wheels or tracks are permitted within or to remove bushfire fuel from the APZ (Peterson 2018). The APZ must be maintained to the standards outlined by the Rural Fire Service (RFS; RFS 2018).

5.2.3 Treatment and removal of weeds and vegetation waste

A large proportion of weeds within the study area occur within the subject site and must be removed by qualified bush regenerators. Vegetation waste should be contained and removed directly from the study area. Vegetation waste should not be stored within the study area for long periods of time.

Weed removal must be undertaken using a combination of hand removal, cut/scrape and painting, brush cutting and spot spraying as required. Machinery is not to be used within any of the management zones, outside of the development footprint (Peterson Bushfire 2017). A description of weed removal techniques is provided in **Appendix B**. The performance evaluation targets for percent cover of native and exotic species, are detailed in Table 6.

5.2.4 Landscaping within the development footprint

Any landscaping which occurs within the study area and specifically within the development footprint must conform to **Section C.1 – Landscaping** of the Pittwater 21 Development Control Plan (DCP). Landscaping must not use plant species that are, or are likely to become environmental weeds. Species such as *Cenchrus setaceus* (sold as Fountain Grass and syn. *Pennisetum setaceum*) must not be used. These species are prolific seeders and highly invasive.

5.2.5 Tree hollow salvage

The proposed works would only remove 2 stags from within the Development Footprint and retain 7 HBTs within the APZ. In the event that one of the stags contains a hollow, or a HBT in the APZ is accidentally removed the section of tree which contains the hollow should be salvaged for habitat restoration elsewhere in the site.

5.2.6 Nest boxes

Eastern Pygmy Possum, a threatened arboreal mammal which roosts in hollows was not recorded in the study area during a targeted survey using 10 next boxes. The study area was determined to contain low quality potential habitat for this species as there was a low density of high nectar-producing plants (ELA 2018). Therefore, this BMP has not advised the provision of nest boxes within the study area.

5.2.7 Vertebrate pest management

Should vertebrate pest management (such as fox, rabbit and cat control) be implemented within the bushland on the site, it should be carried out in co-ordination with pest management programs run by Council or other local land management agencies.

6 Management of retained vegetation and rehabilitation areas

Areas of retained vegetation have been mapped in **Figure 8.** Areas relating to the management of retained vegetation are mapped as Zone 1, Zone 2, and Zone 3 (Figure 9). Those areas which have not been allocated a zone are located outside of the APZ, are scattered canopy trees, or comprise garden plantings.

6.1 All zones

Task 1 – Fencing

Construction fencing pre-construction and during construction to ensure that related impacts are contained within the work areas.

Task 2 – Soil and water management

Sediment fencing will be required around the subject site to prevent sediment running into adjacent areas, and particularly the Riparian Corridor in Zone 3.

Task 3 – Signage

Signage must be installed within the study area to identify that conservation values must be protected. Further information signage may include permanent signs describing the natural values of the site and surrounding area.

Task 4 – Monitor and Reporting

To assess the success of the Biodiversity Management Plan against the established performance evaluation targets, subsequent reporting will include:

- Demonstrated compliance with performance evaluation targets
- Identification of deficiencies and corrective actions taken to ensure targets are met
- A photographic record at regular 6 monthly intervals before, during and after works.

Six-monthly reports are to be provided to Council's Natural Environment Unit.

6.2 Zone 1 – Retained native vegetation communities within the APZ

This zone contains the following vegetation communities or features:

- Coastal Coast Escarpment Moist Forest (CCEMF)
    - CCEMF - good condition – native understorey
    - CCEMF - low conduction – lantana-dominated understorey
    - CCEMF – exotic understorey
- Coastal Warm Temperate Rainforest (CWTR)
- Weeds and exotics

Task 1 – Mark hollow-bearing trees (HBTs)

Seven HBTs occur within Zone 1, all of which are to be retained. HBTs must be clearly marked before the clearing stage of the project.

Forest Oak trees (primary feed tree species for Glossy Black Cockatoo) within the APZ must be retained wherever possible. If a Forest Oak canopy touches the canopy of a different tree species within the APZ, priority should be given to the retention of the Forest Oak if possible..

Task 2 - APZ maintenance

Following APZ clearance in areas where dense weeds occurred, re-establishment of native vegetation in the APZ at appropriate densities in the ground layer and canopy should be undertaken by bush regenerators who may facilitate natural regeneration and supplement with native plantings where required.

Task 3 – Weed control

Within Zone 1, CCEMF and CWTR contain varying densities of weeds listed under the Biosecurity Act 2015 and listed in Table 2. Although the establishment of the APZ may thin groundcover and remove mid-storey vegetation some weed species may remain or be present in the seedbank. These exotic species must be continually controlled by qualified bush regenerators throughout the establishment and maintenance of the project using the methods outlined in **Appendix B** and NSW WeedWise website (NSW Government 2018).

Task 4 – Revegetation

The north-eastern portion of Zone 1 contains weeds and exotics in the ground and mid-storey which will be removed during the clearance phase. If deemed necessary by bush regenerators, this area may be revegetated with ground-cover species from CCEMF listed in Tozer et al. 2010. This task includes:

- Installation of jute matting as required
- Tube stock planting.

6.3 Zone 2 – Remnant vegetation outside the subject site

Zone 2 includes a large portion of good condition CCEMF in the south-western portion of the study area.

Task 1 – Weed control

Within Zone 2, CCEMF contains a low density of weeds listed under the Biosecurity Act 2015 and in Table 2. These exotic species must be continually controlled by qualified bush regenerators throughout the establishment and maintenance of the project using the methods outlined in **Appendix B** and NSW WeedWise website (NSW Government 2018).

6.4 Zone 3 – Riparian corridor in the western portion of the study area

Zone 3 consists of a 20 m wide corridor of CWTR surrounding a small un-named creek in the western portion of the study area and an adjacent area of CWTR located outside the APZ. Zone 3 is not within the APZ (Peterson Bushfire 2017).

Task 1 – Weed control

Within Zone 3, the CWTR contains a low density of weeds listed under the Biosecurity Act 2015 and in Table 2. These exotic species must be continually controlled by qualified bush regenerators throughout

the establishment and maintenance of the project using the methods outlined in **Appendix B** and NSW WeedWise website (NSW Government 2018).

Figure 9: Mapped management zones

7 Implementation schedule

7.1 Indicative implementation schedule

The BMP will be implemented for at least a five year period. The indicative implementation schedule below provides estimated timing of commencement, task duration and completion (Table 4). Three work phases have been identified, including:

- Preliminary
- Establishment
- Maintenance.

The preliminary phase is the pre-clearance period before construction works commence, which offers the opportunity to commence works that will help to achieve performance criteria in a more efficient manner. This period has not been included in the timeframes of this BMP. These works are to be undertaken by the land manager.

The establishment phase will commence following the end of the preliminary period and continue until all performance evaluation targets outlined in **Table 5** and **Table 6** have been achieved.

Maintenance will be undertaken in perpetuity to maintain the biodiversity objectives of this BMP.

Table 4: Indicative implementation schedule

Zone	Treatment	Preliminary (pre-clearing)	Establishment																				Maintenance			
			Year 1				Year 2				Year 3				Year 4				Year 5				Yearly			
			1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
All zones	Fencing																									
	Soil and water management																									
	Install signage																									
	Monitoring and reporting																									
Zone 1 - Remnant vegetation – revegetation in the APZ	Mark HBT's and Forest Oak																									
	APZ maintenance																									
	Brush matting as required																									
	Jute matting as required																									
	Tube Stock planting																									
	Weed control																									
Zone 2 – Remnant vegetation outside the subject site	Weed control																									

Zone	Treatment	Preliminary (pre-clearing)	Establishment																				Maintenance			
			Year 1				Year 2				Year 3				Year 4				Year 5				Yearly			
			1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Zone 3 - Riparian Corridor	Weed control																									
Zone 4 – APZ with no native understorey	APZ Maintenance																									

8 Monitoring and reporting

The bush regeneration contractor and the land manager will monitor changes in vegetation over time. Information gained through the monitoring and reporting process will identify works that have and have not been successful and the reasons for their success or failure.

The aim of monitoring is to measure the effectiveness of the control actions being undertaken to achieve the desired outcome. Information derived from the results of monitoring will also be used in adaptive management (i.e. learning from past experience to inform future priorities and work plans).

Finally, monitoring and reporting will help determine and quantify the costs related to weed management and the cost effectiveness of the BMP.

8.1 Monitoring

Monitoring will be undertaken with vegetation surveys and photo points and preparation of monitoring reports. Monitoring will need to be undertaken once during the preliminary period to establish a baseline, then six monthly for the establishment period and annually during the maintenance period.

Photo monitoring points should be set-up using a permanent reference point to provide a visual reference of vegetation changes. Photo monitoring to include:

- At minimum, set up one photo point per zone (minimum 3 photo points):
- mark the photo point with a six foot star picket and map the location using GPS;
- take a digital photo showing the length of the star picket at a recorded bearing, preferably with a visual reference point in the background;
- organise the digital photos logically with each image labelled with a unique reference number indicating the location of the photo point and the date the photo is taken.

Monitoring results will be included in Progress Reports (**Section 8.2**).

8.2 Progress reports

Progress reporting will occur on a six monthly basis throughout the establishment period, then annually for the maintenance period, and provided to Council's Natural Environment Unit. This reporting includes the implementation of the monitoring tasks specified in **Section 5**. In addition to a description of the works that have been undertaken, this report should be structured to address the following questions:

- What environmental threats have been reduced?
- What environmental improvements have been achieved?
- What tasks have been successful?
- What has not been successful?
- What measures, if any, have been taken to rectify problems?
- What issues need to be addressed?
- What are the outcomes of the management activities?
- Recommendations for revising the task program, if necessary

8.3 Performance evaluation targets

The performance criteria required for the site have been identified in Table 5 and Table 6.

If monitoring indicates that the BMP tasks are not resulting in achievement of the performance criteria, the task program may be revised. The bush regeneration contractor, in consultation with Northern Beaches Council, can adapt these criteria as required in response to the success of rehabilitation works.

8.4 Adaptive management

As this is a long term project that will be implemented over a number of years, an adaptive management approach will be implemented that enables the successful contractor to learn from and respond to successful and unsuccessful techniques used on the site. In its simplest form this may include the substitution of species used in revegetation works or for undertaking advanced direct seeding techniques in place of manual planting techniques for revegetation.

The success of the works will be determined by meeting the performance criteria identified below. Contractors have the flexibility to implement different techniques to those specified here providing that performance criteria are met.

Table 5: Performance evaluation targets: preliminary and establishment phases for 5 year BMP period (All zones)

Treatment Zones	Preliminary (pre-clearance) phase
All zones	All construction and sediment fencing installed Information signage installed All earthworks completed.

Establishment				
Year 1	Year 2	Year 3	Year 4	Year 5
Commencement of all tasks outlined in the BMP Sediment fences should be checked regularly throughout the construction phase, especially around rain All revegetation works completed in year 1 An increase in native cover and diversity and a decrease in exotic cover and diversity by the end of the maintenance period Maintenance replanting is to replace plants by the same species, or where that species is not available, with the same growth form (i.e. tree for tree etc.) and must not decrease species diversity. Any new species to be planted must be from the community being emulated and of local provenance; Monitoring and reporting undertaken in accordance with **Section 7** All rubbish and debris removed				

Table 6: Performance evaluation targets for establishment phase for 5 year BMP period (management zone specific)

Treatment Zones	Establishment				
	Year 1	Year 2	Year 3	Year 4	Year 5
Zone 1	Native groundcover vegetation no less than 50% of zone	Native groundcover vegetation no less than 70% of zone	Native groundcover vegetation no less than 85% of zone	Native groundcover vegetation no less than 90% of zone	Native groundcover vegetation no less than 95% of zone
	Exotic groundcover vegetation no more than 50% of zone	Exotic groundcover vegetation no more than 30% of zone	Exotic groundcover vegetation no more than 15% of zone	Exotic groundcover vegetation no more than 10% of zone	Exotic groundcover vegetation no more than 5% of zone
Zone 2	Native groundcover vegetation no less than 85% of zone	Native groundcover vegetation no less than 90% of zone	Native groundcover vegetation no less than 95% of zone		
	Exotic groundcover vegetation no more than 15% of zone	Exotic groundcover vegetation no more than 10% of zone	Exotic groundcover vegetation no more than 5% of zone		
Zone 3	Native groundcover vegetation no less than 85% of zone	Native groundcover vegetation no less than 90% of zone	Native groundcover vegetation no less than 95% of zone		
	Exotic groundcover vegetation no more than 15% of zone	Exotic groundcover vegetation no more than 10% of zone	Exotic groundcover vegetation no more than 5% of zone		
Zone 4	To be managed as per the APZ requirements. Remove and prevent establishment of weeds within this zone.				

9 Conclusion

The key points of this BMP are:

- The study area contains a number of vegetation communities and habitat features which will be retained during the proposed works
- The Riparian Corridor is considered a 'No-go Zone' and must be clearly marked at the pre-clearance phase
- Sediment fencing will be required around the subject site to prevent sediment entering adjacent areas, particularly the Riparian Corridor in Zone 3
- Forest Oak trees (primary feed tree species for Glossy Black Cockatoo) within the APZ must be retained wherever possible. If a Forest Oak canopy touches a different tree species within the APZ, priority should be given to the retention of the Forest Oak if possible.
- The clearance of vegetation including the 2 stags within the development footprint must be supervised by a qualified ecologist
- All works within the APZ are to be undertaken by qualified bush regenerators using only hand-held machinery such as brush-cutters and chainsaws. No vehicles or machines with wheels or tracks are permitted within, or to remove bushfire fuels from the APZ (Peterson 2018)
- The APZ must be maintained to the standards outlined by the RFS (RFS 2018)
- The vegetation to be retained must be delineated into management zones and tasks for each completed within the timeframes detailed in Table 4
- Progress reporting will occur on a six monthly basis throughout the establishment period then annually for the maintenance period, and provided to Council's Natural Environment Unit (**Section 7**). Reports will include a minimum of 3 photo points (one per zone).

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Appendix A Flora species List

Table 7: Flora species list

Family	Species name	Common name	Exotic species (*), Priority Weed, or WONS
Family Fabaceae subf. Mimosoideae	*Acacia longissima*	Long-leaf wattle	
Myrtaceae	*Acmena smithii*	Lilly Pilly	
Family Ericaceae subf. Epacridoideae	*Acrotriche divaricata*	-	
Pteridaceae	*Adiantum aethiopicum*	Common maidenhair	
Asteraceae	*Ageratina adenophora*	Crofton Weed	*Priority weed
Casuarinaceae	*Allocasuarina torulosa*	Forest Oak	
Myrtaceae	*Angophora costata*	Smooth-barked Apple	
Araliaceae	*Astrotricha floccosa*	-	
Euphorbiaceae	*Bertya brownii*	-	
Blechnaceae	*Blechnum cartilagineum*	Gristle Fern	
Rutaceae	*Boronia mollis*	Soft Boronia	
Phyllanthaceae	*Breynia oblongifolia*	Coffee bush	
Dicksoniaceae	*Calochlaena dubia*	Soft Bracken	
Convolvulaceae	*Calystegia marginata*	-	
Lauraceae	*Cassytha glabella*	-	
Vitaceae	*Cayratia clematidea*	Native Grape	
Cunoniaceae	*Ceratopetalum apetalum*	Coachwood	
Vitaceae	*Cissus antarctica*	Kangaroo Vine	
Vitaceae	*Cissus hypoglauca*	Water Vine	
Ranunculaceae	*Clematis aristata*	Old man's beard	
Ranunculaceae	*Clematis glycinoides*	Headache Vine	

Family	Species name	Common name	Exotic species (*), Priority Weed, or WONS
Lamiaceae	*Clerodendrum tomentosum*	Hairy Clerodendrum	
Amaryllidaceae	*Clivia* sp.	-	*
Lauraceae	*Cryptocarya microneura*	Murrogun	
Orchidaceae	*Cymbidium suave*	Snake Orchid	
Phormiaceae	*Dianella caerulea*	Blue Flax-lily	
Blechnaceae	*Blechnum neohollandicum (previously Doodia aspera)*	-	
Elaeocarpaceae	*Elaeocarpus reticulatus*	Blueberry Ash	
Poaceae	*Entolasia marginata*	Bordered Panic	
Poaceae	*Entolasia stricta*	Wiry Panic	
Myrtaceae	*Eucalyptus paniculata*	Grey Ironbark	
Myrtaceae	*Eucalyptus resinifera*	Red mahogany	
Myrtaceae	*Eucalyptus umbra*	Broad-leaved White Mahogany	
Eupomatiaceae	*Eupomatia laurina*	Copper laurel	
Luzuriagaceae	*Eustrephus latifolius*	Wombat Berry	
Moraceae	*Ficus coronata*	Sandpaper Fig	
Cyperaceae	*Gahnia sieberiana*	Red-fruit saw-sedge	
Luzuriagaceae	*Geitonoplesium cymosum*	Scrambling Lily	
Phyllanthaceae	*Glochidion ferdinandi*	Cheese tree	
Araceae	*Gymnostachys anceps*	Settlers' Twine	
Dilleniaceae	*Hibbertia dentata*	Trailing Guinea Flower	
Violaceae	*Hymenanthera dentata*	Tree Violet	
Poaceae	*Imperata cylindrica*	Blady Grass	
Verbenaceae	*Lantana camara*	Lantana	*Priority weed, WONS
Cyperaceae	*Lepidosperma laterale*	-	

Family	Species name	Common name	Exotic species (*), Priority Weed, or WONS
Oleaceae	*Ligustrum sinense*	Small-leaved Privet	*Priority weed
Arecaceae	*Livistona australis*	Cabbage fan palm	
Lomandraceae	*Lomandra filiformis*	Wattle Mat-rush	
Lomandraceae	*Lomandra longifolia*	Spiny-headed Mat-rush	
Lomandraceae	*Lomandra multiflora*	Many-flowered Mat-rush	
Apocynaceae	*Marsdenia suaveolens*	Scented Marsdenia	
Celastraceae	*Maytenus silvestris (synonum Denhamia silvestris)*	Narrow-leaved Orangebark	
Poaceae	*Microlaena stipoides*	Weeping grass	
Rubiaceae	*Morinda jasminoides (syn. Gynochthodes jasminoides)*	Sweet Morinda	
Lomariopsidaceae	*Nephrolepis cordifolia*	Fishbone Fern	
Oleaceae	*Notelaea longifolia*	Large Mock-olive	
Ochnaceae	*Ochna serrulata*	Mickey Mouse Plant	*Priority Weed
Poaceae	*Oplismenus imbecillis*	Creeping Beard Grass	
Asteraceae	*Ozothamnus diosmifolius*	Rice flower	
Bignoniaceae	*Pandorea pandorana*	Wonga wonga vine	
Apocynaceae	*Parsonsia straminea*	Common Silkpod	
Pittosporaceae	*Pittosporum multiflorum*	Orange Thorn	
Pittosporaceae	*Pittosporum revolutum*	Wild Yellow Jasmine	
Pittosporaceae	*Pittosporum undulatum*	Native Daphne	
Family Fabaceae subf. Faboideae	*Podolobium ilicifolium*	Prickly Shaggy Pea	
Phyllanthaceae	*Poranthera microphylla*	-	
Lobeliaceae	*Pratia purpurascens*	Whiteroot	
Lamiaceae	*Prostanthera denticulata*	Rough Mint-bush	
Lamiaceae	*Prostanthera scutellarioides*	-	

Family	Species name	Common name	Exotic species (*), Priority Weed, or WONS
Acanthaceae	*Pseuderanthemum variabile*	Pastel Flower	
Dennstaedtiaceae	*Pteridium esculentum*	Common Bracken	
Menispermaceae	*Sarcopetalum harveyanum*	Pearl Vine	
Cyperaceae	*Schoenus brevifolius*	Zig-zag Bog-rush	
Family Fabaceae subf. Caesalpinioideae	*Senna pendula*	-	*Priority weed
Smilacaceae	*Smilax australis*	Lawyer Vine	
Smilacaceae	*Smilax glyciphylla*	Sweet Sarsaparilla	
Solanaceae	*Solanum mauritianum*	Wild Tobacco Bush	*Priority weed
Menispermaceae	*Stephania japonica*	Snake Vine	
Gleicheniaceae	*Sticherus urceolatus*	Fan Fern	
Myrtaceae	*Syncarpia glomulifera*	Turpentine	
Meliaceae	*Synoum glandulosum*	Scentless Rosewood	
Commelinaceae	*Tradescantia fluminensis*	Trad	*
Ulmaceae	*Trema tomentosa var. aspera*	Peach-leaf Poison-bush	
Family Ericaceae subf. Epacridoideae	*Trochocarpa laurina*	Tree Heath	
Apocynaceae	*Tylophora barbata*	Bearded Tylophora	
Violaceae	*Viola hederacea*	Ivy-leaved Violet	
Monimiaceae	*Wilkiea huegeliana*	Veiny Wilkiea	
Rutaceae	*Zieria smithii*	Sandfly Zieria	

Appendix B Techniques and specifications

Weed control

Weed control involves a combination of mechanical, physical and chemical techniques to remove the weeds and prevent regrowth. A selection of the best suited weed control method within the site depends on a number of factors including:

- the species or combination of weeds being targeted
- the density of the weeds
- resources available (time, labour, equipment and finances)
- weather conditions of the day.

Weed control techniques

Detail of specific weed control techniques to be used such as cut and paint, scrape and paint, herbicide spraying and hand weeding are given in Brodie (1999). The principles of bush regeneration and techniques to trigger natural regeneration are to be in accordance with the Bradley Method and other techniques described in Buchanan (2000). Management techniques for different types of weeds are provided below.

Perennial grasses

Perennial grasses will be hand removed where isolated or in low concentrations. Larger patches may be slashed prior to seed production in spring or summer (depending on the growth cycle of the species) and the regrowth spot-sprayed 2-3 weeks later when it is actively growing and approximately 10 cm in length. Monitoring of these species will occur and if new seed production occurs, the same treatment will be applied again as required. However, slashing will not reduce the presence of exotic grasses on its own and must always be combined with targeted removal to reduce densities and allow for native regeneration. Individual plants should be hand removed. All propagative vegetative material removed should be bagged, removed from site and disposed of at a registered green waste facility.

Woody weeds

Existing woody weeds, such as *Ochna serrulata*, will be controlled by cut and paste / drill and frill with a non-selective herbicide and be left to die *in situ*. Other woody weeds will be controlled by the cut and paint or drill and fill method using a non-selective herbicide. The most appropriate method to be used depends on the size of the individual to be removed and will be determined by the bush regeneration contractor. Primary weed control should use techniques that will not encourage flushes of secondary weed growth. All seedlings of woody weeds will be hand pulled or spot-sprayed with a non-selective herbicide.

Weedy sedges and rushes

Wetland weeds may require control by hand in wet areas to avoid herbicide use in wet areas. If water levels prevent removal of these species, but they are in flower then seeds will be removed by hand, bagged and removed from site.

Creepers and climbers

For vines, control will vary depending on the species, generally seedlings may be hand pulled with mature plants can be controlled by the stem-scrape method or spot spraying using a non-selective herbicide. The precise method to be used will be determined by the bush regeneration contractor depending on the species, size and reproductive status of the individual. All propagative vegetative material removed should be bagged, removed from site and disposed of at a registered green waste facility.

Herbaceous weeds

Where individual plants of herbaceous weeds, including *Solanum mauritianum* (Wild Tobacco Bush) and *Tradescantia fluminensis* (Trad), are found, they will be hand pulled prior to flowering. Where large swaths of these species occur they will be sprayed using a non-selective herbicide. If high densities of mature stands occur, weeds may be slashed first using a brush cutter and any subsequent regrowth sprayed. Regular monitoring of these species will be required to prevent seed production. All vegetative material that is pulled out and has the potential to regrow if deposited on ground will be bagged and removed from site.

Management of weed waste

All weed propagules especially noxious weeds will be bagged and disposed of as directed by legislation at facility licensed to receive green waste. All weed waste without propagules will be composted onsite in small unobtrusive piles.

Herbicide use

The use of herbicide to control weeds should be carefully considered. Herbicide use should assess potential long-term impacts of the technique including whether the proposed works actually address the source of the weed infestation. However, herbicide application forms an important and useful component of an integrated weed management approach and can be the most appropriate method to control some weed species.

Herbicide use should occur during the active growing season for plants to encourage the chemical uptake into the plant. The selection of herbicides should also consider the type of weed and the location. Where non-selective herbicides are required for use, glyphosate is the most suitable. If herbicides are required to be used near waterways, a glyphosate-based herbicide formulated for use near waterways will be used (e.g. RoundUp© Biactive™). No herbicide is to be used within the riparian corridor (Figure 3 and **Figure 8**).

Broad-leaf selective herbicide is extremely toxic to aquatic life and must not be used in, or adjacent to, waterways. Registration and records must be kept in accordance with the NSW *Pesticide Regulation 2009*.

Revegetation works

Revegetation has the twin aims of both re-establishing the original native vegetation community at the site and reducing erosion along the length of the riparian corridor. Any plantings should consist of local provenance stock.

Planting of *Hiko* for trees and shrub species and *Hiko* or *Viro* cells for grasses, sedges and other groundcover species is the preferred planting stock for Tubestock (TS) planting. Planting should be done via a low impact method such as hand digging or hand auger. The holes dug

for each plant should be at least 1.5x the width and 2x the depth of the rootball. Fertiliser should be added to each hole dug as per the label specifications. Initial irrigation of the plantings is essential to ensure that the soil forms around the rootball and no air pockets are left. This will be required unless sufficient rainfall (approx. 10mm) occurs on the day of planting.

The local provenance native seed mix will be as per the groundcover species identified in Tozer et al 2010 for the relevant vegetation community, to achieve the required densities. An exotic cover crop can be used, however this must be sterile. The areas should be watered manually until grasses are thoroughly established.

Tree guards will need to be installed on each tree or shrub to protect seedlings from extreme weather (frosts and heat), herbivorous grazing and herbicide drift during maintenance. Bio-degradable tree guards are recommended to protect the seedlings.

Mulch should be used where identified. The use of mulch is very important because it provides organic matter to the top soil, improves soil structure and aeration, water infiltration, nutrient availability, and is also useful in the suppression of weed growth (Buchanan 2000). Mulch should be sourced from within the local area. Mulch must be free of weed propagules and invasive woody species such as Coral Tree (*Erythrina x sykesii*). Mulching should not be undertaken within areas of high potential erosion. It is recommended jute matting is used in these areas prior to revegetation.

Bush regeneration contractors

All vegetation management works in the establishment phase will be undertaken by suitably qualified and experienced bush regeneration contractors who are members of the Australian Association of Bush Regenerators or fulfil the membership criteria. In addition to this, team leaders should have, as a minimum, a Certificate III in Conservation & Land Management or equivalent. The contractor will need to carry out best practice bush regeneration techniques as described by Buchanan (2000).

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AS/NZS 4801:2001 Occupational Health and Safety Management

ISO 9001 Quality Management

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