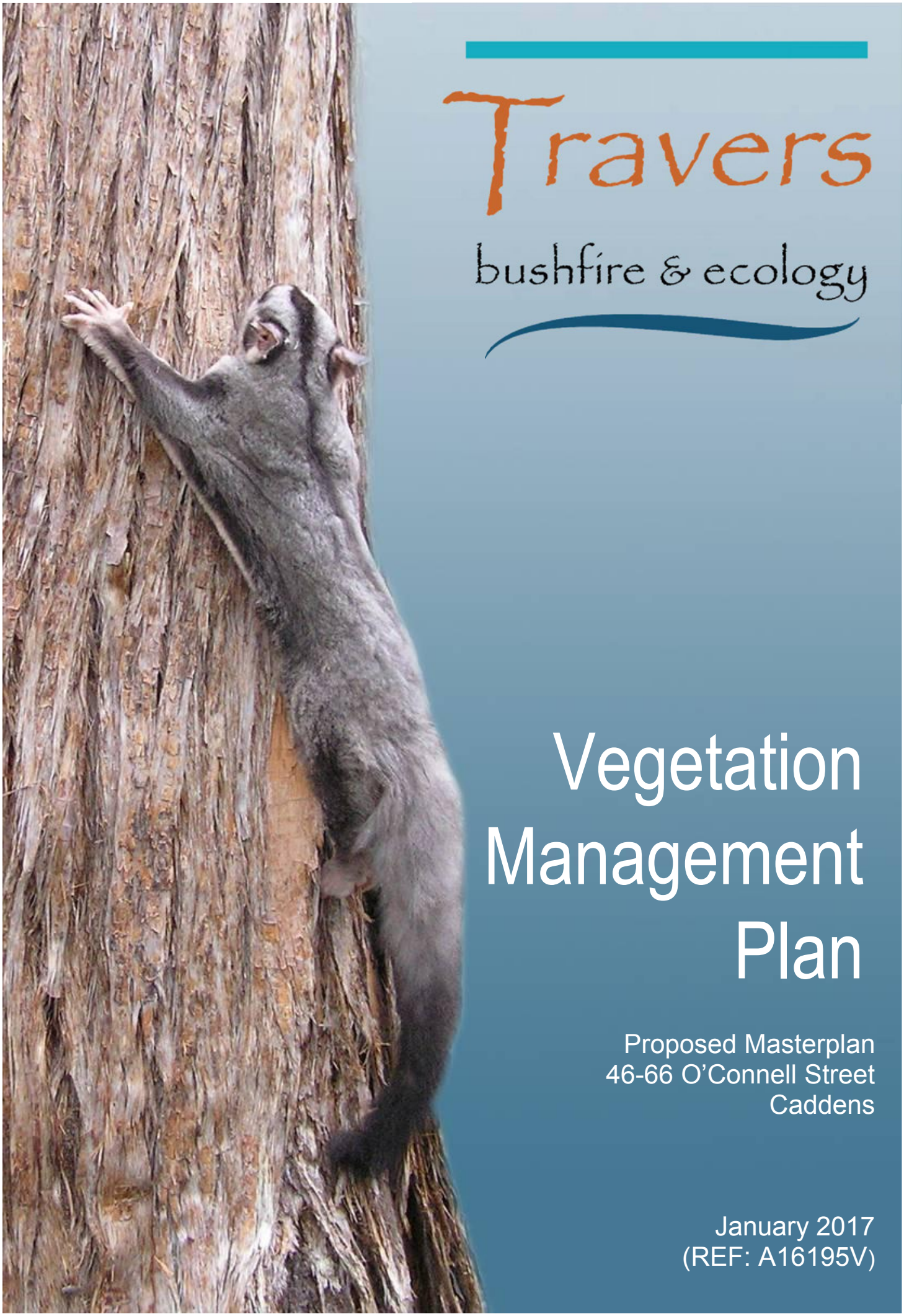

Travers

bushfire & ecology

Vegetation Management Plan

Proposed Masterplan
46-66 O'Connell Street
Caddens

January 2017
(REF: A16195V)

Vegetation Management Plan

Lot 3 DP 1103503
Lot 6 DP 593628,
46-66 and 29 O'Connell Street, Caddens

JANUARY 2017

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Date: January 2017
File: A16195V

Disclaimer:

This report has been prepared to provide advice to the client on matters pertaining to the particular and specific development proposal as advised by the client and / or their authorised representatives. This report can be used by the client only for its intended purpose and for that purpose only. Should any other use of the advice be made by any person including the client then this firm advises that the advice should not be relied upon. The report and its attachments should be read as a whole and no individual part of the report or its attachments should be interpreted without reference to the entire report.

The mapping is indicative of available space and location of features which may prove critical in assessing the viability of the proposed works. Mapping has been produced on a map base with an inherent level of inaccuracy, the location of all mapped features are to be confirmed by a registered surveyor.

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List of abbreviations

APZ	asset protection zone
BPA	bushfire protection assessment
CEEC	critically endangered ecological community
CPW	Cumberland Plain Woodlands
DEC	NSW Department of Environment and Conservation (superseded by DECC from 4/07)
DECC	NSW Department of Environment and Climate Change (superseded by DECCW from 10/09)
DECCW	NSW Department of Environment, Climate Change and Water (superseded by OEH from 4/11)
DCP	Development Control Plan
DoEE	Commonwealth Department of Environment & Energy
EEC	endangered ecological community
EPA	Environmental Protection Agency
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
ESMP	environmental site management plan
FF	flora and fauna assessment
FM Act	*Fisheries Management Act 1994*
FMP	fuel management plan
HTA	habitat tree assessment
IPA	inner protection area
LEP	Local Environment Plan
LGA	local government area
NES	national environmental significance
NPWS	NSW National Parks and Wildlife Service
NSW DPI	NSW Department of Industry and Investment
OEH	Office of Environment and Heritage (Part of the NSW Department of Premier and Cabinet)
OPA	outer protection area
PBP	*Planning for Bush Fire Protection 2006: A Guide for Councils, Planners, Fire Authorities and Developers*
POM	plan of management
RF Act	*Rural Fires Act*
RFS	NSW Rural Fire Service
SIS	species impact statement

SULE	safe useful life expectancy
TPO	tree preservation order
TPZ	tree preservation zone
TRRP	tree retention and removal plan
TSC Act	*Threatened Species Conservation Act 1995*
VMP	vegetation management plan

Introduction 1

Travers bushfire & ecology has been engaged to undertake a vegetation management plan (VMP) for Lot 3 DP 1103503 46-66 O'Connell Street and Lot 6 DP 593628 29 O'Connell Street, Caddens, in the Penrith local government area (LGA). These lots are subject to subdivision and development and will hereafter be referred to as the 'subject site'. The site is part of a larger development concept for the local area, including a town centre to the south.

The VMP will address a 0.64 hectare patch of remnant Cumberland Plains Woodland (CPW) vegetation within the southern portion of the site. CPW is listed as a Critically Endangered Ecological Community (CEEC) within the NSW *TSC Act* (1995) and is also commensurate with the "*Cumberland Plain Shale Woodlands and Shale Gravel Transition Forest*" listed as a CEEC within the Commonwealth *EPBC Act* (1999).

1.1 Proposed development

The proposal is to subdivide the subject site of approximately 12.18ha into 320 dwellings and a yet to be determined number of apartments within ancillary infrastructure such as roads and services. The existing two residences and associated structures will be removed. Whilst site is part of a larger development concept for the local area, standard impact assessment protocol applies to this development application.

The site is zoned B2 – Local Centre and R3 – Medium Density Residential.

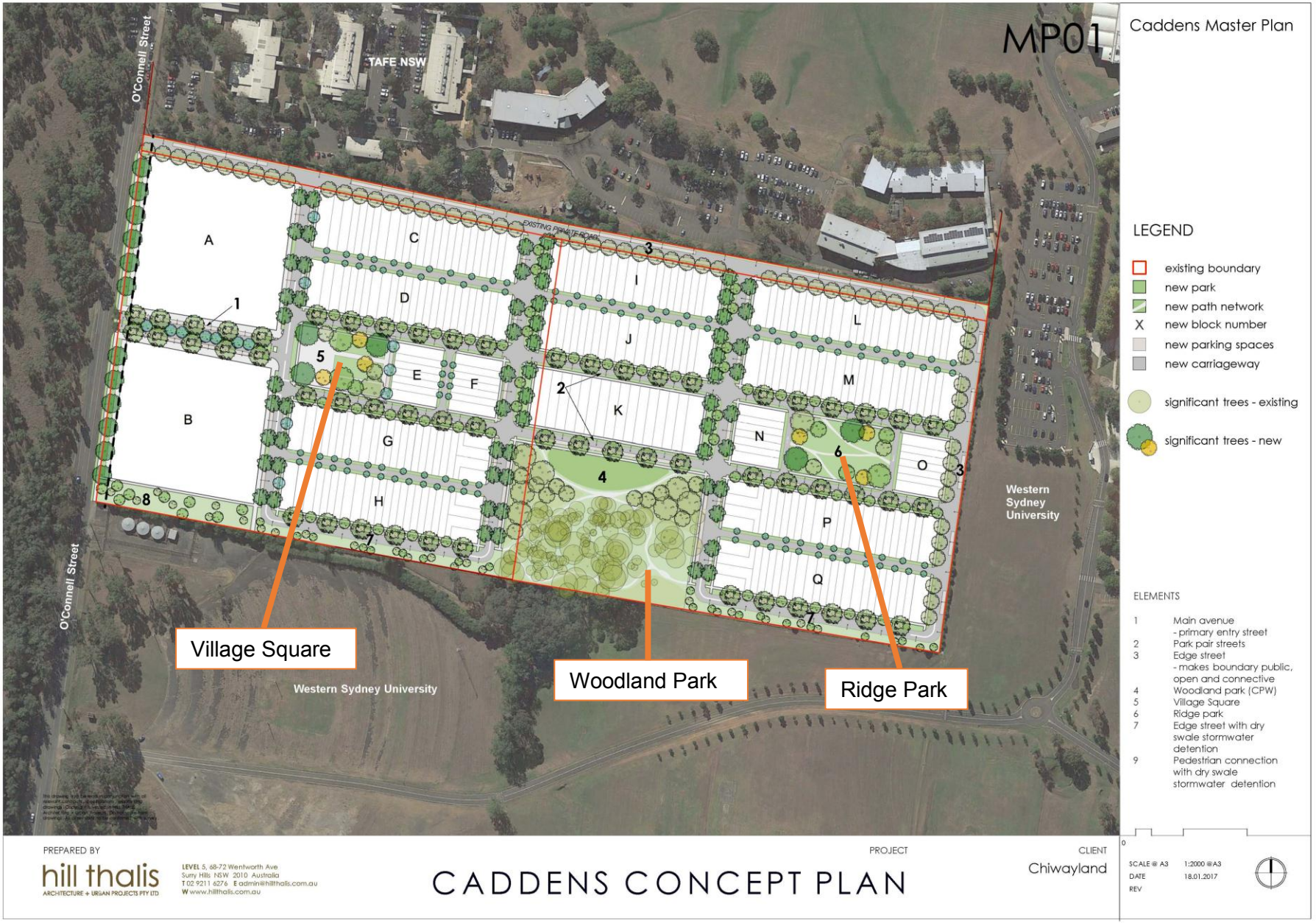

Figure 1 – Proposed development

1.2 Background information

A small area (0.64 ha) of vegetation within the central-southern portions of the subject site is commensurate with "*Cumberland Plain Woodland in the Sydney Basin Bioregion*" which is listed as a Critically Endangered Ecological Community (CEEC) within the NSW *TSC Act* (1995).

The Penrith Council Urban Design Review Panel Advice meeting held on 7 October 2016 to assist in the preparation for Stage 1 DA, highlighted the importance of preserving the existing significant CPW vegetation on the site.

Subsequent to this meeting a new Stage 1 concept plan has been formulated to reduce the original planned loss of approximately 0.145 ha (24.7%) of CPW to an approximate loss of 0.10 ha of CPW associated with the development proposal. Measures to mitigate this loss are:

- Retain, regenerate and protect 0.53 ha of remnant CPW in the form of a Native Bushland Reserve within a proposed 'communal open space'; and

- Increase the percentage of CPW within the proposed development by revegetation of a fully structured CPW buffer of approximately 0.16ha to be established adjacent and to the north of the existing CPW remnant

Locations are shown on Schedule 1 – Vegetation Management Plan. These measures will increase the CPW on the site by 8.6% (total of 0.7 ha CPW). To further increase CPW patches the following is recommended:

- Creation of an on-site stormwater detention basin approximately 0.05ha in size. As shown on Schedule 1 – Vegetation Management Plan. The surrounds willbe planted with species commensurate with CPW and managed in a similar manner to the Native Bushland Reserve and open spaces.

The retained and revegetated areas of CPW will be managed for the retention, management and improvement of the CPW patches under this Vegetation Management Plan (VMP).

Figure 2 - Site overview

1.3 Objectives

Objectives for the VMP are as follows:

1. Maximise on-site conservation, coverage and quality of Cumberland Plains Woodland (CPW) vegetation within a proposed Native Bushland Reserve to maintain this vegetation type within the locality and provide, maintain and improve a “stepping stone” to other CPW in the region;

2. Detail the location and extent of the proposed CPW Native Bushland Reserve and specify strategies, methods and works required to maintain or improve the quality and diversity of this remnant;

3. Protection of the proposed Native Bushland Reserve from potential edge effects such as invasion by exotic / weed species, dumping of household or garden refuse, increased fire risk and other anthropogenic impacts;

4. Fully structured CPW revegetation using locally occurring (endemic) species including ground covers, shrubs and trees commensurate with this critically endangered ecological community;

5. Improve potential foraging and habitat for locally-occurring species; and

6. Sediment and erosion control measures to minimise potential impacts to local drainage lines.

Schedule 1 of this VMP provides a plan of works and the performance targets to be achieved by contractors undertaking restoration works.

Management Context 2

2.1 Site description

The vegetation within the subject site was mostly cleared prior to 1943. *Travers bushfire & ecology* detailed survey, January 2016 and post examination of the survey data (*Flora and Fauna Assessment October 2016*) has determined an existing on-site remnant patch of vegetation commensurate with Cumberland Plains Woodland (CPW) located near the central portion of the southern site boundary which is approximately 0.59ha in size. This patch of critically endangered ecological community (EEC) extends to the south beyond the site and totals approximately 0.9ha.

Disused orchards occupy a large proportion of the site while household gardens and lawns surround the two existing dwellings and ancillary structures.

Table 1 provides a summary of the planning, cadastral, topographical, and disturbance details of the subject site.

Table 1 – Site features

Location	Lot 3 DP 1103503, 46-66 O'Connell Street, Caddens Lot 6 DP 593628, 29 O'Connell Street, Caddens
Size	Approximately 12.18ha
Local government area	Penrith City Council
Grid reference MGA-56	290430E 6261290N
Zoning	B2 – Local Centre (Part of Lot 3) R3 – Medium Density Residential (Part of Lot 3 and all of Lot 6)
Elevation	Approximately 55-70m AHD
Topography	Situated on a east-west running ridgeline with northerly, easterly and southerly aspects
Landscape and soils	Landscape: Undulating to low rolling hills on Wiannamatta Group shales. Local relief 50-80m, Slopes 5-20%. Soils: Luddenham Soil Landscape – Soils shallow (<100cm) dark podzolic soils or massive earthy clays on crests or upper slopes.
Catchment and drainage	Overland flow in a northerly or southerly direction. Constructed drainage channel located within property to the south. Drainage generally in a westerly direction into Werrington Creek which joins South Creek then to the Hawkesbury River near Windsor
Vegetation	Household gardens and lawns (2.22 ha) Disused Orchard (9.42 ha) Remnant Cumberland Plains Woodland (0.64 ha)
Existing land use	Disused agricultural (orchards)
Clearing	100% of the original canopy vegetation has been cleared. Regrowth of CPW has occurred in the central southern portion since 1940 (see Figure 2)

2.2 Vegetation description

The *Travers bushfire & ecology Flora and Fauna Assessment December 2016*, notes the following vegetation communities within the site:

- Remnant Cumberland Plains Woodland (*CPW – Listed as a Critically Endangered Ecological Community*) (0.64 ha)
- Household Gardens and Lawns (2.16 ha)
- Disused Orchard (7.91 ha)

2.2.1 Remnant Cumberland Plain Woodland

The vegetation within the subject site was mostly cleared prior to 1943, however an existing patch exists on this site and lands to the south of approximately 0.9ha of which 0.64ha is within the subject site. Historical aerial photography taken in 1943 shows the site established as orchards with a small area of regrowth (native trees) near the centre of the southern border as shown in Figure 2.

Trees were to 25 metres (mostly 20-22m) with 30-40% projected foliage cover (PFC). Species observed were *Eucalyptus tereticornis* (Forest Red Gum), with a few scattered *Eucalyptus amplifolia* (Cabbage Gum) and only two *Eucalyptus moluccana* (Grey Box).

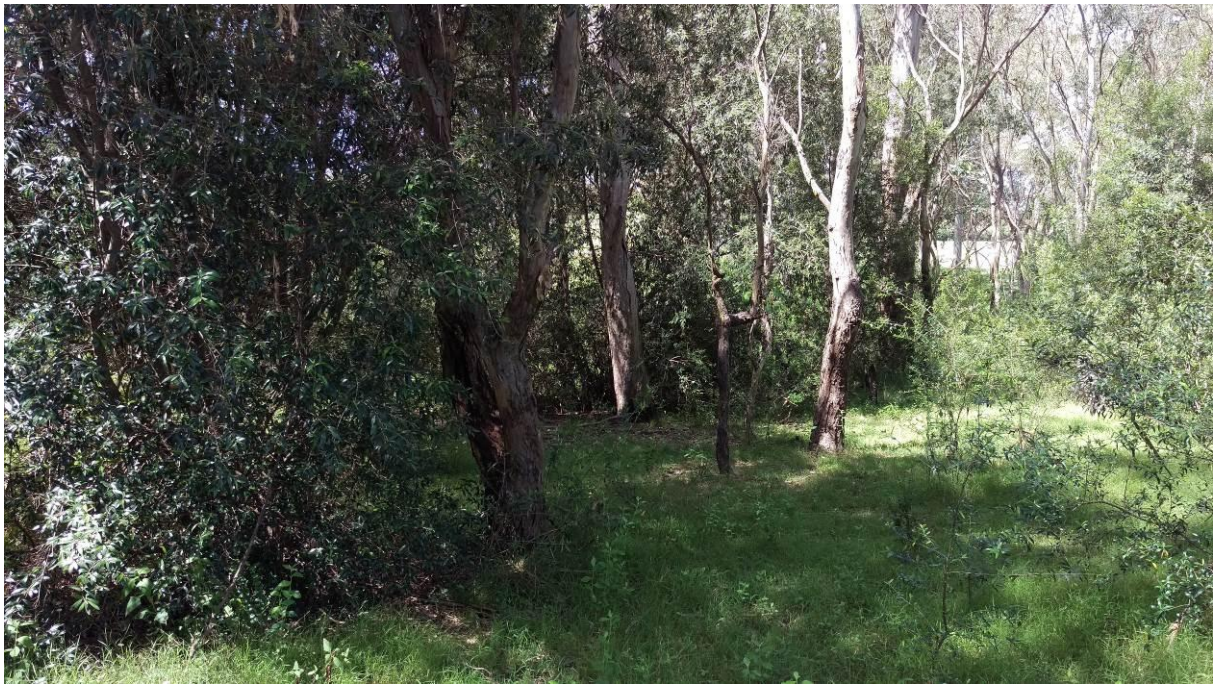

Photo 1 – Cumberland Plains Woodland vegetation (Quadrat 1)

Shrubs within this vegetation community were to 5m with a highly variable PFC of 4 to 70%. The shrub layer consisted of dense stands of *Olea europaea* subsp*. europaea* (Common Olive) with occasional *Olea europaea* subsp. *cuspidata* (African Olive) forming dense clumps to 10m high. Other shrubs present were African Boxthorn (*Lycium ferocissimum*), Nightshade (*Solanum sisymbriifolium*) Small-leaved privet (*Ligustrum sinense*), Large-leaved Privet (*Ligustrum lucidum*) and sparse occurrences of Blackthorn (*Bursaria spinosa*).

The groundlayer was to 1.2 m tall with 85-95% PFC consisting of mixed exotic and native grasses, herbs and forbs. Common species included native species such as Weeping Grass

(*Microlaena stipoides*), Kangaroo grass (*Themeda australis*), Barbwire Grass (*Cymbopogon refractus*), Wiry Panic (*Entolasia stricta*), and exotic species such as Narrow-leaved Carpet Grass (*Axonopus fissifolius*), African Lovegrass (*Eragrostis curvula*), Kikuyu (*Pennisetum clandestinum*), various Pigeon Grass (*Setaria*) species and Johnson Grass (*Sorghum halpense*).

2.2.2 Household gardens and lawns

This vegetation community generally occurs in areas surrounding the two dwellings and ancillary structures within the study area.

This vegetation consists of well-maintained lawns with numerous and varied exotic trees, shrubs and groundcovers. Many of the trees are while the shrubs are generally flowering. Groundcovers were a mixture of mostly exotic grasses and a variety of flowering and vegetable species.

Canopy – where present, the canopy is largely comprised of fruit or nut bearing species such as Mango, Fig, Lemon, Tangelo, Hazelnut, Pecan Nut, Mulberry, Avocado, Orange, and Paw Paw.

Mid-storey – where present, the mid-storey was found to contain exotic flowering shrubs such as Hibiscus, Oleander, Cotoneaster and Roses.

Ground-layer – was comprised of numerous but mostly exotic grasses such as Kikuyu, Common couch and Paspalum. Some flowering or vegetable species were also present.

2.2.3 Disused orchard

This vegetation community occurs over the largest proportion of the subject site **(**7.91 ha). The whole of the subject site was cleared and established as orchards by 1943. These orchards were removed in approximately 2008 and were then left largely unmanaged to the present.

Canopy – The canopy consists of widely scattered individual orchard species, mostly stone-fruits such as apricot, peach, plum, nectarines and other varieties. Rare occurrences of single isolated individual eucalypt trees are present. These isolated eucalypts are 10 to 18 metres tall with less than 1% projected Foliage Cover (PFC). The scattered fruit trees are generally less than 5 metres tall with less than 2% PFC. A large number of African Olive and Common Olive trees (*Olea europa* subsp. *cuspidata* and *Olea europa* subsp. *europaea*) in various stages of growth are also present. These olive trees are scattered individuals or are in clumps throughout this vegetation community they are 2 to 15 metres in height with a patchy 15 to 20% PFC as can be seen in Figure 2.

Mid-storey – This consists of numerous scattered individual and clumps of juvenile African Olive and Common Olive trees (*Olea europaea* subsp. *cuspidata* and *Olea europaea* subsp. *europaea*). *Bursaria spinosa* (Blackthorn) is also a common shrub, especially on the south and east facing aspects. Other shrub species observed were Oleander, Grey-leaved Cotoneaster, Red Fruited Cotoneaster, Small-leaved Privet, Blackberry and African Boxthorn.

Ground Layer – The ground layer was comprised of exotic and native grasses, herbs and forbs. This layer was from 0.7 to 1.2 metres tall with a 95% PFC. It was dominated by exotic grass species such as *Ehrharta erecta* (Panic Veldtgrass), *Eragrostis curvula* (African Lovegrass), *Setaria parviflora* (Slender Pigeon Grass), *Sporobolus africanus* (Parramatta Grass), *Sorghum halpense* (Johnson Grass) and *Axonopus fissifolius* (Narrow-leaved Carpet Grass). Other common exotic species included *Foeniculum vulgare* (Fennel), *Bidens pilosa*

(Cobblers Pegs), *Cirsium vulgare* (Spear Thistle), *Conyza bonariensis* (Fleabane), *Conyza sumatrensis* (Tall Fleabane), *Senecio madagascariensis* (Fireweed), *Opuntia stricta* (Prickly Pear), *Sida rhombifolia* (Paddy's Lucerne) and *Solanum nigrum* (Black Nightshade).

There were some areas within the ground layer that were comprised of mono-specific stands of *Imperata cylindrica* var. *major* (Blady Grass).

Photo 2 – Disused Orchard vegetation looking west from Quadrat 3

2.2.4 Observed flora species

Flora species recorded on site as listed in the *Travers bushfire & ecology Flora and Fauna Assessment December 2016* are shown in Attachment 2.

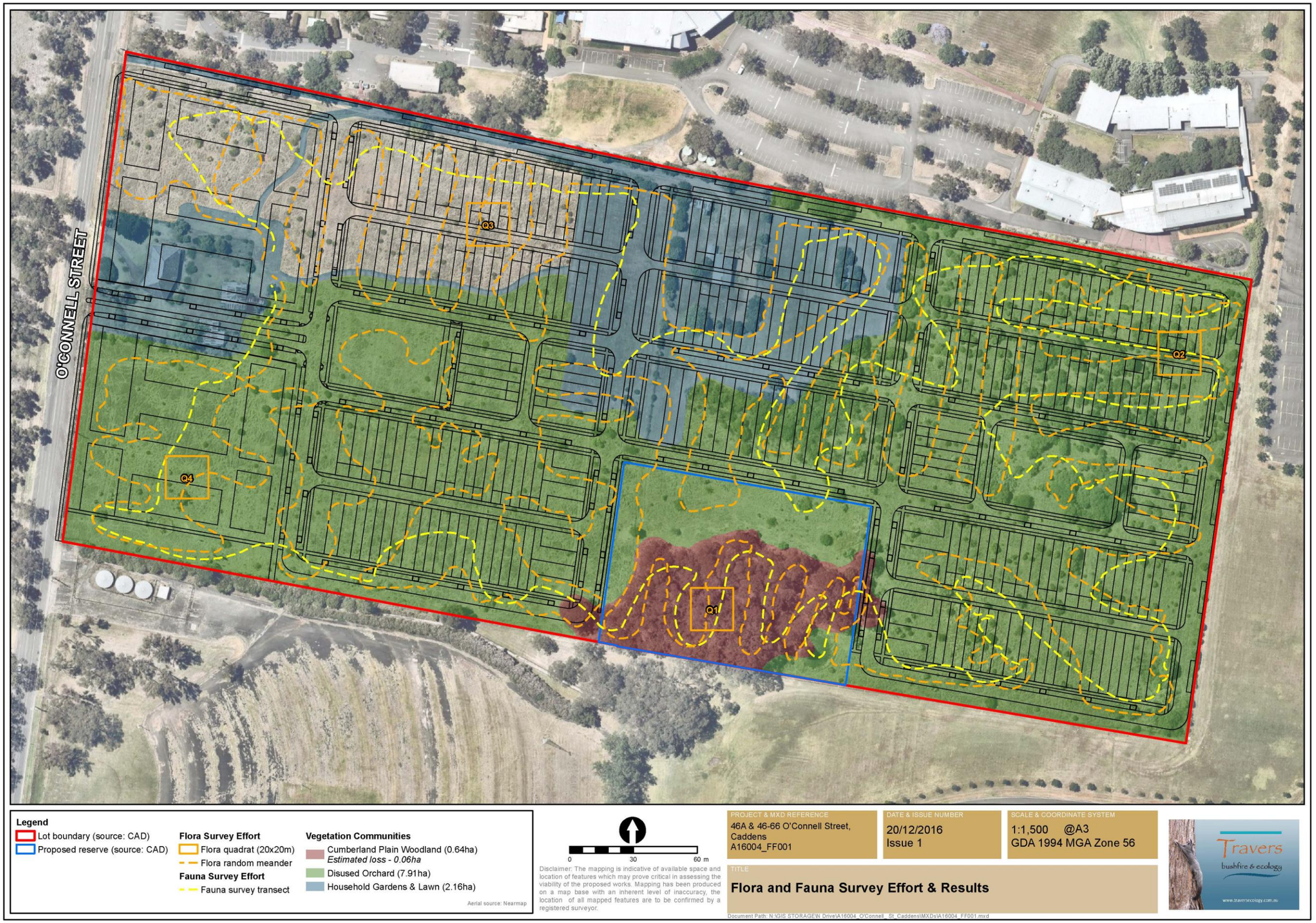

Figure 3 – Flora and fauna survey effort

2.3 Important habitat features

The *Travers bushfire & ecology Tree Assessment* (June 2016) notes the absence of hollow-bearing trees within the Native Bushland Reserve.

Five (5) trees which were found to contain a variety of small cracks and splits suitable for roosting by microchiropteran bats. All of these trees were dead stags that are to be retained within the native bushland reserve.

There are no permanent water bodies although an intermittent constructed drain is located just outside the south-western boundary of the lot.

2.4 Threatened species and EECs

The site contains an area (0.64 ha) of regrowth Cumberland Plains Woodland (CPW) which is listed as a Critically Endangered Ecological Community (CEEC) within the NSW *TSC Act* (1995). The flora and fauna report (*Travers bushfire & ecology*) advised that the vegetation did not meet the criteria for the Commonwealth *EPBC Act* (1999) listed CEEC, "*Cumberland Plain Shale Woodlands and Shale Gravel Transition Forest*".

The *Travers bushfire & ecology Flora and Fauna* (F&F) *Assessment, December* 2016 found no threatened flora species observed with very limited potential habitat given past disturbances and isolation of the remnant patch.

Table 2 - Threatened flora – potential to occur

Scientific name	TSC Act	Potential to occur	Potential impact
Grevillea juniperina ssp. *juniperina*	V	Low	Removal of low potential habitat
Pimelea spicata	E	Low	Removal of low potential habitat
Pultenaea parviflora	E	Low	Removal of low potential habitat

Threatened fauna with some potential to occur on site are highlighted in Table 3.

Table 3 – Threatened fauna – potential to occur

Common name	TSC Act	Potential to occur	Potential impact
Swift Parrot	E	✓	Direct - removal of suitable foraging habitat
Grey-headed Flying-fox	V	✓	Direct - removal of likely foraging habitat
East-coast Freetail Bat	V	✓	Direct - removal of potential foraging habitat
Eastern Falsistrelle	V	✓	Direct - removal of potential foraging habitat
Little Bentwing-bat	V	✓	Direct - removal of potential foraging habitat
Eastern Bentwing-bat	V	✓	Direct - removal of likely foraging habitat
Little Eagle	V	low	Direct - removal of suitable foraging habitat
Square-tailed Kite	V	low	Direct - removal of suitable foraging habitat
Yellow-bellied Sheathtail-bat	V	low	Direct - removal of low potential foraging habitat
Greater Broad-nosed Bat	V	low	Direct - removal of low potential foraging habitat

Whilst fauna survey has not been undertaken, the F&F considered that the habitat attributes within the subject site do not provide any significant or unique habitat of breeding importance or central to the home range for any threatened fauna species. Remnant, regrowth and planted vegetation may provide low-key foraging value only.

Vegetation connectivity

There is no native vegetation connectivity within the subject site however there is direct CPW connectivity to an offsite patch of CPW approximately 0.3 hectares in size lying adjacent to the southern lot boundary.

Apart from this there is no connectivity from the subject site to other areas of native vegetation. The connectivity values in the locality are highly fragmented, with limited canopy connectivity located along Werrington Creek to the west of the subject site. The CPW vegetation within the subject site is isolated and provides only a small “stepping stone” or island of habitat.

Management Strategy 3

The VMP management strategy will focus on enrichment planting within the proposed Native Bushland Reserve to achieve a fully structured CPW vegetation and to improve natural resilience against weed invasions and establishment of a CPW revegetation buffer zone to enhance the Native Bushland Reserve and to reduce potential edge effects.

Protective exclusion fencing will be installed to minimise potential anthropological impacts. Weed management and native habitat enhancement will be undertaken to increase the quality of the Native Bushland Reserve.

3.1 Site preparation

Initial site preparation includes the preparation of any documentation prior to the issue of construction certificate as required by Council, the surveying of works boundaries, installation of temporary construction proof and permanent fencing, installation of nest boxes installation of sediment and erosion control measures and engagement of project ecologist and bush regeneration contractors.

3.1.1 Protective fencing and access

The proposed Native Bushland Reserve is to be maintained as an area of native bushland, protected from the detrimental impacts of construction works, motor vehicles, rubbish dumping and stormwater runoff.

A permanent post and rail fence is to be installed along the perimeter of the reserve. Sediment fencing is to be installed along the eastern and western perimeters of the reserve to protect existing vegetation near proposed construction works. This is detailed in Section 3.2. Permanent protection fencing will also be run along the CPW boundary of the Surface Detention Basin to protect adjacent trees and vegetation from construction works.

A constructed gravel /concrete walking track will run through the northern portion of the reserve providing access from the northern, eastern and western areas of the development.

Fencing and access details are shown on Schedule 1 – Vegetation Management Plan.

3.1.2 Nest box installation

It is proposed that a total of eight (8) nest boxes are to be installed within the Native Bushland Reserve under the supervision of the project ecologist. These are to constitute:

- One (1) nest boxes suitable for use by large parrot;
- Two (2) boxes should also be constructed for Common Ringtail Possum and;
- Five (5) boxes for microchiropteran bats.

Nest boxes are to be installed as follows:

- All nest boxes are to be installed prior issue of Construction Certificate and any vegetation clearance works.
- The nest boxes are to be secured to trees at a minimum height of four metres above ground level facing the east to northeast direction. Nest boxes and re-erected limbs are not to be placed near locations where public access is planned.
- All nest boxes and re-erected limbs will be inspected annually and any damaged, or in danger of falling, are to be repaired or replaced.
- A fauna ecologist is to locate appropriate trees and locations for installing the nest boxes. The specific locations of nest boxes within the locality are to be determined by the Project Ecologist within each of the designated locations.
- Nest boxes are to be erected by a qualified arborist under the supervision of the project ecologist or fauna ecologist.

Recommended dimensions for nest boxes are outlined below. For detailed construction we refer to the attached nest box design specifications (Appendix 4).

Table 4 – Recommended dimensions for nest boxes

Species	Internal diameter (cm)	Depth/ length of box (cm)	Entry diameter (cm) & type	Vertical (v) or horizontal (h) slits	Height (above ground) (m)
Large parrot	10-20	50-60	6-8	V/H	5
Possum	25	35	8	V	4-8
Microchiropteran bats	7-10 x 15-24	20-25	1.5-2 slit	V	>4

3.1.3 Trees retention and removal

The *Travers bushfire & ecology Tree Assessment* (August 2016) assessed 139 trees within the remnant Cumberland Plain Woodland (CPW) located within the site. In line with the January 2017 Concept Plan, the proposed development will remove 7 trees and retain all other trees wherever possible (132 trees).

Tree protection zones (TPZ) are to be implemented for any retained tree in accordance with Australian Standard *AS4970* and other protection measures required for trees to be retained also in accordance with Australian Standard AS4970.

Key recommended tree protection measures are:

i. Protection of all CPW vegetation by permanent fencing that is to be erected prior to any bulk earthworks or construction works.

ii. AQ5 qualified arborist to manage any construction works within the TPZ of any retained trees adjacent to construction works (as identified by the project ecologist) where the there is a proposed impact on more than 10% of the TPZ. Such arborist will also identify any other mitigation measures to maintain or improve the condition of retained trees

iii. TPZs in close proximity to proposed works should be adequately marked and sign-posted as a “Native Bushland Reserve”. Signage identifying the Native Bushland Reserve (TPZ) and complying with *AS 1319* shall be placed at 10 metre intervals along the TPZ fencing.

iv. All trees nominated for removal are to be removed prior to any construction activity or bulk earthworks. Approved tree removal operations in the vicinity of retained trees are

to be undertaken in a manner that avoids canopy or root damage and soil compaction to retained trees. Such works should be supervised by a qualified arborist.

v. Stumps are to be ground, not dozed or dug out unless they impact on the installation of services, roads or building works.

vi. All trenches footings and major earth movement are to avoid TPZs.

vii. Stockpiling materials and soils within TPZs is forbidden.

viii. Machinery and other vehicles are to avoid TPZs during all operations.

ix. Any trenching or construction works unavoidably undertaken within TPZs should be witnessed, supervised and recorded (photographed and documented) by an AQ5 qualified arborist.

x. Any inadvertently affected or damaged trees are to be replaced insitu with the mature stock of the same species with a minimum 20L pot size, protected with a 1x 1 m timber tree protection guard and maintained for the term of the VMP.

Hollows

There were no hollows identified by the *Travers bushfire & Ecology Flora and Fauna* Assessment (December 2016) however five (5) trees were found to contain a variety of small cracks, splits or hollows.

All of these trees were Dead Stags that are to be retained within the native bushland reserve as potential habitat.

3.2 Sediment and erosion control

3.1.1 Stormwater basin

An area of approximately 0.05 ha in the south-eastern corner of the reserve is dedicated as a stormwater basin. A surface water detention basin and stormwater outlet, stabilised with rock scour protection over geotextile, will be constructed in this area as shown on Schedule 1 - Vegetation Management Plan

Drainage stabilisation and stormwater works will comply with *NSW DPI – Office of Water Guidelines for Controlled Activities on Waterfront Land – Guidelines for Outlet Structures 2012*.

Both the surface water detention basin and stormwater outlet will be fully stabilised and will be planted with suitable, native, locally-sourced species such as *Juncus usitatus* and *Carex appressa*. Embankments will be planted at CPW densities with appropriate local CPW species to integrate the basin with the CPW reserve. The following planting densities are to be achieved:

- 5 plants per $1m^2$ (total 2,500 plants)

Examples of appropriate stormwater outlets are shown in photos 3, 4, and 5.

Photo 3 - Stormwater outlet protection

Photo 4 – Stormwater outlet protection

Photo 5 – Stormwater outlet protection

3.1.2 Erosion control

Erosion and sediment control measures are to be implemented during all phases of the proposed development to minimise adverse effects as a result of increased erosion and sediment loading. These include:

- Identification of all potential erosion areas and installation of sediment fencing around all construction works to catch all surface runoff on the site prior to commencement of any earth or construction works. Sediment control infrastructure is to be installed in accordance with *Managing Urban Stormwater Soils and Construction* (Landcom 2004) (see Figure 4);
- Coordinated work practices are to minimise land disturbance through the use of stabilising materials/treatments to prevent erosion on disturbed soil and steeper slopes (such as temporary seeding, erosion control matting, turfing and bonded spray seed stabilization mix / hay sprays);
- All bare soils are to be stabilised, especially near drainage lines and re-vegetated immediately with appropriate local native plants typical of CPW;
- Regular site inspections of drains, channels and sediment control structures by the site manager and immediately after major rain events; and
- Safe and ecologically friendly disposal of all waste products.

Sediment fencing is to be supported a maximum of every three metres with the lower edge trenched to a depth of 150mm. Kick-backs are to be installed along all sections of sediment fencing that run downslope to slow down any waters being directed down the fence line. The sediment fence is to be supported by fixed hay bales in low sections of the fence where potential concentrated runoff is directed through the fence.

Sediment basins (if necessary) are to be installed prior to commencement of construction works.

Techniques used for erosion and sediment control on site are to be adequately maintained and monitored at all times, particularly after periods of rain, and shall remain in proper operation until all development activities have been completed and the site is sufficiently stabilised with vegetation.

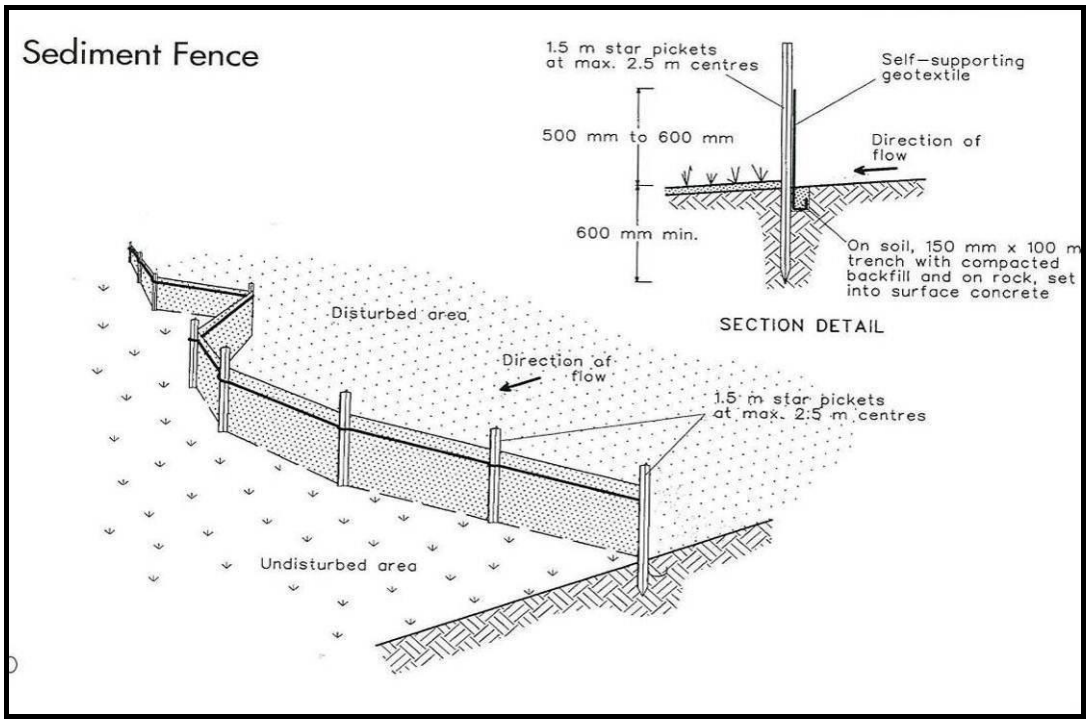

Figure 4 - Generic installation detail of geotextile fences

3.2 Weed management

The site as a whole exhibits highly disturbed shrub and ground layers which are significantly impacted by exotic species. Nonetheless, the shrub and ground layers within the proposed Native Bushland Reserve do contain a high proportion of the expected flora species for CPW.

3.2.1 Weed management strategy

The objectives of weed management are to remove weed threats from the reserve and to protect and rehabilitate the Cumberland Plain Woodland and in doing so, enhance potential fauna habitat in the long term. This will primarily involve the removal of weed infestations, bush regeneration, enrichment planting of suitable native endemic species for foraging, retention of on-ground logs for ground dwelling fauna and the ongoing maintenance of remnant vegetation and disturbed areas.

The project ecologist will confirm the effectiveness of weed control methods in accordance with the stipulated performance targets.

Weed control and revegetation works are to be carried out by a qualified bushland regenerator to achieve the following weed control targets. The presence, abundance and cover of noxious and environmental weed species are to achieve a maximum 10% weed coverage at the end of Year 1, progressively reducing to less than 1% at the end of Year 5).

Highly invasive and persistent weed species found within the proposed Native Bushland Reserve include:

- *Olea europaea* subsp. *cuspidata* (African Olive)
- *Rubus fruticosus sp. agg.* (Blackberry complex)
- *Araujia sericifera* (Moth vine)
- *Cotoneaster glaucophyllus* (Grey-leaved Cotoneaster)
- *Cotoneaster pannosus* (Cotoneaster (cultivar))
- *Ehrharta erecta* (Panic Veldtgrass)
- *Ligustrum lucidum* (Large-leaved Privet)
- *Ligustrum sinense* (Small-leaved Privet)
- *Lycium ferocissimum* (African Boxthorn)
- *Nerium oleander* (Oleander Bush)
- *Opuntia stricta* (Prickly Pear)
- *Senecio madagascariensis* (Fireweed)

The Noxious Weeds (Weed Control) Order 2014 details various classes of noxious weeds in NSW and the control requirements which apply to such classes. Relevant noxious weeds and their classes for the Local Control Authority area of Hawkesbury River County Council are outlined in Table 5.

Table 5 - Noxious weeds within proposed native bushland reserve

Scientific name	Common name	Class
Lantana camara	Lantana	4
Ligustrum sinense	Small-leaved privet	4
Ligustrum lucidum	Large-leaved privet	4
Lycium ferocissimum	African Boxthorn	4
Olea europaea subsp. *cuspidata*	African Olive	4
Rubus fruticosus sp.	Blackberry	4
Senecio madagascariensis	Fireweed	4

Class 4 - growth of these plants must be managed in a manner that continuously inhibits the ability of such plants to spread

Exotic species observed elsewhere within the lot include Camphor Laurel (*Cinnamomum camphora*), Crepe Myrtle (*Lagerstroemia indica*), Fig Tree (*Ficus carica*) and Mulberry (*Morus alba*). Exotic remnant orchard trees include Lemon Tree (*Citrus limon*), Orange Tree (*Citrus sinensis*), Grapefruit Tree (*Citrus* x *paradise*), Pecan (*Carya illinoensis*), Avocado (*Persea Americana*),

A list of weeds identified in the *Travers bushfire & ecology Flora and Fauna Assessment* (October 2016) for the site as a whole are shown in Appendix 3.

Under the Noxious Weeds (Weed Control) Order 2014, Class 4 plants (as shown in Table 5), pose a potentially serious threat to primary production, the environment or human health, are widely distributed in an area to which the order applies and are likely to spread in the area or to another area. The growth of these plants must be managed in a manner that continuously inhibits the ability of such plants to spread.

Noxious weeds will require targeted weed control and ongoing management throughout the maintenance period.

Primary, secondary and maintenance weed control measures will focus on the Native Bushland Reserve and the Bushland Interface Zone as shown on Schedule 1 – Vegetation Management Plan.

No plant species other than those native species associated with the vegetation communities present will be planted or used in revegetation works.

Weed control is to extend ongoing for five years. The weed control priorities are listed in Attachment 3.

3.2.2 Low impact weeding techniques

The following weed management and maintenance works will primarily involve the removal of any weed infestations, bush regeneration, mass planting of suitable native endemic species in small identified areas and the ongoing maintenance of remnant vegetation and disturbed areas.

There are currently a number of low impact bush regeneration techniques used in bushland management for the removal of weeds. The bush regeneration process (Buchanan, 1989) involves:

- The *Bradley Method* of minimal soil disturbance during weed removal
- Clearing and stabilising techniques
- The use of herbicides
- The use of fire (pile burns)
- Biological controls

Employing the *Bradley Method* for regeneration requires the removal of weeds in phases. Stages of weed removal can be broken into three components:

Primary weeding

All weed materials need to be selectively isolated from native vegetation and disposed of separately to native brush.

Secondary or follow-up weeding

Secondary or follow-up weeding involves intensive weeding in areas that have already received primary work to remove weed regrowth or overlooked weeds. It is recommended that secondary weeding be conducted in the following 3-6 months after primary weeding. Secondary weeding of the site may take up to three (3) months over several sessions.

Maintenance weeding

After primary and secondary weeding and natural regeneration of the bushland, the area should be able to resist most weeds. However, weeds will re-establish on the site from bird, wind, water transport and other seed or propagule dispersal mechanisms within the site. Maintenance weeding should be undertaken 6-12 times a year until such time as the resistance of the bushland to weeds increases, then only requiring hand weeding on a needs basis. Maintenance weeding is to be conducted for a minimum period of five (5) years after construction works have been completed.

Weeding works are to be carried out by an appropriately qualified and licensed bushland regeneration company under the direction of a consulting project ecologist.

3.2.3 Removal technique for African Olive

African Olive invasion is recognised as the greatest invasive threat to CPW, and is listed under the NSW TSC Act as a Key Threatening Process. As the shrub layer within the Native Bushland Reserve is characterised by scattered, dense stands African Olive forming dense clumps to 10m high, removal and ongoing suppression of this weed is a priority.

Primary weed control techniques for African Olive will involve cutting trees with a chainsaw to ground level treating cut stumps with undiluted glyphosate (360 g/L). All cut tree material is to be mechanically chipped outside the Native Bushland Reserve.

Any cleared areas within the Native Bushland Reserve should be covered with wood chip generated from the mechanical removal of Olive biomass. This mulch layer can then be used as a weed suppressant and substrate for seeding with native understorey species.

African Olive fruit maturation generally occurs between June and September and the importance of avian dispersers in the spread of seeds within mature fruit is noted (Cuneo and Leishman, 2006). An expected flush of African Olive regrowth will be addressed via secondary weeding works within a short period (3 months) following primary weeding.

Re-establishment of early successional understorey species is seen as a key methodology for restoring CPW after African Olive invasion (Cuneo and Leishman, 2015). This approach can be achieved by mulching of African Olive biomass as outlined above and direct (drilling) seeding of selected native coloniser species to a depth of ~20 mm. Recommended species are:

- Hickory Wattle (*Acacia implexa*),
- Blackthorn (*Bursaria spinosa*),
- Native Indigo (*Indigofera australis*),
- Weeping Grass (*Microlaena stipoides*),
- Common Wheatgrass (*Elymus scaber*),
- Tall Windmill Grass (*Chloris ventricosa*) and
- Kangaroo Grass (*Themeda triandra*).

African Olive seedlings will be controlled by spot spraying with herbicide.

3.2.4 Herbicide use

The use of *Roundup Bi-active* ® or equivalent formulations is recommended for weed infestations which may require spraying within Lot 205.

An advantage of herbicide use is the low time taken to spray weeds as compared to physically removing them, particularly for large infestations of weeds. The disadvantage is that no single herbicide is effective on all weed species, thus the herbicide used needs to achieve an effective kill.

In general, *Travers bushfire & ecology* supports that the use of herbicides in non-ecologically sensitive areas can be undertaken if:

- There are small areas of dense weeds with few or no native plants to protect;
- There are large areas of predominantly weed coverage;
- Application can be undertaken without the risk of spray drift or off target kills, and
- Weeds are growing too rapidly for physical removal.

Only operators with *Chemcert* or equivalent training must undertake the spraying of weeds. The operator must evaluate the success of each treatment after a set period of time, according to the labelled effective treatment of each species for each herbicide. Care must be taken when applying herbicides near water bodies due to the sensitivity of the waterways and resident flora and fauna to runoff containing these herbicides.

All herbicides must be applied according to the herbicide usage label and provisions of the *Protection of the Environmental Operations Act (NSW PEO Act).*

All noxious and environmental weeds need to be eradicated and controlled across the entire site. Weed propagules (seeds, tubers etc.) need to be periodically collected and disposed of at an approved waste transfer facility and shall not be dumped on adjacent bushland or allowed to be washed into stormwater facilities.

3.3 Proposed restoration works

3.3.1 CPW regeneration zone

A minimum of 0.53 ha CPW regeneration is to be undertaken as located on Figure 1 – Vegetation Management Works. A minimum of 30 species for revegetation will be installed using species from Appendix 1 Recommended Planting List however may be supplemented from species which typically occur in Cumberland Plain Woodland. Planting densities are to achieve the following:

- Trees – Selective replanting (total 20 plants plus a 20% contingency for losses)
- Shrubs – 1 per 10m^2 (total 530 plants plus a 20% contingency for losses)
- Groundcovers – 1 per 1m^2 (total 5,300 plants plus a 20% contingency for losses)

3.3.2 CPW revegetation

Areas with small habitat fragments often exhibit especially pronounced edge effects, i.e. the effect of an abrupt transition between two quite different adjoining ecological communities on the numbers and kinds of organisms in the marginal habitat. The *Cumberland Plain Recovery Plan* notes that active management of CPW recovery efforts include the need to focus on management of 'edge effects'.

A minimum of 0.16ha of fully structured CPW revegetation will be established as a bushland buffer as shown on Schedule 1 Vegetation Management Works (VMP). Management details for this zone are discussed in Section 3.3.1.

The management aim for this zone will be to manage weeds and increase CPW floral diversity and density. These efforts will provide a buffer against weed incursions from adjoining residential development and provide a sheltered internal habitat for the insitu fauna.

A minimum of 30 species for revegetation will be selected from Appendix 1 Recommended Planting List however may be supplemented from species which typically occur locally in Cumberland Plain Woodland. Planting densities are to achieve the following:

- Dominant Trees – 1 per 50m^2 (total 32 plants plus a 20% contingency for losses)
- Sub canopy Trees – 1 per 30m^2 (total 54 plants plus a 20% contingency for losses)
- Shrubs – 1 per 10 m^2 (total 160 plants plus a 20% contingency for losses)
- Groundcovers – 3 per 1m^2 (total 4,800 plants plus a 20% contingency for losses)

3.3.3 Roadside strip park

A roadside strip park of approximately 0.23 ha will be established to the north of the bushland revegetation buffer in line with APZ requirements. This area will be turfed and managed via regular mowing and slashing.

This area will be implemented by the developer and managed by either Council or via Community Title.

3.3.4 Basin planting

All basin plantings will be planted with locally occurring macrophyte species at a rate of 5 per m2. The number of plants required will be dependent upon the basin depth. Typically plantings should go to a depth of 40cm but maintain sufficient open water area.

3.3.5 General

All installed plantings are to be protected with a 2L cardboard box or plastic guards to protect from grazing animals. Pindone rabbit baiting is to be undertaken throughout the entire maintenance period.

Watering of all revegetated areas is to be undertaken once a week for the first six to eight weeks post planting in the event of a dry spell.

It is expected that at least 85% of plantings will survive. If the success rate is less than this, supplementary planting will be required. All plant maintenance is to be undertaken over a 5 year period.

Suitable key trees, shrubs and groundcover species for revegetation are shown in Attachment 1. Native species from typical of CPW can also be used to supplement restoration works in cases where such recommended species are unavailable.

Planting densities should achieve a quick vegetative cover and root mass to maximise bed and bank stability along the subject watercourse. Planting density will generally create a fully structured woodland. Whilst the ground layer species generally stays across communities, the tree and shrub planting densities can be varied to reflect the natural vegetation community in the locality.

3.4 Species habitat enhancement

The *Travers bushfire & ecology Flora and fauna assessment* (December 2016) noted the presence of Australian Magpie, Australian Raven, Black-shouldered Kite, Crested Pigeon, Laughing Kookaburra, Little Corella, Magpie-lark, Masked Lapwing, Superb Fairy-wren and Willie Wagtail Rainbow Lorikeet on site.

State-threatened including Swift Parrot, Grey-headed Flying-fox, Little Eagle and several species of bat are also noted as having some potential to occur on site.

There is an absence of hollow-bearing trees within the site however five (5) trees within the proposed Native Bushland Reserve were found to contain a variety of small cracks and splits suitable for roosting by microchiropteran bats. All of these trees are dead stags which are to be retained.

Eight nest boxes will be installed within the proposed Native Bushland Reserve to increase potential habitat for the abovementioned species (section 3.1.2).

All CPW trees earmarked for removal will be sectionally dismantled and logs placed in suitable locations throughout the proposed Native Bushland Reserve as potential habitat for ground-dwelling species.

Monitoring 4

4.1 Monitoring actions

Monitoring of the progress of weed removal, plant growth and natural regeneration is to be undertaken every six (6) months for three (3) years with annual progress reports for the remaining 2 years of the maintenance program to be submitted to Penrith Council.

Monitoring activities will include:

1. A photographic record for comparative purposes taken on an annual basis;
2. A minimum of two (2) 20 x 20m Floristic biometric quadrats are to be established to assess the achievement of the performance targets. The quadrats are to be placed in representative locations identified in Schedule 1 – Vegetation Management Works.
3. An overall vegetation condition map reviewed every 12 months based on standard bush regeneration vegetation condition assessment methodology.

Photopoints, annual vegetation condition mapping and the monitoring of Floristic biometric plots throughout restoration works will enable the comparison of flora densities and population composition over time.

The biometric plots assessment is a component of the NSW Framework for Biodiversity Assessment based on transect and plot data that is collected on site for each vegetation zone. This biometric scoring considers ecosystem structure, composition and function.

Monitoring of the site is required to be set up at the commencement of restoration works. This will allow the determination of pre and post condition of the vegetation and its habitat, and may include identification of any areas suffering from disturbance, sedimentation or in need of contingency rehabilitation, weed control, stabilisation or maintenance of rehabilitated or regenerating areas.

The monitoring and review process will focus on the presence / absence of exotic species, floristic diversity of the bushland, structural integrity of the bushland, revegetation progress and success, and monitoring of any sediment fencing or protective fencing.

Inspections of the site by the project ecologist should be undertaken prior to, during and post operations to ensure that vegetated areas designated for retention and exclusion zones are adequately marked and that other appropriate protection procedures are being maintained.

An inspection is to be undertaken by the project ecologist every month during primary restoration works, with the submission of a compliance certificate at the completion of the revegetation works. An annual site audit is to be undertaken by the project ecologist detailing any restoration works required to be achieved following restoration performance targets (Section 4.3).

The restoration area is to be maintained to a high standard and is to be maintained as an indigenous native vegetation area.

4.2 Compliance certificates

A site restoration audit will be annually until the completion of the 5 year maintenance period. This will be undertaken by an independent project ecologist assessing achievements and recommended mitigation measures.

Compliance certificates will be issued by the project ecologist for the following items:

- Engagement of a bush regeneration company and independent project ecologist;
- Installation of all protective fencing;
- Completion of primary restoration works including planting of tree and shrub species at the required densities;
- Completion of all required restoration maintenance tasks including successful revegetation of CPW; and
- Achievement of all remaining restoration performance targets as stipulated within Section 4 and mirrored on Schedule 1 – Vegetation Management Works.

4.3 Restoration performance targets

The site audits are to assess the achievement of the following restoration performance targets:

1. Permanent protective fencing is to be installed as located on Schedule 1 - Vegetation Management Works.

2. Weed control and revegetation works are to be carried out by a qualified bushland regenerator to achieve the following weed control targets. The presence, abundance and cover of noxious and environmental weed species are to achieve a maximum 10% weed coverage at the end of Year 1, progressively reducing to less than 1% at the end of Year 5).

3. All highly invasive weed species are to be continuously suppressed and eradicated from the restoration area in accordance with noxious weed control guidelines. All woody weeds including African Olive, Privets and Boxthorn are to be removed and eradicated. Vines such as Blackberry and Bridal Veil Creeper are to be continuously suppressed and eradicated.

4. A target 60% native vegetation cover applies at the end of Year 1, 75% native vegetation cover at the end of Year 2, and 95% native vegetation cover at the end of Year 5.

5. Minimum of 0.16 ha of fully structured CPW revegetation will be undertaken as located on Schedule 1 – Vegetation Management Works. A minimum of 30 species for revegetation will be selected from Appendix 1 Recommended Planting List. Planting densities are to achieve:

    - Dominant Trees – 1 per 50m^2 (total 32 plants plus a 20% contingency for losses)
    - Sub canopy Trees – 1 per 30m^2 (total 54 plants plus a 20% contingency for losses)
    - Shrubs – 1 per 10m^2 (total 480 plants plus a 20% contingency for losses)
    - Groundcovers – 3 per 1m^2 (total 4,800 plants plus a 20% contingency for losses)

6. Minimum of 0.53 ha CPW regeneration to be undertaken as located on Figure 1 – Vegetation Management Works. A minimum of 30 species for revegetation will be

installed using species from Appendix 1 Recommended Planting List. Planting densities are to achieve:

- Trees – Selective replanting (total 20 plants plus a 20% contingency for losses)
- Shrubs – 1 per $10m^2$ (total 530 plants plus a 20% contingency for losses)
- Groundcovers – 1 per $1m^2$ (total 5,300 plants plus a 20% contingency for losses)

7. A surface water detention basin and stormwater outlet, stabilised with rock scour protection over geotextile to be constructed as shown on Schedule 1 Vegetation Management Plan. Drainage stabilisation and stormwater works will comply with *NSW DPI – Office of Water Guidelines for Controlled Activities on Waterfront Land – Guidelines for Outlet Structures 2012*. Both the surface water detention basin and stormwater outlet will be fully stabilised and will be planted with suitable, native, locally-sourced species such as *Juncus usitatus* and *Carex appressa* at a density of 5 plants per square metre (approximately $500m^2$ – 2,500 units). The surrounding embankments will be planted at CPW revegetation densities to integrate the basin within the CPW reserve.

8. Installation of 8 nest boxes including one (1) nest box suitable for use by large parrot, two (2) boxes should also be constructed for Common Ringtail Possum and, and five (5) boxes for micro-chiropteran bats.

9. Harvesting, relocation and placement of six (6) 3m native hardwood logs harvested from the adjoining affected CPW vegetation remnants throughout the reserve as habitat enrichment.

10. Monitoring and site audit will be undertaken annually until the completion of the 5 year maintenance period by an independent project ecologist assessing achievements and recommended mitigation measures. A condition assessment and review of works will be undertaken annually and a report will be produced by the site bush regeneration contractors.

11. Compliance certificates will be issued by the project ecologist upon engagement of a bush regeneration company and independent project ecologist, installation of all protective fencing, completion of primary restoration works, completion of all required restoration maintenance tasks including successful revegetation of CPW and achievement of all remaining restoration performance targets as stipulated within Schedule 1 – Vegetation Management Works.

Program of Works

5

The program of works (Table 6) is aimed at providing a management framework for enacting undertaking revegetation, maintenance, monitoring and review works reasonably required for the conservation of the CPW. Site rehabilitation, including weed control works is to be undertaken in accordance with the Schedule 1 – Vegetation Management Works.

5.1 Program of works

For the purposes of the program of works, the listed tasks are divided into the following stages.

Pre-construction Works

Pre-construction works refers to all site preparation activities prior to the commencement of construction works on site and generally excludes any landscaping and planting works.

Construction works

Construction works refers to the period during which earthworks and construction of buildings, roads and other facilities and services are being installed. It is during this period that the protection of remnant vegetation is critical to minimising accidental loss of trees or associated vegetation. It is also during this phase that primary restoration works are completed.

Primary restoration works, as defined under this VMP, include the completion of primary and secondary weed control, protective fencing, pathways, mulching and any planting works. Practical completion of the primary restoration phase is determined by the project ecologist at which point all primary restoration actions need to have been completed and the installed plants are well established only requiring periodic maintenance or watering. Should there be a delay in the completion of works, for any reason, then the construction works phase may be extended.

Post construction works

Post construction works essentially consist of maintenance activities, unless further contingency works are identified by the project ecologist for auditing purposes. Maintenance will be undertaken by a fully qualified bush regeneration crew for a minimum of three (3) years post completion of primary restoration works.

All bush regeneration or landscape crews working within the site are required to have at a minimum TAFE Certificate Level II Bush Regeneration qualifications or equivalent to work within the bush regeneration zone. All staff are to be supervised by a qualified bush regeneration supervisor with a minimum five (5) years full time experience and a minimum TAFE Certificate Level II Bush Regeneration qualifications and / or a degree in Natural Areas Management or the equivalent.

Prior to the release of the construction certificate primary weed control works and the installation of protective fencing is to be completed.

Table 6 - Table of works

Action	Responsibility
Stage 1 – Pre-construction works	
• Formation of site management team and establish supervision and consultation processes – minimum Project Ecologist, and site manager	• Site project manager
• Erection of protective control fencing	• Site manager
• Commencement of *primary weed control*	• Suitably qualified bushland regenerator
• Provide certificates of compliance	• Project ecologist
Stage 2 – Construction works	
• Supervision of any vegetation and tree removal and management works	• Site project manager in association with the project ecologist
• Waste removal and soil amelioration works to control weed infestations and provide suitable restoration soil base.	• Earthworks contractor / suitably qualified bushland regenerator
• Complete revegetation works	• Contractor / project manager
• Commencement of secondary weed control and maintenance weed control	• Contractor / project manager
• Maintenance of fencing and signage around protected vegetation	• Contractor / suitably qualified bushland regenerator
• Continuation of primary restoration and revegetation works	• Contractor / suitably qualified bushland regenerator
• Provide certificates of compliance	• Project ecologist
Stage 3 – Post Construction Works	
• Enrichment planting within revegetation areas if required.	• Contractor with advice of project ecologist
• Continuation of regeneration and weed control maintenance.	• Contractor / suitably qualified bushland regenerator
• Monitoring of retained vegetation at six (6) months, then annually for five (5) years post construction stage.	• Project ecologist

5.2 Typical timeline of restoration works

The following typical timeline (Figure 5) is provided to indicate the overall timing of site works. The commencement of the maintenance period of five (5) years is subject to the completion of primary restoration works as certified by the project ecologist. A certificate of completion will be required as evidence of satisfactory completion. Upon engagement, contractors are expected to meet the following typical schedule of works.

Typical Restoration Schedule

ID	Task Name	Time
	PROJECT INITIATION (Note 1)	
1.1	Preparation of project restoration plan	1 mth
1.2	Preparation of contract schedules	1 mth
1.3	Project restoration plan signoff	2 wk
1.4	Confirmation of pricing/quotations	2 wk
2	**NOXIOUS WEED CONTROL**	
2.1	Primary noxious weed control	2 mth
2.2	Secondary weed control	4 mth
2.3	Follow-up weed control	3 mth
3	**PRECONSTRUCTION WORKS**	
3.1	Survey vegetation clearance boundaries and mark trees to be retained or removed	2 wk
3.2	Habitat searches and relocation of affected wildlife	2 wk
3.3	Dismantling of hollow bearing trees and relocate	2 wk
3.4	Supply and installation of artificial nest boxes	2 wk
3.5	Installation of temporary tree protection fencing/bunting	2 wk
4	**REVEGETATION WORKS**	
4.1	Site preparation	
4.1.1	Seed collection	8 mth
4.1.2	Plant propagation (initial and contingency)	6-9 mth
4.1.3	Site stabilisation	1 wk
4.1.4	Temporary protective and erosion control fencing	1 wk
4.1.5	Commence pest control (rabbits)	6 mth
4.2	Tube-stock planting and initial maintenance	
4.2.1	Pre-planting weed & waste clearance	2 wk
4.2.2	Planting & guarding	2 wk
4.2.3	Initial watering and maintenance	3 mth
5	**MAINTENANCE PERIOD**	
5.1	Watering, weed control and repairs	5 yrs
5.2	Ongoing pest control (rabbits)	5 yrs
6	**CONTRACT MANAGEMENT**	
6.1	Contractor supervision	5 yrs
6.2	Monitoring	5 yrs
6.3	Prepare and submit audit reports	5 yrs
6.4	Prepare and submit compliance certificates	5 yrs
7	**CONTINGENCY PLANTING**	
7.1	Site preparation	1 wk
7.2	Replacement or contingency planting	1 wk
7.3	Watering and maintenance	3 mth
7.4	Medium term maintenance	3 mth

Figure 3 - Restoration timeline

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Recommended Planting List

A1

The following locally occurring native plant species are to be established for revegetation purposes. Further species will also be suitable provided that they are recognised as being typical or common species known or demonstrated to occur within CPW.

Table A1 - CPW revegetation species list

Scientific name	Common name
TREES	
Dominants (1 tree per 50m^2)	
Eucalyptus crebra	Narrow-leaved Ironbark
Eucalyptus eugenioides	Thin-leaved Stringybark
Eucalyptus moluccana	Grey Box
Eucalyptus tereticornis	Forest Red Gum
Subdominants (1 tree per 30m^2)	
Melaleuca decora	White feather honeymyrtle
A. parramattensis	Parramatta Wattle
A. subvelutina	Broad-leaved Apple
SHRUBS (1 shrub per 10m^2)	
Bursaria spinosa var. *spinosa*	Blackthorn
Acacia implexa	Hickory Wattle
Acacia decurrens	Black Wattle
Daviesia ulicifolia	Gorse Bitter Pea
Dillwynia sieberi	Prickly Parrot-pea
Indigofera australis	Native Indigo
Melaleuca nodosa	Ball Honey Myrtle
GROUNDCOVERS & VINES (3 plants per 1m^2 subject to existing native vegetation cover)	
Centella asiatica	Swamp Pennywort
Commelina cyanea	Scurvy Weed
Cymbopogon refractus	Barbwire Grass
Dianella caerulea var. *caerulea*	Flax Lily
Dichelachne micrantha	Short-hair Plume Grass
Dichondra repens	Native kidney weed
Echinopogon caespitosus var. *caespitosus*	Tufted Hedgehog Grass
Einadia hastata	Berry Saltbush
Geranium homeanum	Northern Cranesbill
Hardenbergia violacea	Native Sarsaparilla
Indigofera australis	Native Indigo
Lomandra longifolia	Spiky-headed Mat-rush
Microlaena stipoides var. *stipoides*	Weeping Rice Grass
Poa labillardieri var. *labillardieri*	Common tussock-grass

Scientific name	Common name
Pratia purpurascens	Whiteroot
Rytidosperma racemosum	Wallaby Grass
Rytidosperma tenuius	Wallaby Grass
Themeda triandra	Kangaroo Grass

Observed flora species

A2

Table A2 - Observed flora species within lot

Scientific name	Common name
Trees	
*Mangifera indica**	Mango Tree
*Asimina triloba**	Paw Paw Tree
*Corylus avellana**	Hazel Nut Tree
Casuarina cunninghamiana subsp. cunninghamiana	River Oak
*Carya illinoensis**	Pecan
*Cinnamomum camphora**	Camphor Laurel
*Persea americana**	Avocado
*Lagerstroemia indica** (Cultivar)	Crepe Myrtle
Melia azedarach	White Cedar
*Ficus carica**	Fig Tree
*Morus alba**	Mulberry
Eucalyptus amplifolia	Cabbage Gum
Eucalyptus moluccana	Grey Box
Eucalyptus tereticornis	Forest Red Gum
Olea europaea subsp. *cuspidata**	African Olive
Olea europaea subsp. *europaea**	Common Olive Tree
*Citrus limon** (Cultivar)	Lemon Tree
*Citrus sinensis** (Cultivar)	Orange Tree
Citrus tangelo	Tangelo
Citrus x *paradisi** (Cultivar)	Grapefruit Tree
*Populus alba**	White Poplar
Shrubs	
*Nerium oleander**	Oleander Bush
Atriplex semibaccata	Creeping Saltbush
*Cotoneaster glaucophyllus**	Grey-leaved Cotoneaster
*Cotoneaster pannosus**	Cotoneaster (cultivar)
Hibiscus sp. (Cultivar)	Hibiscus
*Ligustrum lucidum**	Large-leaved Privet
*Ligustrum sinense**	Small-leaved Privet
Bursaria spinosa subsp. spinosa	Native Blackthorn
Rosa sp. (cultivar)*	Rose
*Rubus fruticosus sp. agg.**	Blackberry complex
Opercularia diphylla	-

Scientific name	Common name
*Lycium ferocissimum**	African Boxthorn
*Solanum sisymbriifolium**	-
Groundcovers	
Brunoniella australis	Blue Trumpet
Arthropodium milleflorum	Pale Vanilla Lily
Centella asiatica	Swamp Pennywort
*Foeniculum vulgare**	Fennel
*Bidens pilosa**	Cobbler's Pegs
*Cirsium vulgare**	Spear Thistle
*Conyza bonariensis**	Flax-leaf Fleabane
*Conyza sumatrensis**	Tall Fleabane
Euchiton sphaericus	-
*Hypochaeris radicata**	Flatweed
*Senecio madagascariensis**	Fireweed
Sigesbeckia orientalis subsp. orientalis	Indian Weed
*Sonchus oleraceus**	Common Sow-thistle
*Taraxacum officinale**	Dandelion
*Opuntia stricta**	Prickly Pear
Wahlenbergia gracilis	Australian Bluebell
Wahlenbergia stricta subsp. *stricta*	Austral Bluebell
*Cerastium glomeratum**	Mouse-ear Chickweed
Einadia hastata	Berry Saltbush
Einadia polygonoides	-
Hypericum gramineum	Small St Johns Wort
Commelina cyanea	Scurvy Weed
Dichondra repens	Kidney Weed
Carex inversa	Knob Sedge
Cyperus brevifolius	Mullumbimby Couch
*Cyperus eragrostis**	Umbrella Sedge
Cyperus gracilis	Slender Flat Sedge
Phyllanthus virgatus	-
*Trifolium repens**	White Clover
*Centaurium erythraea**	Common Centaury
Pratia purpurascens	Whiteroot
Sida corrugata	Corrugated Sida
*Sida rhombifolia**	Paddy's Lucerne
*Oxalis latifolia**	Pink Fishtail
Oxalis perrenans	Yellow-flowered Wood Sorrel
Plantago debilis	Slender Plantain
*Plantago lanceolata**	Ribwort
Aristida ramosa	Purple Wiregrass
Aristida vagans	Three-awn Speargrass
*Axonopus fissifolius**	Narrow-leaved Carpet Grass

Scientific name	Common name
*Briza subaristata**	-
Cymbopogon refractus	Barbwire Grass
Cynodon dactylon	Common Couch
Dichelachne micrantha	Short-hair Plume Grass
*Ehrharta erecta**	Panic Veldtgrass
Entolasia stricta	Wiry Panic
Eragrostis brownii	Brown's Lovegrass
*Eragrostis curvula**	African Lovegrass
Eragrostis leptostachya	Paddock Lovegrass
*Holcus spp.**	-
Imperata cylindrica	Blady Grass
Microlaena stipoides	Weeping Grass
*Paspalum dilatatum**	Paspalum
*Paspalum urvillei**	Vasey Grass
*Pennisetum clandestinum**	Kikuyu, Kikuyu Grass
Poa labillardierei var. labillardierei	Tussock Grass
Rytidosperma tenuius	Wallaby Grass
*Setaria parviflora**	Slender Pigeon Grass
*Setaria pumila**	Pale Pigeon Grass
*Sorghum halpense**	Johnson Grass
*Sporobolus africanus**	Parramatta Grass
Sporobolus creber	Slender Rat's Tail Grass
Sporobolus elongatus	Rat's Tail Grass
Themeda australis	Kangaroo Grass
*Anagallis arvensis**	Scarlet Pimpernel
Acaena ovina	Acaena
Veronica plebeia	Creeping Speedwell
*Solanum nigrum**	Black Nightshade
Solanum prinophyllum	Forest Nightshade
Urtica incisa	Stinging Nettle
*Verbena bonariensis**	Purpletop
*Verbena rigida var. rigida**	Veined Verbena
Viola hederacea	Ivy-leaved Violet
*Xanthium spp.**	
Climbers	
*Araujia sericifera**	Mothvine
Desmodium varians	Slender Tick-trefoil
Glycine clandestina	Twining Glycine
Glycine tabacina	Twining Glycine
Vicia sativa subsp. *sativa**	Common Vetch
Passiflora herbertiana	Native Passionfruit
Clematis aristata	Old Man's Beard
* denotes exotic species	

Target Weed Species

A3

The following weed species were recorded within the proposed Native Bushland Reserve and are to be targeted on a priority basis subject to degree of invasiveness and implications for regeneration of native flora.

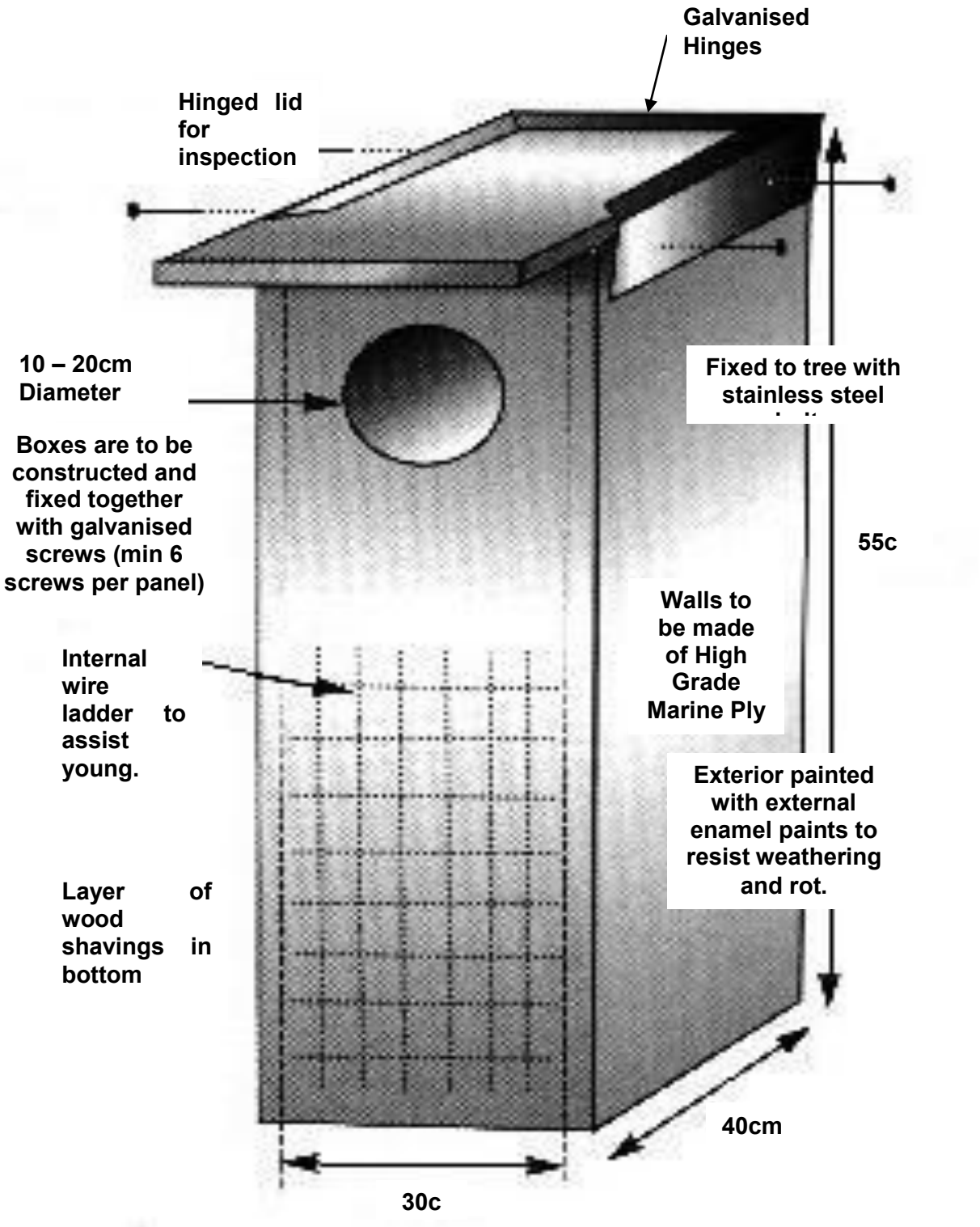
Table A3 - Target weed species within native bushland reserve

Scientific name	Common name	Priority control
Olea europaea subsp. *cuspidata*	African Olive	Very High
Rubus fruticosus sp. agg.	Blackberry complex	Very High
Araujia sericifera	Moth vine	High
Cotoneaster glaucophyllus	Grey-leaved Cotoneaster	High
Cotoneaster pannosus	Cotoneaster (cultivar)	High
Ehrharta erecta	Panic Veldtgrass	High
Ligustrum lucidum	Large-leaved Privet	High
Ligustrum sinense	Small-leaved Privet	High
Lycium ferocissimum	African Boxthorn	High
Nerium oleander	Oleander Bush	High
Opuntia stricta	Prickly Pear	High
Senecio madagascariensis	Fireweed	High
Axonopus fissifolius	Narrow-leaved Carpet Grass	Medium
Cirsium vulgare	Spear Thistle	Medium
Cyperus eragrostis	Umbrella Sedge	Medium
Foeniculum vulgare	Fennel	Medium
Paspalum dilatatum	Paspalum	Medium
Paspalum urvillei	Vasey Grass	Medium
Pennisetum clandestinum	Kikuyu, Kikuyu Grass	Medium
Rosa sp. (cultivar)	Rose	Medium
Sida rhombifolia	Paddy's Lucerne	Medium
Solanum sisymbriifolium	-	Medium
Sporobolus africanus	Parramatta Grass	Medium
Trifolium repens	White Clover	Medium
Anagallis arvensis	Scarlet Pimpernel	Low
Bidens pilosa	Cobbler's Pegs	Low
Briza subaristata	-	Low
Centaurium erythraea	Common Centaury	Low

Cerastium glomeratum	Mouse-ear Chickweed	Low
Conyza bonariensis	Flax-leaf Fleabane	Low
Conyza sumatrensis	Tall Fleabane	Low
Eragrostis curvula	African Lovegrass	Low
Holcus spp.	-	Low
Hypochaeris radicata	Flatweed	Low
Oxalis latifolia	Pink Fishtail	Low
Plantago lanceolata	Ribwort	Low
Setaria parviflora	Slender Pigeon Grass	Low
Setaria pumila	Pale Pigeon Grass	Low
Solanum nigrum	Black Nightshade	
Sonchus oleraceus	Common Sow-thistle	Low
Sorghum halpense	Johnson Grass	Low
Taraxacum officinale	Dandelion	Low
Verbena bonariensis	Purpletop	Low
Verbena rigida var. rigida	Veined Verbena	Low
Vicia sativa subsp. *sativa*	Common Vetch	Medium
Xanthium spp.		Medium

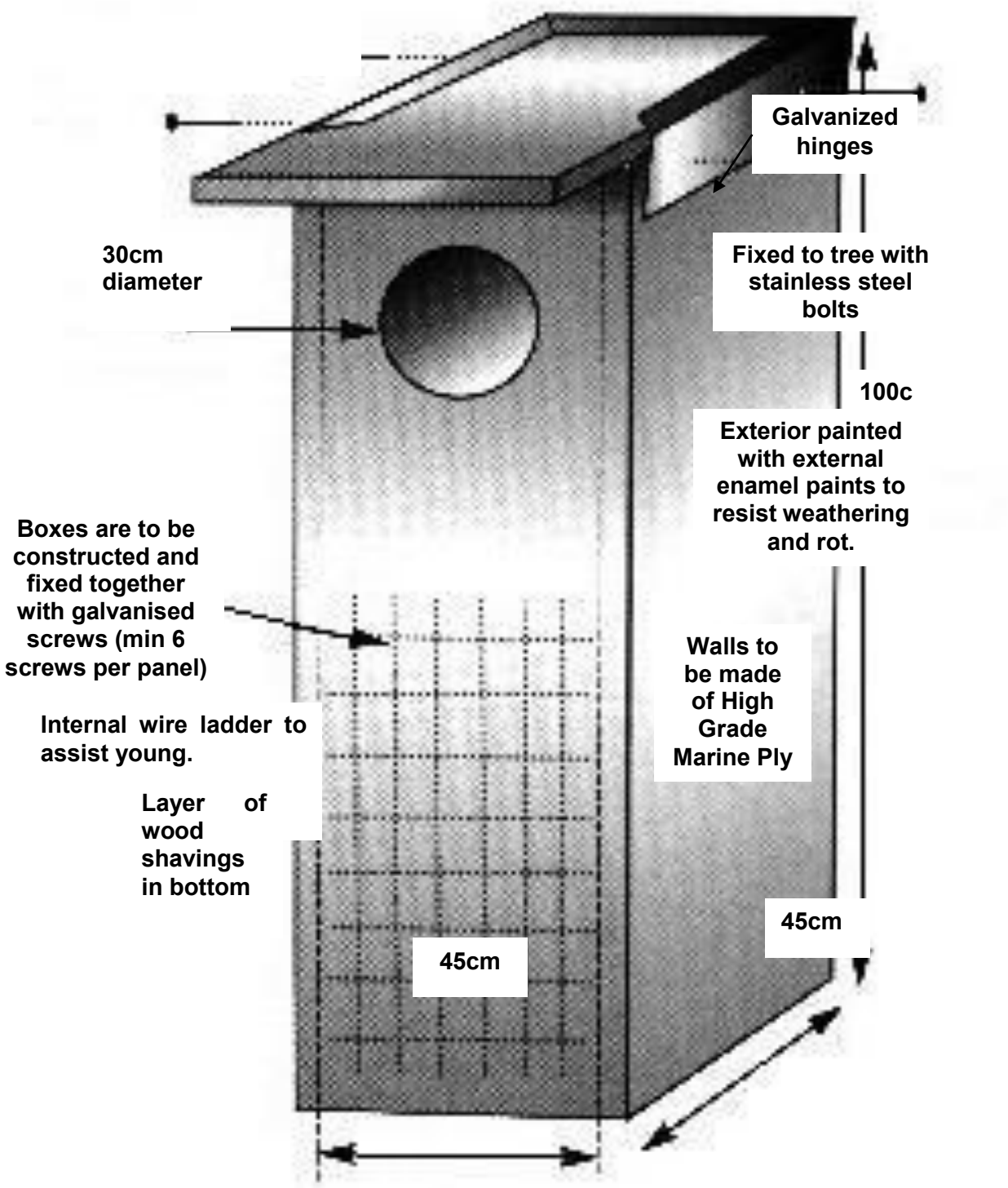
Nest box design guidelines

A4

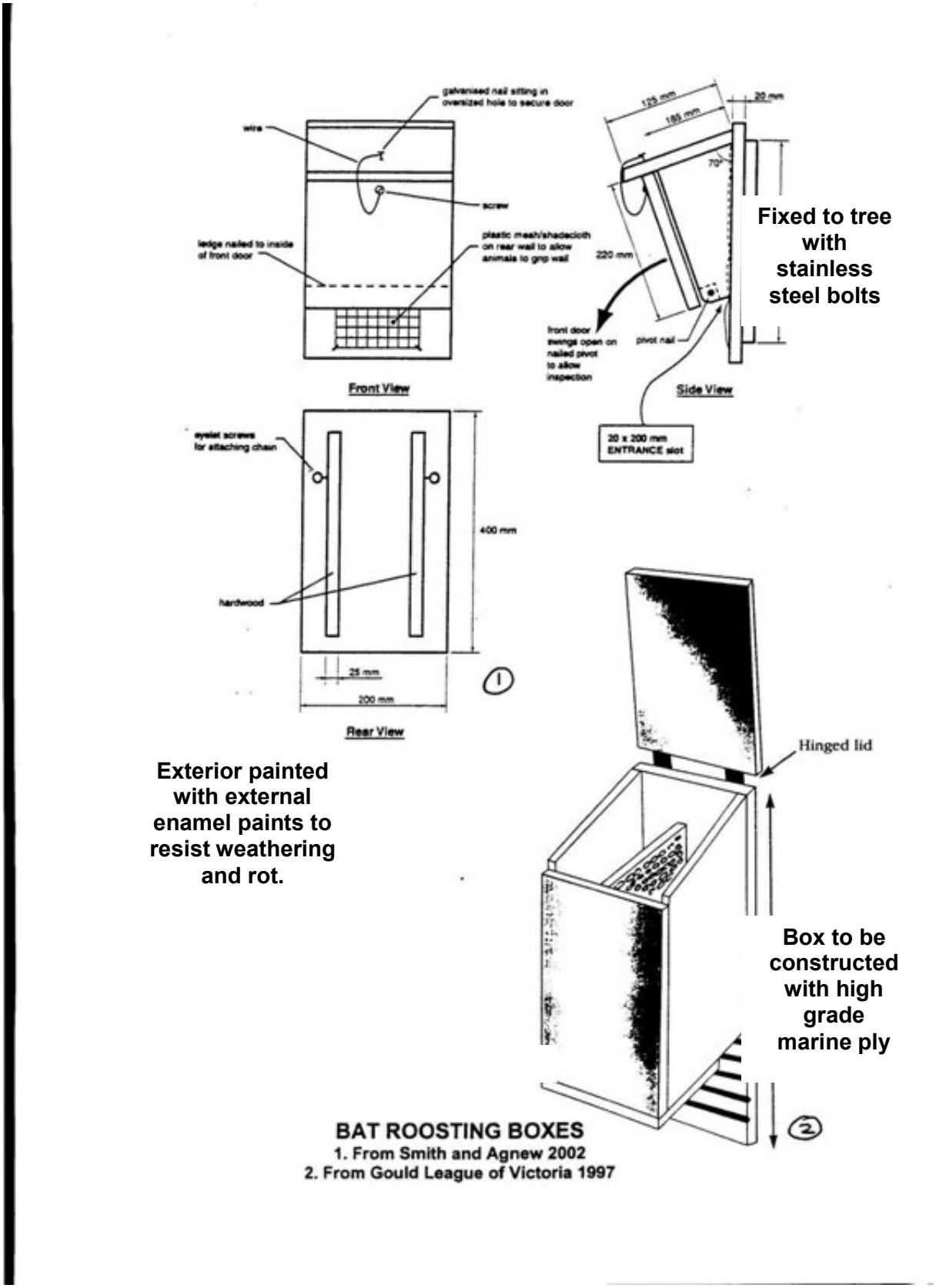


LARGE PARROT ROOSTING BOX

Note: Small parrot nest boxes will require a reduced entry hole size of 5 – 10cm in diameter



COMMON BRUSHTAIL POSSUM & OWL NEST BOX DETAIL



BAT ROOSTING BOXES
1. From Smith and Agnew 2002
2. From Gould League of Victoria 1997

MICROBAT NEST BOX DETAIL

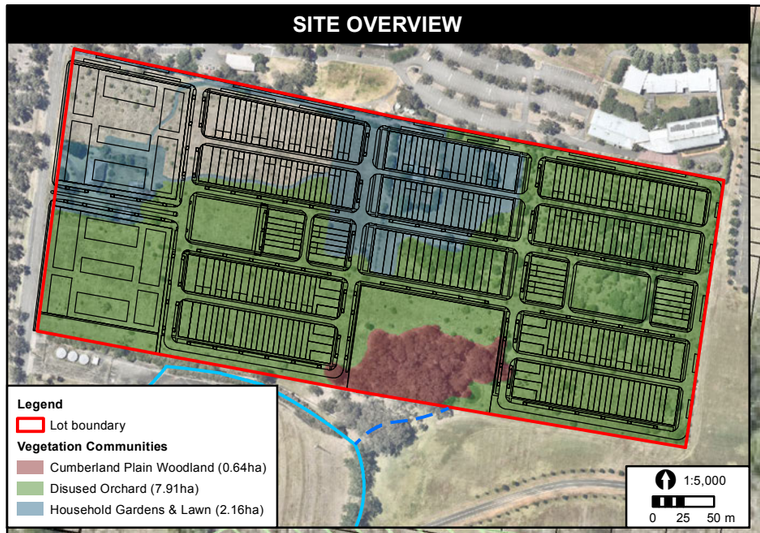
Note: Alternative designs available for alternative mounts

Recommended Dimensions for Nestboxes

SPECIES	INT DIAM	DEPTH/LENGTH	ENT DIAM	VERT/HOR	HEIGHT	SEASON	REF
Antechinus, Yellow-footed	-	-	20-25 mm	-	-	-	Trainor (1995)
Bat sp.	70-100 x 150-240 mm	200-250 mm	15-20 mm slit	v	-	-	BFNC (n.d.)
Bat, Chocolate Wattled	-	-	10 mm slit	-	-	-	Trainor (1995)
Bat, Gould's Wattled	-	-	10 mm slit	-	-	-	Trainor (1995)
Bat, Lesser Long-eared	-	-	10 mm slit	-	-	-	Trainor (1995)
Black-Cockatoo, Glossy	300 mm	870-1000 mm	160 x 200 mm	v	-	-	Pedler (1996)
Boobook, Southern	-	-	150 mm	h	-	-	Trainor (1995)
Brushtail-Possum sp.	320 mm	400 mm	120-150 mm	v	4-8 m	Autumn	MZES (n.d.)
Brushtail-Possum sp.	210 x 240 mm	380 mm	c.120 mm	v	-	-	RSPCA (n.d.)
Brushtail-Possum sp.	-	-	90 mm	-	-	-	Trainor (1995)
Cockatoo, Sulphur-crested	-	-	150 mm	v	-	-	Trainor (1995)
Corella, Little	-	-	150 mm	-	-	-	Trainor (1995)
Corella, Long-billed	-	-	150 mm	-	-	-	Trainor (1995)
Duck, Australian Wood	200 mm	500 mm	120 mm	v	-	-	Trainor (1995)
Duck, Pacific Black	450 x 300 mm	-	120 mm	-	-	-	Elliot (1994)
Duck, Pacific Black	-	-	120 mm	h	-	-	Trainor (1995)
Duck, Pink-eared	-	-	-	-	-	-	Elliot (1994)
Galah	200 mm	650 mm	120 mm	v	6 m	Aug-Nov	Adams (1980)
Galah	200 mm	650 mm	120 mm	v	6 m	Sep-Jan	MZES (n.d.)
Galah	-	-	150 mm	-	-	-	Trainor (1995)
Glider, Feather-tailed	-	-	20-25 mm	-	-	-	Trainor (1995)
Glider, Squirrel	-	-	60 mm	-	-	-	Trainor (1995)
Glider, Sugar	250 mm	300 mm	50 mm	v	4-8 m	Jun-Dec	MZES (n.d.)
Glider, Sugar	200 mm	450 mm	35-40 mm	v	-	-	BFNC (n.d.)
Glider, Sugar	-	-	25-30 mm	-	-	-	Trainor (1995)
Kestrel, Nankeen	400 mm	750 mm	100 mm	v	5 m	Aug-Nov	Adams (1980)
Kingfisher, Sacred	130 mm	600-900 mm	75 mm	h	5-10 m	Sep-Mar	Adams (1980)
Kookaburra sp.	300 mm	500 mm	>130 mm	h	5-10 m	Sep-Jan	Adams (1980)
Kookaburra sp.	400 mm	-	130 mm	h	5-10 m	Sep-Jan	MZES (n.d.)
Kookaburra sp.	300 x 150-200 mm	600 mm	open	h	-	-	BFNC (n.d.)
Kookaburra, Laughing	150-300 mm	>400 mm	80-120 mm	h	-	-	Elliot (1994)
Kookaburra, Laughing	-	-	120 mm	h	-	-	Trainor (1995)
Lorikeet sp.	120 mm	600 mm	60 mm	h	5 m	Aug-Jan	Adams (1980)
Lorikeet, Little	-	-	25-30 mm	-	-	-	Trainor (1995)
Lorikeet, Musk	-	-	25-30 mm	-	-	-	Trainor (1995)
Lorikeet, Purple-crowned	-	-	25-30 mm	-	-	-	Trainor (1995)
Owl, Barn	400 mm	750 mm	open	h	5 m	Aut-Spr	Adams (1980)
Owl, Barn	-	-	150 mm	h	-	-	Trainor (1995)
Owlet-nightjar, Australian	100-150 mm	300-350 mm	60-80 mm	v	5 m	Sep-Dec	Adams (1980)
Owlet-nightjar, Australian	150 mm	>150 mm	70-120 mm	v	-	-	Elliot (1994)
Owlet-nightjar, Australian	150 mm	400 mm	50 mm	v	-	Sep-Dec	BFNC (n.d.)
Owlet-nightjar, Australian	-	-	40 mm	-	>5 m	-	Trainor (1995)
Owlet-nightjar, Australian	-	-	25-30 mm	-	-	-	Trainor (1995)
Pardalote sp.	120 mm	400-500 mm	30-45 mm	h	5 m	Jul-Jan	Adams (1980)
Pardalote sp.	120 mm	450 mm	30-45 mm	h	5 m	Jul-Jan	MZES (n.d.)
Pardalote, Striated	200 x 120-150 mm		25-35 mm	v/h	-	-	Elliot (1994)
Pardalote, Striated	90 x 120-140 mm	200 mm	30 mm	h	-	Aug-Feb	BFNC (n.d.)
Parrot, Red-rumped	100 mm	600 mm	75 mm	v/h	5 m	Aug-Jan	Adams (1980)
Parrot, Red-rumped	100-150 mm	400 mm	70-120 mm	h	-	-	Elliot (1994)
Parrot, Red-rumped	200-240 mm	400 mm	60-70 mm	v	-	-	BFNC (n.d.)
Parrot, Red-rumped	-	-	25-30 mm	-	-	-	Trainor (1995)
Phascogale, Brush-tailed	-	-	25-30 mm	-	-	-	Trainor (1995)
Ringtail-Possum sp.	250 mm	350 mm	80 mm	v	4-8 m	Apr-Nov	MZES (n.d.)
Ringtail-Possum sp.	250 mm	400 mm	60-80 mm	v	-	Mar-Nov	BFNC (n.d.)
Ringtail-Possum sp.	-	-	90 mm	-	-	-	Trainor (1995)
Rosella sp.	120-150 mm	>400 mm	70-120 mm	-	-	-	Elliot (1994)
Rosella sp.	150-200 mm	350-800 mm	75-100 mm	v/h	5 m	Aug-Jan	MZES (n.d.)
Rosella sp.	c.130 x 180 mm	c.400 mm	80 mm	v	-	-	Morrison (1996)
Rosella, Crimson	150-200 mm	350-800 mm	75-100 mm	v/h	5-6 m	Sep-Jan	Adams (1980)
Rosella, Eastern	135-150 mm	350-800 mm	75-100 mm	v/h	5-6 m	Aug-Jan	Adams (1980)
Rosella, Eastern	240 mm	400 mm	70 mm	v	-	-	BFNC (n.d.)
Rosella, Eastern	-	>500 mm	60 mm	-	>5 m	-	Trainor (1995)
Shrike-thrush, Grey	150-200 mm	200-300 mm	150 mm	-	-	-	Elliot (1994)
Shrike-thrush, Grey	150-200 x 200-300 mm	150-200 mm	open	h	-	-	BFNC (n.d.)
Swallow, Welcome	130 mm	-	open	h	3 m	Aug-Dec	Adams (1980)
Teal, Chestnut	200-400 mm	450-750 mm	100-120 mm	v	1.5 m	Sep-Dec	Adams (1980)
Teal, Chestnut	450 x 300 mm	-	80-100 mm	-	-	-	Elliot (1994)
Teal, Grey	200-400 mm	450-750 mm	100-120 mm	v	1.5 m	All year	Adams (1980)
Teal, Grey	450 x 300 mm	-	80-100 mm	-	-	-	Elliot (1994)
Teal, Grey	-	-	90 mm	-	-	-	Trainor (1995)
Treecreeper sp.	90-150 mm	100-150 mm	50-80 mm	v	-	-	Elliot (1994)
Treecreeper sp.	150 mm	400 mm	50 mm	v	-	-	BFNC (n.d.)
Treecreeper, White-throated	75-100 mm	300-400 mm	50-70 mm	v	5 m	Aug-Jan	Adams (1980)

Supplement to Birds Australia Information Sheet 5: Nestboxes for Natives

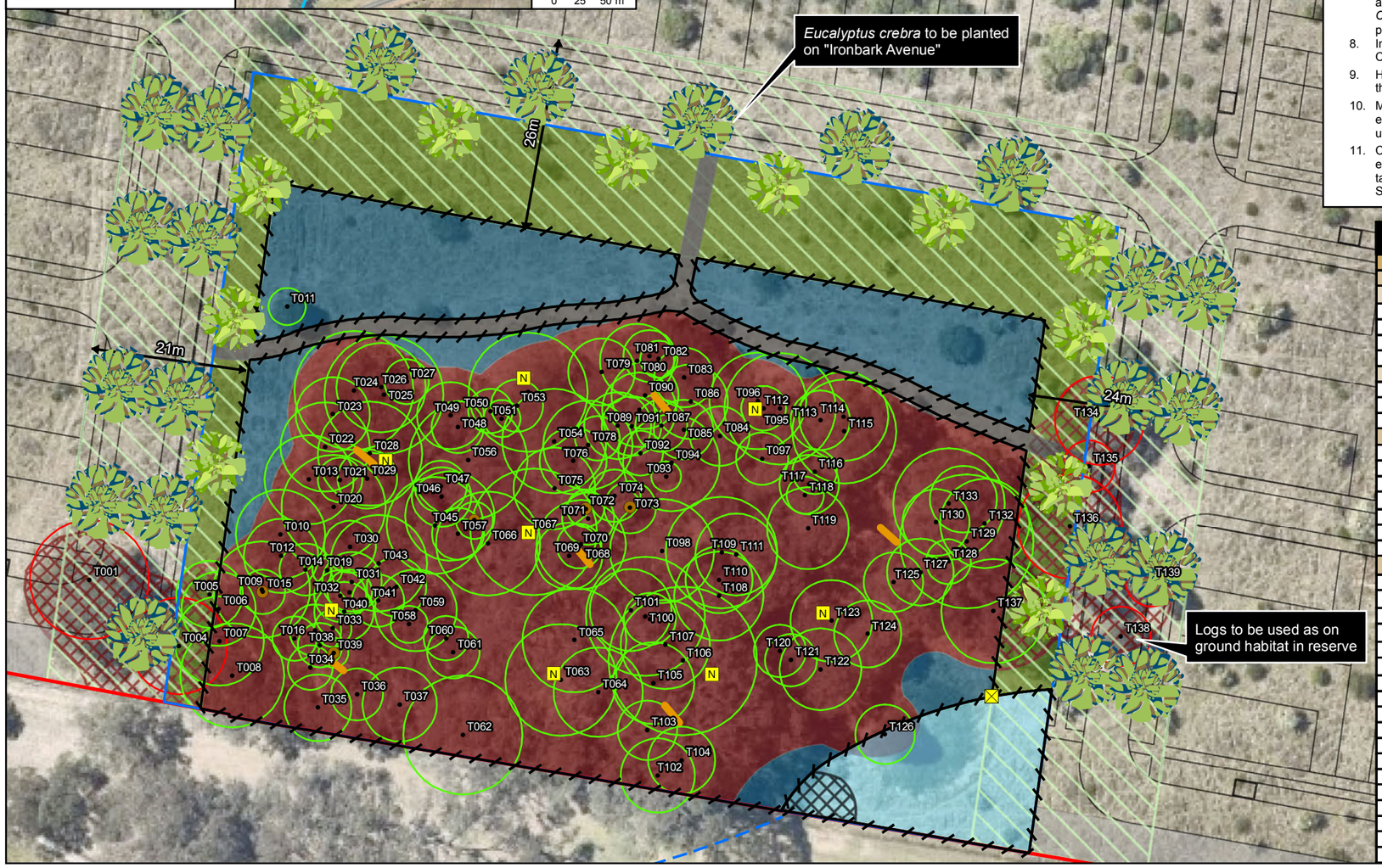
SITE OVERVIEW



RESTORATION PERFORMANCE TARGETS

The site audits are to assess the achievement of the following restoration performance targets:

1. Permanent protective fencing is to be installed as located on Schedule 1 - Vegetation Management Works.
2. Weed control and revegetation works are to be carried out by a qualified bushland regenerator to achieve the following weed control targets. The presence, abundance and cover of noxious and environmental weed species are to achieve a maximum 10% weed coverage at the end of Year 1, progressively reducing to less than 1% at the end of Year 5).
3. All highly invasive weed species are to be continuously suppressed and eradicated from the restoration area in accordance with noxious weed control guidelines. All woody weeds including African Olive, Privets and Boxthorn are to be removed and eradicated. Vines such as Blackberry and Bridal Veil Creeper are to be continuously suppressed and eradicated.
4. A target 60% native vegetation cover applies at the end of Year 1, 75% native vegetation cover at the end of Year 2, and 95% native vegetation cover at the end of Year 5.
5. Minimum of 0.16ha of fully structured CPW revegetation will be undertaken as located on Schedule 1 – Vegetation Management Works. A minimum of 30 species for revegetation will be selected from Appendix 1 Recommended Planting List. Planting densities are to achieve:
   - Dominant Trees – 1 per 50m^2 (total 32 plants plus a 20% contingency for losses)
   - Sub canopy Trees – 1 per 30m^2 (total 54 plants plus a 20% contingency for losses)
   - Shrubs – 1 per 10m^2 (total 160 plants plus a 20% contingency for losses)
   - Groundcovers – 3 per 1m^2 (total 4800 plants plus a 20% contingency for losses)
6. Minimum of 0.53ha CPW regeneration to be undertaken as located on Figure 1 – Vegetation Management Works. A minimum of 30 species for revegetation will be installed using species from Appendix 1 Recommended Planting List. Planting densities are to achieve:
   - Trees – Selective replanting (total 20 plants plus a 20% contingency for losses)
   - Shrubs – 1 per 10m^2 (total 530 plants plus a 20% contingency for losses)
   - Groundcovers – 1 per 1m^2 (total 5300 plants plus a 20% contingency for losses)
7. A surface water detention basin and stormwater outlet, stabilised with rock scour protection over geotextile to be constructed as shown on Schedule 1 Vegetation Management Plan. Drainage stabilisation and stormwater works will comply with *NSW DPI – Office of Water Guidelines for Controlled Activities on Waterfront Land – Guidelines for Outlet Structures 2012*. Both the surface water detention basin and stormwater outlet will be fully stabilised and will be planted with suitable, native, locally-sourced species such as *Juncus usitatus* and *Carex appressa* at a density of 5 plants per square metre (approximately 500m^2 – 2500 units). The surrounding embankments will be planted at CPW revegetation densities to integrate the basin within the CPW reserve.
8. Installation of 8 nest boxes including One (1) nest box suitable for use by large parrot, two (2) boxes should also be constructed for Common Ringtail Possum and, and five (5) boxes for micro-chiropteran bats.
9. Harvesting, relocation and placement of six (6) 3m native hardwood logs harvested from the adjoining affected CPW vegetation remnants throughout the reserve as habitat enrichment.
10. Monitoring and site audit will be undertaken annually until the completion of the 5 year maintenance period by an independent project ecologist assessing achievements and recommended mitigation measures. A condition assessment and review of works will be undertaken annually and a report will be produced by the site bush regeneration contractors.
11. Compliance certificates will be issued by the project ecologist upon engagement of a bush regeneration company and independent project ecologist, installation of all protective fencing, completion of primary restoration works, completion of all required restoration maintenance tasks including successful revegetation of CPW and achievement of all remaining restoration performance targets as stipulated within Schedule 1 – Vegetation Management Works.



REVEGETATION SPECIES LIST

Family	Scientific Name	Common Name
TREES		
Dominants (1 tree every 50m^2) – 52 units plus 20% contingency		
Myrtaceae	*Eucalyptus crebra*	Narrow-leaved Ironbark
Myrtaceae	*Eucalyptus eugenioides*	Thin-leaved Stringybark
Myrtaceae	*Eucalyptus moluccana*	Grey Box
Myrtaceae	*Eucalyptus tereticornis*	Forest Red Gum
Subdominants (1 tree every 30m^2) – 230 units plus 20% contingency		
Myrtaceae	*Melaleuca decora*	White feather honeymyrtle
Fabaceae	*A. parramattensis*	Parramatta Wattle
Myrtaceae	*A. subvelutina*	Broad-leaved Apple
SHRUBS (1 shrub every 10m^2) – 690 units plus 20% contingency		
Pittosporaceae	*Bursaria spinosa* var. *spinosa*	Blackthorn
Fabaceae	*Acacia implexa*	Hickory Wattle
Fabaceae	*Acacia decurrens*	Black Wattle
Fabaceae	*Daviesia ulicifolia*	Gorse Bitter Pea
Fabaceae	*Dillwynia sieberi*	Prickly Parrot-pea
Fabaceae	*Indigofera australis*	Native Indigo
Myrtaceae	*Melaleuca nodosa*	Ball Honey Myrtle
GROUNDCOVERS & VINES (3 plants every 1m^2 subject to existing native vegetation cover) – 5990 units plus 20% contingency		
Apiaceae	*Centella asiatica*	Swamp Pennywort
Commelinaceae	*Commelina cyanea*	Scurvy Weed
Poaceae	*Cymbopogon refractus*	Barbwire Grass
Phormiaceae	*Dianella caerulea* var. *caerulea*	Flax Lily
Poaceae	*Dichelachne micrantha*	Short-hair Plume Grass
Convolvulaceae	*Dichondra repens*	Native kidney weed
Poaceae	*Echinopogon caespitosus* var. *caespitosus*	Tufted Hedgehog Grass
Chenopodiaceae	*Einadia hastata*	Berry Saltbush
Geraniaceae	*Geranium homeanum*	Northern Cranesbill
Fabaceae	*Hardenbergia violacea*	Native Sarsaparilla
Fabaceae	*Indigofera australis*	Native Indigo
Lomandraceae	*Lomandra longifolia*	Spiky-headed Mat-rush
Poaceae	*Microlaena stipoides* var. *stipoides*	Weeping Rice Grass
Poaceae	*Poa labillardieri* var. *labillardieri*	Common tussock-grass
Lobeliaceae	*Pratia purpurascens*	Whiteroot
Poaceae	*Rytidosperma racemosum*	Wallaby Grass
Poaceae	*Rytidosperma tenuius*	Wallaby Grass
Poaceae	*Themeda triandra*	Kangaroo Grass

Legend

- Lot boundary
- Creek
- Drainage
- Contours - 1m
- Proposed reserve
- Asset Protection Zone
- Trees for retention
- Trees for removal
- Stag
- On ground logs
- Post and rail fencing (622m)
- Gate
- Nest boxes

Surface detention
source: scanned CAD. Locations are approximate.

- Stormwater drainage
- Surface stormwater basin (0.05ha)
- Stormwater outlet (rock scour protection over geotextile)
- Pathway (0.03ha)

- Cumberland Plain Woodland removal (0.10ha)
- Cumberland Plain Woodland regeneration (0.53ha)
- Cumberland Plain Woodland revegetation (0.16ha)
- Roadside strip park / mown verge (0.23ha)

Tree plantings

- E. crebra
- M. decora

Aerial source: Nearmap

0 10 20 m

Disclaimer: The mapping is indicative of available space and location of features which may prove critical in assessing the viability of the proposed works. Mapping has been produced on a map base with an inherent level of inaccuracy, the location of all mapped features are to be confirmed by a registered surveyor.

PROJECT & MXD REFERENCE
46A & 46-66 O'Connell Street, Caddens
A16195_VMP001

DATE & ISSUE NUMBER
22/12/2016
Issue 1

SCALE & COORDINATE SYSTEM
1:700 @A3
GDA 1994 MGA Zone 56

TITLE
Schedule 1 - Vegetation Management Works

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