

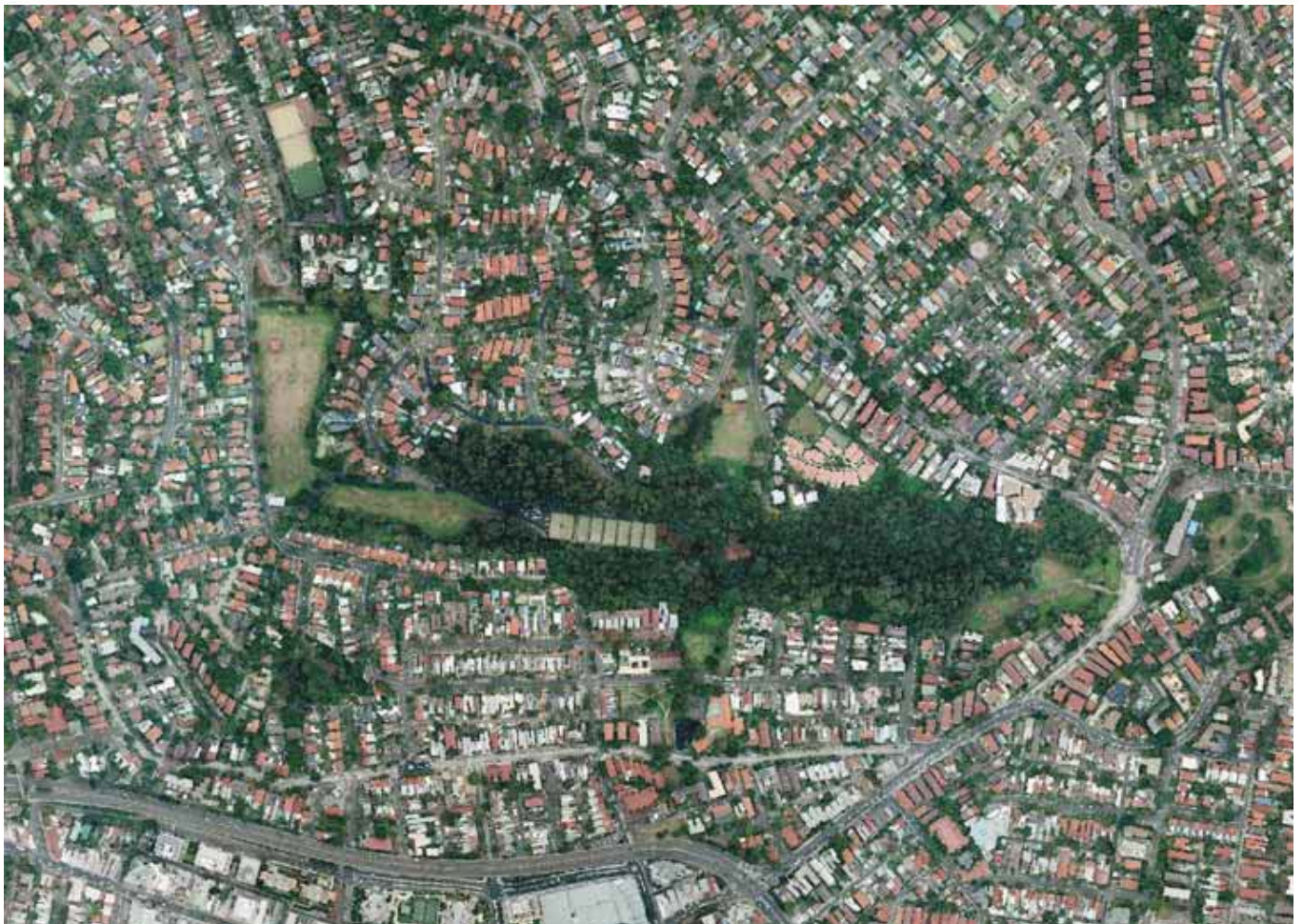


## COOPER PARK

### Vegetation Management Plan

Prepared for  
**Woollahra Municipal Council**

October 2010





# Cooper Park

---

## Vegetation Management Plan

PREPARED FOR	Woollahra Municipal Council
PROJECT NO	09SYDPLA - 0047
DATE	October 2010

**DOCUMENT TRACKING**

ITEM	DETAIL
Project Name	Cooper Park Conservation Significance Assessment
Project Number	09SYDPLA-0047
File location	<a href="G:\Synergy\Projects\09SYDPLA\09SYDPLA-0047 Cooper Park CMP\Report\Draft Reports">G:\Synergy\Projects\09SYDPLA\09SYDPLA-0047 Cooper Park CMP\Report\Draft Reports</a>
Prepared by	Brian Towle, Enhua Lee
Approved by	Bruce Mullins
Status	Final
Version Number	1
Last saved on	15 October 2010

**ACKNOWLEDGEMENTS**

This document has been prepared by Eco Logical Australia Pty Ltd with support from Thompson Berrill Landscape Design and staff of Woollahra Municipal Council.

**Disclaimer**

*This document may only be used for the purpose for which it was commissioned and in accordance with the contract between Eco Logical Australia Pty Ltd and Thompson Berrill Landscape Design. The scope of services was defined in consultation with Thompson Berrill Landscape Design, by time and budgetary constraints imposed by the client, and the availability of reports and other data on the subject area. Changes to available information, legislation and schedules are made on an ongoing basis and readers should obtain up to date information.*

*Eco Logical Australia Pty Ltd accepts no liability or responsibility whatsoever for or in respect of any use of or reliance upon this report and its supporting material by any third party. Information provided is not intended to be a substitute for site specific assessment or legal advice in relation to any matter. Unauthorised use of this report in any form is prohibited.*

# Contents

<b>1</b>	Introduction .....	4
1.1	Background.....	4
1.2	Aims and objectives.....	4
<b>2</b>	Methodology .....	5
2.1	ecological community identification.....	5
2.2	Conservation significance assessment .....	5
<b>3</b>	Site Description.....	7
3.1	Soils and Geology.....	7
3.2	Vegetation communities .....	7
3.2.1	Regional context.....	8
3.2.2	Local context .....	8
3.3	Flora.....	14
3.4	Fauna.....	14
3.5	Conservation significance.....	15
3.5.1	Areas of High Conservation Significance.....	15
3.5.2	Areas of moderate Conservation Significance .....	16
3.5.3	Areas of low conservation significance .....	17
<b>4</b>	Vegetation Management .....	19
4.1	Bush regeneration works.....	19
4.2	Moist Woodland .....	21
4.3	Dry Woodland .....	22
4.4	Disturbed patches of woodland .....	22
4.5	Riparian vegetation.....	23
4.6	Sand dune vegetation.....	23
4.7	Native Re-vegetation .....	24
4.8	Exotic plantings.....	24
4.9	Weed/exotic Areas.....	24
4.10	Lawn Areas.....	25

<b>5</b>	Fire.....	25
5.1	Fire intervals .....	26
5.2	Recommendations.....	27
5.3	Legislative framework and hazard assessment .....	27
<b>6</b>	<i>Acacia terminalis</i> subsp. <i>terminalis</i> .....	29
<b>7</b>	Conclusions .....	31
	References .....	33
	Attachment A: Cooper Park Precinct Plan .....	34

# 1 Introduction

This Vegetation Management Plan (VMP) has been prepared to inform and integrate with a Conservation Management Plan (CMP) being prepared for Cooper Park by Thompson Berrill Landscape Design (TBLD). The CMP by TBLD is being prepared to ensure the compatible management of cultural and natural heritage values of Cooper Park.

## 1.1 BACKGROUND

Cooper Park is an urban parkland located within the southern part of Woollahra Municipality, occupying 17.7 hectares and crossing the suburbs of Bellevue Hill and Woollahra. A Draft Plan of Management (PoM) was prepared for Cooper Park and exhibited by Woollahra Council. Community feedback in response to the exhibited Draft Plan of Management highlighted the need for additional consideration of the Park's ecological and heritage values. Consequently, Woollahra Council has engaged TBLD, with assistance from Eco Logical Australia, to prepare a CMP detailing management of the cultural and natural heritage values of Cooper Park.

## 1.2 AIMS AND OBJECTIVES

The aim and objectives of this VMP are to:

- Identify and map historical and existing vegetation communities on the site including their conservation values and areas of disturbance;
- Identify long term conservation policies for each community to ensure ongoing protection of their conservation values;
- Discuss the feasibility of fire use, including a hazard assessment and consideration of fire for ecological conservation purposes;
- Provide recommendations for protecting and enhancing native fauna habitat within the site; and
- Provide recommendations for best practice approach for implementation of NPWS Recovery Plan for *Acacia terminalis* subsp. *terminalis* (Sunshine Wattle).

## 2 Methodology

The VMP was prepared using a staged approach consisting of:

- Literature review;
- Initial site inspection with Council Staff;
- Identification of vegetation communities, and species of flora and fauna within the park, including a brief fauna survey;
- Assessment of the conservation significance of vegetation communities within the park; and
- Identification of management options for various vegetation communities, and other aspects of natural heritage, within Cooper Park

### 2.1 ECOLOGICAL COMMUNITY IDENTIFICATION

The ecology of the study area was assessed via random traverses conducted throughout vegetated areas within the Park. During these traverses, site-specific data pertaining to the vegetation species, vegetation structure, disturbances and fauna habitat values were collected. Additionally, targeted surveys for amphibians and microchiropteran bats were conducted utilising the call-playback and ultrasonic echolocation detectors (Anabats), respectively. All incidental fauna species observed during random traverses were recorded.

The vegetation communities within Cooper Park were identified on the basis of species composition, topography and disturbance patterns, incorporating historic and current land uses. Vegetation communities were divided into discrete zones according to the above factors. Community boundaries were noted in the field and mapped using a handheld GPS and refined via review of aerial photography and contour information.

### 2.2 CONSERVATION SIGNIFICANCE ASSESSMENT

To achieve a fine-scale delineation of the conservation significance of Cooper Park, a subjective approach was taken to assess the conservation significance of the different vegetation communities and regions within Cooper Park which took into consideration the following factors:

- Rare or threatened vegetation communities and flora species;
- Habitat for threatened fauna species;
- Integrity of vegetation communities;
- Diversity of native vegetation;
- Fauna habitat values;



- Weed invasion; and
- Existing land uses.

Other, more objective conservation significance assessment methodologies, such as the Conservation Significance Assessment of Native Vegetation of the Cumberland Plain (NPWS 2002) and the Biobanking Assessment Methodology (DECC 2009a), were to be applied initially in a modified form for the Park. However, after an initial site inspection and review of historical aerial photographs, it was concluded that these methodologies were too broad and could not delineate the subtle changes in vegetation and land uses within Cooper Park, and the unique location of Cooper Park within a highly modified landscape.

The vegetation communities within the Park were assessed for the presence or absence of factors listed above. From this assessment, three categories of significance were defined: high, medium and low conservation significance.

High conservation significance was used to describe zones which contributed highest to the overall natural heritage value of Cooper Park. These areas were considered core areas for conservation of native flora and fauna within the park and represented zones where pressure from exotic species was lowest and zones from which native plants may spread into surrounding areas.

Moderate conservation significance represented areas which, in conjunction with areas of high conservation significance, played an important role in the conservation of flora and fauna biodiversity within the park. However, this category of conservation significance also represented areas where biodiversity was under pressure from adjacent land uses and associated edge effects, predominately invasion by exotic species.

Low conservation significance represented those areas which contributed little to the overall conservation value of the park and where management actions for biodiversity conservation may be limited to avoiding impacts to adjacent areas of moderate and high conservation significance.



## 3 Site Description

Cooper Park is situated within a steep, natural gully associated with Cooper Creek. This gully has a westerly aspect with Cooper Creek flowing west through the park before entering a piped system and discharging into Double Bay. The Park is surrounded by urban landscapes on all sides with no connectivity between Cooper Park and other areas supporting dense vegetation.

The Park occupies approximately 17.7 hectares, approximately 12 hectares of which supports urban bushland. The Park also includes nature trails, a network of pathways, tennis courts and kiosk, cricket ovals and practice nets, playgrounds, public toilets, a community hall and park furniture.

### 3.1 SOILS AND GEOLOGY

The Park and surrounding areas are underlain by the Hawkesbury Sandstone geological formation. Soils derived from this parent material, such as those within the park, typically have high sand contents, low fertility and are susceptible to erosion.

Within the Park, two soil landscapes have previously been identified (Chapman and Murphy 1989), namely the 'Hawkesbury' and 'Deep Creek' soil landscapes. The Hawkesbury soil landscape is mapped as occurring in association with the steep slopes in the east of the Park while Deep Creek is identified as occurring in the valley axis in the lower reaches of the Park. The Deep Creek soil landscape is a deeper soil landscape consisting of an alluvial mixture of sands, silts and clays.

In addition to the two previously identified soil landscapes, a small area in the very east of Cooper Park appears to contain aeolian sands. It is unclear whether the soils in this area occur there naturally or if they were placed in the current location during construction works along Bellevue Road.

All the soil landscapes within Cooper Park have a moderate to high erosion risk and have naturally low fertility. As such, vegetation management actions within Cooper Park should avoid creating areas of bare earth which would create areas highly susceptible to erosion. Additionally, management of Cooper Park should avoid actions which increase soils fertility, particularly the elements of phosphorous and nitrogen, which can create conditions which encourage the growth of exotic weed species while suppressing, or causing dieback, to native plant species.

### 3.2 VEGETATION COMMUNITIES

The vegetation communities within Cooper Park are described at two levels. At a regional scale the vegetation communities are ascribed to previously described vegetation communities which allows for an assessment of the significance of vegetation within a regional context. This also provides a reference for the likely composition of the vegetation within Cooper Park prior to current disturbances.

Vegetation communities are also described at the local context (i.e. within the park) to describe the small-scale changes in vegetation within the park. This finer scale description allows for a more specific assessment of the vegetation types and disturbances within the park. Naming of vegetation

communities at this scale does not directly correspond to any previous vegetation community descriptions.

### 3.2.1 Regional context

The vegetation within Cooper Park was identified as comprising two broad vegetation communities; Sydney Sandstone Gully Forest (SSGF) across the vast majority of the park, and a small area of aeolian dune vegetation in the east.

The identification of SSGF across the vast majority of the park is supported by previous mapping, with Benson & Howell (1994) mapping the entire park as SSGF, and also follows descriptions of the park as a tall woodland and forest community (Benson & Howell 1990). Other vegetation mapping (Tozer *et al.* 2006) identified small areas of '*Coastal Sandstone Ridgetop Woodland*' (corresponds with Sydney Sandstone Ridgetop Woodland of Benson & Howell (1994)) on the upper slopes to the north and south of the park. Coastal Sandstone Ridgetop Woodland is described as a low forest, with Red Bloodwood (*Corymbia gummifera*), Narrow-leaved Scribbly Gum (*Eucalyptus racemosa*) and Silvertop Ash (*E. sieberi*) as dominant canopy species. While the areas mapped as Tozer *et al.*'s '*Coastal Sandstone Ridgetop Woodland*' are generally drier and more exposed than the rest of the park, none of the dominant species were observed in these areas, and it is considered that these areas more closely resemble a drier form of SSGF than '*Coastal Sandstone Ridgetop Woodland*'.

A number of sub-forms of SSGF are recognised in the Benson & Howell (1994) mapping, and these sub-forms were identified within the park. As a result of different levels of exposure, disturbances and regeneration activities, distinct differences were observed in species composition.

A second vegetation community, located in the north-east of Cooper Park (see map unit 9; Section 3.1.2 and Figure 1), was identified as distinct to SSGF as it occurred on what appeared to be aeolian sands rather than sedimentary sands derived from underlying sandstone bedrock. The species composition and structure of this area has been highly modified by weed invasion and subsequent bush regeneration although it is generally a tall shrubland to low woodland. This community, including the species present and soil type, has some affinity with the endangered ecological community, Eastern Suburbs Banksia Scrub (ESBS), although in its current highly disturbed state, with few naturally occurring native species, it is difficult to identify whether this area represents a highly degraded and modified stand of this community. It is also difficult to know whether the sands in this area occur naturally or if they were placed in their current location during construction of Bellevue Road and adjacent developments.

### 3.2.2 Local context

An outline of each of the vegetation communities identified within Cooper Park is outlined below.

#### *Moist Woodland (Map unit 2)*

Two patches of this vegetation community were identified on the north side of Cooper Park (map unit 2; Figure 1).

The Moist Woodland patches generally formed woodland to open forest, with a canopy including Sydney Red Gum (*Angophora costata*), Blackbutt (*Eucalyptus pilularis*) and *Corymbia gummifera*. Suspected plantings of non-local native and exotic canopy species were also present at varying densities within the western stand of this community, including Lemon-scented Gum (*Corymbia citriodora*), Tallowwood (*E. microcorys*), Swamp Mahogany (*E. robusta*), Brush Box (*Lophostemon confertus*) and Hoop Pine (*Araucaria cunninghamii*). A relatively diverse shrub layer was present at varying densities, from open to moderately dense. Commonly recorded species included Sweet

Pittosporum (*Pittosporum undulatum*), Cheese Tree (*Glochidion ferdinandi*), Mountain Devil (*Lambertia formosa*), Tick Bush (*Kunzea ambigua*), Large-leaf Hop Bush (*Dodonaea triquetra*), Sydney Golden Wattle (*Acacia longifolia* subsp. *longifolia*), Blueberry Ash (*Elaeocarpus reticulatus*), Tree Broom Heath (*Monotoca elliptica*), Large Mock-olive (*Notelaea longifolia*) and the endangered species, Sunshine Wattle (*Acacia terminalis* subsp. *terminalis*). Ground cover vegetation occurred at varying densities within this community, with sparse open areas occurring in the patch to the west where canopy cover was high and deep leaf litter was present. The stand in the east generally had a denser ground cover, although species composition was similar. Commonly recorded groundcover species included Native Wandering Jew (*Commelina cyanea*), Weeping Grass (*Microlaena stipoides*), Broad-leaved Basket Grass (*Oplismenus aemulus*), Narrow-leaved Basket Grass (*Oplismenus imbecillis*), Blady Grass (*Imperata cylindrica*), Kangaroo Vine (*Cissus antarctica*), Blue Flax-lily (*Dianella caerulea*), Common Bracken (*Pteridium esculentum*), Harsh Ground Fern (*Hypolepis muelleri*), and on the lower slopes, Bat's Wing Fern (*Histiopteris incisa*).

In general, naturalised exotic species were infrequent within these intact woodland patches and were only observed as young individuals at low densities. Naturalised exotic species observed included Camphor Laurel (*Cinnamomum camphora*), Lantana (*Lantana camara*), Fishbone Fern (*Nephrolepis cordifolia*) and Mickey Mouse Plant (*Ochna serrulata*).

#### *Dry Woodland (Map Unit 2a)*

A Dry Woodland community dominated by Grey Gum (*Eucalyptus punctata*) and Bangalay (*E. botryoides*) was identified as occurring on the south side of the Park (map unit 2a). This vegetation was distinct from the moist woodland to the north (map unit 2), as it occurred in a more exposed location, producing drier conditions. Floristically, the shrub layer within the dry woodland community was similar to that in the moist woodland, with the exception that *Kunzea ambigua* occurred at a much higher density and the shrub layer was less diverse in the dry woodland than the moist woodland. The understorey within this dry woodland community was variable, although it was generally quite dense and commonly included Spiny-headed Mat-rush (*Lomandra longifolia*), Weeping Grass (*Microlaena stipoides*), *Commelina cyanea* and Wiry Panic (*Entolasia stricta*). There were very few naturalised weeds within this community and non-local native plantings were infrequent.

No *Acacia terminalis* subsp. *terminalis* were observed within this stand, although it is still considered potential habitat for this species.

#### *Disturbed patches of woodland (Map units 3, 6, 8, 10, 12, and 14)*

Scattered throughout the Park were a number of patches of woodland vegetation with a similar composition of native species to both the moist and dry woodland communities (map unit 2 and 2a) but with reduced diversity and more widespread occurrence of weed infestations. Additionally, non-local native and exotic plantings were more frequent within these communities. A brief description of each of these patches of disturbed woodland (map units 3, 6, 8, 10, 12 and 14) is outlined below.

Stands of disturbed woodland were present adjoining Northland Road and residential development along Bellevue Road (map unit 3). These stands contained native canopy species including *Eucalyptus pilularis* and White Stringybark (*Eucalyptus globoidea*) in addition to planted canopy species such as *Corymbia citriodora*, Coral Tree (*Erythrina sykesii*), Radiata Pine (*Pinus radiata*) and *Araucaria cunninghamia*. The understorey in these areas contained occasional natives such as those listed for map unit 2, but with large numbers of exotic species including *Lantana camara*, Trad (*Tradescantia fluminensis*), *Senna pendula* var. *glabrata*, Japanese Hackberry (*Celtis sinensis*) and *Ochna serrulata*.

Adjoining Northland Road and south of North Cooper Park, a small stand of disturbed woodland was present (map unit 6), which resembled map unit 3, although it had a larger native component within the canopy but a more frequent occurrence of exotics in the understorey. The canopy within this area included Red Mahogany (*Eucalyptus resinifera*), *E. punctata*, *E. microcorys* and *Lophostemon confertus*. Commonly observed weeds in the understorey of this area included African Olive (*Olea europaea* subsp. *cuspidata*), *Lantana camara*, *Tradescantia fluminensis*, Climbing Asparagus Fern (*Asparagus plumosus*), Large-leaved Privet (*Ligustrum lucidum*), Madeira Vine (*Anredera cordifolia*) and Balloon Vine (*Cardiospermum grandiflorum*). A small area (map unit 6a), identified as a previous tip site, adjoined map unit 6 and was infested by much of the same understorey weed species; however, the canopy was largely absent with only planted Swamp Oak (*Casuarina glauca*) surviving and several dead Eucalypts present.

Immediately to the north of Northland Avenue and opposite map units 6 and 6a was a stand of disturbed woodland (map unit 6b), which was similar to map unit 6, although there were very few non-local native plantings and an abundance of *Pittosporum undulatum* in the shrub layer. The understorey in this location was floristically similar to map unit 6, although was much more open due to the frequent occurrence of rock outcrops.

In the north-east of the Park, two stands of disturbed woodland vegetation were present (map unit 8), which were floristically similar to map unit 6, however, these areas were more sheltered and contained more mesic weed species and a dense tall shrub/small tree layer of *Ligustrum lucidum*. This area had few native species present, with only *Pittosporum undulatum* common. Many of the weeds recorded in map unit 6, such as *Tradescantia fluminensis*, *Cardiospermum grandiflorum* and *Asparagus plumosus*, were also widespread in this area, and there were also weeds more commonly recorded closer to the drainage line, including Spider Plant (*Chlorophytum comosum*), Ginger Lily (*Hedychium gardnerianum*) and *Nephrolepis cordifolia*.

In the south-eastern of Cooper Park, another disturbed woodland community was present (map unit 10). This community had a moderate canopy cover with a very sparse shrub layer and a dense groundcover of weeds. The canopy included both locally occurring and non-local species with *Angophora costata*, *Eucalyptus pilularis*, *E. botryoides*, Tasmanian Blue Gum (*E. globulus*), Turpentine (*Syncarpia glomulifera*), Spotted Gum (*Corymbia maculata*) and *C. citriodora* all common. The understorey included a very dense cover of weeds with *Cardiospermum grandiflorum*, *Tradescantia fluminensis*, *Anredera cordifolia* and *Asparagus plumosus* all occurring at very high densities. Very few native species were present within the dense covering of exotic groundcover species.

On either side of the dry woodland patch (map unit 2a) were two stands of disturbed woodland (map unit 12) in which ongoing regeneration works were occurring. These areas more closely resembled Moist Woodland (map unit 2) than adjoining Dry Woodland (map unit 2a). Floristically, this area was similar to map unit 10, although the area had an increased occurrence of natives from both natural and assisted regeneration. Many of the canopy species recorded in map unit 10 were also present in this area including *Eucalyptus pilularis*, *E. botryoides*, *E. microcorys* and Sydney Blue Gum (*E. saligna*). The shrub layer was variable throughout this community, being more open in areas with large sandstone outcropping and where weeds had recently been removed (evidenced by stockpiles of weedy biomass). Denser areas of shrubs occurred where plantings had been undertaken (evidenced by empty tube stock) and from natural regeneration. Commonly observed shrubs included *Pittosporum undulatum*, Tuckeroo (*Cupaniopsis anacardioides*), Coffee Bush (*Breynia oblongifolia*), Willow-leaved Hakea (*Hakea salicifolia*), *Glochidion ferdinandi*, *Elaeocarpus reticulatus*, White Wattle (*Acacia linifolia*) and *Kunzea ambigua*. The understorey in this area was sparse, particularly where weed species had

only recently been removed and where a layer of deep leaf litter was present, and included *Glycine clandestina*, *Dianella caerulea*, *Commelina cyanea*, *Lomandra longifolia* and *Oplismenus aemulus*.

In the west of Cooper Park and on the southern side of the Park, a steep slope was present which supported a tall woodland with a dense understorey of weed species (map unit 14). The canopy in this area included both local native species including *Eucalyptus pilularis* as well as planted non-local natives including *Eucalyptus microcorys* and *Casuarina glauca*. A number of exotic tree species were also planted and naturalised within this area including Jacaranda (*Jacaranda mimosifolia*), *Cinnamomum camphora* and *Erythrina sykesii*. The understorey within this area was dominated by *Lantana camara*, with *Cardiospermum grandiflorum* also common.

#### *Riparian vegetation (Map unit 4 and 4a)*

This vegetation community occurred as a narrow band in close association with the drainage line through the middle of Cooper Park, and its tributaries. In the west of the Park, stands of this community (map unit 4) had a canopy consisting of species overhanging from adjoining woodlands, commonly including *Angophora costata*, *Eucalyptus pilularis* and *E. resinifera*. In areas to the east (map unit 4a) the canopy comprised suspected plantings of native species such as *Casuarina glauca*, *E. saligna*, *Syncarpia glomulifera* and Broad-leaved Paperbark (*Melaleuca quinquenervia*) and plantings of non-local natives including Liquidambar (*Liquidambar styraciflua*). The understorey of both subunits of this vegetation community included species which require increased moisture availability including Lilly Pilly (*Acmena smithii*), Bird's Nest Fern (*Asplenium australasicum*), Gristle Fern (*Blechnum cartilagineum*), Black Wattle (*Callicoma serratifolia*), Rough Tree-fern (*Cyathea australis*), Harsh Ground Fern (*Hypolepis muelleri*), Bat's Wing Fern (*Histiopteris incisa*), Native Frangipani (*Hymenosporum flavum*), and Slender knotweed (*Persicaria decipiens*). This vegetation community included a large number of invasive exotic species including Mistflower (*Ageratina riparia*), Asparagus Fern (*Asparagus aethiopicus*), Cobblers Pegs (*Bidens pilosa*), *Chlorophytum comosum*, Umbrella sedge (*Cyperus involucratus*), *Hedychium gardnerianum*, *Lantana camara*, *Nephrolepis cordifolia*, *Senna pendula* var. *glabrata*, Palm Grass (*Setaria palmifolia*) and *Tradescantia fluminensis*. Stands in the east (map unit 4a) also included a number of plantings of non-local rainforest species including Firewheel Tree (*Stenocarpus sinuatus*), Flame Tree (*Brachychiton acerifolius*) and *Cordyline* sp.

#### *Sand dune vegetation (Map unit 9)*

One small area in the north-east of Cooper Park (map unit 9) was identified as being unique as it occurred on what appeared to be aeolian sands rather than sedimentary sands derived from underlying sandstone soils. The structure of this area has been highly modified by weed invasion and subsequent bush regeneration although it was generally a tall shrubland to low woodland. Flora species recorded within this area included *Acacia longifolia* subsp. *longifolia*, Coastal Banksia (*Banksia integrifolia*), *Breynia oblongifolia*, *Monotoca elliptica*, *Pittosporum undulatum*, *Pteridium esculentum* and Woody Pear (*Xylomelum pyriforme*). These species were a mixture of remnant vegetation and planted native species.

#### *Native Re-vegetation (Map unit 1)*

Two areas in the western and eastern end of the park (map unit 1) were recently re-vegetated (Jeff Hill, Woollahra Municipal Council, pers comm.). These areas had jute matting in locations and consisted of planted native species with little, if any, naturally occurring native species. Commonly planted species included *Eucalyptus* species, *Lomandra longifolia*, *Acacia longifolia* subsp. *longifolia*, *Elaeocarpus reticulatus* and Coastal Rosemary (*Westringia fruticosa*).

*Exotic plantings (Map units 13, 15 and 16)*

Three stands of vegetation were identified within Cooper Park (map units 13, 15 and 16) which comprised of planted exotic and non-local native species with no native canopy or understorey.

In the west of Cooper Park where the drainage line enters the piped system, a stand of planted *Casuarina glauca* (map unit 13) was present over an understorey of typical exotic lawn species. A similar stand was present in North Cooper Park which consisted of planted *Pinus radiata* over typical exotic lawn species (map unit 15).

A stand of planted exotic and non-local species (map unit 16) was present in the south-east of North Cooper Park, which consisted of a row of planted trees and shrubs including Deciduous Fig (*Ficus superba*), *Erythrina sykesii*, Banana (*Musa* sp.) and *Ficus* sp. These planting occurred over a largely absent understorey which was suppressed by deep leaf litter. Understorey species were limited to recently germinated Castor Oil Plant (*Ricinus communis*).

*Weed/exotic Areas (Map units 11, 17 and 7)*

There were three vegetation communities within the park which consisted almost exclusively of invasive exotic species (map units 11, 17 and 7). To the west of Figtree Lane (map unit 11) a steep slope supported only Morning Glory (*Ipomea indica*), *Cardiospermum grandiflorum*, *Anredera cordifolia*, Nasturtium (*Tropaeolum majus*) and *Ligustrum lucidum*. There were no signs of any native species. At the top of the steep slope within North Cooper Park (map unit 17), *Lantana camara*, *Anredera cordifolia*, *Cardiospermum grandiflorum* and *Ricinus communis* were recorded.

In the south-east corner of the park (map unit 7), a steep slope supported exotic species, with *Lantana camara* dominant. Other common weeds included *Cardiospermum grandiflorum*, Tall Fleabane (*Conyza sumatrensis*), *Olea europaea* subsp. *cuspidata*, *Ligustrum lucidum*, *Ipomea indica*, Tree of Heaven (*Ailanthus altissima*), Willow (*Salix* sp.) and *Jacaranda mimosifolia*. The only native species observed within this area was a large Port Jackson Fig (*Ficus rubiginosa*).

*Lawn Areas*

Areas comprising mown lawns have been omitted from vegetation mapping. These areas consisted of typical lawn species including Kikuyu (*Pennisetum clandestina*), Couch (*Cynodon dactylon*) and White Clover (*Trifolium repens*).





Figure 1: Vegetation communities within Cooper Park



### 3.3 FLORA

A large flora list already exists for Cooper Park as included in the Draft Management Plan. While flora species within the park were noted during the preparation of this report, the development of a comprehensive list was beyond the scope of this project.

Of note, was the identification of two threatened flora species within Cooper Park, namely *Acacia terminalis* subsp. *terminalis* and Brush Cherry (*Syzygium paniculatum*). The locations of threatened species are shown in Figure 1.

*Acacia terminalis* subsp. *terminalis* has previously been identified within Cooper Park and management of *Acacia terminalis* subsp. *terminalis* is discussed further in section 6. *Syzygium paniculatum* has not been previously identified within Cooper Park. This species is a tree which is widely cultivated and planted that naturally occurs in moist deep sand of old dunes in rainforest and sandy floodplains of creeks with gallery rainforest remnants (Fairley 2004). The three individuals of this species recorded within Cooper Park are considered to have been planted and no specific management recommendations of these individuals are made. *Syzygium paniculatum* should be added to the flora list for Cooper Park included within the Draft PoM.

### 3.4 FAUNA

A fauna list already exists for Cooper Park as included the Draft PoM. This species list does not include a number of fauna species identified in other reports and fauna species observed during field surveys undertaken during the preparation of this report. The species listed in Table 1 should now be added to the fauna species list for Cooper Park. Furthermore, habitat and requirements of these species should be taken into consideration as part of vegetation management works.

**Table 1: Fauna species observed or previously recorded in Cooper Park and not listed in the Draft PoM**

Class	Common Name	Scientific Name	Additional comments
Amphibia	Marsh Frog	<i>Limnodynastes peronii</i>	
	Common Eastern Froglet-	<i>Crinia signifera</i>	
	Leaf Green Tree Frog-	<i>Litoria phyllochroa</i>	
Actinopterygii	Long finned eel	<i>Anguilla reinhardtii</i>	
Mammalia	Grey-head Flying-fox	<i>Pteropus poliocephalus</i>	Vulnerable species listed under the NSW TSC Act & Commonwealth EPBC Act.
	Common Brushtail Possum	<i>Trichosurus vulpecula</i>	

### 3.5 CONSERVATION SIGNIFICANCE

Broadly, the results of the preliminary assessment indicated that Cooper Park is of high conservation significance due to its location within a highly modified and urbanised environment. The relatively infrequent occurrence of large stands of remnant and advanced regrowth vegetation within the surrounding area highlights the importance of protecting and effectively managing the remaining remnants within Cooper Park.

#### 3.5.1 Areas of High Conservation Significance

Three vegetation communities were identified as being of high conservation value within the Park (Figure 2), specifically patches of Moist Woodland (map unit 2) and Dry Woodland (map unit 2a) on the side slopes of the Park, and the riparian corridor (map units 4 and 4a) through the central east of the Park.

The intact woodland patches and riparian corridor included a number of habitat features which would provide habitat for fauna within the park including:

- Intact canopy layer;
- Intact shrub-layer;
- Hollow-bearing trees;
- Stags;
- Leaf litter;
- Woody debris (fallen logs and braches);
- Exposed and exfoliating rock (sandstone)
- Rock crevices and overhangs;
- Streams and riparian vegetation;
- Dams; and
- Wet sandstone seeps;

These habitat elements would provide sheltering, foraging, and roosting habitat for a range of fauna groups, particularly those canopy trees and stags which support hollows for arboreal mammals, birds, reptiles and bats to shelter/roost/breed in. Intact canopy and shrub layers provided foraging habitat for birds and bats. Leaf litter and woody debris provided foraging and sheltering habitat for ground dwelling mammals, frogs and reptiles. Rock outcrops potentially provided basking, sheltering and foraging habitat for reptiles and small mammals. Sandstone seeps and standing water provided foraging and breeding habitat for frog species and foraging habitat for bat species.

Much of these habitat elements are present across the rest of the study area, although they are commonly impacted by some disturbance including weed invasion.

#### *Intact Woodland Patches*

The intact woodland patches (map units 2 and 2a) were identified as being of high conservation value as they:

- Contained the highest diversity of native flora species;
- Most closely resembled the native vegetation communities which would have previously occurred within the park prior to human modification and, thereby, had low densities of non-local native plantings;
- Had low occurrences of naturalised exotic species;

- Represent habitat or potential habitat for threatened flora species;
- Supported the threatened flora species, *Acacia terminalis* subsp. *terminalis*. A total of 31 individuals were recorded. Individuals included a range of age classes from individuals recently germinating to mature individuals approaching senescence; and
- Represent the best quality fauna habitat.

#### *Riparian Corridor*

The riparian corridor in the central eastern portions of the Park, was considered to be of high conservation significance due to the role this area has in providing habitat for fauna. As well, the riparian corridor supported one non-local threatened flora species *Syzygium paniculatum* (Brush Cherry). In terms of remnant vegetation, however, this area was considered to have only moderate conservation value as this area has been highly modified by clearing and subsequent planting of non-local native species, and does not support a diverse range of remnant flora species.

Unique habitat features present in the riparian corridor which were not present within other areas of the park included standing water, flowing water, fringing vegetation and wet sandstone rock faces. These habitat features represent foraging and breeding habitat for frog species and foraging habitat for bat and bird species.

### **3.5.2 Areas of moderate Conservation Significance**

With the exception of areas maintained as mown lawns and the high conservation significance areas discussed above, the remainder of the Park was identified as being of moderate conservation significance (Figure 2). This included the following communities:

- Disturbed Woodland patches;
- Revegetation;
- Sand Dune Vegetation; and
- Weeds / exotics.

In general, areas of moderate conservation significance were located on the margins of the Park and were subjected to edge effects associated with roads, playing fields and walking tracks. These areas commonly formed a buffer around the more intact woodland patches.

The Disturbed Woodland and Revegetation areas had many similarities to areas of high conservation value except for the presence of some of the following features:

- An abundance of naturalised exotic species;
- A relatively low diversity of native vegetation species;
- The presence of planted non-local native species; and
- Lower quality fauna habitat.

Despite having some affinities to the endangered ecological community, ESBS, the area of Sand Dune Vegetation (map unit 9, Section 3.2.2) was considered to be of moderate conservation significance. In its current highly disturbed state, with few naturally occurring native species, it is hard to say whether this area would have once supported the endangered ecological community, ESBS, although this area

is not included in predictions of the 1788 distribution of the endangered ecological community ESBS (DEC 2004). On the basis of its current condition with few naturally occurring native species and uncertainty surrounding the origin of the soils, this area has been considered to be of moderate conservation significance.

The areas of Weeds / exotics were identified as being of moderate conservation significance as they provided fauna habitat elements which were not otherwise present, including a dense shrub layer and / or ground cover vegetation. Areas with a dense shrub layer, such as stands of *Lantana camara*, may provide habitat for smaller bird species and shelter for reptiles. Additionally, the dense cover of vegetation in these areas acts as a deterrent to people entering these areas and as such may provide native fauna with a refuge from people and domestic pets such as dogs.

### **3.5.3 Areas of low conservation significance**

Areas of low conservation significance within Cooper Park were identified as those areas predominately used for recreational purposes, where vegetation cover is generally limited to groundcover species and where native flora species are largely absent. While these areas are considered as being of low conservation that is not to say they have no conservation value, as they do play a role in the broader conservation value of the entire park.





Figure 2: Conservation Significance categories within Cooper Park

## 4 Vegetation Management

Given the conservation significance of vegetation within Cooper Park, as discussed in section 3.5, works to protect and enhance the natural heritage values, including vegetation management works, should be limited to bush regeneration works. This includes works to remove and control weeds, works to trigger germination of native species, planting of local native species and some minor soil conservation works.

All bush regeneration activities will need to be planned to ensure that bush regeneration works do not impact upon existing cultural and natural heritage values within the park. Specific bush regeneration works should be devised with regard to the following sections of this VMP and the CMP which this VMP accompanies. In general, significant cultural plantings within Cooper Park are limited to canopy trees. This VMP does not recommend the removal of any existing canopy trees as to do so would involve impacts to the existing cultural and natural heritage values including habitat for fauna species.

This section of the report identifies general strategies for bush regeneration works, most of which are currently being implemented for the Park, and follows with more specific strategies for various areas of Cooper Park. The exact methodologies for weed control including herbicide application or hand weeding have not been discussed here and should be determined by bush regenerators taking into consideration issues discussed below.

### 4.1 BUSH REGENERATION WORKS

The previous and ongoing bush regeneration works and general management of vegetation within Cooper Park appears to have involved a planned, practical and generally successful approach. The success of the previous management is highlighted by the fact that those areas within the park identified as being of high conservation significance (Figure 2) correspond closely to the areas in which bush regeneration has taken place.

Ongoing bush regeneration works should continue to be undertaken as a planned approach which generally follows the Bradley method (as outlined in Buchanan 1989) and involves working from areas in better condition towards more weed-infested areas, making minimal disturbance and letting native plant regeneration dictate the rate of removal (Buchanan 1989). This should involve prioritising works within areas of high conservation significance and working towards areas of low conservation significance as indicated in Figure 2, and in accordance with the approach outlined in Figure 4.1 of the Draft PoM.

It is important that bush regeneration works progress at the rate which mirrors the rate of regeneration. The isolated nature of Cooper Park means that there is limited opportunity for movement of animals between the Park and other areas of habitat. Thus as part of any bush regeneration works it is necessary to maintain a diversity of vegetation cover and structure to conserve viable animal populations. As such, it is important that bush regeneration works do not create large areas devoid of native vegetation.



Only, where native regeneration does not occur should planting or re-vegetation works be considered as identified in section 4.1.5 of the Draft PoM which states that planting will only occur in areas in which negligible natural regeneration occurs over a period of at least three years.

Any planting that is undertaken should use provenance stock, preferably from seed collected within the Park and as such species selection will be dictated by the remnant vegetation communities within the Park and species availability. It is understood as part of ongoing management Woollahra Council is propagating native seed collected within the park for use as part of planting undertaken within the park.

As part of a strategic approach to bush regeneration within Cooper Park it is necessary to identify threats or barriers to native regeneration and to address these threats. Unless the factors encouraging the spread of weeds are identified and controlled bush regeneration works are unlikely to prove a successful long-term solution to weed control.

A primary threat identified as contributing to weed infestations within Cooper Park was uncontrolled stormwater run-off. Uncontrolled stormwater runoff discharges directly into Cooper Park from a number of adjoining private residences and streets. This untreated stormwater runoff transports rubbish, excess nutrients and weed propagules into Cooper Park, all of which create micro-habitats which promote the growth and spread of weed species at the expense of native vegetation. Strategies to control this threat might include Gross Pollutant Traps or vegetation drainage swales which intercept stormwater run-off at the source and prevent excess nutrients, rubbish or weed propagules moving downslope.

Additionally, the absence of fire from some portions of the vegetation within Cooper Park for extended periods was identified as creating conditions which promote the growth and spread of exotic species. The absence of fire for extended periods has resulted in areas with a dense low canopy, midstorey or shrub layer creating a very low light environment in the understorey to the detriment of native understorey species and the recruitment of native canopy species. Simultaneously this low light environment can promote the growth and spread of exotic species such as *Ligustrum* species, especially where excess nutrients have been transported into the soil (Buchanan 1989; Howell 2003).

In general, all bush regeneration and weed control is to be carried out by qualified bush regenerators, or under the supervision of qualified bush regenerators. Any volunteers undertaking bush regeneration works within Cooper Park should undergo a site induction where the important natural and cultural heritage values within the park are explained as well as relevant risks to these values. Specifically, all bush regenerators should undertake as part of a work plan which identifies appropriate work methods and schedules which take into account any *A. terminalis* subsp. *terminalis*, the sensitivity of the riparian zone, the severe erosion hazard across the Park and the potential for herbicides to enter waterways.

Where herbicide application is to occur only herbicides and other additives formulated for use near waterways (e.g. RoundUp Biactive™) are to be used and no broad scale spraying should occur. All persons using herbicide within the Park should have appropriate training and appropriate records be kept in accordance with the *Pesticide Regulation 1995*.

The locations and timing of bush regeneration works within Cooper Park should be recorded such that the relative success of various techniques / strategies can be reviewed with a goal to identify strategies or approaches which work best within the local context. As part of this recording the condition of the Park should be assessed and reports prepared every 6 months. These reports should include as a minimum:

- a summary of works carried out within the period;



- an approximation of the time spent on each task;
- a description of any problems encountered in implementing the works recommended in the VMP and how they were overcome; and
- any observations made, including new plant species recorded (native and weed species), comments on rates of regeneration and any problems which impact on the implementation of the VMP.

#### 4.2 MOIST WOODLAND

The moist woodland within Cooper Park (map unit 2, Figure 1) represents one of the higher quality areas of native vegetation and is identified as being of high conservation significance. This area has previously undergone bush regeneration works which appear to have been highly successful with minimal ongoing bush regeneration works expected. Weeds are infrequent within the understorey of this community and non-local natives are not widespread within the canopy.

The Moist Woodland vegetation occurs within the Northland Road and North Bushland precincts, identified within the CMP (Attachment A). Cultural plantings within these precincts include Hoop Pines (*Araucaria cunninghamii*), Coral Trees (*Erythrina sykesii*), Silky Oak (*Grevillea robusta*), Canary Island Date Palms (*Phoenix canariensis*) and Weeping Fig (*Ficus benjamina*). As part of the management of cultural values within the park these plantings are to be protected, including recommendation for the removal of re-growth around the Hoop Pines to improve their health and visual prominence in the park, restoring what originally appeared to be an open flat area, framed by Hoop Pines.

Management of both the cultural and natural heritage values within this area will require careful planning and on-going discussion between Council, bush regenerators and any contractors undertaking works related to management of cultural plantings. Specifically, any actions which have potential to impact upon *Acacia terminalis* subsp. *terminalis* will need to be assessed by a Review of Environmental Factors (REF) in accordance with Part 5 of the NSW *Environmental Planning and Assessment Act* 1979. The recommended removal of re-growth around the Hoop Pines to improve their health and visual prominence in the park, restoring what originally appeared to be an open flat area, framed by Hoop Pines, would involve works within proximity of known *Acacia terminalis* subsp. *terminalis* individuals. It is recommended that any proposed works which will or are likely to impact upon *Acacia terminalis* subsp. *terminalis* individuals should be altered to avoid any impacts or should not be undertaken.

Future management of the natural bushland within this area is likely to be limited to:

- Follow up treatment of any germinating weed species;
- Control of progeny from non-local native canopy species including Hoop Pines (*Araucaria cunninghamii*), while ensuring the protection of mature cultural plantings;
- Management of *Acacia terminalis* subsp. *terminalis* in accordance with section 6 including
  - weed control and bush regeneration;
  - adhering to the Best Practice Management Guidelines for *P. cinnamomi* when implementing bush regeneration activities and any others works within this area;

- investigating opportunities for the use of fire as an ecological tool in accordance with section 5;
  - avoiding planting other subspecies of *A. terminalis* within Cooper Park; and
  - regular monitoring to assess the status of the population and the effectiveness of management actions.
- Investigating opportunities for the use of fire as an ecological tool in accordance with section 5.

#### 4.3 DRY WOODLAND

The management of vegetation within the Dry Woodland within Cooper Park (map unit 2a, Figure 1) should follow that of the wet woodland as described above, although no *A. terminalis* subsp. *terminalis* have been identified within this community.

The Dry Woodland vegetation is located within the Adelaide Street Precinct, as identified within the CMP (Attachment A). Specific recommendations relating to cultural heritage in this area include retaining planted Jacarandas (*Jacaranda mimosifolia*) and maintaining views of the historic Adelaide Terrace sandstone wall from the path. As such bush regeneration activities will need to be planned to ensure that any revegetation works do not impact upon views of the sandstone wall (ground covers and low shrubs to be planted) and that planted Jacarandas are not impacted by bush regeneration activities.

#### 4.4 DISTURBED PATCHES OF WOODLAND

The disturbed woodland patches (map units 3, 6, 8, 10, 12 and 14, Figure 1) represent areas with the greatest potential for bush regeneration works to improve the diversity and abundance of native species and reduce the cover of exotic species within Cooper Park. As such, the management of disturbed woodland patches, particularly those adjoining areas of high conservation, should be the second priority after maintaining the low levels of weeds and high diversity of native within areas of high conservation.

The disturbed patches off woodland occurred within small portions of the Northland Road Precinct, in addition to the North Bushland Precinct, Fletchers Street Precinct, Adelaide Street Precinct and Suttie Road/Bunna Place Precinct, as identified within the CMP (Attachment A). These precincts include a range of heritage values including cultural plantings, which will need to be protected/avoided as part of any bush regeneration works.

In general, the weeds which are common throughout this community are species which germinate from, and create, areas of dense shade including *Tradescantia fluminensis*, *Celtis sinensis*, *Olea europaea* subsp. *cuspidata*, *Asparagus plumosus*, *Ligustrum lucidum* and *Ligustrum sinense*. Dense shade from a low canopy or midstorey of species such as *Pittosporum undulatum* or *Glochidion ferdinandi* is common in Sydney Sandstone bushland which remains unburnt for long periods of time. This in turn, commonly suppresses native understorey species and allows shade tolerant weeds species, such as those mention above, to spread. Reducing the spread of these shade tolerant weed species requires treatment of existing and germinating weeds and preventing the development of a dense midstorey or shrub layer which suppresses the understorey and canopy recruitment. Therefore, management strategies within this vegetation community should include both treatment of existing weed infestations and preventing native or exotic species to reach densities at which the diversity of other native species begins to decline.

Current management of this area involves bush regeneration activities to progressively remove areas of *Ligustrum lucidum* creating bare areas. This technique should be continued with investigation of the possibility of fire to be used in conjunction in accordance with section 5. It is important that this approach is done progressively and that large bare areas are not created which would impact on the area of fauna habitats

It is important to note that different stands of this community are infested by different weeds and to different extents such that the specific management of these areas will vary. Some stands of this community, map units 6a, 10 and 14, have large levels of exotic species and as such bush regeneration works in these areas are of a low priority and that a management approach similar to that recommended for weed / exotic areas is more appropriate.

#### 4.5 RIPARIAN VEGETATION

The riparian vegetation within Cooper Park (map unit 4 Figure 1) has previously undergone bush regeneration works, and these appear to be ongoing. The bush regeneration works in this area have generally been successful although weeds are still common in portions of this community. It is expected that ongoing weed control will be required within this community for extended periods given the density of tracks within this community, the high levels of use of this section of the park, the locally damp conditions and existing levels of weeds. Vegetation management works within this area are likely to be limited to bush regeneration works in accordance with the Bradley method as described above.

The riparian vegetation is located within the Cooper Creek precinct, as described in the CMP (Attachment A), which contains a number of items of cultural significance including plantings of Pencil Pines (*Cupressus sempervirens*) and other non-native canopy species including several rainforest species. Bush regeneration activities within this area will generally be limited to the control of understorey exotic species and will not impact upon any cultural plantings. Where further plantings are to be taken to replace any senescent cultural plantings, species to be planted should follow those which have previously been planted and should not include species which are known to invade natural bushland.

A long-term improvement in the cover and diversity of native vegetation within this community is dependent upon control of exotic species and the factors which have led to the occurrence and spread of these species within this community. A large factor in the spread and growth of weeds within this community is uncontrolled stormwater runoff transporting rubbish, excess nutrients and weed propagules into this community. It is understood that Woollahra Council is currently undertaking a sustainable water project in relation to Cooper Creek which will involve water sensitive urban design technologies to improve water sustainability including a bio-retention system to capture and improve stormwater quality from the Bellevue Hill catchment before it flows into Cooper Creek. This project has the potential to reduce to spread of weeds within the riparian vegetation community and increase the effectiveness of bush regeneration works within this community.

#### 4.6 SAND DUNE VEGETATION

Much of the sand dune vegetation (map unit 9, Figure 1) within Cooper Park is infested by large stands of *Ligustrum lucidum* (Large Leaved Privet). The management of this area should involve strategies to remove the *Ligustrum lucidum* and encourage the regeneration by native species. Current management of this area involves bush regeneration activities to progressively remove the *Ligustrum lucidum* creating bare areas with at least some planting occurring. This approach should continue as the open conditions created by removal of *Ligustrum lucidum* will favour germination of any native

seeds in the soil rather than *Ligustrum lucidum* which favours low temperatures and high levels of shade for germination (Buchanan 1989). Plantings in this area should only be undertaken where native regeneration does not occur.

The sand dune vegetation within Cooper Park occurs within the Bushland Precinct identified within the CMP (Attachment A). This precinct includes a number of cultural plantings of canopy species, particularly along Bellvue Road, including Moreton Bay Figs (*Ficus macrophylla*). The existing bush regeneration and recommended further works would not impact upon areas with cultural plantings.

This area has been identified as an area to be targeted for bush regeneration works over the coming years (Figure 4.1 of Draft PoM). While this somewhat represents a deviation from the Bradley methodology, as this area does not adjoin higher quality vegetation communities, the affinities of this community with the endangered ecological community Eastern Suburbs Banksia Scrub and the absence of this vegetation type within the rest of the parks warrants focussing on this area in the short-term.

#### 4.7 NATIVE RE-VEGETATION

Areas of native re-vegetation (map unit 1, Figure 1) have proved successful in establishing small stands of native vegetation and preventing these areas from becoming infested with exotic species. These areas are located within the Amphitheatre and Suttie Road/Bunna Place precincts, as identified within the CMP (Attachment A). Management of these areas is likely to be limited to occasional bush regeneration works targeting the control of any germinating understorey weeds.

The western stand of native re-vegetation, within the Suttie Road/Bunna Place precincts includes a single Cottonwood (*Populus sp.*) which has been identified as a culturally significant planting. Future weed control works would not impact upon this individual. Any future re-vegetation or infill plantings should be sensitive to the planted Cottonwood and should not include planting large canopy species in proximity to the Cottonwood individual.

The CMP recommends selective removal of some mid-storey vegetation from the eastern stand of native re-vegetation, within the Amphitheatre Precinct. As this vegetation is exclusively planted, removal of mid-storey vegetation would not impact heavily upon the natural heritage values of this area, however, it is recommended that the amount of vegetation removed is the minimum necessary to allow for views to be reinstated and the cleared biomass is made available to bush regenerators for brush-matting purposes. Additionally, all vegetation removal should be undertaken in consultation with bush regenerators.

#### 4.8 EXOTIC PLANTINGS

Continued planting of non-local and exotic species should not be undertaken within Cooper Park, except for those culturally significant planting identified within the CMP. Where plantings are necessary to replace the loss of canopy species in this community, local provenance native species should be used wherever possible.

#### 4.9 WEED/EXOTIC AREAS

The management works for weeds / exotic areas within Cooper Park (map units 7, 11 and 17, Figure 1) should involve bush regeneration strategies to:

- Control the spread of these weeds into other vegetation communities;

- Maintain or improve the fauna habitat values of these areas;
- Maintain or improve soil stability within these areas; and
- Increase the occurrence of native species within these areas.

As such, it is desirable small areas of these exotic species are progressively treated and a dense layer of native shrubs planted such the diversity of habitats available to fauna and soil stability are maintained. It is considered that native regeneration will be very limited within these areas and supplementary plantings will be necessary. Furthermore, the soil stability issues prevent the opportunity to create bare areas and wait for native regeneration.

These works should be considered a low priority following the Bradley methodology and due to the labour intensive nature of any works undertaken in this community. The current approach by Council as outlined in the Draft PoM seems to follow this logic with these areas not to be targeted but rather areas of disturbed woodland closer to high conservation areas to be the target in the short-term (next three years).

The weed/exotic areas are located within portions of the Fletchers Gully, Bellevue Gardens, Cooper Park North and Amphitheatre Precincts, as identified within the CMP (Attachment A). The vast majority of the areas of weed/exotic vegetation do not support any culturally significant plantings and bush regeneration/re-vegetation would not impact upon any cultural heritage values. The CMP recommends clearing of weed/exotic vegetation within the Amphitheatre Precinct to reinstate mown grass where feasible and to maintain views to the escarpments and buildings. The clearing of weed/exotic vegetation within the Amphitheatre Precinct and reinstatement of mown grass areas would not impact upon the natural heritage values of this area, although the stability of any newly cleared areas should be considered by qualified personnel prior to any vegetation removal.

#### 4.10 LAWN AREAS

Vegetation management works within these areas should be limited to controlling the spread of exotic grasses from lawn areas into adjacent vegetation communities. Limited evidence of the spread of exotic grasses into adjacent communities was observed during site inspection although this may become an issue in the future. Techniques to control the spread of exotic grasses into adjacent communities may include planting a tall, dense ground layer at the interface of lawn areas and adjacent communities or routine spraying of weed/exotic vegetation at the interface of this and adjacent communities.

## 5 Fire

Fire has played a role in evolutionary development of native flora, fauna and ecological communities across Australia. Individual species and communities are able to cope with some portion of the possible spectrum of fire regimes and a species or community may decline and be eventually lost from an area, if the fire regimes that occur are outside of their tolerances limit. Portions of Cooper Park have not been burnt for extended periods of time such that individual species and communities appear to be in decline.

A number of species within Cooper Park including members of the Fabaceae and Proteaceae families are dependent upon fire for germination and the application of prescribed burns may trigger germination of these and other native species from the soil seedbank. Evidence of the success of this can be seen from areas which have recently burnt (immediate area surrounding *Acacia terminalis* subsp. *terminalis* group in east of Cooper park as shown in Figure 2) in which germination of a number of native species was observed including *A. terminalis* subsp. *terminalis*.

Prescribed burns are likely to benefit fauna within Cooper Park in the long run due to its role in increasing floral diversity. However, fire can be hazardous to fauna both as a direct cause of death to animals through heat and through short-term changes to habitat and the availability of food, shelter and breeding sites. Cooper Park is a relatively small area of native vegetation and is isolated such that there is limited opportunity for movement of animals between the Park and other areas of habitat. Thus as part of any burn program it is necessary to maintain a diversity of vegetation cover and structure to conserve viable animal populations. As such, it is important that any individual fire, or combination of fires within a short period of time, should not completely burn the local extent of any vegetation community. Further, any broad scale fire event is to be avoided.

### 5.1 FIRE INTERVALS

Generally, groups of plant and animal species within an area respond similarly to fire according to the characteristics of their life history (Bradstock, Keith & Auld 1995). Therefore, it is usually not necessary to specify individual fire regimes for every species, but rather the requirements for most plant species can be summarised on the basis of broad groups. NPWS (2004) has summarised biodiversity thresholds for fire frequencies for the broad vegetation groups within Sydney Harbour and Botany Bay national parks. These broad vegetation groups can readily be applied to Cooper Park as outlined in Table 2.

**Table 2: Biodiversity threshold for vegetation communities within Cooper Park. Excerpt from (NPWS 2004).**

Vegetation Community	Decline in biodiversity predicted if:
Sydney Sandstone Ridgetop Forest	<ul style="list-style-type: none"> <li>more than two successive fires occur at less than 5 years apart.</li> <li>there are no fires for more than 30 years.</li> </ul>
Sydney Sandstone Gully Forest	<ul style="list-style-type: none"> <li>successive fires, of any intensity, occur less than 50 years apart.</li> <li>no high intensity fire occurs for 100-200 years.</li> </ul>

The use of fire as a management tool must be sensitive to areas where *Acacia terminalis* subsp. *Terminalis* occurs. *A. terminalis* subsp. *terminalis* is killed by high intensity fire and do not seem to resprout after fire (T. Auld pers. comm. in DECC 2009b). As with other *Acacia* species, the subspecies is thought to have high seed dormancy and long-lived persistent seedbanks with germination from this seedbank occurring mainly after fire, when it is triggered by heat (D. Keith, pers. comm.). Declines in population size have been linked with long periods without fire, while ecological burns appear to have been the trigger for significant recruitment events, such as that observed within Cooper Park. A fire temperature of >60°C is required for maximum germination (D. Keith pers. comm. in Benson &

McDougall 1996) with low intensity fires which do not trigger germination from the seedbank considered to lead to decline of the subspecies.

As the subspecies is killed by high intensity fire, but low intensity fires do not trigger germination from the seedbank, the fire interval between fires should be long enough to allow post-fire seedlings to mature and sufficiently replenish the seedbank. DECC (2009b) advocates the minimum fire interval for the subspecies being at least 3 times the primary juvenile period to achieve good replenishment of the soil seed bank after fire (T. Auld, pers. comm.). The primary juvenile period is at the age of 2-4 years. Hence, a minimum fire-free interval of 6-12 years is appropriate for *A. terminalis* subsp. *terminalis*.

## 5.2 RECOMMENDATIONS

Any burns undertaken within Cooper Park will need to be undertaken as part of a planned approach which considers the ecology, bushfire hazard and users of Cooper Park. In relation to vegetation and ecology the following recommendations are made in relation to prescribed burns:

- The locations and timing of prescribed and unprescribed burns should be recorded on a register and mapped using a GIS system so that the time since fire can be identified for any area of Cooper Park;
- Prescribed burns should be undertaken in accordance with the recommendations for burns in the *A. terminalis* subsp. *terminalis* recovery plan (DECC 2009b), specifically a minimum fire-free interval of 6-12 years should be applied to all areas across Cooper Park;
- Prescribed burns should be undertaken in small patches. Any individual fire, or combination of fires within a short period of time, should not completely burn the local extent of any vegetation community. Further, any broad scale fire event is to be avoided;
- No individual prescribed burn or combination of fires within a short period of time should encompass the known habitat for *A. terminalis* subsp. *terminalis*;
- Any areas where prescribed burns are applied should be fenced to prevent access to these areas and damage to any germinating species;
- Following any prescribed burn the regeneration of vegetation should be monitored for inclusion in bush regeneration reports. Prior to any prescribed burn a Review of Environmental Factors will need to be prepared. This report should take into consideration the success and / or failure of any previous prescribed burns within Cooper Park; and
- Prescribed burns should not be undertaken within areas of riparian vegetation, or within areas containing culturally significant plantings, as identified within the CMP.

## 5.3 LEGISLATIVE FRAMEWORK AND HAZARD ASSESSMENT

Prior to conducting a prescribed burn or series of burns, Woollahra Council will need to prepare, or commission, a Review of Environmental Factors under the *Environmental Planning and Assessment Act 1979*. Under Part 5, Division 2 of this Act Woollahra Council has a duty to consider environmental impacts of activities (in this case the prescribed burn) and must consider to the fullest extent possible all matters affecting or likely to affect the environment, resulting from the prescribed burn.

Ecological burns at Cooper Park will also require approval under the Protection of the Environment Operations (Clean Air) Regulation 2010. Ecological burns are “not expressly permitted” (RFS 2003) like



those that are planned within a Bushfire Risk Management Plan (BFRMP) for hazard reduction purposes aimed to protect life, property and the environment. If not covered by a BFRMP, the argument for an ecological burn has more weight if it has a dual objective of protecting life, property or the environment (*e.g.* a hazard reduction burn within a Park designed within the ecological thresholds and having 'strategic fire advantage' values).

The requirement for a permit to light a fire depends on the local council, the designated bushfire season (not always October to March), and the declaration of 'Total Fire Ban' or 'No Burn' days issued by the RFS. Therefore it is recommended that the local NSW Fire Brigade Station be consulted (Woollahra) for further and up-to-date information. Even when a permit is not required to conduct a burn, at least 24 hours notice must be provided to all adjacent landowners and the local NSW Fire Brigade Station.

## 6 *Acacia terminalis* subsp. *terminalis*

This section outlines the best practice management of *Acacia terminalis* subsp. *terminalis* within Cooper Park in accordance with the Draft Recovery Plan for *Acacia terminalis* subsp. *terminalis*. It should be noted that the objectives and actions within the draft plan may change when the final recovery plan is released, and that the draft recovery plan has no legal status until approved by the Minister and issued as a final document. Nonetheless, management practices which follow the objectives and actions of the draft recovery plan are outlined below.

The overall objective the draft recovery plan is to prevent *A. terminalis* subsp. *terminalis* from becoming critically endangered by reducing the further loss of populations and, by implementing in-situ management regimes aimed at maintaining representative populations of the subspecies' across its natural range.

### ***Specific objective 1: Coordinate the recovery of A.t.terminalis***

This objective relates to co-ordination of recovery actions by DECCW and includes two specific actions. Actions which Council should undertake in relation to this objective would include liaising with DECCW with regards to specific actions undertaken as part of *A. terminalis* subsp. *terminalis* management including prescribed burns.

### ***Specific objective 2: Conserve A.t.terminalis using land-use and conservation planning mechanisms***

This objective aims to increase the legislative protection for high priority sites through variety of mechanisms including classification of land as community land under the *Local Government Act* and subsequent consideration of the subspecies in plans of management for such land. Cooper Park is classified as community land under the *Local Government Act* in the Draft PoM. Furthermore, this vegetation management plan has taken into consideration the requirements of *A. terminalis* subsp. *terminalis*.

Further action required by Council in regard to this objective is to ensure that all relevant Environmental Planning Instruments (prepared under Pt 3 of the EP&A Act) are prepared, or reviewed, with reference to this recovery plan and any further advice from the DECCW regarding this subspecies. Additionally, Council will assess developments and activities with reference to the recovery plan including Appendix 4 of the plan - environmental impact assessment guidelines and any further advice from the DECCW regarding the subspecies.

### ***Specific objective 3: To identify and minimise the threats operating at sites where A.t.terminalis occurs.***

Actions stemming from this objective are to incorporate site specific threat abatement measures for *A. terminalis* subsp. *terminalis* into Plans of Management for community land and to implement these threat abatement measures.

The following threat abatement measures have been recommended in this vegetation management plan in relation to *A. terminalis* subsp. *terminalis* include:

- weed control and bush regeneration works, as outlined in section 4;
- adhering to the Best Practice Management Guidelines for *P. cinnamomi* when implementing *in situ* management activities;
- the application of appropriate fire regimes, as outlined in Section 5;
- avoiding planting other subspecies of *A. terminalis* in proximity to *A. t. terminalis* sites; and
- regular monitoring to assess the status of the population and the effectiveness of threat abatement measures.

Other actions which are not deemed necessary at this stage but which may be necessary in the future include:

- restricting access, informal tracks and green waste dumping through fencing and bollards, informal barriers and/or signs; and
- construction of alternative tracks in more appropriate areas.

Further actions required by Council in relation to this objective are limited to the consideration of *A. terminalis* subsp. *terminalis* when any relevant Bush Fire Management Plans are drafted and reviewed.

***Specific objective 4: To promote surveys, research and monitoring that will assist with the management of A.t.terminalis***

The specific actions relating to this objective do not relate to Council. Nonetheless, this VMP recommends monitoring of the *A. terminalis* subsp. *terminalis* population as part of regular bush regeneration monitoring so that any change in the size or status of the population is detected early and so that the success or otherwise of management actions can be readily identified.

***Specific objective 5: To provide stakeholders with information to assist in conserving A.t.terminalis***

Actions under this objective aim to raise awareness of the recovery program and encourage community involvement in its implementation. A potential area of involvement of the community identified in the recovery plan is in the implementation of threat and habitat management programs and the monitoring of their success. As such, volunteers undertaking bush regeneration within Cooper Park should be informed on the relative success of their actions in relation to the recovery of *A. terminalis* subsp. *terminalis* and native vegetation within Cooper Park as a whole. Volunteers should be provided with access to bush regeneration reports.

***Specific objective 6: To raise awareness about the threats to the subspecies and involve the community in the recovery program.***

The specific actions relating to this objective largely involve preparation and distribution of information by DECCW. Opportunities for Council to support this objective would include informing residents about the risk hybridisation represents to this species and advising residents against planting other *A. terminalis* subspecies on their land.

***Specific Objective 7: To coordinate an ex-situ conservation program to safeguard genetic material from extinction***

This objective seeks to provide protection against the unexpected loss of genetic material, through maintenance of an *ex-situ* collection of seed collected from priority sites including Cooper Park. This seed collection is to be coordinated by DECCW. Actions which may be undertaken by Council would include liaising with DECCW about the timing and status of seed collection to ensure that seed collection by DECCW and actions undertaken as part of the VMP, including prescribed burns, do not conflict with each other.

## 7 Conclusions

Cooper Park is an area with significant natural heritage values due to its location within a highly modified and urbanised environment. The relatively infrequent occurrence of large stands of remnant and advanced regrowth vegetation within the surrounding area highlights the importance of protecting and effectively managing the remaining stands within Cooper Park. These natural heritage values which require on-going management and protection are specifically highlighted by the range of fauna and flora habitat within the park which includes habitat for threatened flora and fauna species (*Acacia terminalis* subsp. *terminalis*, *Syzygium paniculatum* and Grey-headed Flying-fox). Protecting and enhancing the habitat for these threatened species should be a first priority for ongoing management of the park and potential impacts to these threatened species should be considered as part of any works undertaken within the Park. Where planned works cannot be altered to avoid impacts upon these species, works should not be undertaken.

The natural heritage values within Cooper Park are threatened by a number of processes including weed invasion and as such targeted and planned actions are needed to protect these values. This VMP provides a guide for the continuation of bush regeneration works within Cooper Park to ensure the ongoing protection of natural heritage values within the Park. The previous and ongoing bush regeneration works and general management of vegetation within Cooper Park appears to have involved a planned, practical and generally successful approach. Ongoing bush regeneration works should continue to be undertaken as a planned approach which generally follows the Bradley method and involves working from areas in better condition towards more weed-infested areas, making minimal disturbance and letting native plant regeneration dictate the rate of removal. Following the principles of the Bradley method it is recommended that Bush regenerations works are prioritised to:

- Treat any germinating weeds surrounding known occurrences of *Acacia terminalis* subsp. *terminalis*;
- Treat any germinating/re-sprouting weeds within areas of high conservation significance which generally have low occurrences of weed species;
- Treat larger weed infestations at the interface between higher and moderate conservation areas;

In addition to the continuation of on-going bush regenerations works to address threats to biodiversity/natural heritage values within Cooper Park should be undertaken. A primary threat identified to biodiversity/natural heritage values within Cooper Park was uncontrolled stormwater run-off. Uncontrolled stormwater runoff discharges directly into Cooper Park from a number of adjoining private residences and streets. This untreated stormwater runoff transports rubbish, excess nutrients and weed propagules into Cooper Park, all of which create micro-habitats which promote the growth and spread of weed species at the expense of native vegetation. This VMP identifies that control of stormwater flowing into Cooper Park is a necessary step in protecting the natural heritage values within Cooper Park. The sustainable water project involving water sensitive urban design technologies to capture and improve stormwater quality from the Bellevue Hill catchment before it flows into Cooper

Creek which is being undertaken by Council should reduce the current threat to natural heritage posed by uncontrolled stormwater.

The existing fire regime, which is characterized by the absence of fire for extended periods, is also considered a threat to biodiversity/ natural heritage values within Cooper Park. The absence of fire has resulted in areas with vegetation characterized by a dense low canopy, midstorey or shrub layer creating a very low light environment in the understorey to the detriment of native understorey species and the recruitment of native canopy species. This VMP recommends that Woollahra Council investigate opportunities for prescribed burns within Cooper Park to manage both the bushfire hazard within Cooper Park and to maximise biodiversity within the Park.

Finally the management actions for the threatened *Acacia terminalis* subsp. *terminalis*, in line with the draft recovery plan for this species, should be implemented. These actions aim to ensure the on-going survival of *Acacia terminalis* subsp. *terminalis* within the Park and to increase the occurrence of this species through active management including prescribed burns.

# References

- Benson, D. & Howell, J. (1990). *Taken for Granted: The bushland of Sydney and its suburbs*. Kangaroo Press, Sydney.
- Benson, D. & Howell, J. (1994). The natural vegetation of the Sydney 1: 100 000 map sheet. *Cunninghamia*, 3(4):677-1004.
- Bradstock R.A., Keith D.A. and Auld T.D. (1995) Management of fire for conservation: imperatives and constraints. In: *Conserving Biodiversity: Threats and Solutions* (eds R.A. Bradstock, T.D. Auld, D.A. Keith, R. Kingsford, D. Lunney & D. Sivertsen), pp. 323-33. Surrey Beatty & Sons, Sydney.
- Buchanan, R.A. (1989). *Bush Regeneration: Recovering Australian Landscapes*. TAFE Student Learning Publications, Sydney.
- Fairley, A. (2004). *Seldom Seen Rare Plants of Greater Sydney*. Reed New Holland, Sydney.
- Howell, J. (2003). *Pittosporum undulatum* as a case study for native species that change range – how to avoid inappropriate responses?. *Cunninghamia*, 8(1): 153-155.
- New South Wales Department of Environment and Conservation (2004). *Eastern Suburbs Banksia Scrub Endangered Ecological Community Recovery Plan*. NSW Department of Environment and Conservation, Hurstville.
- New South Wales Department of Environment and Conservation (2009a). *Biobanking Assessment Methodology and Credit Calculator Operational Manual*. NSW DECC, Sydney.
- New South Wales Department of Environment and Conservation (2009b). *Draft Recovery Plan Acacia terminalis subsp. terminalis (Sunshine Wattle)*. Department of Environment and Climate Change (NSW), Sydney.
- New South Wales National Parks and Wildlife Service (2002). *Guidelines for the Conservation Significance Assessment of the Native Vegetation of the Cumberland Plain, Western Sydney*. NSW NPWS, Hurstville.
- Tozer, M.G., Turner, K., Simpson, C., Keith, D.A., Beukers, P., MacKenzie, B., Tindall, D. & Pennay, C. (2006). Native vegetation of southeast NSW: a revised classification and map for the coast and eastern tablelands. Version 1.0. NSW Department of Environment and Conservation.

## Attachment A: Cooper Park Precinct Plan



## COOPER PARK PRECINCTS

- |   |                               |    |                           |
|---|-------------------------------|----|---------------------------|
| 1 | SUTTIE RD/BURUNA PL. PRECINCT | 8  | FLETCHERS GULLY PRECINCT  |
| 2 | NORTHLAND RD PRECINCT         | 9  | FIG TREE LAKE PRECINCT    |
| 3 | TEHNA PRECINCT                | 10 | FLETCHER STREET PRECINCT  |
| 4 | ADLAIDE STREET PRECINCT       | 11 | COOPER CREEK PRECINCT     |
| 5 | NORTH BUSHLAND PRECINCT       | 12 | POND/HI PRECINCT          |
| 6 | COOPER PARK NORTH PRECINCT    | 13 | BELLEVUE GARDENS PRECINCT |
| 7 | PICNIC/PLAY PRECINCT          | 14 | AMPHITHEATRE PRECINCT     |



**PRECINCT PLAN**  
CP-CMP-02  
OCTOBER 2010  
SCALE 1:1000 @ A0



# COOPER PARK CONSERVATION MANAGEMENT PLAN

**HEAD OFFICE**

Suite 4, Level 1  
2-4 Merton Street  
Sutherland NSW 2232  
T 02 8536 8600  
F 02 9542 5622

**CANBERRA**

Level 2  
11 London Circuit  
Canberra ACT 2601  
T 02 6103 0145  
F 02 6103 0148

**COFFS HARBOUR**

35 Orlando Street  
Coffs Harbour Jetty NSW 2450  
T 02 6651 5484  
F 02 6651 6890

**WESTERN AUSTRALIA**

108 Stirling Street  
Perth WA 6000  
T 08 9227 1070  
F 08 9227 1078

**SYDNEY**

Suite 604, Level 6  
267 Castlereagh Street  
Sydney NSW 2000  
T 02 9993 0566  
F 02 9993 0573

**HUNTER**

Suite 17, Level 4  
19 Bolton Street  
Newcastle NSW 2300  
T 02 4910 0125  
F 02 4910 0126

**ARMIDALE**

92 Taylor Street  
Armidale NSW 2350  
T 02 8081 2681  
F 02 6772 1279

**WOLLONGONG**

Level 2  
25 Atchison Street  
Wollongong NSW 2500  
T 02 8536 8615  
F 02 4254 6699

**ST GEORGES BASIN**

8/128 Island Point Road  
St Georges Basin NSW 2540  
T 02 4443 5555  
F 02 4443 6655

**NAROOMA**

5/20 Canty Street  
Narooma NSW 2546  
T 02 4476 1151  
F 02 4476 1161

**BRISBANE**

93 Boundary St  
West End QLD 4101  
T 1300 646 131