



# Ivanhoe Estate– Vegetation Management Plan

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**Frasers Property Australia Pty Ltd**

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Template 2.8.1

# Contents

<b>1. Introduction .....</b>	<b>1</b>
1.1 Background.....	1
1.2 Consistency with NRAR Guidelines for Riparian Corridors on Waterfront Land .....	2
1.3 Objectives of the Vegetation Management Plan .....	2
1.4 Preparation and implementation of this plan.....	3
1.5 Key Terms .....	4
<b>2. Description of the environment .....</b>	<b>6</b>
2.1 Location .....	6
2.2 Topography and hydrology.....	6
2.3 Vegetation community .....	6
2.4 Weeds.....	8
<b>3. Construction and preliminary works.....</b>	<b>11</b>
3.1 Temporary fencing and signage.....	11
3.2 Permanent fencing .....	11
3.3 Soil and water management.....	11
3.4 Reducing the spread of pathogens and diseases.....	11
3.5 Fauna habitat enhancement.....	12
<b>4. Vegetation management works .....</b>	<b>13</b>
4.1 VMP management zones .....	13
4.1.1 Zone 1: Assisted Regeneration .....	13
4.1.2 Zone 2: Regeneration.....	13
4.1.3 Zone 3: Revegetation .....	14
4.1.4 Zone 4: Revegetation (Shrimptons Creek) .....	14
4.1.5 Zone 5: Regeneration (Shrimptons Creek).....	14
4.1.6 Primary and secondary weed control .....	14
4.1.7 Maintenance .....	15
4.2 Revegetation.....	15
<b>5. Implementation schedule .....</b>	<b>18</b>
5.1 Implementation schedule .....	18
5.2 Adaptive management .....	18
5.3 VMP management after the initial ten-year maintenance period (in perpetuity).....	18
<b>6. Monitoring and reporting .....</b>	<b>21</b>
6.1 Monitoring.....	21
6.1.1 Photo monitoring.....	21

6.1.2 Vegetation surveys .....	21
6.2 Progress reports .....	22
6.3 Performance criteria.....	22
<b>7. Cost.....</b>	<b>27</b>
7.1 Construction and preparation works .....	27
7.2 Vegetation management works.....	27
7.2.1 Site preparation techniques .....	27
7.2.2 Weed control techniques .....	27
7.2.3 Revegetation treatments .....	27
7.2.4 Seed collection .....	27
7.2.5 Monitoring and reporting.....	27
<b>References .....</b>	<b>31</b>
<b>Appendix A Development plan .....</b>	<b>32</b>
<b>Appendix B Existing vegetation species list.....</b>	<b>34</b>
<b>Appendix C Weed Management Plan .....</b>	<b>37</b>
<b>Appendix D Introduction and Spread of Weed and Pathogens Procedure.....</b>	<b>42</b>
<b>Appendix E Techniques and specifications.....</b>	<b>45</b>
<b>Appendix F Recommended planting list .....</b>	<b>50</b>

## List of Figures

Figure 1: Site location.....	5
Figure 2: Vegetation communities within the VMP area .....	10
Figure 3: Vegetation management zones .....	17

## List of Tables

Table 1: VMP Objectives .....	2
Table 2: Plant community types present within the subject land .....	6
Table 3: A list of priority weeds and Weeds of National Significance identified within VMP .....	8
Table 4: Planting assumptions .....	15
Table 5: Revegetation densities .....	16
Table 6: Implementation schedule (Establishment period and Years 1 – 5) .....	19
Table 7: Implementation schedule (Years 6 – 10).....	20
Table 8: Performance criteria.....	24
Table 9: Benchmark conditions for vegetation communities within the VMP area .....	26
Table 10: Indicative VMP costings (Establishment period and Years 1 – 5) .....	29
Table 11: Indicative VMP costings (Years 6 – 10).....	30

## Abbreviations

Abbreviation	Description
AABR	Australian Association of Bush Regenerators
BC Act	NSW <i>Biodiversity Conservation Act 2016</i>
BMP	Biodiversity Management Plan
CEEC	Critically Endangered Ecological Community
CESMF	Coastal Enriched Sandstone Moist Forest
ELA	Eco Logical Australia Pty Ltd
EP&A Act	NSW <i>Environmental Planning and Assessment Act 1979</i>
EPBC Act	Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>
LAHC	Land and Housing Corporation
LGA	Local Government Area
NRAR	Natural Resources Access Regulator
PCT	Plant Community Type
SSD	State Significant Development
STIF	Sydney Turpentine Ironbark Forest
VMP	Vegetation Management Plan
WoNS	Weeds of National Significance

# 1. Introduction

This Vegetation Management Plan (VMP) has been prepared by Eco Logical Australia Pty Ltd (ELA) on behalf of Frasers Property Australia Pty Ltd for the re-development of the Ivanhoe estate within The City of Ryde Local Government Area (LGA).

## 1.1 Background

The subject land occurs within Ivanhoe Place, Wilcannia Way, Nyngan Way, Narromine Way and Cobar Way (Lot 100 DP1262209), part of 2-4 Lyonpark Road (Lot 1 DP859537) and portions of Shrimptons Creek adjacent to Lot 1 DP859537 to the centre line of the creek, Macquarie Park for the:

- Construction of new roads, bridge over Shrimptons Creek and new road connection to Lyonpark Road
- Construction of two residential apartment buildings (Building A1 and Building C1) with basement car parking:
  - Building A1 with 269 apartments, 233 car parking spaces and a child centre
  - Building C1 with 471 apartments and 346 car parking spaces
- Landscaping and public domain works

The proposed works were given consent by the Minister of Planning and Public Spaces under section 4.38 of the State Environmental Planning and Assessment Act 1979 (EP&A Act). This VMP addresses the consent condition B.47 s in State Significant Development (SSD) application SSD 8903 (below). This VMP covers items (iii) to (vi) shown in bold. Items (i) and (ii) are covered by a separate document titled *Ivanhoe Estate: Biodiversity Management Plan (ELA 2021)*.

### *Biodiversity Management Plan*

*B.47 Prior to the commencement of the relevant works, the Applicant must prepare a Biodiversity Management Plan (BMP) for the site. The BMP must be consistent with the recommendations contained in the Biodiversity Assessment Report prepared by Eco Logical, dated October 2019, and be prepared by an appropriately qualified person, in consultation with Council, the EESG and the Natural Resources Access Regulator (NRAR). The BMP must include:*

- i pre-clearance surveys and clearance supervision of hollow bearing trees*
- ii the replacement of all removed hollows with artificial nest boxes or the removed hollows at a ratio of 1:4 (removed/replaced), with installation occurring within the retained vegetation adjacent to Shrimptons Creek*
- iii a Vegetation Management Plan for the long-term management of all vegetation on the site, including Shrimptons Creek and the Epping Road ecological corridor***
- iv the use of local provenance species appropriate for the threatened ecological communities and plant community types present on the site***
- v appropriate monitoring and maintenance periods of the vegetation to ensure its long-term viability following the completion of the rehabilitation works for ten (10) years***
- vi a Weed Management Plan.***

## 1.2 Consistency with NRAR Guidelines for Riparian Corridors on Waterfront Land

The approved Masterplan (SSD 8707) including Condition A30 requires the activation of the Shrimptons Creek corridor including *the design, construct and dedicate of the land as a public reserve. Rehabilitation of the Shrimptons Creek corridor, consisting of: vegetation management to remove noxious weeds and to improve the ecology and the watercourse; concrete linear pathway to create a shared path for cyclists and pedestrians; wetlands to collect site water and clean it before discharge into Shrimptons Creek; sinuous decking boardwalk along the riparian corridor and under the bridge with lookout and picnic areas; access staircases and accessible ramp to enter the development; new skate park utilising space under the bridge; all ages and abilities exercise station.*

The following works proposed in the riparian corridor are therefore not compliant with the NRAR Guidelines:

- Bridge (already approved)
- New skate park (to replace existing);
- Proposed board walk along creek line;
- Proposed all ages fitness and exercise stations and lawn areas;
- Retaining walls, stairs and landscaped interfaces back towards the development but within the riparian corridor;
- Replacement of the up to 4m wide shared way, as it will in part sit within the inner 50% of the corridor.

The compliant works planned are:

- Weeding, vegetation management, tree protection in the areas that are not affected by the above.
- Wetlands to collect site water and discharge into the creek (stormwater management)

Detailed design to deliver the obligations under Condition 30A will be undertaken as part of the future stages of development and may require an update to the VMP.

The proponent has agreed to complete the establishment period (along Shrimptons Creek only), which consists of site preparation, primary weed control, secondary weed control and revegetation works, prior to or on the delivery of 2,550 apartments.

**Figure 1** shows the location of the subject land, the proposed subdivision and the VMP area.

## 1.3 Objectives of the Vegetation Management Plan

The overall objective of the VMP is to provide a management framework for the conservation of native vegetation and fauna habitat within retained native vegetation within the subject land. The VMP area will be managed in perpetuity. This VMP covers the initial ten-year period. The objectives of the VMP are summarised in **Table 1**.

**Table 1: VMP Objectives**

Objectives	Approach
Improve water quality and riparian vegetation	Revegetation of riparian corridor
Improve ecological health and integrity	Control woody weeds Maximisation of biodiversity and ecological values Revegetate with native terrestrial species using appropriate species Undertake ongoing maintenance weed control
Maintain and enhance habitat values	Protect existing native vegetation Control weeds and prevent new outbreaks Assist in the natural regeneration of species across the VMP area

#### 1.4 Preparation and implementation of this plan

This VMP has been prepared by a Restoration Ecologist with over 5 years' experience in environmental consultancy and relevant Bachelor of Science degree.

A suitably qualified and experienced bush regeneration contractor is required to implement this VMP. They should be a member of the Australian Association of Bush Regenerators (AABR) or should possess the required qualifications and experience for membership. In addition to this, team leaders should have, as a minimum, a Certificate III in Conservation & Land Management or equivalent. The contractor will need to carry out best practice bush regeneration techniques as described by Buchanan (2009).



## 1.5 Key Terms

For the purpose of this VMP, the following terminology has been adopted:

- Subject land: The extent of the land within Ivanhoe Place, Wilcannia Way, Nyngan Way, Narromine Way and Cobar Way (Lot 100 DP1262209), part of 2-4 Lyonpark Road (Lot 1 DP859537) and portions of Shrimptons Creek adjacent to Lot 1 DP859537 to the centre line of the creek, Macquarie Park
- Development footprint: The area of the site to be developed, specifically the construction of new roads, residential apartment buildings, landscaping and public domain work. This area is outside the scope of the VMP area.
- VMP area: The proportion of the site to be conserved and managed by this VMP, specifically the 1.29 ha of native vegetation adjacent to Epping Road and along Shrimptons Creek (See **Figure 1**).

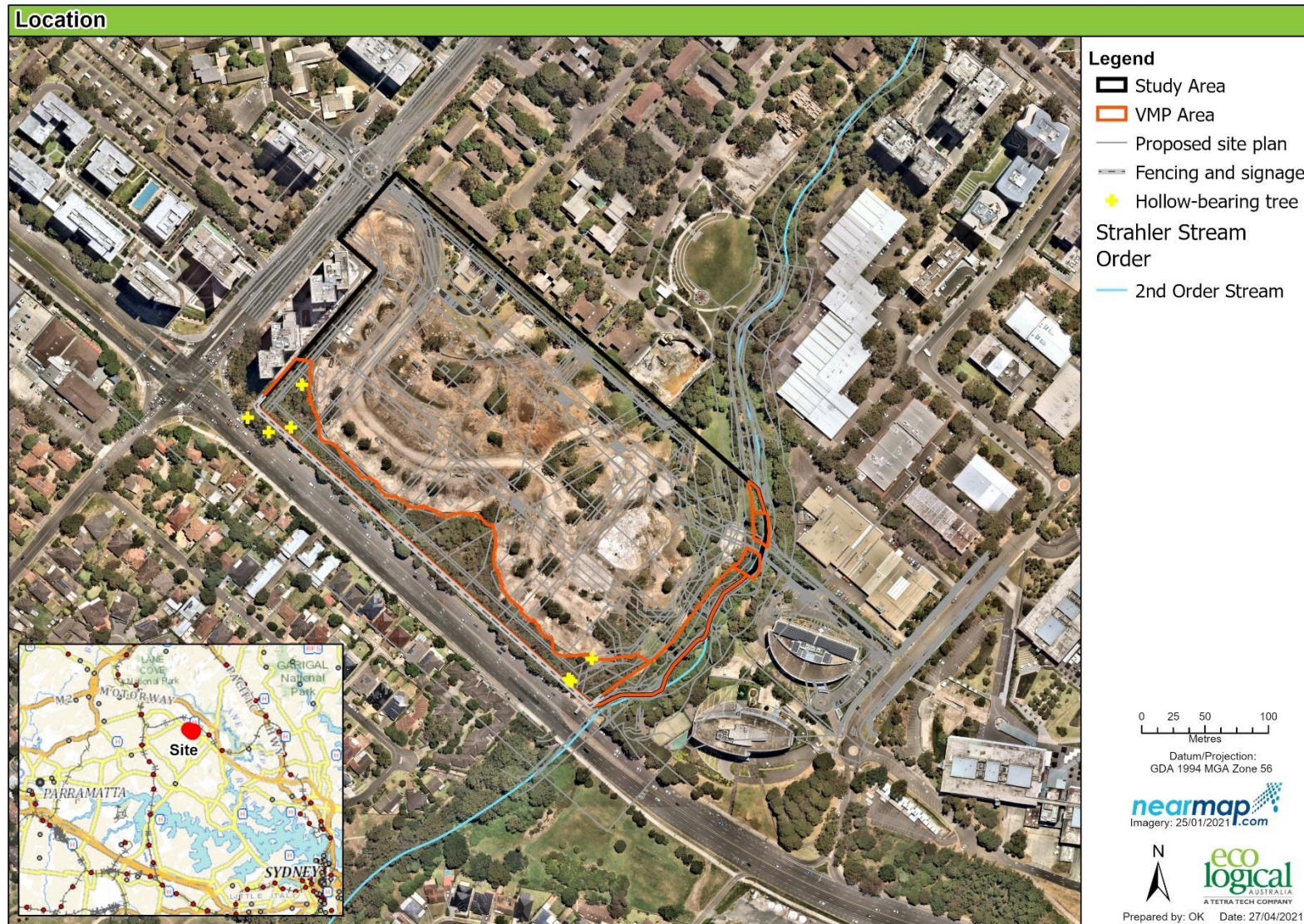


Figure 1: Site location

## 2. Description of the environment

### 2.1 Location

The suburb of Macquarie Park is located in the City of Ryde Local Government Area (LGA) in north-west Sydney. The Ivanhoe Estate (referred to in this report as “the development site”) is located at the intersection of Epping Road, which forms the southern boundary, and Herring Road along the western boundary.

The Ivanhoe Estate is currently owned by the NSW Land and Housing Corporation (LAHC) and provides social housing for up to 259 residential dwellings. The site is approximately 8.95 ha in size and features double-storey units and a large patch of bushland along Epping Road. Shrimptons Creek is located along the eastern boundary and contains dense woody weeds and an example of remnant forest. Residential development forms the northern boundary. In the local vicinity, high-rise residential developments are in the process of construction and complement the commercial aspects of Macquarie Park, i.e., Macquarie Shopping Centre and Macquarie University.

The VMP area (1.29 ha) includes all retained native vegetation adjacent to Epping Road as well as two small sections, each 20 m in length, one either side of the proposed road along Shrimptons Creek (**Figure 1**). Vegetation management of the remainder of Shrimptons Creek will be addressed with subsequent development stages.

### 2.2 Topography and hydrology

The topography within the VMP area descends from north west to south east.

The development site is currently extensively modified. All hydrological flows within the development site are managed via an existing stormwater system.

There is a natural creekline along the eastern boundary of the development site, Shrimptons Creek (**Figure 1**). This creek is classed as a second order stream and is highly impacted by adjacent development. Shrimptons Creek flows northwards underneath a shopping centre, then continues for approximately 1.3 km where it meets the Lane Cove River.

### 2.3 Vegetation community

Validation of the vegetation undertaken by ELA during preparation of the Biodiversity Assessment Report and Offset Strategy (ELA 2019) and identified that 2 plant community types (PCTs) occur within the subject land (**Table 2**). These PCT’s are shown in **Figure 2**.

**Table 2: Plant community types present within the subject land**

PCT ID	PCT Name	Condition	Area within the VMP area (ha)	BC Act listing	EPBC Act listing
1281	Turpentine – Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion	Good	0.73	Critically Endangered Sydney Turpentine-Ironbark Forest	Critically Endangered Turpentine-Ironbark Forest in the Sydney Basin Bioregion



PCT ID	PCT Name	Condition	Area within the VMP area (ha)	BC Act listing	EPBC Act listing
1841	Smooth-barked Apple – Turpentine – Blackbutt tall open forest on enriched sandstone slopes and gullies of the Sydney region	Moderate	0.24	-	-
1841	Smooth-barked Apple – Turpentine – Blackbutt tall open forest on enriched sandstone slopes and gullies of the Sydney region	Poor	0.27	-	-

PCT 1281 *Turpentine – Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion* conforms to the critically endangered ecological community listing under the both the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) and NSW Biodiversity Conservation Act 2016 (BC Act) of Sydney Turpentine – Ironbark Forest (STIF). PCT 1841 *Smooth-barked Apple – Turpentine – Blackbutt tall open forest on enriched sandstone slopes and gullies of the Sydney region* conforms to the ecological community listing Coastal Enriched Sandstone Moist Forest (CESMF).

Sydney Turpentine – Ironbark Forest is found on areas with clay soils derived from Wianamatta Shale, or shale layers within Hawkesbury Sandstone. Occurrences of STIF may occur on plateaus and hillsides and on the margins of shale cappings over sandstone.

The canopy is a mix of native tree species typically including two or more of the following: *Eucalyptus paniculata* (Blackbutt), *E. resinifera* (Red Mahogany), *Eucalyptus saligna* (Sydney Blue Gum), *Syncarpia glomulifera* (Turpentine), *Angophora costata* (Smooth-barked Apple) and *Angophora floribunda* (Rough-leaved Apple). Understorey mid layer is most often dominated by *Allocasuarina torulosa* (Forest Oak), *Elaeocarpus reticulatus* (Blueberry Ash) and *Pittosporum undulatum* (Sweet Pittosporum).

Other common species include *Kunzea ambigua* (Tick Bush), *Dodonaea triquetra* (Large-leaf Hop-bush), *Ozothamnus diosmifolius* (Rice Flower), *Breynia oblongifolia* (Coffee Bush) and *Leucopogon lanceolatus* var. *lanceolatus*. Ground layer is dominated by grasses and herbs including *Dianella caerulea* (Blue Flax-lily), *Lomandra longifolia* (Spiny-headed Mat-rush), *Poa affinis*, *Pteridium esculentum* (Bracken), *Microlaena stipoides* (Weeping Grass), *Entolasia marginata* (Bordered Panic), *Entolasia stricta* (Wiry Panic), *Lepidosperma laterale* (Saw Sedge), *Lomandra multiflora*, *Pomax umbellata* and *Pratia purpurascens* (White Root).

Coastal Enriched Sandstone Moist Forest is a tall open forest with a distinctive mesic shrub and small tree layer that occurs on the upper slopes and dry gullies of Sydney urban areas. Typically, it is situated in sandstone gullies and sheltered slopes enriched by clay. CESMF occurs in areas with an average annual rainfall of 850-1250mm.

The canopy is a mix of native tree species typically including two or more of the following: *Eucalyptus paniculata* (Blackbutt), *E. botryoides* (Southern Mahogany), *Eucalyptus saligna* (Sydney Blue Gum), *Syncarpia glomulifera* (Turpentine) and *Angophora costata* (Smooth-barked Apple). Understorey mid layer is most often dominated by *Allocasuarina torulosa* (Forest Oak), *Elaeocarpus reticulatus* (Blueberry Ash) and *Pittosporum undulatum* (Sweet Pittosporum).

Other common species include *Notelaea longifolia* (Large Mock-olive), *Dodonaea triquetra* (Large-leaf Hop-bush), *Myrsine variabilis* (Mutton Wood), *Breynia oblongifolia* (Coffee Bush) and *Leucopogon lanceolatus* var. *lanceolatus*. Ground layer is dominated by grasses and herbs including *Dianella caerulea* (Blue Flax-lily), *Lomandra longifolia* (Spiny-headed Mat-rush), *Poa affinis*, *Pteridium esculentum* (Bracken), *Microlaena stipoides* (Weeping Grass), *Entolasia marginata* (Bordered Panic), *Entolasia stricta* (Wiry Panic), *Lepidosperma laterale* (Saw Sedge), *Lomandra multiflora*, *Smilax glycyphylla* (Sweet Sarsaparilla) and *Eustrephus latifolius* (Wombat Berry).

A list of flora species recorded within the site have been detailed in **Appendix B**.

## 2.4 Weeds

The *Biosecurity Act 2015* (BA Act) and regulations provide specific legal requirements for state level priority weeds (**Table 3**). Under the BA Act all plants are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.

Specific legal requirements apply to State determined priorities under the Greater Sydney Regional Strategic Weed Management Plan 2017-2022, while Regional priorities include outcomes to demonstrate compliance with the general biosecurity duty and strategical responses in the region to achieve relevant management objectives (Great Sydney Local Land Services 2017). Weeds listed as ‘other weeds of regional concern’ under the plan warrant resources for local control or management programs and are a priority to keep out of the region. Inclusion in this list may assist Local Control Authorities and/or land managers to prioritise action in certain circumstances where it can be demonstrated the weed poses a threat to the environment, human health, agriculture etc. Of the weeds identified during the field survey, **five (5)** have been listed as State level priority weeds and **eighteen (18)** are listed as other weeds of regional concern. The weeds present, their priority listing under the Act, the associated asset / value at risk and whether they are Weeds of National Significance (WoNS), are presented in **Table 3**. A full list of weeds recorded during the field survey is provided in **Appendix B**.

**Table 3: A list of priority weeds and Weeds of National Significance identified within VMP**

Scientific Name	Common Name	WoNS	Biosecurity Act 2015
<b>State level priority weeds (Whole of State)</b>			
<i>Anredera cordifolia</i>	Madeira Vine	Yes	Asset Protection
<i>Asparagus aethiopicus</i>	Asparagus Fern	Yes	Asset Protection
<i>Cestrum parqui</i>	Green Cestrum	No	Asset Protection
<i>Lantana camara</i>	Lantana	Yes	Asset Protection
<i>Rubus fruticosus</i> sp. <i>aggregate</i>	Blackberry	Yes	Asset Protection

Scientific Name	Common Name	WoNS	Biosecurity Act 2015
<b>Regional level priority weed (Greater Sydney Region)</b>			
N/A			
<b>Other weeds of regional concern</b>			
<i>Acer negundo</i>	Box Elder	No	Environment
<i>Agapanthus praecox</i> subsp. <i>orientalis</i>	Agapanthus	No	Environment
<i>Ageratina adenophora</i>	Crofton Weed	No	Environment, Agriculture
<i>Araujia sericifera</i>	Moth Vine	No	Environment
<i>Cardiospermum grandiflorum</i>	Balloon Vine	No	Environment
<i>Cenchrus clandestinus</i>	Kikuyu	No	Environment
<i>Cinnamomum camphora</i>	Camphor Laurel	No	Environment, Agriculture and Human Health
<i>Delairea odorata</i>	Cape Ivy	No	Environment
<i>Eragrostis curvula</i>	African Lovegrass	No	Environment
<i>Ipomoea indica</i>	Blue Morning Glory	No	Environment, Human Health
<i>Ligustrum lucidum</i>	Large-leaved Privet	No	Environment, Human Health
<i>Ligustrum sinense</i>	Small-leaved Privet	No	Environment, Human Health
<i>Lonicera japonica</i>	Japanese Honeysuckle	No	Environment
<i>Nephrolepis cordifolia</i>	Fishbone Fern	No	Environment
<i>Ochna serrulata</i>	Mickey Mouse Plant	No	Environment
<i>Phoenix canariensis</i>	Phoenix Palm	No	Environment
<i>Senna pendula</i> var. <i>glabrata</i>	Cassia	No	Environment
<i>Tradescantia fluminensis</i>	Wandering Jew	No	Environment

The removal of all weeds, in particular the priority weeds listed in **Table 3** should be undertaken by suitably qualified bush regenerators. The best treatment methods and timing of treatment for weeds located within the VMP area can be found in the Weed Management Plan in **Appendix C**.

The control of weeds is required throughout all onsite activities. Wash down of equipment and vehicles prior to and after use is required to minimise the introduction and spread of weed propagules. All weeds are to be treated prior to becoming an environmental threat according to best management practices (see **Appendix D** for protocols and procedures).





Figure 2: Vegetation communities within the VMP area

### 3. Construction and preliminary works

The civil construction company shall be responsible for the following works.

#### 3.1 Temporary fencing and signage

The edge of the VMP area along Epping Road and along the inner boundary between the E2 area and the development footprint is to be fenced with temporary construction fencing to prevent civil construction machinery from entering the VMP, with one exception; civil construction machinery can enter management zone 4 to assist with installation of mulch under the direct supervision of a suitably qualified and experienced ecologist or bush regenerator. Sediment fencing will also be required to prevent sediment movement into the VMP area.

Informational signage must be installed on the construction fencing stating that there is to be no entry into the VMP area, with the exception of the delivery and spreading of mulch which can only be undertaken with an ecologist or bush regenerator present.

#### 3.2 Permanent fencing

The City of Ryde Council requires that the edge of the VMP area along Epping Road and along the inner boundary between the E2 area and the development is protected from disturbance using permanent fencing at the end of the construction period. The City of Ryde Council generally recommends post and rail fencing using recycled black recycled plastic posts (1200mm) and 50mm water pipe double. Interpretive signage is to be located at strategic locations to advise local residents of the importance of the bushland and its habitat. Interpretive signage should be located at key access locations, including existing trails and at the rear of residential properties. Signage should contain the following information:

*‘The vegetation within this property is protected. Activities such as firewood collection, bushrock removal, picking of native flowers and dumping of garden waste are prohibited.’*

#### 3.3 Soil and water management

An Erosion and Sediment Control Plan as part of a Construction Environmental Management Plan, must be developed and implemented prior to any on-ground works. These should be in accordance with best practice management as described in Landcom’s Blue Book (2004).

Prior to construction commencing, sediment fencing will be required around the construction area to prevent sediment running into the VMP area and limit the spread of weed propagules in soil sediments during the construction period.

#### 3.4 Reducing the spread of pathogens and diseases

To reduce the spread of pathogens and diseases, ensure Arrive Clean, Leave Clean Guidelines (Department of the Environment, 2015) should be adhered to:

- Ensure all clothing, hats, footwear, tools, equipment, machinery and vehicles are free of mud, soil and organic matter before entering and exiting bushland



- Ensure any soil, plants or other materials entering the site are certified free of weeds and pathogens.

A dedicated washdown location, at the entry/exit of the site is to be determined prior to construction works. If weeds or pathogens are known to be present within the development site, **Appendix D** must be adhered to.

### 3.5 Fauna habitat enhancement

All hollow bearing tree sections removed from the development in accordance with the BMP (ELA 2021) are to be placed on the ground in the VMP area as habitat. The placement of all fauna habitat augmentation/relocation is to be carried out under the supervision of a qualified ecologist.

## 4. Vegetation management works

### 4.1 VMP management zones

The total VMP area is **1.29 ha** and encompasses the area to the south of the proposed residential development (**Figure 3**). There are **5** management zone for this VMP:

- Zone 1: Assisted Regeneration
- Zone 2: Regeneration
- Zone 3: Revegetation
- Zone 4: Revegetation (Shrimptons Creek)
- Zone 5: Regeneration (Shrimptons Creek)

#### 4.1.1 Zone 1: Assisted Regeneration

Zone 1 encompasses approximately **0.24 ha** of vegetation in the north western corner of the VMP area.

The vegetation throughout this zone is moderate condition PCT 1281 *Turpentine – Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion* (STIF). This Zone is predominantly comprised of an intact canopy of *Eucalyptus paniculata* (Blackbutt) as well as woody weeds including *Lantana camara* (Lantana), *Ligustrum lucidum* (Large-leaved Privet), vines such as *Lonicera japonica* (Japanese Honeysuckle) and grasses such as *Ehrharta erecta* (Panic Veldtgrass). Patches of *Kunzea ambigua* (Tick Bush) and *Imperata cylindrica* (Blady Grass) are also present.

Weed management works in this Zone should include cut and painting all woody weeds and spot spraying vines and grasses using a non-selective herbicide (e.g. Roundup Biactive®). This will likely require a minimum of at least two spray treatments, with follow-up required if further germination of weeds occurs.

For more information on specific weed control techniques, see **Appendix E**.

Following primary weed control, approximately 40% of this zone is expected to require revegetation of shrubs and groundcovers to reinstate the native STIF community throughout all vegetation strata as identified in **Table 4**, with revegetation densities as identified in **Table 5**. All plantings need to be local provenance STIF species as per the recommended planting list included in **Appendix F**.

#### 4.1.2 Zone 2: Regeneration

Zone 2 encompasses approximately **0.51 ha** of remnant bushland.

The vegetation throughout this zone is good condition PCT 1281 *Turpentine – Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion* with intact native canopy, shrubs and groundcovers. Woody weeds such as *Lantana camara* (Lantana), *Ligustrum lucidum* (Large-leaved Privet) are also present in low densities.

Weed management works in this Zone should include cut and painting all woody weeds using a non-selective herbicide (e.g. Roundup Biactive®).

#### 4.1.3 Zone 3: Revegetation

Zone 3 encompasses approximately **0.24 ha** of vegetation in the south eastern corner of the VMP area.

The vegetation throughout this zone is moderate to poor condition PCT 1841 *Smooth-barked Apple – Turpentine – Blackbutt tall open forest on enriched sandstone slopes and gullies of the Sydney region* with intact native canopy, dense exotic midstorey and minimal ground layer. This Zone is predominantly comprised of *Eucalyptus paniculata* (Blackbutt) and *Angophora costata* (Smooth-barked Apple) as well as woody weeds including *Lantana camara* (Lantana), and *Ligustrum lucidum* (Large-leaved Privet).

Following primary weed control, approximately 70% of this Zone is expected to require revegetation of shrubs and groundcovers to reinstate the native CESMF community throughout all vegetation strata as identified in **Table 4**, with revegetation densities as identified in **Table 5**. All plantings need to be local provenance CESMF species as per the recommended planting list included in **Appendix F**.

#### 4.1.4 Zone 4: Revegetation (Shrimptons Creek)

Zone 4 encompasses approximately 0.06 ha of riparian vegetation adjacent to Shrimptons Creek. This Zone is comprised of two sections 20 m in length, one either side of the proposed road. The vegetation throughout this zone is poor condition PCT 1841 *Smooth-barked Apple – Turpentine – Blackbutt tall open forest on enriched sandstone slopes and gullies of the Sydney region*. This Zone is predominantly comprised of *Eucalyptus paniculata* (Blackbutt) and *Angophora floribunda* (Rough-barked Apple) as well as woody weeds including *Ligustrum lucidum* (Large-leaved Privet). The majority of the groundlayer is covered in dense *Ipomoea indica* (Blue Morning Glory).

Following primary weed control, approximately 100% of this zone is expected to require revegetation of trees, shrubs and groundcovers to reinstate the native CESMF community throughout all vegetation strata as identified in **Table 4**, with revegetation densities as identified in **Table 5**. All plantings need to be local provenance CESMF species as per the recommended planting list included in **Appendix F**.

#### 4.1.5 Zone 5: Regeneration (Shrimptons Creek)

Zone 5 encompasses approximately 0.23 ha of riparian vegetation adjacent to Shrimptons Creek. This Zone is in two parts with a small section to the north of Zone 4 with the remainder of the Zone located to the south of Zone 4 and to the North of Epping Road. The vegetation throughout this zone is PCT 1841 *Smooth-barked Apple – Turpentine – Blackbutt tall open forest on enriched sandstone slopes and gullies of the Sydney region*, mostly in poor condition with the exception of a small section in the southern half of the Zone that is in moderate condition. This Zone is predominantly comprised of *Eucalyptus paniculata* (Blackbutt) and *Angophora floribunda* (Rough-barked Apple) as well as woody weeds including *Ligustrum lucidum* (Large-leaved Privet). The majority of the groundlayer is covered in dense *Ipomoea indica* (Blue Morning Glory).

No revegetation is currently planned for this Zone as landscape works are expected to occur at a later date.

#### 4.1.6 Primary and secondary weed control

Primary weed control is to be undertaken in the establishment phase and includes the initial treatment of woody weeds, vines and exotic grasses and groundcovers, specifically the control of

*Lantana camara* (Lantana), *Ligustrum lucidum* (Large-leaved Privet), *Ipomoea indica* (Blue Morning Glory), *Ehrharta erecta* (Panic Veldtgrass) and *Asparagus aethiopicus* (Asparagus Fern). *Agapanthus praecox* subsp. *orientalis* (Agapanthus) plants can be dug out, ensuring the whole root is removed. Woody weeds can be treated using cut and paint method. Woody weeds adjacent to the creek line are to be cut, treated and left in situ if close to the creek line to prevent localised erosion impacts.

Chemical control techniques will be required for grasses and groundcovers with the exception being adjacent to the creek line, near waterways or drainage lines where no spraying should be undertaken to limit pollution. The treatment of exotic grass and groundcover in these sections should be limited to hand removal only.

Secondary weed control is also to be undertaken in the establishment period as and includes follow up treatments of all weed seedling growth after initial weed treatment as well as overlooked weeds. Chemical and mechanical control techniques will be required in follow up treatments. During these weed control activities, care must be taken to avoid natural regeneration of native species. For more information on specific weed control techniques, see **Appendix E**.

#### 4.1.7 Maintenance

Following primary and secondary weed removal, all areas will require ongoing maintenance for a period of 10 years to control weed regrowth from the soil seed bank. The maintenance period will commence at the completion of all establishment period works. Maintenance work is to be undertaken by a qualified bush regeneration contractor(s) as per specifications provided in **Appendix E**.

Maintenance will be undertaken on a regular basis in the peak growing seasons (spring and summer), with less frequent visits in cooler periods (autumn and winter). Maintenance work will include actions to encourage native regeneration where it is not occurring naturally. These actions include techniques such as soil disturbance, niche seeding and transplanting.

## 4.2 Revegetation

Revegetation works are required within Zone 1, 3 and Zone 4. It is assumed that natural regeneration will occur within Zone 2 following targeted weed removal. Revegetation works will include planting of native groundcover, grass, shrub and canopy species using tube stock and Hiko / Viro cells. The revegetation area within each management zone is shown in **Table 4**.

Mulch, where needed, is to be applied providing a depth of 100mm. Mulch can be sourced from native vegetation earmarked for removal from the development area or externally sourced. Jute matting is to be used instead of mulch in areas of high erosional potential along Shrimptons Creek.

Planting densities for the management zones are provided in **Table 5**. A recommended planting list is provided in **Appendix F**. All plantings are to be sourced from local provenance stock as per the Florabank guidelines (Mortlock, 2000). More information on revegetation and seed collection specifications is provided in **Appendix E**.

**Table 4: Planting assumptions**

Zone	Description	Total area (m <sup>2</sup> )	Reveg. Area (%)	Reveg. area (m <sup>2</sup> )	Mulch Area (%)	Mulch area (m <sup>2</sup> )	Jute Matt Area (%)	Jute Matt area (m <sup>2</sup> )
1	Assisted Regeneration	2,448	40	979	0	0	0	0
2	Regeneration	5,094	-	-	0	0	0	0
3	Revegetation	2,439	70	1,707	0	0	0	0
4	Revegetation (Shrimptons Creek)	590	100	590	90	531	10	59
5	Regeneration (Shrimptons Creek)	2,320	-	-	0	0	0	0
		<b>12,891</b>		<b>3,276</b>		<b>531</b>		<b>59</b>

Table 5: Revegetation densities

Zone	Description	PCT	Reveg. area (m <sup>2</sup> )	Planting densities (per m <sup>2</sup> )				Total numbers
				Tree	Shrub	Herb /Scrambler	Sedge /Grass	
1	Assisted Regeneration	1281	979	-	1/5	1.00	3.00	<b>4,113</b>
2	Regeneration	1281	-	-	-	-	-	<b>0</b>
3	Revegetation	1841	1,707	-	1/5	1.00	3.00	<b>7,171</b>
4	Revegetation (Shrimptons Creek)	1841	590	1/20	1/5	1.00	3.00	<b>2,506</b>
5	Regeneration (Shrimptons Creek)	1841	-	-	-	-	-	<b>0</b>
<b>Total</b>			<b>3,276</b>	<b>29</b>	<b>655</b>	<b>3,276</b>	<b>9,829</b>	<b>13,790</b>



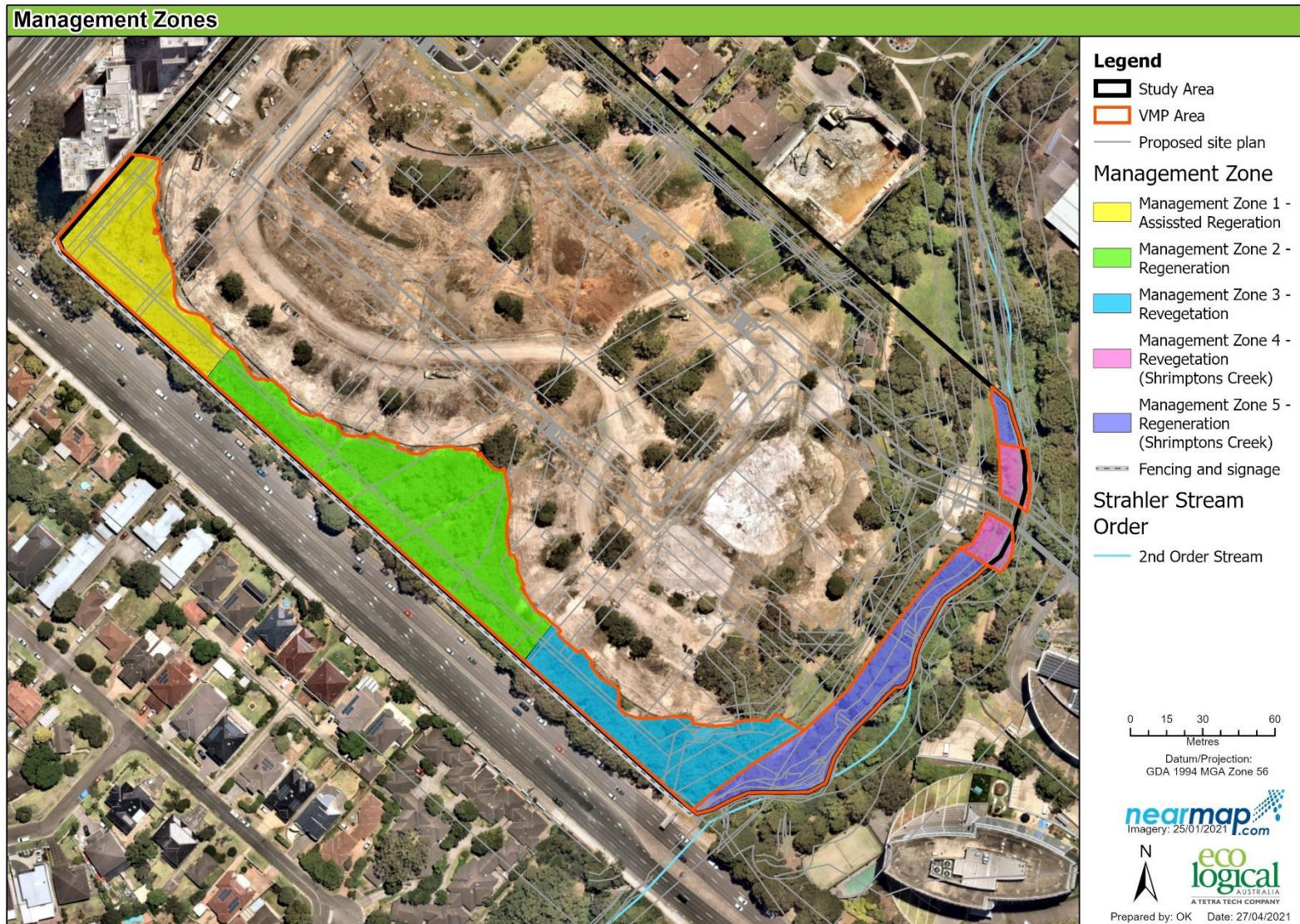


Figure 3: Vegetation management zones

## 5. Implementation schedule

### 5.1 Implementation schedule

The VMP area will be managed in perpetuity with an initial implementation maintenance period of ten years which will commence at the completion of all establishment phase works.

An indicative implementation schedule for the establishment period and initial ten year maintenance period has been provided in **Table 6** and **Table 7**. Responsibilities have been identified as below:

Key	Civil construction activities
	Vegetation management works

### 5.2 Adaptive management

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

The success of the works will be determined by meeting the performance criteria identified in **Table 8**. Contractors have the flexibility to implement different techniques to those specified here providing that performance criteria are met. Any major departures from the VMP or proposed changes to performance criteria must be approved in writing by the City of Ryde Council.

### 5.3 VMP management after the initial ten-year maintenance period (in perpetuity)

After the completion of all works described within this VMP, on-going inspection of the vegetation within the VMP area is to be carried out at least every three years to ensure the site meets the performance criteria. Areas that do not conform to the performance criteria after the initial-ten year period are required to be rehabilitated using the methods outlined within this VMP until such time that the performance criteria is met. Survey at these inspections is to focus on both priority and environmental weed populations.

**Table 6: Implementation schedule (Establishment period and Years 1 – 5)**

	Establishment Period	Year 1				Year 2				Year 3				Year 4				Year 5				
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	
<b>Civil works</b>																						
Install construction fencing																						
Install sediment fencing																						
Install informational signage																						
<b>Revegetation</b>																						
Seed collection, cleaning, storage																						
Site Preparation																						
Install jute matt and mulch																						
Tubestock, supply and install																						
Replacement tubestock, supply and install																						
Irrigation																						
<b>Weed control</b>																						
Primary																						
Secondary																						
Maintenance																						
<b>Other works</b>																						
Monitoring and reporting																						



**Table 7: Implementation schedule (Years 6 – 10)**

	Year 6				Year 7				Year 8				Year 9				Year 10			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
<b>Civil works</b>																				
Install construction fencing																				
Install sediment fencing																				
Install informational signage																				
<b>Revegetation</b>																				
Seed collection, cleaning, storage																				
Site Preparation																				
Install jute matt and mulch																				
Tubestock, supply and install																				
Replacement tubestock, supply and install																				
Irrigation																				
<b>Weed control</b>																				
Primary																				
Secondary																				
Maintenance																				
<b>Other works</b>																				
Monitoring and reporting																				

## 6. Monitoring and reporting

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

The aim of monitoring is to measure the effectiveness of the control actions being undertaken to achieve the desired outcome. It will identify non-conformance and provide the land manager with the ability to implement corrective actions. Information derived from the results of monitoring will also be used in adaptive management (i.e. learning from past experience to inform future priorities and work plans). For example, as annual grass weeds are removed, herbaceous and perennial weeds may establish.

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

### 6.1 Monitoring

Monitoring will be undertaken by photo monitoring and vegetation surveys. Monitoring will need to be implemented prior to works commencing to establish a benchmark for performance, and to occur on an annual basis until the completion of the project. Monitoring results will be included in the progress report.

#### 6.1.1 Photo monitoring

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

- set up a minimum of **seven** photo monitoring points within the VMP area
- place two six-foot star pickets 10 m apart
- record the location (eastings and northings) of the first star picket with a GPS
- as well as the bearing to the second star picket
- take a digital photo from the first star picket looking towards the second star picket, showing the entire length of first star picket

Label each digital image with a unique reference number that indicates where the photo was taken (i.e. the photo monitoring point) and the date it was taken (e.g. 01\_200330 for a photo taken at the first photo monitoring point on the 30th March 2020).

#### 6.1.2 Vegetation surveys

Quadrat data points will be within the VMP area to monitor changes in the vegetation through time. A minimum of **seven** quadrat data points are to be set up within the VMP area. The quadrat data forms the baseline for monitoring against the performance criteria for the first ten years of the duration of the VMP. Floristic plot data is to be collected including species richness, cover and abundance in a 10x10 m quadrat.

## 6.2 Progress reports

A baseline report is to be prepared prior to works being undertaken to establish a benchmark for performance of works over time.

Progress reports are then to be provided at the completion of the establishment period, on an annual basis throughout the maintenance period of the VMP and then every three years thereafter in perpetuity. This reporting includes the implementation of the monitoring actions specified in **Section 6.1** and a description of the works that have been undertaken. These reports will be submitted to the City of Ryde Council. Reports will include at a minimum:

- the time period the report relates to
- qualifications and experience of contractors
- certification of seed and local provenance stock
- a summary of works carried out within the period including:
  - date and time of site visits
  - works completed on the site at each visit
  - a table detailing total person hours for each task carried out on site
  - methods of weeding undertaken and details of herbicide use
  - numbers of tubestock planted if applicable
  - methods implemented for Assisted Natural Regeneration
- photo monitoring results to date
- a description of any problems encountered in implementing the works outlined in this VMP and how they were overcome
- 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
- if applicable, the results of the implementation works in relation to the relevant performance criteria.

## 6.3 Performance criteria

The performance criteria are detailed in **Table 8**. Failure to meet these performance criteria will mean that the maintenance period will be extended until they are achieved. Therefore, maintenance must continue until the City of Ryde Council agrees that the objectives and performance criteria have been met and the maintenance period has concluded. The author of this VMP or equally qualified and experienced person must prepare a statement certifying the compliance of the performance criteria at the end of the ten-year maintenance period.

If monitoring indicates that the VMP tasks are not resulting in achievement of the performance criteria, the task program will be revised. The project manager and the bush regeneration contractor, in consultation with the City of Ryde Council, can adapt these criteria as required in response to the success of rehabilitation works. In addition, the following performance criteria will need to be achieved in perpetuity:

- Across the VMP area, <2% priority weeds cover and <4% environmental weeds cover
- No dumped garden waste within the VMP area

- No bare areas >5m<sup>2</sup> or erosion from exposed surface
- Species richness and cover goals after the initial ten-year maintenance period based on BioNet Benchmark conditions for vegetation communities present on site (**Table 9**).

Table 8: Performance criteria

Management Zones	Establishment Period	Year 1 – 2	Year 3 – 5	Year 6 – 8	Year 9 – 10	
All Zones		<ul style="list-style-type: none"> <li>Commencement of all tasks outlined in the VMP or evidence of planning for their implementation</li> </ul>				
		<p><i>Civil construction works:</i></p> <ul style="list-style-type: none"> <li>All construction and sediment fencing installed</li> <li>Information signage installed</li> <li>All earthworks completed under the supervision of an ecologist or bush regenerator</li> <li>Soil preparation works completed to specifications in <b>Section 3.3</b></li> <li>All rubbish and debris removed</li> </ul> <p><i>Vegetation management works:</i></p> <ul style="list-style-type: none"> <li>Revegetation is to be undertaken with a minimum of 40% of the benchmark levels for species diversity provided in <b>Table 9</b></li> <li>Maintenance replanting is to replace plants by the same species, or where that species is not available, with the same growth form (i.e. tree for tree, etc.) and must not decrease species diversity. Any new species must be from the community being emulated and of local provenance</li> <li>Treatment of any new weed infestations</li> <li>No woody weeds present which are capable of producing seeds</li> <li>No erosion or sedimentation beyond the boundary of the development lot</li> <li>Monitoring and reporting undertaken in accordance with <b>Section 6</b>.</li> </ul>				
All Zones		<ul style="list-style-type: none"> <li>Treat 100% of priority weeds</li> <li>Treat 95% of other weeds</li> <li>Treatment of new weed breakouts</li> <li>Shrub and groundcover no less than 40% of their benchmark levels provided in <b>Table 9</b>.</li> </ul>	<ul style="list-style-type: none"> <li>Treatment of new weed outbreaks</li> <li>Shrub and groundcover no less than 40% of their benchmark levels provided in <b>Table 9</b>.</li> </ul>	<ul style="list-style-type: none"> <li>Treatment of new weed outbreaks</li> <li>Shrub and groundcover no less than 40% of their benchmark levels provided in <b>Table 9</b>.</li> </ul>	<ul style="list-style-type: none"> <li>Treatment of new weed outbreaks</li> <li>Shrub and groundcover no less than 40% of their benchmark levels provided in <b>Table 9</b>.</li> </ul>	<ul style="list-style-type: none"> <li>Treatment of new weed outbreaks</li> <li>Shrub and groundcover no less than 40% of their benchmark levels provided in <b>Table 9</b>.</li> </ul>
Zones 1 and 3		<ul style="list-style-type: none"> <li>Native vegetation cover no less than 50%</li> <li>85% survival rate of plantings, replacement plantings where required</li> </ul>	<ul style="list-style-type: none"> <li>Native vegetation cover no less than 60%</li> <li>85% survival rate of plantings, replacement plantings where required</li> </ul>	<ul style="list-style-type: none"> <li>Native vegetation cover no less than 70%</li> <li>85% survival rate of plantings, replacement plantings where required</li> </ul>	<ul style="list-style-type: none"> <li>Native vegetation cover no less than 80%</li> <li>85% survival rate of plantings, or equivalent regeneration</li> </ul>	<ul style="list-style-type: none"> <li>Native vegetation cover no less than 90%</li> <li>85% survival rate of plantings, or equivalent regeneration*</li> </ul>

Management Zones	Establishment Period	Year 1 – 2	Year 3 – 5	Year 6 – 8	Year 9 – 10
	<ul style="list-style-type: none"> <li>• Suppression of all weeds during revegetation</li> <li>• No greater than 20% cover by priority weeds</li> <li>• No greater than 30% cover by other weeds</li> </ul>	<ul style="list-style-type: none"> <li>• No greater than 15% cover by priority weeds</li> <li>• No greater than 25% cover by other weeds</li> </ul>	<ul style="list-style-type: none"> <li>• No greater than 10% cover by priority weeds</li> <li>• No greater than 20% cover by other weeds</li> </ul>	<ul style="list-style-type: none"> <li>• No greater than 5% cover by priority weeds</li> <li>• No greater than 10% cover by other weeds</li> </ul>	<ul style="list-style-type: none"> <li>• No greater than 2% cover by priority weeds</li> <li>• No greater than 4% cover by other weeds</li> </ul>
Zone 2	<ul style="list-style-type: none"> <li>• No greater than 20% cover by priority weeds</li> <li>• No greater than 30% cover by other environmental weeds</li> </ul>	<ul style="list-style-type: none"> <li>• No greater than 15% cover by priority weeds</li> <li>• No greater than 25% cover by other environmental weeds</li> </ul>	<ul style="list-style-type: none"> <li>• No greater than 10% cover by priority weeds</li> <li>• No greater than 20% cover by other environmental weeds</li> </ul>	<ul style="list-style-type: none"> <li>• No greater than 5% cover by priority weeds</li> <li>• No greater than 10% cover by other environmental weeds</li> </ul>	<ul style="list-style-type: none"> <li>• No greater than 2% cover by priority weeds</li> <li>• No greater than 4% cover by other environmental weeds</li> </ul>
Zone 4	<ul style="list-style-type: none"> <li>• Native vegetation cover no less than 30%</li> <li>• 85% survival rate of plantings, replacement plantings where required</li> <li>• No greater than 25% cover by priority weeds</li> <li>• No greater than 40% cover by other environmental weeds</li> </ul>	<ul style="list-style-type: none"> <li>• Native vegetation cover no less than 40%</li> <li>• 85% survival rate of plantings, replacement plantings where required</li> <li>• No greater than 20% cover by priority weeds</li> <li>• No greater than 30% cover by other environmental weeds</li> </ul>	<ul style="list-style-type: none"> <li>• Native vegetation cover no less than 50%</li> <li>• 85% survival rate of plantings, replacement plantings where required</li> <li>• No greater than 15% cover by priority weeds</li> <li>• No greater than 20% cover by other environmental weeds</li> </ul>	<ul style="list-style-type: none"> <li>• Native vegetation cover no less than 70%</li> <li>• 85% survival rate of plantings, replacement plantings where required</li> <li>• No greater than 5% cover by priority weeds</li> <li>• No greater than 10% cover by other environmental weeds</li> </ul>	<ul style="list-style-type: none"> <li>• Native vegetation cover no less than 80%</li> <li>• 85% survival rate of plantings, replacement plantings where required</li> <li>• No greater than 2% cover by priority weeds</li> <li>• No greater than 4% cover by other environmental weeds</li> </ul>
Zone 5	<ul style="list-style-type: none"> <li>• No greater than 30% cover by priority weeds</li> <li>• No greater than 40% cover by other environmental weeds</li> </ul>	<ul style="list-style-type: none"> <li>• No greater than 20% cover by priority weeds</li> <li>• No greater than 30% cover by other environmental weeds</li> </ul>	<ul style="list-style-type: none"> <li>• No greater than 15% cover by priority weeds</li> <li>• No greater than 20% cover by other environmental weeds</li> </ul>	<ul style="list-style-type: none"> <li>• No greater than 5% cover by priority weeds</li> <li>• No greater than 10% cover by other environmental weeds</li> </ul>	<ul style="list-style-type: none"> <li>• No greater than 2% cover by priority weeds</li> <li>• No greater than 4% cover by other environmental weeds</li> </ul>

*\*Installed canopy tree and some shrub plantings are not expected to achieve BioMetric benchmark cover abundances identified in **Table 9** by the end of the ten-year VMP period. However, canopy trees and shrubs must achieve the densities included in **Table 9**, achieve 85% survival rate and must be at a height to suggest health, vigour and capacity to achieve BioMetric cover abundances*

**Table 9: Benchmark conditions for vegetation communities within the VMP area**

PCT - ID	PCT – Common name (community) (BioNet 2017)	Species Richness			Cover* (%)		
		Canopy	Shrub	Groundcover #	Canopy	Shrub	Groundcover
PCT 1281	Turpentine – Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion	7	13	24	63	30	49
PCT 1395	Smooth-barked Apple – Turpentine – Blackbutt tall open forest on enriched sandstone slopes and gullies of the Sydney region	8	15	19	43	60	25

\* Based on monthly average following average rainfall year.

# Includes grasses, forbs and ferns

## 7. Cost

The cost of implementation for ten-year period is approximately **\$357,000** exclusive of GST and CPI. An indicative annual costing timeline is provided in **Table 10** and **Table 11**. Rates and costs are based on typical commercial rates. Assumptions that have been made regarding the estimation of costs have been outlined below.

### 7.1 Construction and preparation works

Civil construction activities are identified in **Table 8** and have not been included in **Table 10** and **Table 11**.

### 7.2 Vegetation management works

#### 7.2.1 Site preparation techniques

Costings have assumed that truck access will be possible for the installation of mulch in Management Zone 4. If truck access is not available, then this may be an additional cost. If additional mulch or jute matting is required due to changes in the resilience of the site, this may be an additional cost.

#### 7.2.2 Weed control techniques

Bush regeneration contractors will implement the weed control treatments identified in this VMP. These works have been estimated to cost **\$2,200** for a team of four bush regenerators, including a supervisor, per day. The cost of bush regeneration works includes the costs of herbicide, vehicles and equipment which are required to implement the VMP.

#### 7.2.3 Revegetation treatments

Bush regeneration contractors will implement the revegetation treatments identified in this VMP. Tubestock costs have been budgeted at an estimated \$3.50 per tree and shrub including, planting, water crystals, fertiliser and initial watering, and an estimated \$2.50 per grass, sedge and groundcover including planting, water crystals and initial watering.

A total of approximately **13,790** plants will be required to achieve the densities identified in the VMP. The total estimated cost of revegetation is approximately **\$38,675** for tubestock installation, including a 10% rate for replacement plantings to be installed throughout the remainder of the VMP period after initial revegetation works.

#### 7.2.4 Seed collection

Budget for the collection of seed has been included as a separate task. This is an indicative figure and does not take into account the risks from climactic variable. If further seed collection works are required, this may be an additional cost.

#### 7.2.5 Monitoring and reporting

Bush regeneration contractors or ecologists will undertake the monitoring and reporting identified in this VMP. This includes:

- initial setup of the photo points and conducting the baseline surveys



- preparing a yearly report, including photo points and vegetation surveying until the completion of the project

Table 10: Indicative VMP costings (Establishment period and Years 1 – 5)

Treatment	Establishment	Maintenance					Total (Years 1 – 5)
		Year 1	Year 2	Year 3	Year 4	Year 5	
<b>Revegetation</b>							
Seed collection, cleaning, storage	\$ 2,068	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,068
Site Preparation	\$ 1,638	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1,638
Jute matting / mulch	\$ 3,862						\$ 3,862
Tubestock, supply and install	\$ 35,159	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 35,159
Replacement tubestock, supply and install	\$ -	\$ 3,516	\$ -	\$ -	\$ -	\$ -	\$ 3,516
Irrigation	\$ 3,276	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 3,276
<b>Weed control</b>							
Primary	\$ 42,081	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 42,081
Secondary	\$ 30,289	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 30,289
Maintenance – Year 1 - 5	\$ -	\$ 28,035	\$ 28,035	\$ 22,428	\$ 16,821	\$ 16,821	\$ 112,141
Maintenance – Year 6 - 10	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
<b>Associated costs</b>							
Disbursements	\$ 7,237	\$ 2,804	\$ 2,804	\$ 2,243	\$ 1,682	\$ 1,682	\$ 18,451
Monitoring & Reporting	\$ 4,102	\$ 2,051	\$ 2,051	\$ 2,051	\$ 2,051	\$ 2,051	\$ 14,358
<b>Totals</b>	<b>\$ 129,714</b>	<b>\$ 36,406</b>	<b>\$ 32,890</b>	<b>\$ 26,722</b>	<b>\$ 20,554</b>	<b>\$ 20,554</b>	<b>\$ 266,840</b>

Table 11: Indicative VMP costings (Years 6 – 10)

Treatment	Maintenance					Total (Year 6 – 10)	Grand Total
	Year 6	Year 7	Year 8	Year 9	Year 10		
<b>Revegetation</b>							
Seed collection, cleaning, storage	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,068
Site Preparation	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1,638
Jute matting / mulch	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 3,862
Tubestock, supply and install	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 35,159
Replacement tubestock, supply and install	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 3,516
Irrigation	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 3,276
<b>Weed control</b>							
Primary – Year 1	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 42,081
Secondary – Year 2	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 30,289
Maintenance – Year 3 - 5	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 112,141
Maintenance – Year 6 - 10	\$ 14,582	\$ 14,582	\$ 14,582	\$ 14,582	\$ 14,582	\$ 72,911	\$ 72,911
<b>Associated costs</b>							
Disbursements	\$ 1,458	\$ 1,458	\$ 1,458	\$ 1,458	\$ 1,458	\$ 7,291	\$ 25,742
Monitoring & Reporting	\$ 2,051	\$ 2,051	\$ 2,051	\$ 2,051	\$ 2,051	\$ 10,254	\$ 24,614
<b>Totals</b>	<b>\$ 18,091</b>	<b>\$ 18,091</b>	<b>\$ 18,091</b>	<b>\$ 18,091</b>	<b>\$ 18,091</b>	<b>\$ 90,456</b>	<b>\$ 357,299</b>

## References

- Brodie, L. 1999. *The National Trust Bush Regenerators Handbook*. National Trust of Australia (NSW).
- Buchanan, R.A. 2000. *Bush regeneration: recovering Australian landscapes*. 2nd ed., TAFE NSW, Sydney.
- Commonwealth Department of the Environment and Energy (DoEE 2004) *Catalogue of fence designs*. Online resource: <https://www.environment.gov.au/system/files/resources/b39c119e-c58a-4473-9507-db68da31a95c/files/catalogue.pdf>
- Department of the Environment. 2015. *Arrive Clean, Leave Clean*. Australian Government.
- Department of Infrastructure, Planning and Natural Resources (DoIPNR) 2003. *Bringing the bush back – Best practice guidelines for bush regeneration on the Cumberland Plain*. Online resource: [http://www.aabr.org.au/images/stories/resources/manuals/bringing\\_the\\_bush\\_back.pdf](http://www.aabr.org.au/images/stories/resources/manuals/bringing_the_bush_back.pdf) Accessed 18 June 2018.
- Eco Logical Australia 2019. *Ivanhoe Estate Re-development SSD 17\_8707 - Biodiversity Assessment Report and Offset Strategy*. Prepared for Frasers Property Australia - Rhodes.
- Eco Logical Australia 2021. *Ivanhoe Estate: Biodiversity Management Plan*. Prepared for Frasers Property Australia Australia Pty Ltd
- Office of Environment and Heritage (OEH) 2013. *The Native Vegetation of the Sydney Metropolitan Area. Volume 2: Vegetation Community Profiles*. Version 2.0. NSW Office of Environment and Heritage, Sydney.
- Greater Sydney Local Land Services 2017. *Greater Sydney Regional Strategic Weed Management Plan 2017 - 2022*.
- Mortlock, W. 2000. *The Hawkesbury-Nepean Catchment Management Authority (2000) Florabank Guideline 10: Seed collection ranges for revegetation*. Online resource: <http://www.florabank.org.au/files/documents/Guideline%20No.%2010%20-%20Seed%20collection%20ranges%20for%20revegetation.pdf> Accessed 19 June 2018.
- Sydney Metropolitan Catchment Management Authority (SMCMA) 2016. *Native Vegetation of the Sydney Metropolitan Area*. OEH, Sydney.
- Tozer, M. 2003. The native vegetation of the Cumberland Plain, *Western Sydney: systematic classification and field identification of communities*. *Cunninghamia* 8(1): 1-75.

## Appendix A Development plan



## Appendix B Existing vegetation species list

Scientific name	Common name
<b>Native species</b>	
<i>Acacia elata</i>	Cedar Wattle
<i>Acacia longifolia</i>	Sydney Golden Wattle
<i>Acacia parramattensis</i>	Parramatta Wattle
<i>Acacia ulicifolia</i>	Prickly Moses
<i>Allocasuarina littoralis</i>	Black She-oak
<i>Alternanthera denticulata</i>	Lesser Joyweed
<i>Angophora costata</i>	Smooth-barked Apple
<i>Angophora floribunda</i>	Rough-barked Apple
<i>Billardiera scandens</i>	Apple Berry
<i>Bursaria spinosa</i>	Black Thorn
<i>Callistemon linearis</i>	Narrow-leaved Bottlebrush
<i>Cayratia clematidea</i>	Native Grape
<i>Commelina cyanea</i>	Scurvy Weed
<i>Dianella caerulea</i>	Blue Flax-lily
<i>Dodonaea triquetra</i>	Common Hopbush
<i>Elaeocarpus reticulatus</i>	Blueberry Ash
<i>Entolasia stricta</i>	Wiry Panic
<i>Eucalyptus pilularis</i>	Blackbutt
<i>Eucalyptus resinifera</i>	Red Mahogany
<i>Eucalyptus saligna</i>	Sydney Blue Gum
<i>Glycine clandestina</i>	Twining Glycine
<i>Goodenia hederacea</i>	Forest Goodenia
<i>Hardenbergia violacea</i>	Coral Pea Flower
<i>Imperata cylindrica</i>	Blady Ggrass
<i>Kunzea ambigua</i>	Tick Bush
<i>Lepidosperma laterale</i>	Variable Sawsedge
<i>Leucopogon juniperinus</i>	Prickly Beard-heath
<i>Lomandra longifolia</i>	Spiny-head Mat-rush
<i>Melaleuca decora</i>	White Feather Honeymyrtle
<i>Microlaena stipoides</i>	Weeping Grass

Scientific name	Common name
<i>Oplismenus imbecillis</i>	Basket Grass
<i>Ozothamnus diosmifolius</i>	Rice Flower
<i>Pittosporum undulatum</i>	Sweet Pittosporum
<i>Polyscias sambucifolia</i>	Elderberry Panax
<i>Pomax umbellata</i>	Pomax
<i>Pratia purpurascens</i>	White Root
<i>Pseuderanthemum variabile</i>	Pastel flower
<i>Pteridium esculentum</i>	Bracken Fern
<i>Smilax glycyphylla</i>	Sweet Sarsaparilla
<i>Syncarpia glomulifera</i>	Turpentine
<i>Themeda triandra</i>	Kangaroo grass
<i>Xanthorrhoea resinosa</i>	Grass Tree
<b>Exotic species</b>	
<i>Acer negundo</i>	Box Elder
<i>Agapanthus praecox subsp. orientalis</i>	Agapanthus
<i>Ageratina adenophora</i>	Crofton Weed
<i>Anredera cordifolia*</i>	Madeira Vine
<i>Araujia sericifera</i>	Moth Vine
<i>Asparagus aethiopicus*</i>	Asparagus Fern
<i>Bidens pilosa</i>	Cobbler's Pegs
<i>Bromus catharticus</i>	Bromus
<i>Cardiospermum grandiflorum</i>	Balloon Vine
<i>Cenchrus clandestinus</i>	Kikuyu
<i>Cestrum parqui*</i>	Green Cestrum
<i>Cinnamomum camphora</i>	Camphor Laurel
<i>Colocasia esculenta</i>	Taro
<i>Conyza bonariensis</i>	Fleabane
<i>Cyperus eragrostis</i>	Umbrella sedge
<i>Delairea odorata</i>	Cape Ivy
<i>Ehrharta erecta</i>	Panic Veldtgrass
<i>Eragrostis curvula</i>	African Lovegrass
<i>Galinsoga parviflora</i>	Potato Weed
<i>Hypochaeris radicata</i>	Flatweed



Scientific name	Common name
<i>Ipomoea indica</i>	Blue Morning Glory
<i>Jacaranda mimosifolia</i>	Jacaranda
<i>Lantana camara*</i>	Lantana
<i>Ligustrum lucidum</i>	Large-leaved Privet
<i>Ligustrum sinense</i>	Small-leaved Privet
<i>Lonicera japonica</i>	Japanese Honeysuckle
<i>Melia azedarach</i>	White Cedar
<i>Nandina domestica</i>	Heavenly Bamboo
<i>Nephrolepis cordifolia</i>	Fishbone Fern
<i>Ochna serrulata</i>	Mikey Mouse Plant
<i>Oxalis corniculata</i>	Creeping Woodsorrel
<i>Paspalum dilatatum</i>	Paspalum
<i>Phoenix canariensis</i>	Phoenix Palm
<i>Plantago lanceolata</i>	Plantain
<i>Ricinus communis</i>	Castor Oil Plant
<i>Rubus fruticosus sp. aggregate*</i>	Blackberry
<i>Senna pendula var. glabrata</i>	Cassia
<i>Setaria palmifolia</i>	Palm Grass
<i>Sida rhombifolia</i>	Paddy's Luerne
<i>Solanum nigrum</i>	Blackberry Nightshade
<i>Sonchus oleraceus</i>	Common Sowthistle
<i>Tradescantia fluminensis</i>	Wandering Jew
<i>Tropaeolum majus</i>	Nasturtium
<i>Verbena bonariensis</i>	Purpletop

\*indicates Priority Weed in NSW

## Appendix C Weed Management Plan

Species	Common Name	Priority	Window of control	Significance and Managemnt
<i>Acer negundo</i>	Box Elder Maple	Low	All year	<p>Relatively long lived, produces a large amount of mobile seed. Deciduous tree.</p> <p>Restrict its spread from the riverbank to new areas.</p> <p>Slash saplings where possible.</p>
<i>Ageratina adenophora</i>	Crofton Weed	Low	All year prior to flowering	<p>State Priority Weed. Poisonous to livestock.</p> <p>Easily controlled through pasture management practices.</p> <p>Early pasture establishment prevents infestation.</p> <p>Slashing reduces vigour.</p>
<i>Anredera cordifolia</i>	Madeira Vine	High	All year	<p>Produces high volumes of propagules (seed and tubers) and is capable of smothering desirable vegetation.</p> <p>Restrict its spread to new areas.</p> <p>Repeated herbicide treatments.</p>
<i>Araujia sericifera</i>	Moth Vine	Low	All year	<p>Produces high volumes of wind dispersed seed and is capable of smothering desirable vegetation.</p> <p>Broad leaf herbicide treatments or hand pull.</p>
<i>Asparagus aethiopicus</i>	Asparagus Fern	Medium	All year	<p>State Priority Weed</p> <p>Restrict its spread to new areas through quarantine practices.</p> <p>Chemical treatment.</p>
<i>Bidens pilosa</i>	Farmers Friends	Low	All year prior to flowering	<p>Annual weed capable of producing high volumes of seed. Likes disturbed areas.</p> <p>Restrict its spread to new areas through quarantine practices.</p> <p>Chemical treatment.</p>

Species	Common Name	Priority	Window of control	Significance and Managemnt
<i>Cardiospermum grandiflorum</i>	Balloon Vine	High	All year	<p>Produces high volumes of seed and is capable of smothering desirable vegetation.</p> <p>Restrict its spread to new areas through quarantine practices.</p> <p>Chemical treatment.</p>
<i>Cenchrus clandestinum</i>	Kikuyu	Low	All year, on actively growing plants.	<p>Vigorous grower. Will require high maintenance levels.</p> <p>Chemical treatment.</p> <p>Use other turf species where possible.</p>
<i>Cestrum parqui</i>	Green Cestrum	High	All year	<p>Regional Priority Weed. Poisonous to stock.</p> <p>Chemical treatment.</p> <p>Restrict its spread to new areas through appropriate soil management and quarantine practices.</p>
<i>Cinnamomum camphora</i>	Camphor Laurel	Low	All year	<p>Allelopathic plant. Long lived. Already on site. Primarily associated with heritage areas.</p> <p>Cut and paint or basal bark application.</p>
<i>Conyza sp</i>	Fleabane	Medium	All year prior to flowering	<p>Annual weed capable of producing high volumes of wind dispersed seed. Likes disturbed areas.</p> <p>Chemical treatment.</p> <p>Slash to prevent flowering.</p>
<i>Cyperus eragrostis</i>	Umbrella Sedge	Medium	All year	<p>Produces large amounts of seed and colonises wetland very fast.</p> <p>Best control method is to plant out wet areas ASAP.</p> <p>Careful chemical application.</p>
<i>Delairea odorata</i>	Cape Ivy	Medium	All year	<p>Produces high volumes of seed and is capable of smothering desirable vegetation.</p> <p>Chemical treatment.</p> <p>Early control is best.</p>

Species	Common Name	Priority	Window of control	Significance and Managemnt
<i>Eragrostis curvula</i>	African Lovegrass	Low	All year, best results achieved on actively growing plants	<p>Restrict its spread to new areas.</p> <p>Capable of producing high volumes of seed. A coloniser species that will establish easily if not managed. Detrimental to native grass seed production.</p> <p>Chemical treatment.</p> <p>Restrict its spread to new areas through quarantine practices.</p> <p>Slash to prevent flowering.</p>
<i>Ipomoea indica</i>	Morning Glory	High	All year	<p>Produces high volumes of seed and is capable of smothering desirable vegetation. Has underground tubers.</p> <p>Chemical treatment.</p> <p>Restrict its spread to new areas through quarantine practices.</p> <p>Slash to prevent flowering.</p>
<i>Lantana camara</i>	Lantana	High	All year	<p>State Priority Weed</p> <p>Restrict its spread to new areas through appropriate soil management and quarantine practices.</p> <p>Inspection and monitoring procedures.</p> <p>Chemical treatment.</p>
<i>Ligustrum lucidum and sinense</i>	Large and Small Leaf Privet	Medium	All year	<p>State Priority Weed. Do not produce seed in first year which reduces urgency to control saplings.</p> <p>Restrict its spread to new areas through appropriate soil management and quarantine practices.</p> <p>Inspection and monitoring procedures.</p> <p>Chemical treatment.</p>
<i>Lonicera japonica</i>	Japanese Honeysuckle	High	All year	<p>Produces high volumes of seed and is capable of smothering desirable vegetation.</p>

Species	Common Name	Priority	Window of control	Significance and Managemnt
				<p>Restrict its spread to new areas through appropriate soil management and quarantine practices.</p> <p>Inspection and monitoring procedures.</p> <p>Chemical treatment.</p> <p>Slash to prevent flowering.</p>
<i>Ochna serrulata</i>	Ochna	Low	All year	<p>Relatively long lived woody weed. Produces high volumes of seed and can be very invasive.</p> <p>Slash saplings where possible.</p> <p>Chemical treatment.</p>
<i>Plantago lanceolata</i>	Common Plantain	Low	All year	<p>Annual weed capable of producing high volumes of seed. Likes disturbed areas.</p> <p>Chemical treatment.</p> <p>Slash to prevent flowering.</p>
<i>Ricinus communis</i>	Castor Oil Plant	High	All year	<p>Coloniser of disturbed sites. Grows very fast and can out compete desirable species.</p> <p>Chemical treatment.</p> <p>Slash to prevent flowering.</p>
<i>Rubus fruticosus</i>	Blackberry	High	Summer. Best results achieved on actively growing plants	<p>State Priority Weed</p> <p>Slash followed by chemical application.</p> <p>Restrict its spread to new areas through appropriate soil management and quarantine practices.</p>
<i>Tradescantia fluminensis</i>	Wandering Jew	Low	All year	<p>Forms a monoculture if it gets into shady moist spots.</p> <p>Restrict its spread to new areas through quarantine practices.</p>
<i>Verbena bonariensis</i>	Purple Tops	Low	All year prior to flowering	<p>Perennial weed that is easily controlled with broadleaf herbicide.</p> <p>Chemical treatment.</p>

Species	Common Name	Priority	Window of control	Significance and Managemnt
				Slash to prevent flowering.



## Appendix D Introduction and Spread of Weed and Pathogens Procedure

Construction works on development sites have the potential to introduce and promote the spread of weed species. This procedure is intended to prevent or minimise the spread of priority weed species. During construction, the Project Manager and Site Supervisor should adhere to best practice methods for weed management, which include:

- Mowing or slashing areas infested with weeds before they seed. This may reduce the propagation of new plants.
- Program works from least to most weed infested areas.
- Clean machinery, vehicles and footwear before moving to a new location.
- Securely cover loads of weed-contaminated material to prevent weed plant material falling or blowing off vehicles.
- Dispose of weed-contaminated soil at an appropriate waste management facility.
- Remove weeds immediately onto suitable trucks and dispose of without stockpiling.

### WEED MANAGEMENT PLAN

Weed Management Plan has been developed for the proposed re-development. This plan includes the following information:

- Identification and description of weed infested areas within the site.
- Recommendations for managing weeds.
- Weed control methods.
- Measures to prevent the spread of weeds.
- A monitoring program to measure the success of weed management.
- Communication strategies to improve contractor awareness of weeds and weed management.

Pathogens are agents such as bacterium, virus or fungus that cause disease in flora and fauna, which are be spread on footwear, vehicles or machinery. The four most common pathogens found in NSW include:

- **Phytophthora (*Phytophthora cinnamomi*):** A soil-borne fungus that attacks the roots of native plant species, causing them to rot and eventually die.
- **Chytrid fungus (*Batrachochytrium dendrobatidis*):** A waterborne fungus that affects native frog species.
- **Myrtle rust (*Uredo rangelli*):** An introduced fungus that attacks young leaves, shoot tips and stems of Myrtaceous plants (such as Bottle Brush, Tea Tree, Lilly Pilly and Turpentine), eventually killing the plant.

Construction works on development sites have the potential to promote the spread of pathogens. This procedure is intended to prevent or minimise the spread of pathogens if they have been identified within the development site. If the occurrence of pathogens is known within the locality, a test for presence through soil or water tests should fire be undertaken. If pathogens are present, during

construction, the Project Manager and Site Supervisor should adhere to best practice methods for pathogens (**Table C1**)

**Table C1: Best practice hygiene methods**

Pathogen	Best Practice Hygiene Protocols
<b>Phytophthora</b>	<ul style="list-style-type: none"> <li>• Minimise work during excessively wet or muddy conditions.</li> <li>• Programming of works should always move from uninfected areas to infected areas.</li> <li>• Set up exclusion zones with fencing and signage to restrict access into contaminated areas.</li> <li>• All personnel (including visitors) to be inducted on Phytophthora management measures for the site. Provide vehicle wash down facility.</li> <li>• Restrict vehicles to designated tracks, trails and parking areas.</li> <li>• Provide parking and turn-around points on hard, well-drained surfaces.</li> <li>• Provide boot wash down facility.</li> <li>• Restrict personnel to designated tracks and trails.</li> <li>• Use a certified supply of plants and soil that is disease-free.</li> <li>• Retain all potentially affected materials within the contaminated area.</li> <li>• Ensure stockpiles of mulch, topsoil and fill material are separated to avoid potential contamination and spread.</li> </ul>
<b>Chytrid Fungus</b>	<ul style="list-style-type: none"> <li>• Minimise work during excessively wet or muddy conditions.</li> <li>• Programming of works should always move from uninfected areas to infected areas.</li> <li>• Set up exclusion zones with fencing and signage to restrict access into contaminated areas.</li> <li>• All personnel (including visitors) to be inducted on chytrid management measures for the site.</li> <li>• Provide vehicle wash down facility.</li> <li>• Restrict vehicles to designated tracks, trails and parking areas.</li> <li>• Provide parking and turn-around points on hard, well-drained surfaces.</li> <li>• Provide boot wash down facility.</li> <li>• Disinfect with cleaning products containing benzalkonium chloride or 70% methylated spirits in 30% water.</li> <li>• Disinfect hands or change gloves between the handling of individual frogs and between each site.</li> <li>• Only handle frogs when necessary. Use the 'one bag-one frog' approach.</li> <li>• To avoid cross contamination, generally avoid transferring water between two or more separate waterbodies.</li> </ul>
<b>Myrtle Rust</b>	<ul style="list-style-type: none"> <li>• To determine if Myrtle Rust is known within the locality of the development site, the following should be undertaken: <ul style="list-style-type: none"> <li>○ Use of The DPI Myrtle Rust Management Zone map (<a href="http://www.dpi.nsw.gov.au/_data/assets/pdf_file/0008/374633/myrtle-rust-nsw-mgt-zones.pdf">http://www.dpi.nsw.gov.au/_data/assets/pdf_file/0008/374633/myrtle-rust-nsw-mgt-zones.pdf</a>)</li> <li>○ Consultation with DPIE for additional rust records and risk assessments.</li> <li>○ Photograph potentially infected plants and send to: <a href="mailto:biosecurity@industry.nsw.gov.au">biosecurity@industry.nsw.gov.au</a> for confirmation.</li> </ul> </li> <li>• Programming of works should always move from uninfected areas to infected areas.</li> <li>• Set up exclusion zones with fencing and signage to restrict access into contaminated areas.</li> <li>• All personnel (including visitors) to be inducted on Myrtle rust management measures for the site.</li> <li>• Provide vehicle wash down facility.</li> <li>• All vehicles and machinery to be washed with Truckwash® (or equivalent).</li> <li>• Restrict vehicles to designated tracks, trails and parking areas.</li> <li>• For medium-long term projects, install a concrete wash down bay which will capture the water in a trench or bunded area.</li> <li>• Water used for wash downs must not be used for dust control.</li> </ul>

Pathogen	Best Practice Hygiene Protocols
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- Personnel working in an infected site should shower and launder clothes (especially hats) before moving to another bushland site.
- Provide boot wash down facility.
- Footwear and equipment to be cleaned of soil/mud then sprayed with 70% methylated spirits in 30% water.
- Use a certified supply of plants and soil that is disease-free (Nursery & Garden Industry 2011) provides best practice Myrtle rust management that is to be expected from suppliers).
- Plant material should be buried on site if possible.
- Do not dispose of waste at another bushland site.
- Buried material sites must be mapped to prevent re-exposure, especially if located near utility easements.
- If material cannot be buried advice should be sought from DPIE.

## Appendix E Techniques and specifications

### WEED CONTROL

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

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

### WEED CONTROL TECHNIQUES

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

#### *Annual grasses*

Annual grasses should be hand removed or spot sprayed where isolated or in low concentrations. Larger patches of annual grasses may be slashed/brush cut in late spring to early summer, after flowering, but prior to seed set. For most species, slashing/brush cutting prior to late spring through to early summer will promote vigorous growth and should not occur. However, some annual grasses can grow and produce seed at any time of the year dependent on climatic conditions such as high rainfall and warm temperatures. Monitoring of annual species should be undertaken and if new growth occurs, the same treatment will be applied to the new growth to prevent seed production. Individual plants should be hand removed, bagged and disposed of appropriately offsite.

#### *Perennial grasses*

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

#### *Woody weeds*

Follow up treatment of woody weeds, including *Sida rhombifolia* (Sida) and *Lantana camara* (Lantana) will be controlled by the cut and paint or drill and fill method using a non-selective herbicide.

The most appropriate method to be used depends on the size of the individual to be removed and will be determined by the bush regeneration contractor. Primary weed control should use techniques that will not encourage flushes of secondary weed growth. All seedlings of woody weeds will be hand pulled or spot-sprayed with a non-selective herbicide.

#### *Creepers and climbers*

The control of creepers, including *Rubus fruticosus* (Blackberry), varies depending on the species. For the most part, seedlings will be hand pulled, while mature plants can be controlled by the stem-scrape method or spot spraying using a non-selective herbicide. The precise method to be used will be determined by the bush regeneration contractor depending on the species, size and reproductive status of the individual. All vegetative material removed should be bagged, removed from site and disposed of appropriately.

#### *Herbaceous weeds*

Where individual plants of herbaceous weeds, including *Senecio madagascariensis* (Fireweed) and *Solanum* sp. are found, they will be hand pulled prior to flowering. Where large swaths of these species occur, they will be sprayed using a non-selective herbicide. If high densities of mature stands occur, weeds may be slashed first using a brush cutter and any subsequent regrowth sprayed. Regular monitoring of these species will be required to prevent seed production. *Cirsium vulgare* (Spear Thistle) will not be hand-pulled due to its thorns and instead will be treated using cut and paint methods or spot sprayed for larger infestations using a non-selective herbicide. All vegetative material that is pulled out and has the potential to regrow if deposited on ground will be bagged and removed from site.

#### *Management of weed waste*

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

#### *Herbicide use*

The use of herbicide to control weeds should be carefully considered. Herbicide must only be used for the purpose described on the product label, as per the NSW *Pesticides Act 1999*. Herbicide use should assess potential long-term impacts of the technique, including whether the proposed works address the source of the weed infestation. However, herbicide application forms an important and useful component of an integrated weed management approach and can be the most appropriate method for the control and eventual eradications of some weed species.

Herbicide use should occur during the active growing season for plants to encourage the chemical uptake into the plant. The selection of herbicides should also consider the type of weed and the location. Where non-selective herbicides are required for use, glyphosate is the most suitable. A glyphosate-based herbicide, formulated for use near waterways, will be used if works require herbicide application near waterways, a (e.g. Roundup Biactive®).

Broad-leaf selective herbicide may be used as per the NSW Weed Control Handbook (DPI 2018). However, this type of herbicide is extremely toxic to aquatic life and must not be used in, or adjacent to, waterways.

Registration and records must be kept in accordance with the NSW *Pesticides Regulation 2017*.

### REVEGETATION WORKS

Revegetation has the dual aim of both re-establishing the original native vegetation community at the site and reducing erosion along the length of the riparian corridor, which will carry greatly increased peak flows due to the increased run-off from the hard surfaces created by the associated residential development. Any plantings should consist of local provenance stock.

Planting of Hiko for trees and shrub species and Hiko or Viro cells for grasses and other groundcover species is the preferred method. Planting should be done via a low impact method such as hand digging or hand auger. The holes dug for each plant should be at least 1.5x the width and 2x the depth of the root ball. Fertiliser should be added to each hole dug as per the label specifications. Water crystals or wetting agents should be added to each plant hole. This will increase the water holding capacity of the soil and reduce watering schedules. Initial irrigation of the plantings is essential to ensure that the soil forms around the root ball and air pockets are removed. This will be required unless sufficient rainfall (approx. 10mm) occurs on the day of planting.

Tree guards will need to be installed on each tree or shrub to protect seedlings from extreme weather (frosts and heat), herbivorous grazing and herbicide drift during maintenance works. Bio-degradable tree guards are recommended to protect the seedlings. Following the revegetation works, irrigation needs to be undertaken for at least 8 weeks following planting to ensure the establishment of the plants. The level of irrigation will be determined by rainfall and temperature experienced at the planting site.

A temporary irrigation system should be installed to assist in the establishment of vegetation. Timing of the planting of these areas will need to take into consideration surrounding civil works and erosion/sediment control requirements, these areas will not be planted until earthworks have been completed. A maximum rate of attrition of 15% is to be tolerated, with any plant loss above this rate to be replaced at the contractor's expense.

Mulch can be derived from vegetation removed from the development area, if available. Alternately, mulch should be comprised of un-composted wood (preferably wood waste), with a particle size of 15 mm to 40 mm, with no fines, and good air-filled porosity. Mulch should not contain any weed seeds, nor be derived from diseased trees or from any part of the tree lower than 1 m above the ground. Mulch, where required, should be installed to a depth of 100 mm.

Jute matting, where required, must be comprised of 100% biodegradable jute fibres with a minimum weight of 680g/m<sup>2</sup> (~6 mm thickness). Jute must be pegged with at least 3 x 150 mm pins per m<sup>2</sup> and each roll overlapped by 100 mm.

#### *Seed collection*

For the growth of the plants used in the revegetation works, seed must be collected from local provenance species. Groundcovers, shrubs and trees should be collected as within close proximity (i.e. <20km) to the site. However, soil type, climate and aspect of the collection site(s) should also be

considered. Native grasses typically have much larger dispersal mechanisms and are to be collected from within the Cumberland Plain Sydney.

Where species identified in this VMP cannot be sourced, they may be substituted for other STIF (Management Zones 1 and 2) or CESMF (Management Zones 3 – 5) species as identified by Tozer (2003). Species must be substituted with species of a similar form, e.g. trees for tree, grasses for grasses, etc. Only wild native species are to be used. Plants are not to be substituted with horticultural varieties under any circumstances.

Record keeping of seed collection and planting locations are to follow the Florabank guidelines (Mortlock, 2000). A Section 132C licence under the NSW *National Parks and Wildlife Act 1974* will be required to undertake seed collection works. The bush regeneration contractor is responsible for recording this information and providing it to THSC.

### BUSH REGENERATION CONTRACTORS

All vegetation management works in the establishment phase will be undertaken by suitably qualified and experienced bush regeneration contractors who are members of the Australian Association of Bush Regenerators (AABR) or fulfil the membership criteria. Additionally, team leaders should have, as a minimum, a Certificate III in Conservation & Land Management or equivalent. The contractor will need to carry out best practice bush regeneration techniques as described by Buchanan (2009). A flexible approach to this site is recommended since techniques may need to be changed or modified to suit site conditions. This approach is consistent with adaptive management and allows the contractor to develop and build on site knowledge whilst implementing this VMP. Monitoring will assist in the development of the VMP actions in subsequent years.

### HYGIENE PROTOCOLS

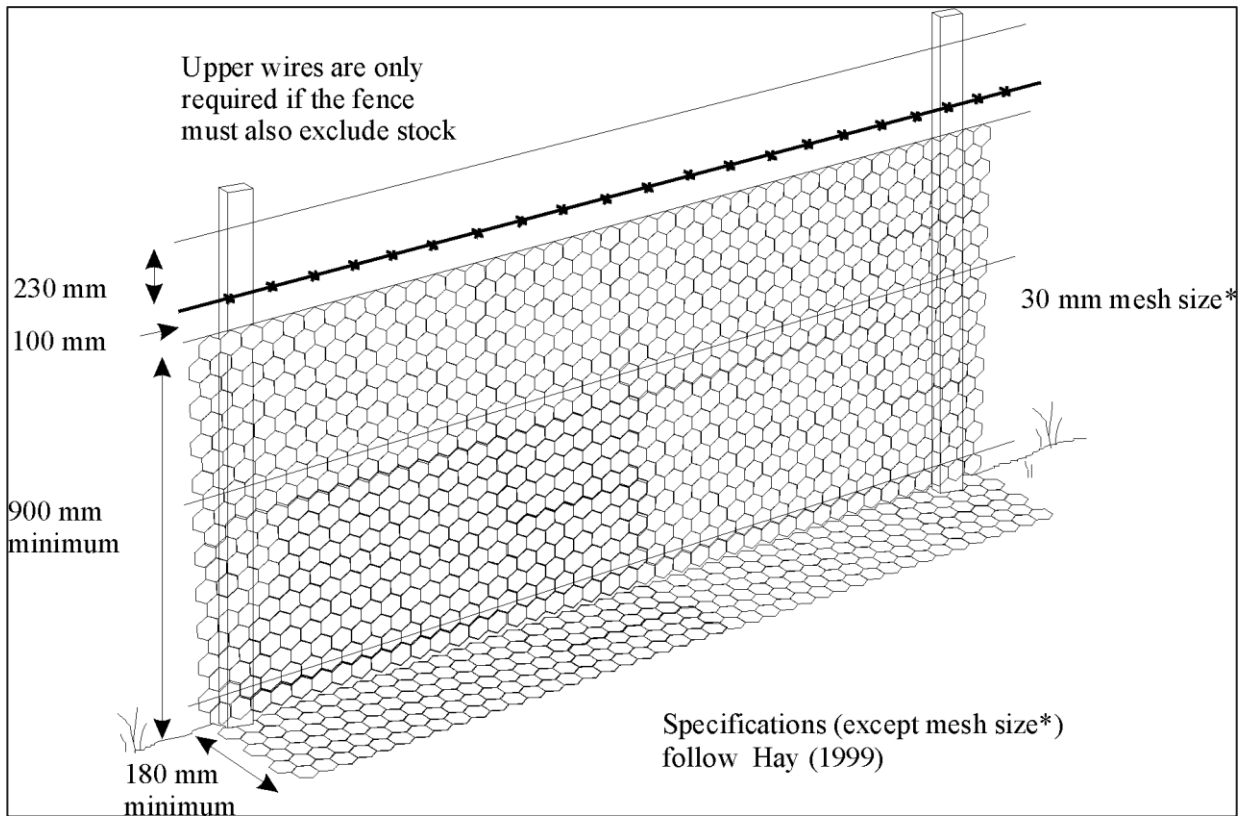
To avoid introducing soil pathogens / diseases in particular *Phytophthora cinnamomi* (Root rot disease) onto site a hygiene protocol should be undertaken as per the guidelines developed by the Royal Botanic Gardens in 'Best Practice Management Guidelines for *Phytophthora cinnamomi* with the Sydney Metropolitan Catchment Management Authority'.

For Bush Regenerators all tools and boots should be washed down and thoroughly cleaned of soil / mud using a solution of water and disinfectants prior to undertaking works onsite. All machinery should be thoroughly cleaned of all soil / mud / debris prior to working within the VMP area.

### RABBIT EXCLUSION FENCING

Rabbit proof fencing may be required to be installed to the guidelines in the Commonwealth Department of the Environment Catalogue of fence designs. The fencing will need to be a minimum of 90mm high, with a 180 mm skirt as per the figure below.





**Recommended fencing for rabbit exclusion (DoEE 2004)**

## Appendix F Recommended planting list

Form	Scientific Name	Common Name	STIF	CESMF
Trees	<i>Angophora costata</i>	Smooth-barked Apple	X	X
	<i>Angophora floribunda</i>	Rough-barked Apple	X	
	<i>Eucalyptus botryoides</i>	Bangalay		X
	<i>Eucalyptus paniculata</i>	Grey Ironbark	X	
	<i>Eucalyptus pilularis</i>	Blackbutt	X	X
	<i>Eucalyptus piperita</i>	Sydney Peppermint		X
	<i>Eucalyptus punctata</i>	Grey Gum	X	
	<i>Eucalyptus resinifera</i>	Red Mahogany	X	
	<i>Eucalyptus saligna</i>	Sydney Blue Gum		X
	<i>Syncarpia glomulifera</i>	Turpentine	X	X
Shrubs (1.5-6m)	<i>Acacia longifolia</i>	Sydney Golden Wattle	X	
	<i>Acacia parramattensis</i>	Parramatta Wattle	X	
	<i>Acacia ulicifolia</i>	Prickly Moses	X	X
	<i>Allocasurina torulosa</i>	Forest Oak	X	X
	<i>Breynia oblongifolia</i>	Coffee Bush	X	X
	<i>Bursaria spinosa</i>	Black Thorn	X	
	<i>Ceratopetalum apetalum</i>	Coachwood		X
	<i>Clerodendrum tomentosum</i>	Hairy Clerodendrum	X	
	<i>Dodonaea triquetra</i>	Common Hopbush	X	X
	<i>Elaeocarpus reticulatus</i>	Blueberry Ash	X	X
	<i>Glochidion ferdinandi</i>	Cheese Tree		X
	<i>Kunzea ambigua</i>	Tick Bush	X	
	<i>Leucopogon juniperinus</i>	Prickly Beard-heath	X	X
	<i>Myrsine variabilis</i>	Muttonwood		X
	<i>Notelaea longifolia</i>	Large Mock-olive	X	X
	<i>Ozothamnus diosmifolius</i>	Rice Flower	X	
<i>Pittosporum revolutum</i>	Yellow Pittosporum	X		
<i>Polyscias sambucifolia</i>	Elderberry Panax	X	X	
Sedges, rushes & grasses	<i>Aristida vagans</i>	Threeawn Speargrass	X	
	<i>Entolasia marginata</i>	Bordered Panic Grass	X	X
	<i>Entolasia stricta</i>	Wiry Panic	X	X
	<i>Microlaena stipoides</i>	Weeping Grass	X	X
	<i>Panicum simile</i>	Colour Panic	X	
	<i>Poa affinis</i>	Tussock Grass	X	X

Form	Scientific Name	Common Name	STIF	CESMF
	<i>Themeda triandra</i>	Kangaroo grass	X	
	<i>Imperata cylindrica</i>	Blady Grass	X	
	<i>Lepidosperma laterale</i>	Variable Sawsedge	X	X
Ground covers	<i>Billardiera scandens</i>	Apple Berry	X	X
	<i>Calochlaena dubia</i>	False Bracken		X
	<i>Clematis aristata</i>	Old Man's Beard	X	
	<i>Commelina cyanea</i>	Scurvy Weed	X	
	<i>Dianella caerulea</i>	Blue Flax-lily	X	X
	<i>Dichondra repens</i>	Kidney Weed	X	
	<i>Glycine clandestina</i>	Twining Glycine	X	
	<i>Gonocarpus teucrioides</i>	Forest Raspwort		X
	<i>Goodenia hederacea</i>	Forest Goodenia	X	
	<i>Hardenbergia violacea</i>	Coral Pea Flower	X	
	<i>Lomandra longifolia</i>	Spiny-head Mat-rush	X	X
	<i>Pandorea pandorana</i>	Wonga Wonga Vine	X	
	<i>Pomax umbellata</i>	Pomax	X	
	<i>Pratia purpurascens</i>	White Root	X	
	<i>Pseuderanthemum variabile</i>	Pastel flower	X	X
	<i>Pteridium esculentum</i>	Bracken Fern		X
<i>Smilax glycyphylla</i>	Sweet Sarsaparilla	X	X	
<i>Veronica plebeia</i>	Trailing Speedwell	X		

