



# Lachlan's Line Pedestrian Bridge: Vegetation Management Plan

FINAL REPORT

Prepared for Landcom

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- Paul Price
- Gareth Davies (mapping)

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# 1 Introduction

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## 1.1 Project background

Biosis Pty Ltd was commissioned by Landcom to develop a Vegetation Management Plan (VMP) for construction area of the Lachlan's Pedestrian Bridge (the 'Pedestrian Bridge') (Figure 1) across Delhi Road and the M2 motorway at North Ryde, NSW (the 'Project'). The proposed development includes the installation of an elevated pedestrian bridge which will require vegetation removal for the construction of two piers within the study area. This VMP is to be implemented to minimise potential risk to ecologically sensitive bushland surrounding the works zones and to guide revegetation efforts after the construction phase.

For the purpose of this VMP, the area to be managed by this plan is defined by the 'VMP area' shown in (Figure 1). This VMP clearly defines the roles and responsibilities of ongoing works, provides a timeline for completion of related works and outlines monitoring requirements for the VMP area.

This VMP herein provides controls and actions required to manage the restoration of ecological features within the study area (the 'VMP area') (Figure 1). This VMP has been prepared in accordance with the *Best Practice Guidelines for Sydney Turpentine – Ironbark Forest* (DECC 2008).

## 1.2 Description of VMP area

The VMP area is located approximately 11 kilometres north-west of the Sydney CBD. It encompasses approximately 0.2 hectares of vegetation including roadside reserves of Delhi Road, the roadside embankment of the M2 motorway, and Bundara Reserve under management of Ryde City Council. The land comprising Bundara Reserve is currently zoned E2 – Environmental Conservation whilst the roadside reserves are zoned SP2 – Infrastructure.

Surrounding land use consists of commercial and business parks, low density residential development, infrastructure consisting of the M2 motorway as well as the nearby Ryde railway station, land conserved in Council and National Parks and the Macquarie Park Cemetery and Crematorium all serviced by adjacent roads. Lane Cove National Park located approximately 700 metres to the east of the study area.

The study area is within the:

- Pittwater Subregion within the Sydney Bioregion.
- Port Jackson catchment.
- Greater Sydney Local Land Services (LLS) Management Area.
- Ryde Local Government Area (LGA).

The northern half of the study area occurs on the natural 1:100k soil landscapes of Lucas Heights residual soil landscape and the southern half on the Glenorie erosional soil landscape (Chapman and Murphy, 1989).

The Lucas Heights residual soil landscape is described as occurring on gently undulating crests and ridges on plateau surfaces of the Mittagong Formation. Local relief is up to 30 metres, with moderately deep soils (50-150 centimetres) comprising hard setting yellow podzolic soils and yellow soloths. The Glenorie erosional soil landscape is characterised by undulating to rolling low hills situated on Wianamatta Group shales. Local relief ranges between 40 and 120 metres with soils predominantly comprised of clay podzols described as shallow to moderately deep (<100 centimetres) on crests, moderately deep (70-150 centimetres) on upper slopes and deep (>200 centimetres) along drainage lines.

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### 1.3 Potential ecological impacts

Key aspects of the proposed works that could result in potential ecological impacts include:

- Removal of native vegetation.
- Invasion of exotic plant species.
- Stockpile/compound road construction.
- Noise, vibration, light and vehicular movement impacts.
- General earth vegetation resulting in disturbance of soils, erosion, and the mobilisation of sediment.
- Open excavation works.



Figure 1: Location of the study area

## 2 VMP Scope and Objectives

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### 2.1 Scope

The scope of this VMP is to develop a framework for the management of vegetation to be retained, vegetation to be removed, and the ongoing management of weeds within the study area. The VMP will also outline ongoing management actions required for successful establishment of native plants within the VMP area, and actions to protect the surrounding vegetation from future negative pressures.

The implementation of the VMP will encompass a 12 month establishment phase followed by a maintenance period that will run for a minimum of 5 years or until the objectives and performance criteria outlined in this VMP are met.

This VMP will guide the bushland restoration of the study area. The objectives of this VMP are to provide a guide to bush regeneration contractors.

### 2.2 Objectives

The specific objectives for the implementation of this VMP are to:

- Manage and rehabilitate Sydney Turpentine-Ironbark Forest vegetation disturbed by the construction of the pedestrian bridge within and adjacent to Bundarra Reserve and the M2 road corridor.
- Outline strategies to avoid or minimise impacts on vegetation where possible.
- Outline the management requirements for any vegetation to be retained, including details on tree and vegetation protection measures e.g. fencing.
- Outline rehabilitation details, including identification of flora species and measures for the management and maintenance of rehabilitated areas (including the duration of the implementation of such measures).
- Provide schedules for inspection, monitoring, management and corrective actions.
- Describe weed management activities.
- Incorporate a seed collection and revegetation strategy.
- Review flora species lists of Sydney Turpentine Ironbark Forest with scope to identify a suite of flora species suitable for revegetation works within the VMP area.
- Identify native flora species present within the study area that are suitable for seed collection, propagation and planting.
- Describe planting density and composition for revegetation works within the VMP area.

## 3 Methods

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### 3.1 Desktop Research

A review of all available design plans and reports relating to the site and adjacent areas was conducted, as well as relevant legislation, recent vegetation mapping and other documentation relevant to the current project, including;

- Commonwealth Department of the Environment and Energy (DEE) Protected Matters Search Tool for matters protected by the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).
- NSW Office of Environment and Heritage (OEH) BioNet Atlas of NSW Wildlife, for species, populations and ecological communities listed under the *Biodiversity Conservation Act 2017* (BC Act).
- PlantNET (The Royal Botanic Gardens and Domain Trust).
- BirdLife Australia, the New Atlas of Australian Birds 1998-2015.
- Relevant vegetation mapping, including *The Native Vegetation of the Sydney Metropolitan Area; Volumes 1 and 2* (OEH 2016).
- NSW Scientific Committee final determinations for threatened biodiversity.

The following reports were also reviewed:

- North Ryde Station Precinct, M2 Site, State Significant Development, Ecological Impact Assessment. Prepared for Landcom NSW (ELA 2014).
- *Lachlan's Line Pedestrian Bridge: Biodiversity Development Assessment Report*. Prepared for Landcom NSW (Biosis 2018)
- *Ryde Flora and Fauna Study 2008: Ryde Bushland Reserves* (Biosphere Environmental Consultants Pty Ltd 2008).
- *Modification request to amend the approval for the M2 Site, North Ryde Urban Activation Precinct (SSD5093MOD4)*. City of Ryde, Sydney.
- *Modification to M2 site, North Ryde Station Urban Activation Precinct (SSD 5093 MOD 4) (Lachlan's Line) – Request for Response to Submissions* NSW Planning and Environment, NSW.
- Peer review of the Biosis Pty Ltd ecological consistency assessment, Lachlan's line pedestrian bridge. Lesryk Environmental (3 April 2018).
- NSW Scientific Committee Sydney Turpentine-Ironbark Forest - final determination (NSW Scientific Committee 2011).
- Commonwealth Listing Advice for Turpentine-Ironbark Forest of the Sydney Basin Bioregion (DEE 2017).
- *Best Practice Guidelines – Sydney Turpentine-Ironbark Forest* (DECC 2008).

Site plans (including Lachlan's Line Pedestrian Bridge – Plan View – SSK – 010 [Arup 2016] and North Ryde Station Precinct Map [Landcom NSW]) were supplied by Landcom. NSW Aerial photography was supplied by Near Maps (2018).

## 3.2 Site Assessment

Assessments of the study area was undertaken by Biosis on 12 August 2016, 7 November 2017 and 16 May 2018 by qualified and experienced ecologists (Nicola Trulock – Botanist; Averill Wilson - Botanist; Callan Wharfe – Senior Ecologist). The study area was surveyed in accordance with the BAM (OEH 2017), the NSW Guide to surveying Threatened Plants (OEH 2016) and random meander methods (Cropper 1993). This involved:

- The identification and mapping of PCTs according to the structural definitions of Native Vegetation of the Sydney Metropolitan Area (OEH 2016).
- Undertaking floristic plots within each vegetation zone in accordance with Section 5 of the BAM (OEH 2017a).
- The identification of native and exotic plant species, according to the Flora of NSW (Harden 1992, 1993, 2000, 2002), with reference to recent taxonomic changes.
- Targeted searches for plant species of conservation significance according to the NSW Guide to surveying Threatened Plants (OEH 2016)
- Incidental observations using the “random meander” method (Cropper 1993).
- Identifying fauna habitats, assessing their condition and assessing their value to threatened fauna species.
- Observations of animal activity and searches for indirect evidence of fauna (such as scats, nests, burrows, hollows, tracks, scratches and diggings).
- An assessment of the natural resilience of the vegetation of the study area.
- Identification of previous and current factors threatening the ecological function and survival of native vegetation within and adjacent to the study area.
- Determination of appropriate rehabilitation and bush regeneration techniques for the native vegetation of the site.

The conservation significance of plant species and plant communities was determined according to:

- BC Act for significance within NSW.
- EPBC Act for significance within Australia.

Detailed mapping of PCTs was conducted using hand-held (uncorrected) tablet units (Samsung Galaxy Tab 3) using the ArcGIS Collector application and aerial photo interpretation. Areas of native vegetation for which a PCT could validly be assigned were identified and delineated in the field, and their condition determined. Identification of PCTs within the study area was confirmed with reference to the community profile descriptors (and diagnostic species tests) held within the OEH (2016) mapping project and NSW BioNet Vegetation Classification database (OEH 2017b). The identification of native and exotic plant species, according to *Field Guide to the Native Plants of Sydney* (Robinson 2003) and the *Flora of NSW* (Harden 1992, 1993, 2000, 2002), with reference to recent taxonomic changes.

## 3.3 Limitations

Ecological surveys provide a sampling of flora and fauna at a given time and season. There are a number of reasons why not all species will be detected at a site during survey, such as species dormancy, seasonal conditions, ephemeral status of waterbodies and the migration and breeding behaviours of some fauna. In many cases these factors do not present a significant limitation to assessing the overall ecological values of a site.

## 4 Site description

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### 4.1 Vegetation communities

The VMP area contains two vegetation types:

- Sydney Turpentine-ironbark Forest
- Urban Native/Exotics

#### Sydney Turpentine-ironbark Forest

Sydney Turpentine-Ironbark Forest within the study area occurs within two distinct patches located within the eastern and western portions of the study area. Sydney Turpentine-Ironbark Forest is listed as a Critically Endangered Ecological Community (CEEC) under the BC Act and EPBC Act.

The western portion of the study area (Pier 2 – adjacent to Bundarra Reserve) is characterised by three distinct stratum layers with a canopy layer primarily consisting of Apple *Angophora costata*, Grey Ironbark *Eucalyptus paniculata*, Blackbutt *Eucalyptus pilularis*. A number of these trees will be removed for the construction of the pedestrian bridge. The midstorey is characteristically open with native species such as Parramatta Wattle *Acacia parramattensis* and Sweet Pittosporum *Pittosporum undulatum*. The ground layer is represented by a diverse assemblage of native grasses, sedges and herbs including Pastel Flower *Pseuderanthemum variable*, Whiteroot *Pratia purpurascens*, Weeping Grass *Microlaena stipoides*, Basket Grass *Oplismenus aemulus*. Vines are located throughout with Kangaroo Vine *Cissus antarctica* and Old Man's Beard *Clematis aristata* occurring in a few dense patches throughout ground and shrub layers.

The eastern portion of the study area (Pier 3 – nearest North Ryde train station) has been characterised by two remnant Turpentine *Syncarpia glomulifera*, one of which has been determined to have been present prior to the construction of the M2 motorway based on maximum growth rate (0.5 centimetres /year) and a >70 centimetres diameter at breast height. The second specimen is likely to be grown from the seed of the adjacent parent tree. Planted White Mahogany *Eucalyptus acmenoides* occur adjacent to the remnant Turpentine and extends the area of the PCT to the north. One Turpentine and all planted White Mahogany will be removed for construction of the pedestrian bridge. The understorey consists of regrowth Parramatta Wattle, Old Man's Beard and planted Kangaroo Vine, Blue-flax Lily *Dianella longifolia* and Spiny-headed Mat-rush *Lomandra longifolia*.

Exotic species are found intermittently throughout this community and are typically confined to the edges where prior disturbance has facilitated colonisation. Exotic species recorded include Asparagus Fern *Asparagus aethiopicus*, Cobbler's Pegs *Bidens pilosa*, *Senna pendula*, Fountain Grass *Cenchrus setaceum* and Mickey Mouse Plant *Ochna serrulata*.

#### Disturbed Vegetation - Urban Native/Exotics

This community was generally in a degraded condition state as a result of the impacts associated edge effects as it is located directly adjacent to the road corridor. Exotic flora species recorded within the mapped vegetation type included Asparagus Fern, Mickey Mouse Plant and Panic Veldtgrass *Ehrharta erecta*. In the eastern portion, although edge effects are still a primary factor, unmaintained natives plantings, primarily Kangaroo Vine, has caused a depauperate condition within this area.

## 4.2 Fauna habitats

Fauna habitat assessment was undertaken to determine whether the vegetation to be impacted by the proposed development contained microhabitats suitable to support fauna species. The habitat assessments focussed on the presence of the following features within the study area:

- Habitat trees including large hollow-bearing trees, availability of flowering shrubs and feed tree species.
- Condition of native vegetation and the presence of exotic species.
- Quantity of ground litter and logs.
- Searches for indirect evidence.
- General degradation of the site as a result of past industrial land management practices and lack of maintenance.

Fauna habitat is highly limited within the study area. Angophora, Eucalypt and other flowering perennial species recorded in the study area may provide nectar resources suitable for a range of arboreal and flying fauna (such as gliders, Grey-headed Flying-fox and nectivorous bird species) whilst in flower. Highly mobile threatened fauna may from time-to-time utilise these resources as part of their wider home range. The midstorey vegetation within the study area is highly limited and consists of occasional semi-mature wattles and eucalypts. Large woody debris is common within the study area and leaf and bark litter accumulation occurs at moderate levels. Habitats within the study area are considered highly isolated a fragmented for fauna other than highly mobile birds and bats as a result of the large roads and residential development on all sides of the patch.

Tree hollows provide potential roosting and/or nesting habitat for microbats, owls, parrots and other arboreal mammals, however no tree hollows were recorded within the study area or more specifically within the impact area.

**Table 1 Key fauna habitat features present across the study area**

Habitat features	Fauna species
Vegetated areas of tall open forest	Arboreal mammals, microchiropteran bats and owls.
Leaf litter/woody debris	Foraging resources for birds, mammals, frogs and reptiles.

## 4.3 Threatened species habitats

Habitat for threatened flora species within the VMP area is considered to be limited. Historical and ongoing disturbance in the form of vegetation removal and invasion of dense and smothering exotic and native species has significantly degraded the habitats present within the VMP area.

Review of the OEH Bionet Atlas (OEH 2018) and the DEE Protected Matters Search Tool (DoE 2016) found records of 34 threatened flora species and 67 threatened fauna species as previously recorded, or predicted to occur, within a five kilometre radius of the study area. Following the results of targeted surveys (Biosis 2018) and the above habitat assessment it has been concluded that it is highly unlikely for there to be threatened flora or fauna present within the VMP area.

## 4.4 Priority and environmental weeds

All plants in NSW fall within the general biosecurity duty established under the Biosecurity Act, with some “Priority” species assessed as requiring specific management to achieve the Act’s objectives of prevention, elimination and minimisation of the biosecurity threat posed by weeds.

The Biosecurity Act defines the following terms:

- *General biosecurity duty* - Any person who deals with biosecurity matter or a carrier and who knows, or ought reasonably to know, the biosecurity risk posed or likely to be posed by the biosecurity matter, carrier or dealing has a biosecurity duty to ensure that, so far as is reasonably practicable, the biosecurity risk is prevented, eliminated or minimised.
- *Biosecurity matter* - Any living thing, other than a human, or any part of an animal, plant or living thing, other than a human.
- *Biosecurity risk* - The risk of a biosecurity impact occurring.
- *Biosecurity impact* - An adverse effect on the economy, the environment or the community that arises, or has the potential to arise, from biosecurity matter, a carrier or dealing with biosecurity matter or a carrier.

As such, Landcom, in dealing with weeds present within the study area, is obliged under the general biosecurity duty to prevent, eliminate and minimise the risk of potential biosecurity impacts.

Three NSW Priority Weeds for Greater Sydney Local Land Services (LLS), which includes the LGA, was recorded within the study area.

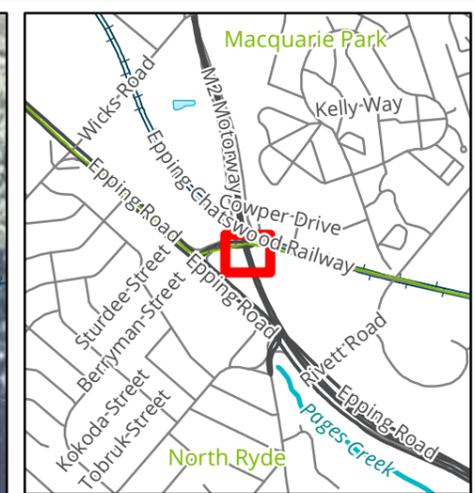
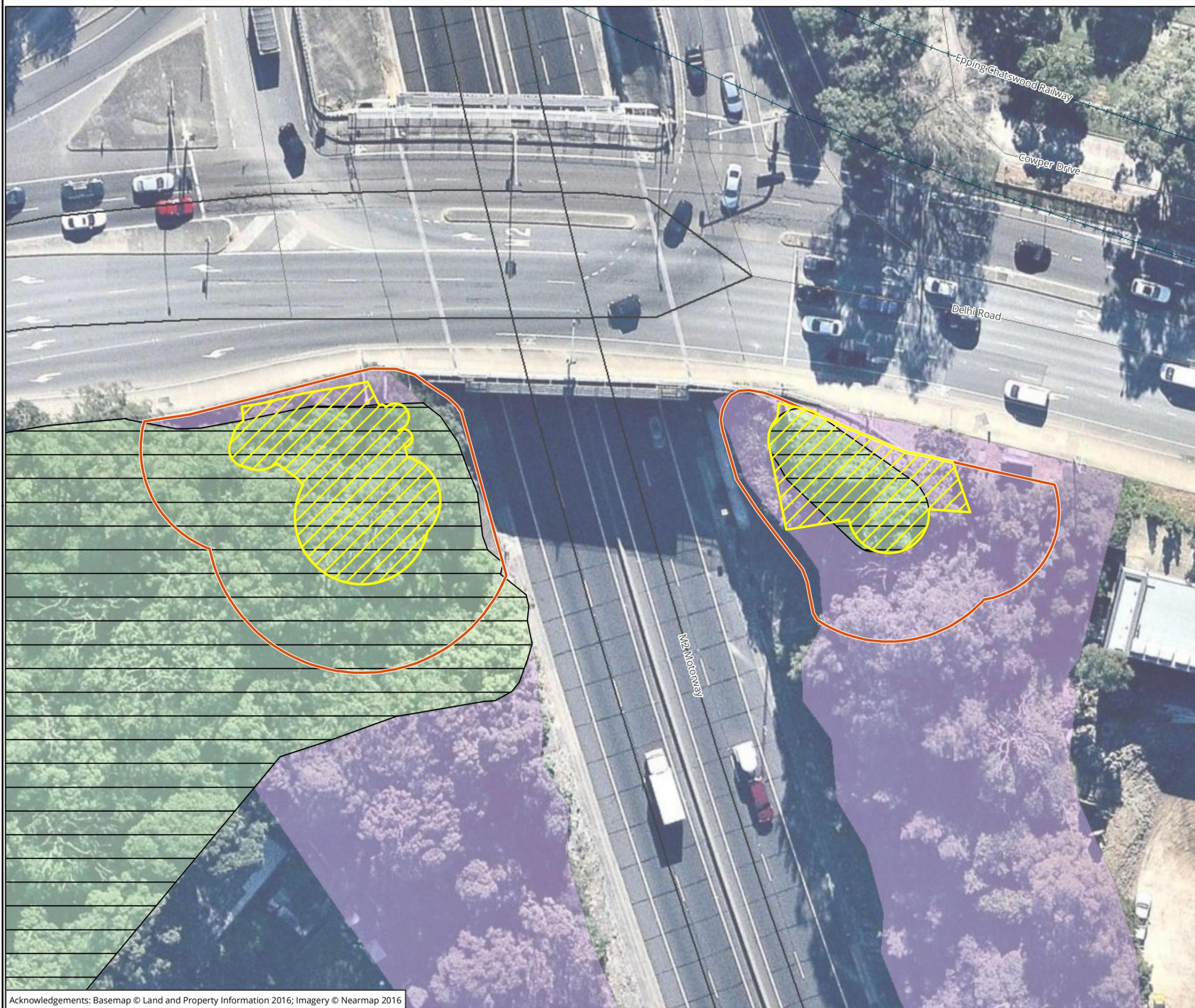
One environmental weed has been identified by Biosis as presenting a risk of causing an adverse impact on the environment and therefore has been included to be considered and treated under the general biosecurity duty.

Table 2 outlines the priority and environmental weeds recorded within the study area and details Sydney Water’s requirements under the Biosecurity Act and the general biosecurity duty.

**Table 2 Priority weeds within the study area**

Status	Weed species	Relevant biosecurity duty*
Priority	Bridal Creeper <i>Asparagus aethiopicus</i>	General biosecurity duty
Priority	Green Cestrum <i>Cestrum parqui</i>	General biosecurity duty
Priority	Lantana <i>Lantana camara</i>	General biosecurity duty
Environmental	Small Leaved Privet <i>Ligustrum sinense</i>	General biosecurity duty

As such to prevent the above listed biosecurity impacts from occurring as a result of the presence of the above listed Priority Weeds within the study area, all practical steps (outlined in section 6.2) should be taken to control and eradicate the weeds from the study area prior to vegetation removal.



- Legend**
- Study area
  - Impact area
- TEC**
- Sydney Turpentine-Ironbark Forest EEC
- Vegetation community**
- 1281 Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion
  - Urban natives and exotics

**Figure 2: Ecological values**

0 4 8 12 16 20  
Metres  
Scale: 1:400 @ A3  
Coordinate System: GDA 1994 MGA Zone 56

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## 5 Vegetation Management

### 5.1 General approach

This VMP provides a prioritised succession of restoration works that have considered a long term commitment to biodiversity management and time frames for the reinstatement of important ecological values. The key to prioritising areas for restoration and the order of which works should be undertaken are the established principles of 'retain, regenerate and revegetate'. Inherent in this approach is the need to work from areas of more resilient bushland to areas of more degraded bushland (Buchanan 1989; DEC 2005).

### 5.2 Vegetation management zones

The ecological assessment completed by Biosis (2018) has been used to delineate the Vegetation Management Zones to which this VMP will apply. The delineation of Vegetation Management Zones was determined based on various site attributes identified during the field investigation, including:

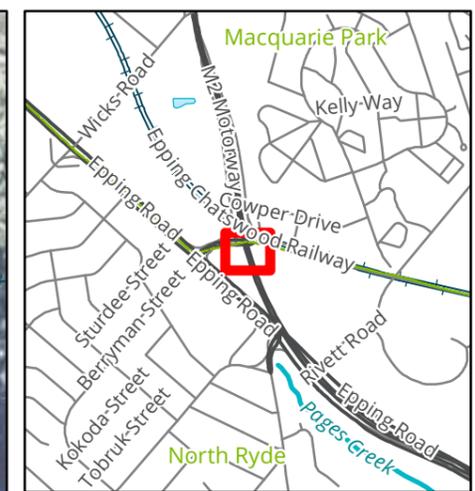
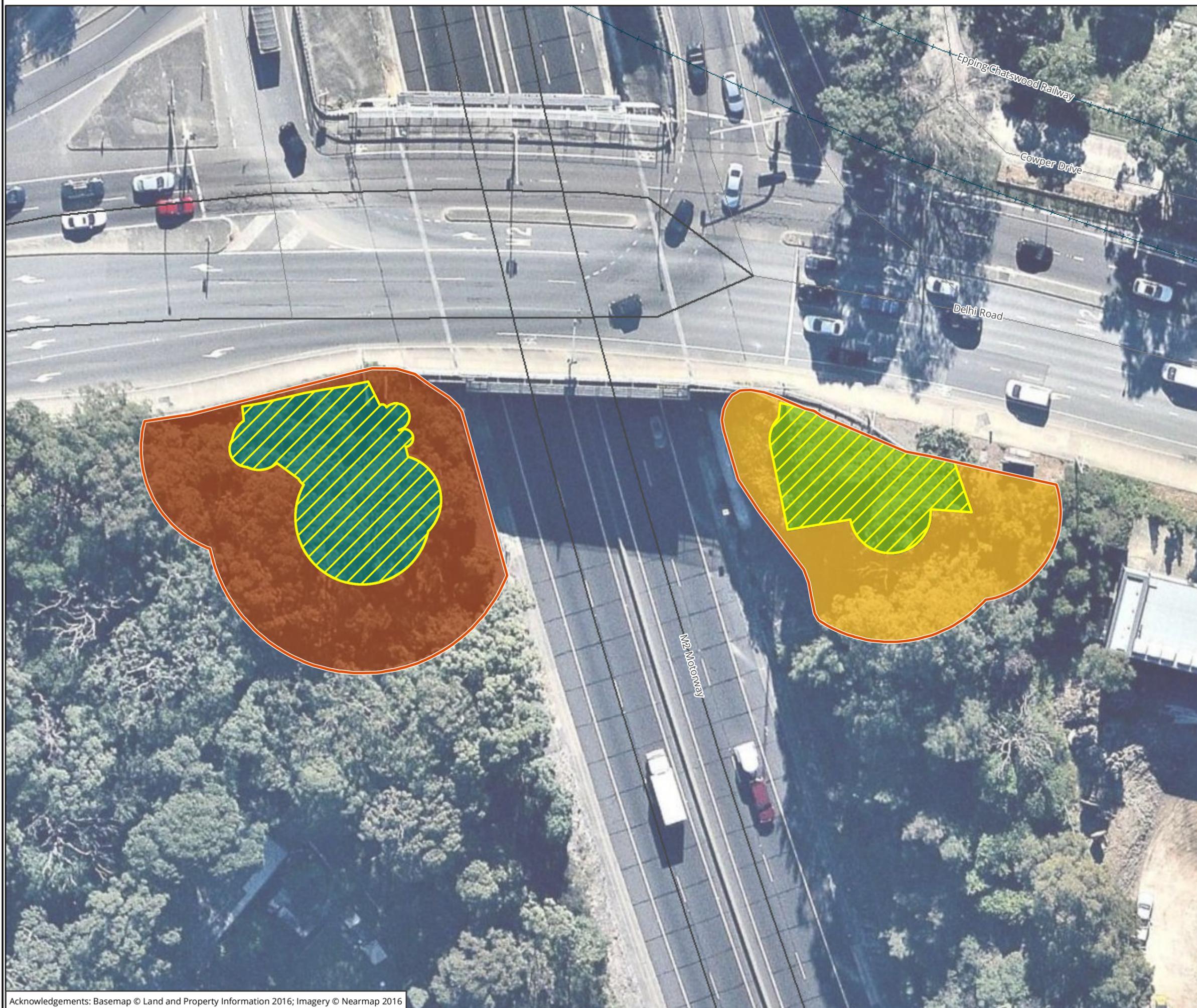
- Future land use (retain or remove)
- Vegetation community type
- Resilience within the overstorey, shrub storey and understorey
- Level of recruitment of exotic species (including priority weeds).

Using these attributes, four management zones have been identified within the VMP area (Table 3). The location and extent of each zone is provided in Figure 3 with corresponding summary of the management requirements for each zone provided in Table 4 below.

All other areas deemed required for management i.e. easements and services access are not included within this VMP.

**Table 3 Management zones**

Management zone	Area	Description
Management Zone 1: Revegetation zone (high resilience)	0.03 hectares	MZ 1 is to be managed with full revegetation following vegetation clearing for the project. Due to the high resilience seen within this area it is expected there will be a percentage of native regeneration within this zone.
Management Zone 2: Revegetation zone (low resilience)	0.02 hectares	MZ 2 is to be managed with full revegetation following vegetation clearing for the project. Due to the disturbed nature of this zone it is expected to have a high potential to become further degraded and weed infested without sufficient maintenance.
Management Zone 3: Buffer maintenance zone (high resilience)	0.07 hectares	MZ3 is located within good bushland surrounding the full revegetation zone of MZ1. This zone is to be maintained with scope to minimize the potential for edge effects encroaching into the adjacent bushland. This zone is within Bundara Reserve and will not require any revegetation activities.
Management Zone 4: Buffer maintenance zone (low resilience)	0.04 hectares	MZ4 is located within the disturbed mixed native and exotic vegetation to the south of MZ2. Vegetation management will consist of weed control and prevention of new weed species becoming established.



**Legend**

-  Study area
-  Impact area
- Management**
-  Zone 1: Revegetation zone (high resilience)
-  Zone 2: Revegetation zone (low resilience)
-  Zone 3: Buffer maintenance zone (high resilience)
-  Zone 4: Buffer maintenance zone (low resilience)

**Figure 3: Management zones**



Scale: 1:400 @ A3  
 Coordinate System: GDA 1994 MGA Zone 56



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Matter: 22504  
 Date: 05 June 2018,  
 Checked by: CW, Drawn by: LW, Last edited by: lwilson  
 Location: P:\22500s\22504\Mapping\22504\_VMP\_F3\_ManagementZones

## 6 Specific management actions

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### 6.1 Site establishment and pre-civil works

#### 6.1.1 Site inductions

Supervisors are required to identify all potential environmental impacts and implement and maintain control measures, procedures and constraints accordingly, and these should be documented as part of a Construction Environmental Management Plan (CEMP) or similar. Site specifics include the presence of threatened species habitat and locally significant vegetation communities. General site inductions must also include strict hygiene protocols to reduce the potential the introduction of invasive flora and fauna species or disease into the protected vegetation within the study area.

#### 6.1.2 Exclusion fencing

The extent of ecologically sensitive areas located adjacent to the works areas will be shown on relevant sensitive area maps and physically delineated on site using protective fencing and signposting. Prior to the commencement of earthworks, exclusion fencing is to be installed along the boundaries of vegetated areas to be retained. The alignment of this fencing is to be in accordance with the Australian Standard *Protection of Trees on Development Sites (AS4970-2009)* and incorporate the relevant tree protection zones for trees and vegetation to be retained.

Fencing for exclusion from no-go areas should be constructed of, as a minimum, capped star pickets and high visibility para webbing and have appropriate signage stating that it is an environmentally sensitive area to inform and educate construction personnel. Exclusion zones are to be clearly marked and labelled on design drawings issued for construction and should be displayed in prominent places and provided in site inductions. A register of sensitive area maps will be maintained. Tree protection zones for trees outside of the environmentally sensitive areas should be with chainlink fencing and 1.8 m posts.

No storage of materials or machinery is to be undertaken within exclusion zones or retained vegetation, no preparation of chemicals or concrete to be mixed in these areas, or adjacent, and care to avoid the compaction of soils to be observed.

#### 6.1.3 Erosion and sediment controls

Earthworks are not to commence until sediment and erosion controls have been installed as per an approved Erosion and Sediment Control Plan / Soil and/or Water Management Plan. Site inductions regarding sensitivity of the area and necessary adherence to the controls should be provided to all staff working on the site. Erosion and sediment control is to be observed and monitored for the entire construction phase of the development. All objectives and measures outlined within Landcom Managing Urban Stormwater: Soils and Construction (2004), this VMP and any Sediment and Erosion Control Plan prepared for the development are to be enforced.

#### 6.1.4 Vegetation clearing and civil works supervision

To provide for future revegetation works, where practicable and seasonally appropriate, seed is to be collected from all native vegetation deemed within the approved development footprint.

Woody debris derived for tree felling and vegetation clearing activities is to be cut into 2 to 4m lengths (where practicable), stockpiled and distributed throughout the VMP area and adjacent Bundarra Reserve, following approval by Ryde Council (under the direction of a suitably qualified Ecologist) with scope to create additional habitat feature within the study area.

## 6.2 Restoration works

All bushland restoration and revegetation works are to be undertaken by a suitably qualified and experienced bush regeneration contractor where, as a minimum, staff are to have obtained a Certificate II in Conservation and Land Management or equivalent.

### 6.2.1 Seed collection

To provide for the propagation and installation of local provincial flora species, seed is to be collected from within the Ryde Council LGA.

Where appropriate and possible, time should be allocated to seed collection for the project to allow for seasonal variations in seed production. Depending on timing, this may include collecting seed up to 12 months in advance of revegetation works. Collection of additional seed from the adjoining retained vegetation may be required (depending on seasonal variations in seed production) to ensure adequate genetic diversity is maintained.

Seed collection is to be carried out in accordance with the Florabank Guidelines, by experienced and licenced seed collectors/ecologists whom are registered as a member of the Australian Association of Bush Regenerators (AABR).

Additional written approvals for seed collection will be required when collecting outside of the VMP area i.e. private property owners and public managed lands. Furthermore, if seed collection is required within a recognised Threatened Ecological Community, a Section 132C licence under the NSW *National Parks and Wildlife Act 1974*, will be required.

Further information in relation to seed collection is provided as Appendix A.

### 6.2.2 Weed management

The proposed works have the potential to introduce and promote weeds and pathogens within and adjacent to the construction footprint as well as in the surrounding area. Environmental weeds are exotic species considered either a high risk of dispersing and becoming established in adjacent native vegetation, or have the potential to cause significant ecological harm. Recommended methods for control of environmental weeds recorded on site, along with priority species, are outlined in Appendix 2. Methods have been prescribed in accordance with the *Best Practice Guidelines – Sydney Turpentine-Ironbark Forest* (DECC 2008).

### 6.2.3 Natural regeneration

Encouraging the natural regeneration of pre-existing vegetation is an effective form of site restoration as:

- Seeds and propagules exist within the seed bank.
- Species of local provenance are better adapted to the environmental conditions in the area.
- Re-establishment of the community will follow natural patterns of re-colonisation and succession.
- Soil fauna, fungal and microbial populations that are essential to a healthy plant growing environment are already present.

Natural regeneration and encouragement of natural regrowth will be most effective in MZ 1 and MZ 3. Appropriate monitoring and management of these zones must be carried out as actions such as soil disturbance and canopy gaps may also result in the establishment of weed populations.

## 6.3 Revegetation

When native vegetation is lost as a result of project works, revegetation may be necessary to reinstate native vegetation and habitat in the VMP area.

The purpose of revegetation for this project includes:

- The promotion of an appropriately structured vegetative community.
- Reducing the incidence of surface and rill erosion within the study area.
- Creating buffer zones around retained native vegetation to protect it from edge effects.
- Help to maintain native seed banks, local provenance of species endemic to the area and genetic diversity.

Plants to be installed as part of the required revegetation works are to be preferentially of either forestry tubes, hiko's and/or enviro-cells sized pots. Advanced stock may be used for revegetation works where necessary for a landscaping outcome.

A revegetation species list and percentage of species per stratum is provided as Appendix 3. The recommended planting list is based on species that are characteristic of Sydney Turpentine Ironbark Forest and plant species that have been recorded within the study area.

All species installed in the VMP are must be selected from this list and be grown from local provenance seed.

### 6.3.1 Planting densities

The following is a guide to inform the revegetation densities:

- Full revegetation: Shrubs at a rate 1 plant/ 5 square metres, Forbs at a rate 1 plant/ 3 square metres, Scramblers at a rate 1 plant/ 10 square metres and groundcovers/grasses/sedges installed at a rate of 3 plants per square metre.
- A 3 metre buffer surrounding the pedestrian bridge will be revegetated with low maintenance groundcover and shrub species to enable unrestricted access to the bridge for maintenance tasks.

Plants are to be installed at the density rates as provided in Table 4. No revegetation will be undertaken in management zones 3 and 4 due to these areas being buffer weed control zones only.

**Table 4 Planting densities**

Zone	Trees	Shrubs	Forbs	Scramblers	Ground covers/ sedges/ grasses	Total
Zone 1	-	30	150	30	900	1100
Zone 2	-	20	100	20	650	790
Total	-	50	250	50	1550	1890

An estimated 1890 plants are to be installed as part of the proposed VMP works. In the event of plant loss, a nominated replacement of 10% of the total plants installed (190) should be allowed. No trees, and minimal shrubs are to be installed to ensure the future built form of the pedestrian bridge is not compromised by revegetation works, with no taller shrub species planted with 3-5 metres of the bridge.

Plants installed under the pedestrian bridge are to be selected from drought and shade tolerant species to maximise the likelihood of establishment.

The revegetation recommended herein is considered more appropriate, and more aligned with the Best Practice Guidelines for Sydney Turpentine – Ironbark Forest (DECC 2008), that the CoA requirement for *'Replacement planting at a ratio of 2:1 for each tree removed'*.

### 6.3.2 Soil conditioner and additives

At the time of planting, fertiliser is to be applied to each plant in the form of a native slow release product with a N: P: K ratio of similar to that of 21.8: 0.7: 7.2. This will reduce the incidence of 'Nitrogen draw down' when planting in mulched areas.

Water crystal may also be used to reduce the incidence of death amongst establishing plants. Such an additive will also reduce initial water costs during the establishment phase of the VMP implementation.

### 6.3.3 Mulch

Mulch is not to be used in areas mapped as Sydney Turpentine-Ironbark Forest as outlined in the Best Practice Guidelines for Sydney Turpentine – Ironbark Forest (DECC 2008).

Outside areas of Sydney Turpentine-Ironbark Forest mulch is to be either of eucalypt wood or leaf chip derived source (not 'tub ground') and preferably chipped from parent material within a 10 kilometre range of the ERAP area to ensure any potential tree seeds are compatible with the corresponding vegetative communities. Mulch is not to contain any chipped Pine, Coral tree, Palm (or any exotic species propagules) and is not to contain the remnants of recycled wood products such as pallets.

Mulch should be at a maximum of 100 mm in depth and applied before or at the time of planting.

Where appropriate mulching of native vegetation removed during construction is to be re-used on the site to stabilise bare ground.

### 6.3.4 Watering

Watering of newly planted stock will be undertaken to ensure that an adequate survival and establishment rate is achieved. Watering is to abide by any local authority water restrictions or guidelines. To assist in this process, a soil wetting agent such as Hydrocell®, or similar approved product, may be applied into each planting hole to maximise water retention around the root ball during the establishment period.

Watering of all stock will occur at the time of the planting itself during the establishment phase, to minimise shock on the tubestock in their new conditions. Further watering will be on an as required basis to ensure compliance with the allocated performance criteria as provided in Section 7: Vegetation management actions.

During the 18 month establishment period, the frequency of watering to achieve plant establishment will depend on the prevailing climatic conditions at the time of planting and thereafter. Watering will generally be carried out in the cooler hours of the day (morning or afternoon), and will be frequent enough to prevent wilting of plants. Tubestock is to be watered prior to planting as well as immediately after planting installation.

During the establishment phase the following watering program is recommended (dependent on weather):

Weeks 1 - 8	Months 2 - 4	Months 5 - 6
Once a day	Once a week	Once a Month

The necessity for watering during the above program will be dependent upon rainfall. The frequency of watering will be gradually reduced as the plantings mature and it is anticipated that after period of 4 – 6 months the planting will be sufficiently established such that supplementary watering will no longer be required.

Planting areas are to be monitored during the extended maintenance period to ensure that climatic conditions are not affecting the newly planted tube stock. If climate or environmental conditions are affecting the tube stock a watering program may be reinstated pending the approval by the environmental manager.

## 6.4 Maintenance

Maintenance works will commence following the implementation of the establishment phase (Table 6), maintenance weed control and supplementary revegetation activities and will continue for a period of 60 months or until the performance criteria has been met. It is anticipated that the maintenance activities will occur monthly during cooler months and bi-monthly in the warmer months. Required works and indicative effort are outlined in Table 5.

**Table 5 Indicative maintenance works summary**

Maintenance Activity	Minimum Effort	Frequency	Responsibility
<b>Spot spraying of annual and perennial weeds</b>	One person days, monthly	Monthly in cooler months, fortnightly in warmer months	Land manager/bush regeneration contractor
<b>Watering</b>	As required	Only during excessively hot periods of summer	Land manager/bush regeneration contractor
<b>Replacement planting of tubestock</b>	As required	Annual checks and planting	Land manager/bush regeneration contractor

In the event that tree pruning is required for the long-term maintenance of the bridge, works should be completed by an appropriately qualified arborist. All machinery and equipment should be sterile and free of material with the potential to facilitate the transport of pathogens and/or weed propagules into the study area.

## 7 Vegetation management actions

**Table 6** Vegetation management actions and performance criteria

Management Action	Management Zone/area	Responsibility	Task / Performance Criteria	Timing
Seed collection	All zones	Contracted nursery/ Bush Regeneration (BR) contractor	<ul style="list-style-type: none"> <li>The collection of local native species in preparation for the proposed VMP vegetation management actions or with suitably identified plant stock purchasing. Local providers may have previously sourced local provenance and this can be sourced, following the species list of suitability.</li> <li>Where seed is collected from local native species, these should be species that are easily located and accessed.</li> </ul>	<ul style="list-style-type: none"> <li>Prior and during vegetation removal</li> </ul>
Vegetation Clearance	MZ1 and MZ2	Construction contractor	<ul style="list-style-type: none"> <li>Implement site specific CEMP throughout all stages of construction works</li> </ul>	<ul style="list-style-type: none"> <li>During prescribed earthworks.</li> </ul>
Bush regeneration (primary, secondary & maintenance weed control)	All Zones	Bush Regeneration contractor (BR)	<p>Primary and secondary weed control works are to include the following actions:</p> <ul style="list-style-type: none"> <li>All priority, environmental, vine and woody weeds undergo primary treatment within 4 weeks of the commencement of the vegetation management program.</li> <li>All weeds are to be treated as per Appendix 2, in accordance with the best practice guidelines relevant to the protection of Sydney Turpentine-Ironbark Forest.</li> <li>Commencement of maintenance works will occur once mature exotic species have been reduced to 5% Projected Foliage Cover (PFC). This is expected to be 12 weeks (3 months) after commencement of primary weed control works.</li> <li>All mature priority weeds are to be successfully treated within the VMP area prior to commencement of the maintenance period.</li> </ul>	<ul style="list-style-type: none"> <li>From the outset of vegetation management program.</li> </ul>

Management Action	Management Zone/area	Responsibility	Task / Performance Criteria	Timing
			<ul style="list-style-type: none"> <li>At the completion of the required five year maintenance period, weed densities across the site are to have an average coverage abundance of &lt; 5%</li> <li>All rubbish is to be removed.</li> </ul>	
Revegetation	MZ 1 and MZ2	BR contractor	<ul style="list-style-type: none"> <li>Following primary and secondary weed control, revegetation is to be undertaken to ensure sufficient vegetation cover exists to prevent soil erosion and to assist in rehabilitation of the threatened ecological community.</li> <li>All installed plants are to be propagated from locally sourced seed stock collected within the Ryde LGA, and selected from the list for contained in Appendix 3 of this VMP.</li> <li>Where revegetation works are required, plants installed as per densities as provided in Table 4. A minimum of 90% survivorship of all planted specimens is to be maintained over the duration of the VMPs implementation.</li> <li>Any replacement planting is to occur in year 2 of the maintenance phase.</li> </ul>	<ul style="list-style-type: none"> <li>Immediately following successful completion of secondary weed control.</li> </ul>
	3m maintenance buffer around the pedestrian bridge	BR Contractor	<ul style="list-style-type: none"> <li>Following consultation with RMS, an area 3m wide surrounding the bridge is to be revegetated with low maintenance groundcover and shrub species to ensure safe access for personnel to undertake bridge maintenance as required.</li> </ul>	<ul style="list-style-type: none"> <li>Immediately following successful completion of secondary weed control.</li> </ul>
Revegetation maintenance	MZ 1, and MZ2 (incl. 3m maintenance buffer)	BR contractor	<ul style="list-style-type: none"> <li>Installed plantings are to be maintained with key elements of water, prevention of predation and suppression of smothering weeds.</li> <li>Monitoring of plantings should occur at week 12 to identify survivorship.</li> <li>A minimum of 90% survivorship for each species is to be maintained.</li> <li>Replacement planting is to be carried out throughout the maintenance period to sustain the 90% survival rate at the completion of the maintenance period.</li> <li>Losses of greater than 10% of originally installed plantings may have the maintenance period extended until survival rates have been achieved.</li> </ul>	<ul style="list-style-type: none"> <li>Commences immediately following final installation of all plants.</li> <li>Minimum weekly watering over 8 weeks in summer, or 3 weeks in winter, immediately following installation.</li> </ul>

Management Action	Management Zone/area	Responsibility	Task / Performance Criteria	Timing
			<ul style="list-style-type: none"> <li>Planting works not to occur from November to end of February to improve species survival opportunity and reduce water usage.</li> </ul>	<ul style="list-style-type: none"> <li>Watering visits to continue as required to plant establishment.</li> <li>Weed removal as required to the completion of the maintenance period.</li> <li>Monitor success of plantings at 12 weeks and 12 weeks post planting.</li> </ul>
Bush regeneration maintenance	All Zones	BR contractor	<ul style="list-style-type: none"> <li>All mature priority weeds are to be successfully treated in accordance with Appendix 2 prior to commencement of maintenance period. Seedlings of priority species are to be continually suppressed to a level of &lt;5% Projected Foliage Cover (PFC) where they occur in the seed bank below mature specimens, and &lt;1% PFC across remainder of the VMP area.</li> <li>Works to be undertaken utilising best practice bush regeneration techniques.</li> <li>Less than 5% exotic species FPC to be achieved over the entire VMP area after 12 months of maintenance works.</li> <li>Continual suppression at &lt;5% for the remaining 12 months of the maintenance period (60 month total maintenance period).</li> </ul>	<ul style="list-style-type: none"> <li>The maintenance period will run for a 50 month term following successful secondary weed control and/or installation of final plantings (whichever is later).</li> <li>The commencement of this maintenance period may be adjusted if there are delays beyond the contractor's control.</li> <li>Commencement and completion dates of the maintenance period will be determined by the Project Restoration Ecologist, following</li> </ul>

Management Action	Management Zone/area	Responsibility	Task / Performance Criteria	Timing
				consultation with Council, the contractor and Principle.
On-going-tree pruning required for the long-term maintenance of the bridge	Various	Arborist	<ul style="list-style-type: none"> <li>Appropriately qualified arborist to undertake works and ensure all machinery and equipment are sterile and free of material with the potential to facilitate the transport of pathogens and/or weed propagules into the study area</li> </ul>	<ul style="list-style-type: none"> <li>On-going</li> </ul>

**Table 7 Vegetation management actions - Monitoring**

Management Action	Specification / Requirement
Ecological Monitoring Framework	<p>The restoration zones will be monitored in terms of vegetation condition and the achievement of performance criteria. Monitoring activities are to include:</p> <ul style="list-style-type: none"> <li>• Establishing a minimum of two photo-points in representative locations.</li> <li>• Compile initial and on-going weed density maps.</li> <li>• Assessment of weed control works including priority and woody weed control, and weed density surrounding plantings, via monitoring techniques such as weed density mapping, and quadrat / transect surveys.</li> <li>• Identification and assessment of any natural regeneration of native plant species.</li> <li>• Assessment of the success rate of plantings and assessment of plant replacement requirements, and convey any need to BR contractor</li> <li>• Assessment of the site for evidence of herbivory and erosion.</li> <li>• Reporting of any sited fauna or invertebrate within the site demonstrating improved habitat condition from the works.</li> </ul> <p>Monitoring works will also provide the following certifications to the proponent / project manager, and then on to Council:</p> <ul style="list-style-type: none"> <li>• Certification of commencement of maintenance period, i.e. all primary secondary and revegetation works have been completed to acceptable standards.</li> <li>• Final certification that the targets of the vegetation management works have been achieved.</li> </ul>

## 8 Schedule of Works

The VMP will be undertaken in general accordance with the schedule of works provided below and the relevant specifications provided. The responsibility for completing the actions within the schedule of works will be attributed to the principal bush regeneration contractor that is engaged to complete the work.

**Table 8 Five year action plan for vegetation management**

Actions	Timeframe		
	Establishment	Year 2	Year 3 – Year 5
Engage licensed seed collectors to collect seed			
Log installation post vegetation clearing			
Propagation and sourcing of plants for revegetation			
Implement primary weed removal			
Implement secondary/ Maintenance weed removal			
Revegetation			
Replacement planting			As required.
Remove litter and general rubbish			
Photo point monitoring and annual reporting			

## 9 Adaptive Management

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An adaptive management approach is to be employed in respect of the works forming part of this VMP. An adaptive management approach involves an integrated process of monitoring, reviewing and then responding to the health and condition of the plantings as well as the status of the weed species to identify any alterations to the design and maintenance of works that may be required to ensure the objectives of the VMP are achieved.

For example, the application rates for fertiliser and the watering schedule should be flexible in responding to the health and vigour of the plantings and changing climatic conditions. Monitoring the plantings will also allow for a review of the selected species to enable changes in the species composition of the supplementary planting if it is determined that a particular species or stock sourced from a certain location is not performing adequately. The supplementary planting species, planting densities and planting patterns nominated within this VMP may be subject to change and review if certain species are unavailable or are performing inadequately. If species are required to deviate from those approved for planting under the VMP by Council, Council approval by the Environment Unit, will be required prior to being sourced and planted. The weed control works are also to be reviewed and appropriate changes implemented accordingly, if required. By example, if the nominated weed suppression schedule is not achieving the Performance Indicators specified, the frequency of weed suppression activities should be increased accordingly.

It is important to note that any changes should comply with the aims of this VMP and any licensing or approval conditions issued before implementation. An Adaptive Management Statement (or similar) will be prepared and signed by both parties prior to implementation of any adaptive management actions. All annual reporting and photos should be provided to Council to ensure compliance and outcome satisfaction through years 1 – 5.

## References

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- OEH 2017b NSW BioNet Vegetation Classification database <http://www.environment.nsw.gov.au/NSWVCA20PRapp/LoginPR.aspx> Accessed 09.01.2018
- OEH 2017d Sydney Basin Bioregion Plant Communities <http://www.environment.nsw.gov.au/bioregions/SydneyBasin-Biodiversity.htm>. Accessed 23 November 2017.

## Appendices

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## Appendix 1 Seed collection and propagation methods

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### Seed collection methods

To minimise negative impacts associated with seed collection, no more than 10% of the total seed available at the site (and from individual plants) should be collected in any one year (Ralph 1993). However, in areas where all native vegetation is to be cleared, this does not apply. General considerations for seed collection include:

- Collect seed from as many individual plants as possible to maximise genetic diversity.
- Collect from stands or groups of plants rather than isolated plants, even if they carry large amounts of seed.
- Neighbouring plants are likely to be related so ensure that seed is collected from plants across the entire area.
- Collect approximately equal amounts of seed from each plant.
- Collect seed from various parts of the plant (not just those easily accessible).
- Label each batch of seed collected with:
  - Species
  - Location
  - Date collected and collector's name
  - Number of plants collected from
  - Details on position in the landscape, percentage of seed ripe, soil type, other relevant details.

Seed may be collected from tall trees by utilising fallen limbs and branches, or using a long-handled pruner. Seed on small trees and shrubs can be collected using secateurs or pruners, hand-picked, or the branches hand-stripped. A drop-sheet or tarpaulin under the plant can be used to catch fallen seeds and fruit when branches are shaken. For species which release their seed very quickly upon ripening (such as wattles and bush-peas), it may be worthwhile to tie paper bags or nylon stockings around the branches before the seed pods ripen (OEH 2011).

### Timing of seed collection

Timing of seed collection is a critical consideration. Timing is mostly dependant on when the seed matures and how long the seed remains on the plant after maturity. The peak seed collection period in NSW usually occurs from October to December. Although seed ripens generally the same time each year, seasonal variations and local climatic factors and conditions may lead to variations in timing from year to year (Ralph 1993).

Key indications of seed maturity include:

- Colour changes of fruits, seed heads or cones
- Seed or fruit hardness
- Dryness of fruits
- Ease of removal

- Opening of fruits

Another consideration of seed collection is that many plants flower over a long period of time and therefore contain seeds of varying maturity. It is important to only collect the mature seed and a second or third visit to the plant may be required to allow time for all seed to mature.

### **Propagation**

A nursery, local to the VMP area should be sourced as soon as practicable on project approval and provided with the proposed planting list in Table 10, so that seed can be sourced and propagated for revegetation works on site. Seed collection should follow the procedure outline above.

All plants shall be true to scheduled nomenclature, well formed, hardened off and disease free nursery stock.

They shall be container grown in potting soil with a firmly established root system but with no large roots growing out of the container. No plant shall be pot bound.

The condition of plant stock should encourage future growth that is strong and typical of the species. Correct nursery/growing practices shall help ensure the long-term health and viability of the plant stock on site after planting.

The Bush Regeneration Contractor shall allow for an independent Horticultural certification of all stock prior to delivery to site that confirms the following:

- Stock is disease free and healthy.
- Rootball has adequately grown into the container appropriate to the specified size.
- Stock shows no evidence of spirally, being pot bound, or other undesired outcomes of growth at the nursery.

## Appendix 2 Weed management measures

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### Standard methods

Weed management measures consistent with the *Best Practice Guidelines – Sydney Turpentine-Ironbark Forest* (DECC 2008) that should be undertaken prior to and during revegetation works include:

- Use a range of weed management methods such as slashing or mowing (physical and mechanical control) as well as a range of appropriate herbicides (to avoid herbicide resistance).
- Herbicides are to be used as a minimum and only where necessary. ‘Cut and paint’ and ‘scrape and paint’ methods are to be prioritised. Spot-spraying should only be undertaken after careful preparation of the spray target area by hand-weeding or mechanical methods where practicable, avoiding off-target herbicide application.
- Mow/slash areas infested with weeds before they seed (avoiding native vegetation).
- Employ appropriate vehicle hygiene such as:
  - Clean machinery, vehicles and footwear before moving to a new location.
  - Securely cover loads of weed contaminated material.
  - Dispose of weed contaminated soil at an appropriate waste management facility.
  - Remove weeds immediately and dispose of without stockpiling.
  - Minimise soil disturbance in weed infested areas.

Weed control methods adopted in the implementation of this VMP are based on a combination of the current site management, bush regeneration industry standards, botanical knowledge of the weeds and in accordance with the *Best Practice Guidelines – Sydney Turpentine-Ironbark Forest* (DECC 2008). Techniques and methods recommended in following sections such as ‘hand weeding’ are described in detail in various publications such as *Recovering Bushland on the Cumberland Plain: Best practice guidelines for the management and restoration of bushland*. (DEC 2005). The publication *Noxious and Environmental Weed Control Handbook. A Guide to Weed Control in Non-crop, Aquatic and Bushland Situations, 5th Edition* (DPI, 2011) provides descriptions on general and standard weed control methods.

Application of herbicide during weed control works will depend on species targeted and the growing situation. For example the selection of a herbicide and the application method for a particular species or class of plant will be determined by factors such as the degree of infestation of target species, limiting damage to off target native flora and preventing herbicides entering waterways. The DPI (2011) document cited above should be referred to as guide for specific herbicides, record keeping and herbicide application techniques.

Use of herbicides must be kept to an absolute minimum, but when necessary should be used according to the NSW *Pesticides Act 1999*, Material Safety Data Sheets and labelling instructions for specific trade name herbicides and off label use permits registered with the APVMA. The use of herbicide as part of this VMP will be limited to direct application to cut stumps and spot spraying, consistent with the protection of the CEEC in accordance with the guidelines (DECC 2008). Any contractors using herbicides on the site must be trained and appropriately qualified to do so (ChemCert Level 2 or equivalent for subordinates and ChemCert Level 3 or equivalent for supervisors).

Slashing can be used to prevent weeds from flowering and setting seed. This method can be undertaken with a tractor and slashing implement or by using a hand held brush cutter (DPI, 2011). In addition DEC (2005)

have highlighted that slashing or mowing can also be used in bushland areas (with grassy native understorey) as an initial or holding treatment to reduce weed mass. This allows for more efficient follow up as fast growing reshooting weeds can be spot sprayed with herbicide among areas of native grasses and herbs. DEC (2005) also suggest that to effectively control exotic annual herbs and grasses, mowing or slashing must be done at least monthly in summer (possibly more frequently if conditions are warm and wet and weed growth is accelerated). For perennial weeds which mature in mid to late summer, mowing or slashing may be reduced to two to three times each season, with the final treatment being applied late in the season ideally before fruit ripens and seed becomes viable (DEC, 2005). Further simple techniques for reducing the potential for assisting the dispersal of weed species as a result of slashing are to:

- Slash from areas dominated by native species to more degraded areas dominated by introduced species.
- Shake or wash down slashing implements in disturbed and managed areas prior to use in more intact areas.

In summary it is recommended that a combination of reducing the height and number of occasions slashing occurs and appropriate weed hygiene protocols be implemented.

Species specific control for priority and environmental weeds recorded within the VMP area are provided in Table 9.

**Table 9 Priority and environmental weed management measures**

Botanical name	Common name	Initial treatment	Follow up control
Annual weed species	Various	Prioritise hand removal of weeds. Where not practicable to do so, chemically treat (spray) deseeded mature specimens with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/Litres of water ( 1:100)	Monitor for seedlings. Hand remove and/or remove seedlings or spot spray with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/Litres of water
<i>Acetosa sagittata</i>	Turkey Rhubarb	Seeds to be bagged and removed from site. Hand removal all underground tubers. Chemically treat (spray) using a 333g/L Fluroxypyr based product at a dilution rate of 300 to 600 ml per 100 L water Or with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/Litres of water	Hand remove seedlings or spot spray with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/Litres of water.
<i>Araujia sericifera</i>	Moth Plant	Prioritise hand removal of weeds. Where not practicable to do so, chemically treat (spray) deseeded mature specimens with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/Litres of water ( 1:100).May require the use of a penetrant for effective kill rate. Fruits to be disposed off-site	Hand remove seedlings or spot spray with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/Litres of water
<i>Asparagus aethiopicus.</i>	Ground Asparagus Fern	Hand remove in area of high regeneration potential ensure that all fruiting bodies and central 'rhizome' has been removed and disposed off-site. Aerial tubers do not require removal and can act as a preventative measure against soil erosion.	Hand remove seedlings or spot spray with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/Litres of water. All seeds and biomass are to be disposed off-site.
		Large infestations to be chemically treated (spray) with a Metsulfuron-methyl 600 g/kg based herbicide at a diluted rate of 1 –2 g per 10 L of water plus a non-ionic surfactant. As per APVMA approved Offlabel permit PER9907.	

Botanical name	Common name	Initial treatment	Follow up control
<i>Asparagus asparagoides</i>	Bridal Creeper	Hand remove in area of high regeneration potential ensure that all fruiting bodies and central 'rhizomes' has been removed and disposed of site Or Chemically treat during peak growing season ( Aug - Sept) using either a Metsulfuron-methyl 600 g/kg based herbicide at a diluted rate 10 g Metsulfuron-methyl to 100 L water, or a 360g/L Glyphosate based herbicide at a diluted rate of 1 part glyphosate to 50 parts water. As per APVMA approved Off label permit PER9907. Introduction of a bio-control (rust) will assist in areas of heavy infestation.	Hand remove seedlings or spot spray with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/Litre of water. All seeds and biomass are to be disposed off-site.
<i>Bidens pilosa</i>	Cobblers Pegs	Prioritise hand removal of weeds. Where not practicable to do so, chemically treat (spray) deseeded mature specimens with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/Litres of water ( 1:100).	Hand remove seedlings or spot spray with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/Litres of water.
<i>Cestrum parqui</i>	Green Poison berry, Green Cestrum	Specimens are to be 'scraped and painted' using a 'neat' 360g/L Glyphosate based herbicide in areas of high regeneration potential.	Hand remove seedlings or spot spray with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/Litre of water.
<i>Conyza bonariensis</i>	Fleabane	Hand remove in area of high regeneration potential. Flowers and seeds to be removed and disposed of site. Remaining biomass can be composted on site on. Larger infestations can be chemically treated using a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/Litres of water. Treatment prior to flowering to reduce seed set is recommended.	Hand remove seedlings or spot spray with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/Litres of water.
<i>Lantana camara</i>	Lantana	Small to isolated infestations: Hand remove or Cut and paint stems with 'neat' 360g/L Glyphosate based herbicide in areas of high regeneration potential. Large infestations: can be cleared/treated in a mosaic pattern to reduce impacts to wildlife and the incidence of mass germination of secondary weed species. Can be chemically treated (foliage spray) via the use of a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/Litres of water or a broadleaf selective herbicide such as a Metsulfuron-methyl 600 g/kg based herbicide.	Hand remove seedlings/shooting nodes or spot spray with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/Litres of water.

Botanical name	Common name	Initial treatment	Follow up control
<i>Ligustrum lucidum</i>	Broad-leaved Privet	Cut/paint, Fill/drill and apply 'neat' 360g/L Glyphosate based herbicide during growing season.	Hand remove seedlings/shooting nodes or spot spray with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/Litres of water.
<i>Ligustrum sinense</i>	Small Leaf privet	Cut/paint, Fill/drill and apply 'neat' 360g/L Glyphosate based herbicide during growing season. Larger specimens may produce vegetative suckers in response treatments.	Hand remove seedlings/shooting nodes or spot spray with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/Litre of water.
<i>Ochna serrulata</i>	Ochna, Mickey Mouse Bush	Small specimens may be manually removed. Established specimens can be either scaped/ painted using a 'neat' Glyphosate 360g/L based product or foliage spray using of a Glyphosate 360g/L and Metsulfuron-methyl 600 g/kg based herbicides at a dilution rate of 200 mL glyphosate plus 1.5 g Metsulfuron methyl per 10 L of water (Offlabel permit : PER9907).	Hand remove seedlings or spot spray with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/Litres of water.
<i>Sida rhombifolia</i>	Paddy's Lucerne, Common Sida	Cut/paint, scrape/paint and apply 'neat' 360g/L Glyphosate based herbicide to actively growing stems in areas of in areas of high regeneration potential (Off label permit : PER9907). Spot spray with a with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/Litres of water.	Hand remove seedlings or spot spray with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/Litres of water.
<i>Tradescantia fluminensis</i>	Trad	Manually remove in areas of in areas of high regeneration potential Or chemically treat with (adjacent to waterways and creek lines) a 360g/L Glyphosate based herbicide (Off label permit: PER9907) at a diluted rate of 200ml in Litres of water.	Hand remove seedlings or spot spray with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/Litres of water.

## Appendix 3 Revegetation species list

**Table 10 Recommended species planting list for Sydney Turpentine Ironbark Forest**

Botanical name	Common name
<b>Shrubs</b>	
<i>Acacia decurrens</i>	Black Wattle
<i>Acacia falcata</i>	Sickle Leaf Wattle
<i>Acacia longifolia</i>	Sydney Golden wattle
<i>Acacia parramattensis</i>	Parramatta Green Wattle
<i>Acacia myrtifolia</i>	Red-stemmed wattle
<i>Allocasuarina torulosa</i>	Forest Oak
<i>Breynia oblongifolia</i>	Coffee Bush
<i>Bursaria spinosa</i>	Blackthorn
<i>Clerodendrum tomentosum</i>	Hairy Clerodendrum
<i>Dodonaea triquetra</i>	Hop Bush
<i>Indigofera australis</i>	Native Indigo
<i>Kunzea ambigua</i>	Tick Bush
<i>Pittosporum revolutum</i>	Rough-Fruited Pittosporum
<i>Polyscias sambucifolius</i>	Elderberry Panax
<b>Forbs, herbs and ground covers</b>	
<i>Centella asiatica</i>	
<i>Commelina cyanea</i>	Survey Weed
<i>Dianella caerulea</i>	Blue Flax-lily
<i>Lomandra filiformis</i> subsp. <i>Filiformis</i>	Wattle Mat-rush
<i>Lomandra longifolia</i>	Spiny Matt Rush
<i>Lomandra multiflora</i> subsp. <i>Multiflora</i>	Many-flowered Mat-rush
<b>Scramblers</b>	
<i>Hardenbergia violacea</i>	Purple Coral Pea
<i>Kennedia rubicunda</i>	Dusky Coral Pea
<i>Rubus parvifolius</i>	Native raspberry
<i>Smilax glycyphylla</i>	Sweet Sarsaparilla

Botanical name	Common name
<b>Grasses</b>	
<i>Echinopogon caespitosus</i> var. <i>caespitosus</i>	Hedgehog Grass
<i>Entolasia marginata</i>	Bordered Panic
<i>Entolasia stricta</i>	Wiry Panic
<i>Imperata cylindrica</i>	Bladey Grass
<i>Microlaena stipoides</i> var. <i>stipoides</i>	Weeping meadow Grass
<i>Panicum simile</i>	
<i>Poa affinis</i>	
<i>Rytidosperma tenuius</i>	Wallaby Grass
<i>Themeda australis</i>	Kangaroo Grass