530 Raymond Terrace Road, Thornton

Vegetation Management Plan

FINAL REPORT

Prepared for Thornton Brentwood Pty Ltd

15 July 2019

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- NSW Office of Environment and Heritage for access to the BioNet Atlas of NSW Wildlife.
- NSW Department of Primary Industries Fisheries for access to the predicted distribution maps for threatened species and fish communities.

Biosis staff involved in this project were:

- Alejandro Barreto (Field investigation and Report writing)
- Paul Price (Report writing)
- Sonika Kumar (Mapping)

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1 Introduction

1.1 Project background

Biosis Pty Ltd was commissioned by Catalyst Project Consulting Pty Ltd to develop a Vegetation Management Plan (VMP) for the Environmental Management zone (E3) located at Lot 20 DP10419, 530 Raymond Terrace Road, Thornton (Figure 1) (the study area), within the Maitland Local Government Area (LGA).

Proposed development at the study area consists of a Stage 1 subdivision that includes 72 residential housing lots, associated roads, parking, drainage and infrastructure. Stage 1 will not directly impact on the VMP area. The project has been assessed under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) with Maitland City Council as the Consent Authority. This VMP has been prepared in accordance with Development Application (DA) conditions of consent from Council for the protection and management of the retained native vegetation and Endangered Ecological Communities (EECs) within the E3 area (hereafter referred to as the VMP area). This VMP also addresses the recommendations of the BioBanking Assessment Statement Report for Lot 20 10419 Raymond Terrace Road, Thornton (Parsons Brinckerhoff [PB] 2016).

Stage 2 and Stage 3 development at the study area will be subject to separate DA's and will not directly impact the VMP area.

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 for ongoing works, provides a timeline for completion of related works and outlines monitoring requirements for the VMP area.

1.2 Description

The study area is located approximately 9 kilometres southeast of Maitland City and approximately 22 kilometres northwest of the Newcastle Central Business District (CBD), (Figure 1).

The study area occurs within the:

- Hunter catchment area
- Hunter Local Land Services (LLS) Management Area
- Municipality of Maitland City Council LGA.

The VMP area is located within an Environmental Management (E3) zone under the Maitland City Council Local Environmental Plan (LEP) 2011. Where it is expected that all ecological values will be protected and managed under the recommendations of this VMP.

Surrounding land uses are predominantly residential and rural with light livestock grazing. A public recreation reserve, utilised for local sporting events, is also in proximity to the study area. Several vehicle tracks cross the VMP area and are currently used as informal four wheel trails. Two unnamed waterways traverse the VMP area, flowing from west to east. The waterways occur as first order streams (according to Strahler 1952), joining in the east to form a second order stream.

Vegetation within the VMP area consists of an east-west riparian corridor with remnant stands of Lower Hunter Spotted Gum - Ironbark Forest and Hunter Lowland Red Gum Forest, both listed communities under the BC Act.

Regional soil landscape mapping indicates that the study area occurs within the Beresfield landscape, characterised by undulating low hills and rises on Permian sediments in the East Maitland Hills region (Matthei 1995). The moderately deep and imperfectly drained podzolic soil landscape is characterised by sandy and silt loams whilst riparian sections of the VMP area display a layered sediment-based soil stratum. The composition of the soil is highly influential on the vegetation communities observed.

1.3 Potential ecological impacts

Key aspects of the proposed development at the study area (Stage 1) that could result in potential ecological impacts include:

- Habitat fragmentation and loss of connectivity.
- Increased noise, vibration, light and vehicular vehicle movements.
- Clearing of native vegetation and habitat associated with Stage 1 and Stage 2.

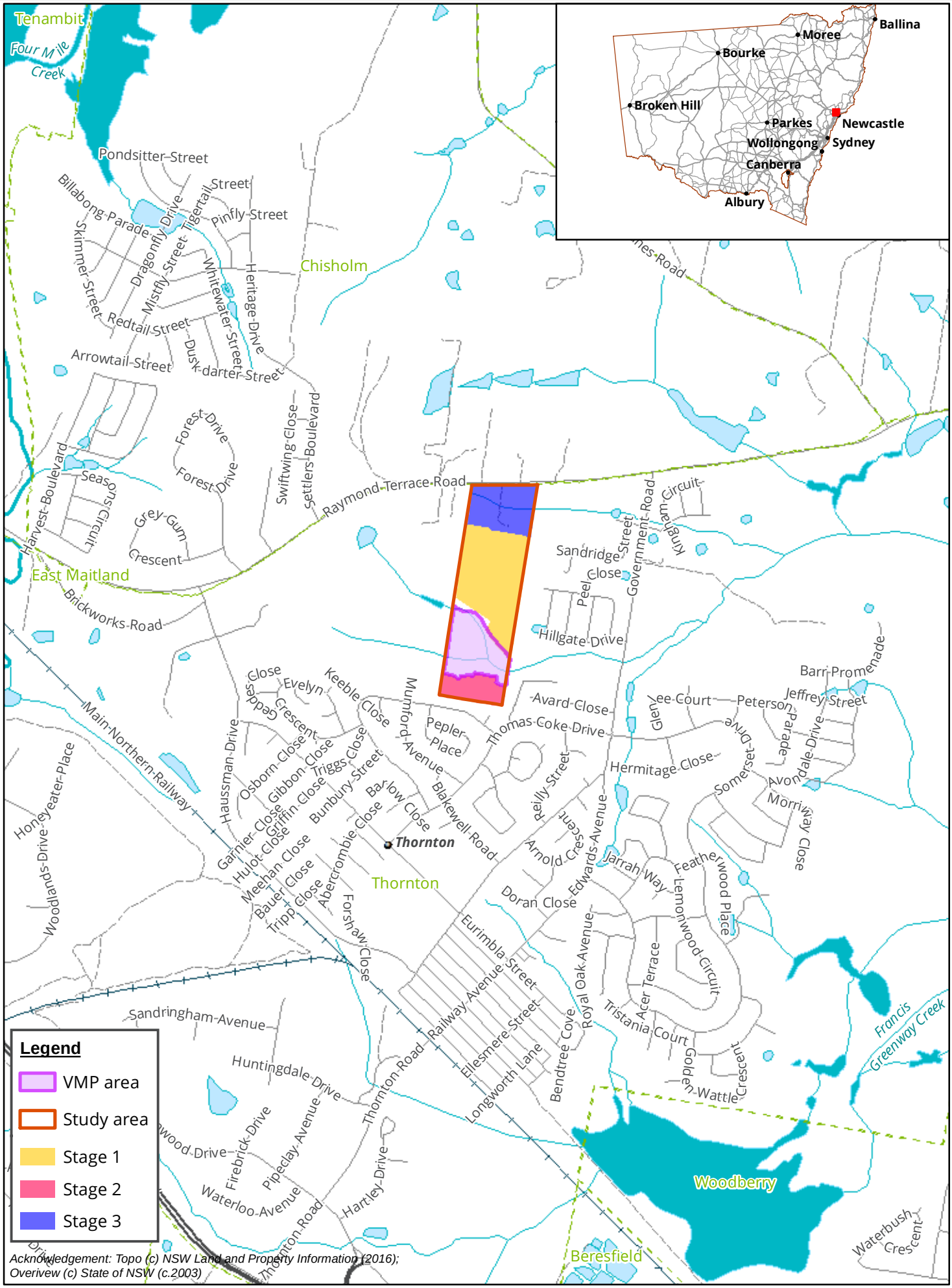

Figure 1: Location of the study area

Biosis Pty Ltd
Albury, Ballarat, Melbourne,
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2 VMP Scope and Objectives

2.1 Scope

The scope of this VMP is to develop a framework for the management of vegetation to be retained, and the ongoing management of weeds within the VMP 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 an 18 month establishment phase followed by a maintenance period that will run for a minimum of four years or until the objectives and performance criteria outlined in this VMP are met.

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

2.2 Objectives

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

- 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 sources, 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 Lower Hunter Spotted Gum - 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 VMP area that are suitable for seed collection, propagation and planting.
- Describe planting density and composition for revegetation works within the VMP area.

3 Methods

3.1 Desktop Research

A review was conducted of all available design plans and reports relating to the study area, as well as relevant legislation, recent vegetation mapping and other information relevant to the project. This included:

- Proposed Site Plans.
- Maitland Local Environment Plan 2011.
- Maitland Development Control Plan 2011.
- Maitland Council Notice of determination (DA 11-932).
- Lower Hunter Vegetation Mapping (Cockerill et al 2013).
- NSW Scientific Committee final determinations for threatened biodiversity.
- BioBanking Assessment Statement Report Lot 20 10419 Raymond Terrace Road, Thornton (PB 2016).
- 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)
- Office of Environment and Heritage (OEH) NSW BioNet, the database for the Atlas of NSW Wildlife, for matters protected under the *Biodiversity Conservation Act 2016* (BC Act).
- 530 Raymond Terrace Road, Thornton: Archaeological Report (Biosis 2018).

3.2 Site Assessment

A flora and fauna survey of the VMP area was conducted on 18 July 2018 by ecologist Alejandro Barreto. The study area was surveyed using random meander methods. This involved:

- The identification of all native and exotic plant species encountered, with nomenclature 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.
- The identification and mapping of plant communities according to the structural definitions of Lower Hunter Vegetation Mapping (Cockerill et al 2013).
- Targeted searches for plant species of conservation significance according to 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, HBTs, tracks, scratches and diggings).
- An assessment of the natural resilience of the vegetation of the VMP area.
- Identification of previous and current factors threatening the ecological function and survival of native vegetation within and adjacent to the VMP area.

- Determination of appropriate rehabilitation and bush regeneration techniques for the native vegetation of the VMP area.

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.

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

4.1 Vegetation communities

The VMP area contains four vegetation types:

- Lower Hunter Spotted Gum-Ironbark Forest in the Sydney Basin Bioregion, listed as an EEC under the BC Act.
- Hunter Lowland Redgum Forest in the Sydney Basin and New South Wales North Coast Bioregions, listed as an EEC under the BC Act.
- Disturbed land.

Lower Hunter Spotted Gum - Ironbark Forest

The Lower Hunter Spotted Gum - Ironbark Forest within the VMP area was recorded in a moderate to weedy condition, occurring around the riparian and floodplain area (Figure 2). A large amount of rubbish was found within this vegetation community.

The canopy is dominated by Spotted Gum *Corymbia maculata*, Red Ironbark *Eucalyptus fibrosa*, Grey ironbark *Eucalyptus paniculata*, White Stringybark *Eucalyptus globoidea*, Narrow-leaved Stringybark *Eucalyptus sparsifolia* and Grey Box *Eucalyptus moluccana*. The midstorey in moderate condition areas consists of Cherry Ballart *Exocarpos cupressiformis*, Gorse Bitter Pea *Daviesia ulicifolia*, Bush Pea *Pultenaea spinosa*, Hairy Bush-pea *Pultenaea villosa,* Native Blackthorn *Bursaria spinosa*, Coffee Bush *Breynia oblongifolia* and White Dogwood *Ozothamnus diosmifolius*. The midstorey in weedy areas is dominated by Lantana *Lantana camara* and Ochna *Ochna serrulata.* The ground cover was dominated by Wiry Panic *Entolasia stricta*, Kangaroo Grass *Themeda triandra*, Threeawn Speargrass *Aristida vagans*, Kidney Weed *Dichondra repens*, Barbed Wire Grass *Cymbopogon refractus*, Bushy Hedgehog-grass *Echinopogon caespitosus*, Silvertop Wallaby Grass *Rytidosperma pallidum*, Variable Sword-sedge *Lepidosperma laterale*, Rock Fern *Cheilanthes sieberi* and Lomandra species. Exotic groundcovers were also present amongst the ground layer, with Ground Asparagus *Asparagus aethiopicus*, Panic Veldtgrass *Ehrharta erecta* and Kikuyu *Cenchrus clandestinus* being most common.

This species assemblage is consistent with the diagnostic features of the Lower Hunter Spotted Gum-Ironbark Forest in the Sydney Basin Bioregion endangered ecological community (EEC), listed under the BC Act.

Hunter Lowland Red Gum Forest

The Hunter Lowland Red Gum Forest within the VMP area was found to be in a weedy condition occurring predominately within the riparian and floodplain area (Figure 2). A large amount of rubbish was found within this vegetation community.

The canopy consists of Forest Red Gum *Eucalyptus tereticornis*, Spotted Gum and Grey Gum *Eucalyptus punctata*. The midstorey is dominated by woody weed species including Lantana, Ochna and Cassia *Senna pendula* var. *glabrata,* with a limited presence of native shrubs including Blackthorn, Coffee Bush, Green Wattle *Acacia irrorata*, Sweet Pittosporum *Pittosporum undulatum* and Sickle Wattle *Acacia falcata.*

The ground cover along the riparian channel is dominated by the exotic species Crofton weed *Ageratina adenophora,* Ground Asparagus and Black-eyed Susan *Thunbergia alata*. Native groundcover species included Weeping Grass *Microlaena stipoides*, Common Maidenhair *Adiantum aethiopicum*, Indian Pennywort *Centella asiatica,* Tall Sedge *Carex appressa*, Kidney Weed, Glycine species and Bordered Panic Grass *Entolasia marginata.*

This species assemblage is consistent with the diagnostic features of the Hunter Lowland Redgum Forest in the Sydney Basin and New South Wales North Coast Bioregions listed as an EEC under the BC Act.

Disturbed lands

The disturbed lands within the VMP area consist of a heavily disturbed and eroded depression where all vegetation has been removed (Figure 2). The area is currently littered with abandoned vehicles, rubbish and subject to recreational four wheel driving.

4.2 Fauna habitats

A range of fauna habitat features are present throughout the study area. Habitat within the VMP area provides potential foraging, breeding and nesting resources for a range of fauna. Few hollow-bearing trees (HBT) were recorded within the study area during field surveys. The habitat features relevant to each fauna group are identified in Table 1 below.

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.
Watercourses	Habitat for amphibians and fish; foraging for birds, microbats, reptiles and marsupials.
Leaf litter/woody debris	Foraging resources for birds, foraging and nesting habitat for small mammals, frogs and reptiles.

4.3 Threatened species habitats

Threatened species habitat within the VMP area is considered to be limited due to past disturbance including vegetation clearance, exotic flora species invasion and close proximity to residential dwellings. However, the vegetation on the western boundary of the VMP area has contiguous linkages to the north and west and has the potential to support a number of locally-occurring threatened species.

Review of the OEH Bionet Atlas (OEH 2018), Biobanking Credit Calculations (PB 2016) and the DEE Protected Matters Search Tool (DEE 2018) revealed nine threatened flora species and 20 threatened fauna species have been previously recorded, or are predicted to occur, within a 10 kilometre radius of the study area. Of these locally occurring threatened species, the following are considered most likely to occur within the VMP area:

- Yellow-bellied Sheathtail-bat *Saccolaimus flaviventris* (Vulnerable, BC Act).
- Eastern Freetail-bat *Mormopterus norfolkensis* (Vulnerable, BC Act).
- Eastern False Pipistrelle *Falsistrellus tasmaniensis* (Vulnerable, BC Act).
- Greater Broad-nosed Bat *Scoteanax rueppellii* (Vulnerable, BC Act).
- Barking Owl *Ninox connivens* (Vulnerable, BC Act).
- Black-chinned Honeyeater (eastern subspecies) *Melithreptus gularis* subsp. *gularis* (Vulnerable, BC Act).
- Gang-gang Cockatoo *Callocephalon fimbriatum* (Vulnerable, BC Act).

- Grey-crowned Babbler (eastern subspecies) *Pomatostomus temporalis* subsp. *temporalis* (Vulnerable, BC Act).
- Little Eagle *Hieraaetus morphnoides* (Vulnerable, BC Act).
- Little Lorikeet *Glossopsitta pusilla* (Vulnerable, BC Act).
- Masked Owl *Tyto novaehollandiae* (Vulnerable, BC Act).
- Painted Honeyeater *Grantiella picta* (Vulnerable, BC Act and EPBC Act).
- Powerful Owl *Ninox strenua* (Vulnerable, BC Act).
- Square-tailed Kite *Lophoictinia isura* (Vulnerable, BC Act).
- Swift Parrot *Lathamus discolor* (Endangered BC Act, Critically Endangered EPBC Act).
- Varied Sittella *Daphoenositta chrysoptera* (Vulnerable, BC Act).

4.4 Priority and environmental weeds

Three weeds listed as priority weeds in the Maitland City Council LGA under the NSW *Biosecurity Act 2015* (Biosecurity Act) were recorded within the VMP area (Table 2). These weeds are also considered to be Weeds of National Significance (WoNS). Landowners and occupiers are under legal obligations to manage such species in line with the General Biosecurity Duty which states;

> *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.*

Table 2 Priority weeds and WoNS recorded within the study area

Scientific name	Common name	General Biosecurity Duty	WoNS
Asparagus aethiopicus	Ground asparagus	**Prohibition on dealings** *Must not be imported into the State or sold*	Yes
Lantana camara	Lantana	**Prohibition on dealings** *Must not be imported into the State or sold*	Yes
Senecio madagascariensis	Fireweed	***Mandatory Measure*** *Must not be imported into the State or sold.*	Yes

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 1999, OEH 2011b).

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:

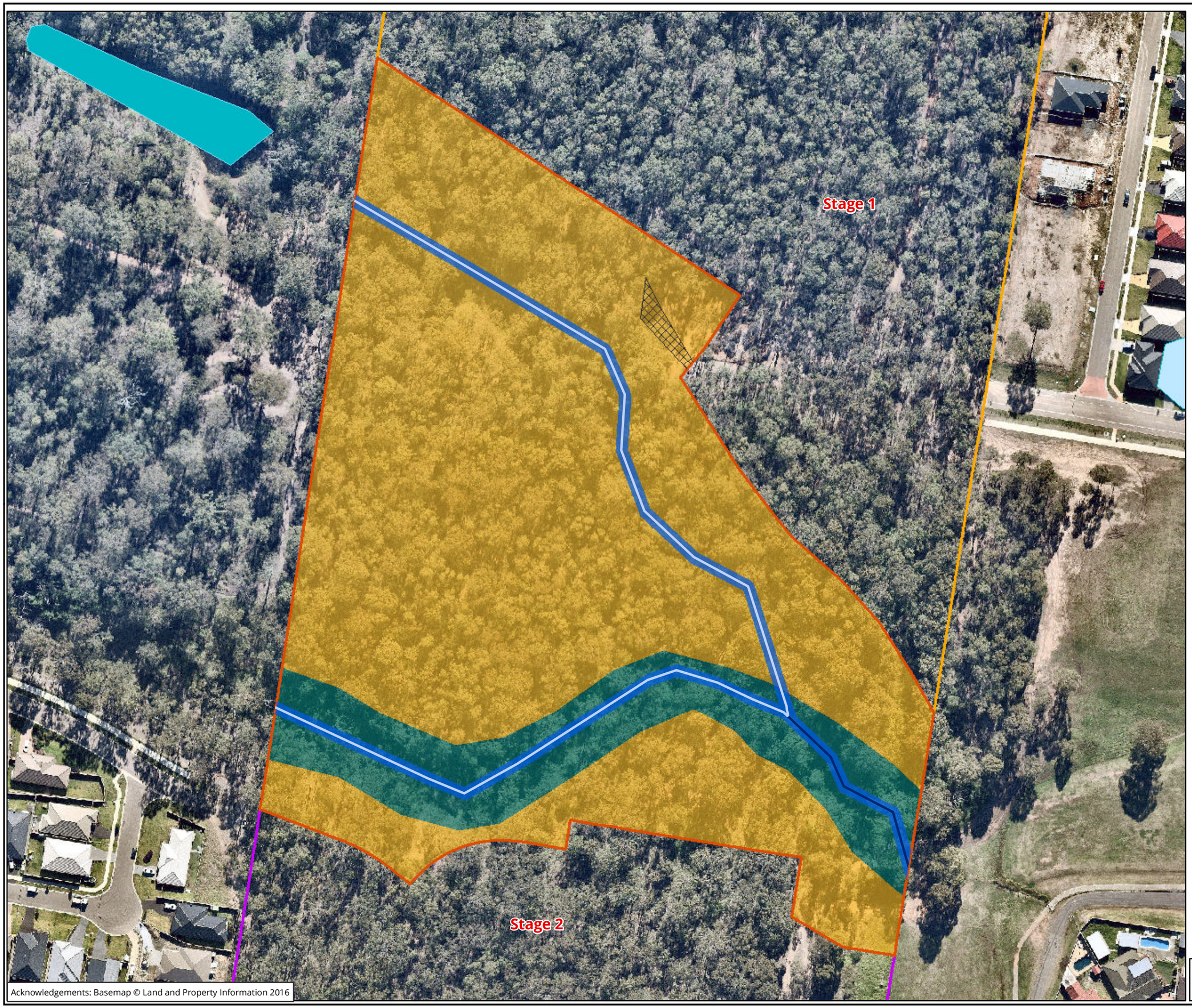
- future land use (retain or remove)
- vegetation community type
- resilience within the overstorey, shrub storey and understorey
- level of recruitment of exotic species (including priority weeds)
- Archaeological sensitivity

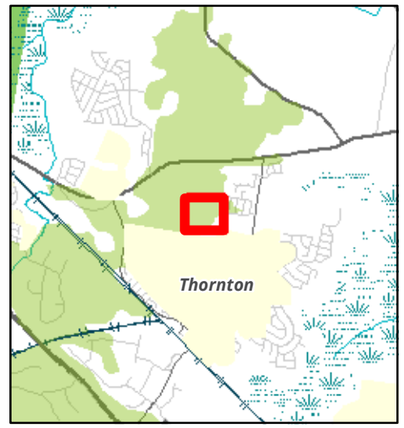
Using these attributes, four management zones have been identified within the VMP area (Table 3). The location and extent of each zone is provided in Figure 2, with corresponding summary of the management requirements for each zone provided in Table 3 below.

Table 3 Management zones

Management zone	Area	Description
Management Zone 1a: Riparian Channel (MZ1a)	0.3 hectares	MZ 1a and MZ1b are mapped as Hunter Lowland Red Gum Forest in a weedy condition, to be managed as a conservation area as a part of the Unnamed creek catchment. All weed control is to be undertaken using industry approved best practice techniques in bush regeneration and weed control with scope to increase the structural and floristic diversity of the Hunter Lowland Red Gum Forest. All weed control and bush regeneration activities have to comply with the Cultural Heritage Management Plan (CHMP) recommendations in order to avoid impacts on potential heritage sites. Key management actions within the zone are to include the strategic treatment and removal of all exotic species, brush matting areas with lower regeneration potential and maintenance for a period of four years as specified by the NSW DPI Office of Water Guidelines (DPI 2015).
Management Zone 1b: Vegetated Riparian Zone (MZ1b)	1.3 hectares	
Management Zone 2: Disturbed Land (MZ2)	0.02 hectares	MZ 2 is part of a larger eroded depression heavily modified by recreational four wheel driving and rubbish dumping. Full revegetation will be required in this area.

Management zone	Area	Description
Management Zone 3: Native woodland (MZ3)	3.85 hectares	MZ 3 is mapped as Lower Hunter Spotted Gum - Ironbark Forest in a Moderate condition to be managed a conservation area. All weed control is to be undertaken using industry approved best practice techniques in bush regeneration and weed control with scope to increase the structural and floristic diversity of the Lower Hunter Spotted Gum - Ironbark Forest. All weed control and bush regeneration activities have to comply with the Cultural Heritage Management Plan (CHMP) recommendations in order to avoid impacts on potential heritage sites. Key management actions within the zone are to include the strategic treatment and removal of all exotic species, brush matting areas with lower regeneration potential and maintenance for a period of four years as specified by the NSW DPI Office of Water Guidelines (DPI 2015).





Legend

VMP area

Study area

Stage 1

Stage 2

Disturbed Land

Vegetation communities

Lower Hunter Spotted Gum - Ironbark Forest EEC

Hunter Lowland Red Gum Forest EEC

Unnamed waterway

Strahler Order 1

Strahler Order 2

Figure 2: Ecological Features of the VMP area

0 10 20 30 40 50

Metres

Scale: 1:1,400 @ A3

Coordinate System: GDA 1994 MGA Zone 56

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Legend

- VMP area
- Riparian channel (MZ1a)
- Vegetated Riparian Zone (MZ1b)
- Disturbed Land (MZ2)
- Native woodland (MZ3)

Acknowledgements: Basemap © Land and Property Information 2016

Figure 3: Management zones

0 10 20 30 40 50 60 70

Metres

Scale: 1:1,500 @ A3

Coordinate System: GDA 1994 MGA Zone 56

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6 Specific management actions

This chapter provides the specific management actions for the proposed development (Stage 1) and the VMP area. Specific actions are detailed for the following management objectives:

- Site establishment and pre-civil works
- Restoration
- Revegetation
- Brush matting
- Maintenance
- Vertebrate pest control.

6.1 Site establishment and pre-civil works

6.1.1 Site inductions

Construction works supervisors are required to identify all potential environmental impacts of the works and implement and maintain control measures, procedures and constraints accordingly. These should be documented as part of a Construction Environmental Management Plan (CEMP) or similar.

General site inductions should include making all personnel aware of the environmental sensitivity of the VMP area and must also include hygiene protocols to reduce the potential for introduction of invasive flora and fauna species or disease into the VMP area.

6.1.2 Exclusion fencing

The extent of ecologically sensitive areas located adjacent to the works areas will be shown on relevant Sensitive Site 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.

The fencing 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.

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. 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, seed is to be collected from all native vegetation within the approved development footprint.

Woody debris derived from tree felling and vegetation clearing activities is to be cut into 2 metre to 4 metre lengths (where applicable) and distributed throughout the disturbed sections of the VMP area (under the direction of a suitably qualified ecologist), to enhance fauna habitat.

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 flora species, seed is to be collected from within the VMP area or the Maitland City Council LGA.

Time should be allocated to seed collection for the project to allow for seasonal variation 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. Seed collection from a Threatened Ecological Community also requires a licence under the NSW National Parks and Wildlife Act 1974. 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.

Further information in relation to seed collection is provided as Appendix 1.

6.2.2 Weed management

The proposed works have the potential to introduce and promote weeds and pathogens into surrounding areas. Environmental weeds are exotic species considered to have 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.

6.2.3 Brush matting

Woody plant material like seed laden branches of native trees and shrubs can be lopped within the VMP area and laid directly on the bare ground. The seed-laden brush not only introduces seeds for regeneration, but can also act as a soil protection layer. By slowing overland water flow, water can infiltrate the soil and provide ideal conditions for germination. Windblown seed from other species can also collect in the brush and germinate.

It may also deter trampling or degrading the site in high use areas. On steeper sites, brush can be pegged with stakes. This is likely to be effective only for small areas. The seed must be ripe, and the ground surface of the revegetation site is suitable as a seedbed (e.g. not compacted or weedy). Disturbance to the source site should be kept to a minimum, and branches should only be collected if they are plentiful.

Brush matting would be required in bare ground areas within MZ1a, MZ1b and MZ3.

6.2.4 Natural regeneration

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

- Seeds and propagules exist within the seed bank.
- Brush matting provides a cover of native seed-laden plant material that promotes regeneration and soil protection.
- 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.

The applicability of any of the above management actions will be dependent on the pre-existing vegetation, archaeological sensitivity of the area and local conditions. Natural regeneration, brush matting and encouragement of natural regrowth will be most effective in MZ1a, MZ1b and MZ3. 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

Native vegetation lost as a result of historical disturbances will require the revegetation works in order to restore native vegetation cover and habitat within the VMP area.

The purpose of revegetation for this project includes:

- The promotion of a structurally diverse vegetative community and maintenance of the riparian corridor.
- Reducing the incidence of surface and rill erosion within the riparian zone.
- Creating buffer zones around retained native vegetation to protect it from edge effects.
- Creating and maintaining habitat corridors to help facilitate the movement of flora and fauna species.
- Maintaining native seed banks, local provenance of species endemic to the area and genetic diversity.

All plants to be installed as part of the required revegetation works are to be either as hiko's and/or enviro-cells sized pots. Advanced stock are not to be used for rehabilitation purposes and do not compensate for multiple plantings within the VMP area. A recommended 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 Lower Hunter Spotted Gum - Ironbark Forest and that have been recorded in the study area.

6.3.1 Planting densities

The following is a guide to inform the revegetation densities:

- Full revegetation (MZ2): Trees are be installed at a rate of one plant/ 10 square metres, Shrubs at a rate of one plant/ 5 square metres and grasses installed at a rate of one plant per square metre.

Plants are to be installed at the density rates as provided in Table 4.

Table 4 Planting densities

Zone	Trees	Shrubs	Climbers	Ground covers/grasses	Total
Zone 1a	-	-	-	-	0
Zone 1b	-	-	-	-	0
Zone 2	150	300	50	3000	3500
Zone 3	-	-	-	-	0
Total	**150**	**300**	**50**	**3000**	**3500**

An estimated 3,500 plants are to be installed as part of the proposed VMP works to satisfy the requirements of the Maitland City Council DA requirements and the OoW guidelines (DPI 2015). In the event of plant loss, a nominated replacement of 10% of the total plants installed (350) has been calculated into the VMP costing schedule (Table 6).

6.3.2 Soil conditioner and additives

At the time of planting, fertiliser is be applied to each plant in the form of a native slow release product with an N: P: K ratio of similar to that of 21.8: 0.7: 7.2. This will reduce the incidence of 'Nitrogen draw down' and subsequent loss of newly installed stock 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 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 Table 7.

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 four to six

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 9), maintenance weed control, brush matting and supplementary revegetation activities and will continue for a period of 48 months or until the performance criteria has been met. It is anticipated that the maintenance activities will occur monthly during cooler months and twice a month 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
Spot spraying of annual and perennial weeds	Two person days, Monthly	Monthly in cooler months, fortnightly in warmer months	Land manager/bush regeneration contractor
Watering	As required	Only during excessively hot periods of summer	Land manager/bush regeneration contractor
Replacement planting of tubestock	As required	Annual checks and planting	Land manager/bush regeneration contractor

6.5 Vertebrate pest control

Two species declared as vertebrate pests under the LLS Act were recorded within the study area:

- European rabbit *Oryctolagus cuniculus*
- European Red Fox *Vulpes Vulpes.*

Under Part 10, Division 2 Section 142 of the LLS Act private land owners and/or manager must eradicate any declared pests on their land by '*any lawful methods*'.

All proposed vertebrate pest management is to be undertaken in consultation with a Local Land services representative and a suitably licensed Vertebrate Pest Control contractor

7 Cost

This section provides details on the predicted costs associated with the implementation of the following components of this VMP:

- Seed collection
- Rubbish removal
- Weed control
- Brush matting
- Revegetation
- Maintenance
- Monitoring.

No costs have been included for preliminary civil works (including ecologist on site during vegetation clearance) or vertebrate pest management. Details of the costing are provided as Table 6.

The total cost for the implementation of the VMP, including an 18 month establishment phase and a four year maintenance period is $217, 289 (ex GST). A breakdown of costs per year is provided as Table 7. All costs are indicative only.

Table 6 VMP budget and breakdown

Task	Establishment phase	Year 2	Year 3	Year 4	Year 5	Total
Preliminary works						
Seed Collection	$1,750					$1,750
Rubbish removal	$5,000					$5,000
Weed Control						
Primary	$68,875	$0	$0			$68,875
Secondary	$16,480.00	$16,480				$32,960
Maintenance		$19,572.50	$15,658	$10,961	$10,961	$57,152
Revegetation						
Revegetation	$7,700					$7,700
Replacement planting		$770				$770
Brush matting	$15,000	$5,000	$2,500			$22,500
Watering	$2,625					$2,625
Monitoring	$3,592	$3,592	$3,592	$3,592	$3,592	$17,958
Total	$121,022	$45,414	$21,750	$14,552	$14,552	$217,289

8 Vegetation management actions

Table 7 Vegetation management actions and performance criteria

Management Action	Management Zone/area	Responsibility	Task / Performance Criteria	Timing	Costs included
Seed collection	All zones	Restoration Ecologist	The collection of local native species in preparation for the proposed VMP vegetation management actions	• Prior and during vegetation removal	Yes
Define property boundary and install vegetation exclusion fencing	All Zones	Construction contractor / Vegetation management consultant	Vegetation exclusion fencing is to be installed as per the specifications above (Section 6.2.2).	• Prior to vegetation removal and during earthworks.	No
Rubbish Removal	All Zones	Construction contractor	Collect and remove rubbish within the VMP area.	• From the outset of vegetation management program.	No
Vegetation Clearance	Development footprint	Construction contractor / Project Restoration Ecologist	• Salvage and placement of logs within VMP area	• During prescribed earthworks	No
Bush regeneration (primary, secondary & maintenance weed control)	All Zones	Bush Regeneration contractor	Primary and secondary weed control works are to include the following actions: • All weeds treated as per Appendix 2. • Commencement of maintenance works will occur once mature exotic species have been reduced to 5% Projected Foliage Cover (PFC). This is expected to be (18 months) after commencement of primary weed control works.	• From the outset of vegetation management program.	Yes

Management Action	Management Zone/area	Responsibility	Task / Performance Criteria	Timing	Costs included
			• All mature priority weeds are to be successfully treated within the VMP area prior to commencement of the maintenance period. • At the completion of the required two year maintenance period, weed densities across the site are to have an average coverage abundance of < 5%.		
VMP area erosion control	All zones	Bush Regeneration contractor	Following primary and secondary weed control and APZ vegetation removal installation of erosion controls may be necessary if vegetation cover is lacking. Recommended erosion controls include terracing made from cut vegetation, and or the installation of coir logs across the slope.	• As required immediately following vegetation removal.	No
Revegetation	MZ1a, MZ1b and MZ2	Bush Regeneration contractor	• 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. • All installed plants are to be propagated from locally sourced seed stock collected within a 5 kilometre radius of the study area, and selected from the list for contained in Appendix 3 of this VMP. ○ A certificate of provenance will be required by the Vegetation management consultant as part of VMP monitoring works. • Where revegetation works are required, plants installed as per densities as provided in Table 4. A minimum of 85% survivorship of all planted specimens is to be maintained over the duration of the VMPs implementation. • Any replacement planting is to occur in year 2 of the maintenance phase.	• Immediately following successful completion of secondary weed control.	Yes
Revegetation maintenance	MZ1a, MZ1b and MZ2	Bush Regeneration contractor	• Installed plantings are to be maintained with key elements of water, prevention of predation and suppression of smothering weeds.	• Commences immediately following final installation of all plants.	Yes

Management Action	Management Zone/area	Responsibility	Task / Performance Criteria	Timing	Costs included
			• A minimum of 85% survivorship for each species is to be maintained. • Replacement planting is to be carried out throughout the maintenance period to sustain the 85% survival rate at the completion of the maintenance period. • Losses of greater than 20% of originally installed plantings may have the maintenance period extended until survival rates have been achieved.	• Minimum weekly watering over 8 weeks in summer, or 3 weeks in winter, immediately following installation. • Watering visits to continue as required to plant establishment. • Weed removal as required to the completion of the maintenance period.	
Bush regeneration maintenance	All Zones	Bush Regeneration contractor	• All mature priority weeds are to be successfully treated prior to commencement of maintenance period. • Seedlings of priority species are to be continually suppressed to a level of <5% Projected Foliage Cover (PFC) where they occur in the seed bank below mature specimens, and <1% PFC across remainder of the VMP area. • Works to be undertaken utilising best practice bush regeneration techniques. • Less than 5% exotic species FPC to be achieved over the entire VMP area after 12 months of maintenance works. • Continual suppression at <5% for the remaining 12 months of the maintenance period (24 month total maintenance period).	• The maintenance period will run for a 24 month term following successful secondary weed control and/or installation of final plantings (whichever is later). • The commencement of this maintenance period may be adjusted if there are delays beyond the contractor's control. • Commencement and completion dates of the maintenance period will be determined by the Project Restoration Ecologist, following consultation with Council, the contractor and Principle.	Yes

Management Action	Management Zone/area	Responsibility	Task / Performance Criteria	Timing	Costs included
Brush matting	MZ1a, MZ1b and MZ3	Bush Regeneration contractor	• Woody material should be pegged with stakes or pegs • The seed must be ripe, and the ground surface of the site is suitable as a seedbed (e.g. not compacted or weedy). • Disturbance to the source site should be kept to a minimum, and branches should only be collected if they are plentiful.	• Immediately following successful completion of secondary weed control.	Yes

Table 8 Vegetation management actions - Monitoring

Management Action	Specification / Requirement
Ecological Monitoring Framework	Ecological Monitoring works are to be undertaken by the Project Restoration Ecologist. Monitoring surveys will assess the success of weed removal, plant growth and natural regeneration, and will be undertaken as follows: • Prior to commencement of works to gather baseline data. • Followed by a survey every six (6) months to gather ecological monitoring data on the progress of the project, commencing at the start of the maintenance period with a final survey and report at the completion of the 48 month program. Each six month survey should be accompanied by brief correspondence with the BR contractor and the proponent / project manager regarding the progress of the vegetation management works, and highlight any areas of concern / merit. • Vegetation monitoring reports are to be prepared at the commencement of maintenance works, at the 12 month stage, and a final report at the end of the 48 month period. • Achievement of performance criteria will be updated in each preceding report as milestones are achieved. • These reports are to be submitted to the Maitland City Council. The restoration zones will be monitored in terms of vegetation condition and the achievement of performance criteria. Monitoring activities are to include: • Establishing a minimum of two photo-points in representative locations. • Compile initial and on-going weed density maps. • 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. • Identification and assessment of any natural regeneration of native plant species. • Certification of local provenance plantings prior to installation. • Assessment of the success rate of plantings and assessment of plant replacement requirements, and convey any need to BR contractor. • Assessment of the site for evidence of herbivory and erosion. Monitoring works will also provide the following certifications to the proponent / project manager, and then on to Council: • Certification that the planting stock (including initial and replacement plantings) is of local provenance as evidenced by the supplying nursery or bush regeneration contractor, and at the required densities. • Certification of commencement of maintenance period, i.e. all primary secondary and revegetation works have been completed to acceptable standards. • Final certification that the targets of the vegetation management works have been achieved.

9 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 9 Five year action plan for vegetation management

Actions	Timeframe				
	Establishment	Year 1	Year 2	Year 3	Year 4
Engage licensed seed collectors to collect seed					
Vertebrate pest management					
Propagation and sourcing of plants for revegetation					
Install sediment control fencing (top of bank and at vegetation clearance boundary)					
Install exclusion fencing along vegetation clearance boundary					
Implement primary weed removal					
Implement secondary weed removal					
Revegetation					
Maintenance weeding					
Replacement planting					
Remove litter and general rubbish					
Brush matting					
Photo point monitoring and annual reporting					

10 Adaptive Management

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. 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.

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Appendices

Appendix 1 Seed collection and propagation methods

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, this is not applicable in the Project footprint where all native vegetation is to be cleared. If seed is collected from adjoining retained areas however, the 10% rule applies. 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 at least six months to 12 months prior to construction and provided with the proposed planting list in Table 11, 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

Standard methods

General weed management measures 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 herbicides (to avoid herbicide resistance).
- 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.
  - Separate weeds from native vegetation to be mulched – do not use weeds for mulch.
  - 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 and botanical knowledge of the weeds. 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, 7th Edition* (DPI 2018) 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 an 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 (2018) document cited above should be referred to as guide for specific herbicides, record keeping and herbicide application techniques.

Use of herbicides must be 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. 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 2018). 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 suggests 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 that 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 of 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 10.

Table 10 Priority and environmental weed management measures

Botanical name	Common name	Initial treatment	Follow up control
Annual weed species	Various	Hand remove Or chemically treat (spray) deseeded mature specimens with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/Litre 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/Litre of water.
Ageratina adenophora	Crofton Weed	Hand remove or chemically treat (spray) deseeded mature specimens with a 600g/kg Metsulfuron-methyl based herbicide at a diluted rate of 15gl/100Litre of water. Add surfactant and thoroughly wet all foliage to point of run-off up to bud stage to prevent seed set.	Monitor for seedlings. Hand remove and/or remove seedlings or spot spray with a 600g/kg Metsulfuron-methyl based herbicide at a diluted rate of 15gl/100Litre of water based herbicide at a diluted rate of 10ml/Litre of water.
Asparagus aethiopicus	Ground Asparagus	Hand remove Or chemically treat (spray) deseeded mature specimens with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/Litre of water (1:50)	Monitor for seedlings. Hand remove and/or remove seedlings or spot spray with a 360g/L Glyphosate based herbicide at a diluted rate of 20ml/Litre of water
Ehrharta erecta	Panic Veldtgrass	Hand remove Or chemically treat (spray) deseeded mature specimens with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/Litre 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/Litre of water.
Cenchrus clandestinus	Kikuyu		
Lantana camara	Lantana	• Spot spray application of Glyphosate 360 g/L Roundup® at a rate of 1 part glyphosate to 50 parts water. Completely wet all leaves and stems. Best done during times of active growth ie. Spring/summer. • Stem injection for basal diameter up to 25 cm of Glyphosate 360 g/L Roundup® at a rate of 1 part glyphosate to 1 part water, 2 mL per cut or for basal diameter 25 cm to 60 cm undiluted, 2 mL per cut. Best done during times of active growth ie. Spring/summer.	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/Litre of water.

Botanical name	Common name	Initial treatment	Follow up control
Ochna serrulata	Ochna	• Small seedlings can be manually removed. • Scrape stem, cut, and paint. Cut stump saplings. Stem injection large trees and shrubs with Glyphosate 360 g/L Roundup® at a rate of 1 part glyphosate to 1.5 part water.	Monitor for seedlings. Hand remove and/or remove seedlings or spot spray with a 360g/L Glyphosate based herbicide at a diluted rate of 20ml/Litre of water.
Senna pendula* var. *glabrata	Cassia	• Young seedlings can be manually removed. Seed pods should be collected and removed from the site. • Scrape stem, cut, and paint. Cut stump saplings. Stem injection large trees and shrubs with Glyphosate 360 g/L Roundup® at a rate of 1 part glyphosate to 1.5 part water. • Chemically treat (spray) deseeded mature specimens with a 360g/L Glyphosate based herbicide at a diluted rate of 20ml/Litre of water (1:50)	Monitor for seedlings. Hand remove and/or remove seedlings or spot spray with a 360g/L Glyphosate based herbicide at a diluted rate of 20ml/Litre of water.
Thunbergia alata	Black-eyed Susan Vine	Hand remove Or chemically treat (spray) deseeded mature specimens with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/Litre 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/Litre of water.

Appendix 3 Recommended planting species list

Table 11 Recommended species planting list for Lower Hunter Spotted Gum - Ironbark Forest

Botanical name	Common name	Percentage of mix
Trees (10 -20 +m)		
Angophora costata	Smooth-barked Apple	10
Eucalyptus fibrosa	Red Ironbark	10
Eucalyptus paniculata	Grey ironbark	20
Corymbia maculata	Spotted Gum	20
Eucalyptus moluccana	Grey Box	10
Eucalyptus sparsifolia	Narrow-leaved Stringybark	15
Corymbia gummifera	Red Bloodwood	15
Shrubs		
Breynia oblongifolia	Coffee bush	80
Bursaria spinosa	Blackthorn	10
Daviesia ulicifolia	Gorse Bitter Pea	10
Forbs, herbs and ground covers		
Dianella revoluta	Blueberry Lily	15
Dianella caerulea	Blue Flax-lily	10
Goodenia hederacea	Ivy Goodenia	15
Laxmannia gracilis	Slender Wire Lily	10
Lomandra filiformis* subsp. *filiformis	Wattle Mat-rush	10
Lomandra multiflora* subsp. *multiflora	Many-flowered Mat-rush	10
Lomandra longifolia	Spiny-headed Mat-rush	10
Pratia purpurascens	Whiteroot	10
Vernonia cinerea		10
Climbers and scramblers		
Hardenbergia violacea	False Sarsaparilla	100
Grasess		
Aristida vagans	Threeawn Speargrass	20
Cymbopogon refractus	Barbed Wire Grass	10

Botanical name	Common name	Percentage of mix
Entolasia stricta	Wiry Panic	10
Panicum simile	Two-colour Panic	10
Microlaena stipoides* var. *stipoides	Weeping Grass	20
Themeda australis	Kangaroo Grass	30