PROPOSED RESIDENTIAL SUBDIVISION
Ravenswood Estate, Tullimbar
Stage 9
Vegetation Management Plan
1501 February 2020

siteplus

planning . engineering . landscape . design . management

VEGETATION MANAGEMENT PLAN

PROPOSED RESIDENTIAL SUBDIVISION
Lot 414 DP 1235168 & Lot 3 DP 1214606
Ravenswood Estate, Tullimbar

PREPARED FOR

Balmoral Parade Pty Ltd

PREPARED BY

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1.0 INTRODUCTION

1.1 Background

It is proposed to develop part Lot 414 DP 1235168 & Lot 3 DP 1214606 Tullimbar, located in the Shellharbour City Council Area. This Vegetation Management Plan (VMP) is a component of the Development Application for the proposed development of Stage 9 of the subdivision, to be submitted to Shellharbour City Council (Council) who is the approval authority.

This document is to form part of a Landscape Master Plan and Riparian Management Plan that is to be prepared for the entirety of Hazelton Creek as a collaboration between adjoining land developers (Allam Property Group and Dahua Group). All vegetation documents are to be compiled and used for holistic management along the creek.

The outline of Stage 9 includes an area to be cleared which comprises the *Illawarra Lowlands Grassy Woodlands,* a Ecological Community / Critically Endangered Ecological Community under the NSW Biodiversity Conservation Act 2016 (BC Act) and Commonwealth Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act) respectively.

Based on the Biodiversity Assessment Methodology (BAM), this VMP addresses vegetation management strategies for native vegetation management, including re-vegetation and regeneration, integrated weed management and control of high threat weeds, management of human disturbance and monitoring including evaluation and reporting.

Pursuant to the *BC Act and EPBC Act,* administered by the Department of Planning, Industry and Environment, this VMP will recommend guidelines to the developer so that the activities occurring within/bordering the *Critically Endangered Ecological Community* will not result in more than minimal impact to the vegetation.

1.1.1 Consultation

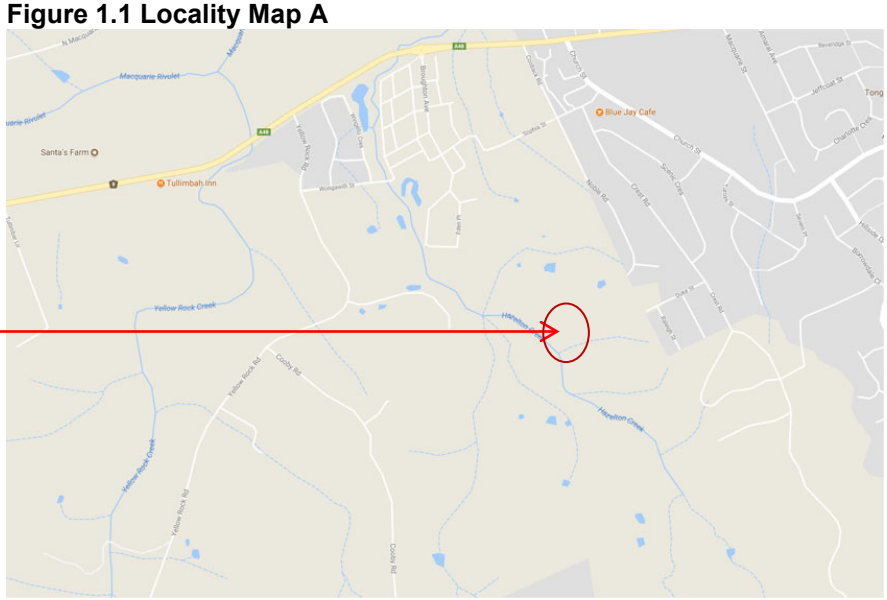
Consultation has occurred with Officers of Shellharbour City Council and Simon Tweed from Niche Environment and Heritage to ascertain requirements.

1.1.2 Site Location

The subject site is located in the Shellharbour suburb of Tullimbar as shown in Figures 1.1 and 1.2.

Figure 1.1 Locality Map A

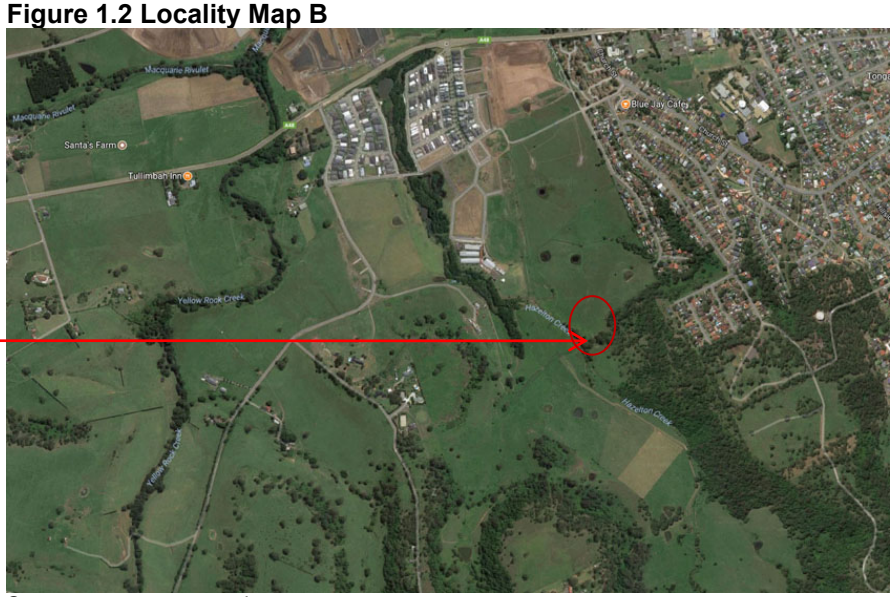
Approximate location of Stage 9



Source: www.maps.google.com.au

Figure 1.2 Locality Map B

Approximate location of Stage 9



Source: www.maps.google.com.au

1.1.3 Scope of Work

Site Plus Pty Ltd (Siteplus) has been engaged by Balmoral Parade Pty Ltd (Balmoral) to prepare a VMP for the Riparian Area and the Area of Impact, resulting from the clearing of approximately 1ha of the Illawarra Lowlands Grassy Woodland EEC. The clearing is required to construct the proposed Stage 9 subdivision (as shown in Figure 2.1). The VMP will include the following work:

- Description of the existing characteristics of the site;
- Native vegetation management including definition and ordering of rehabilitation tasks;
- Description of integrated weed management and control of high threat weeds including definition of weed removal methods;
- Description of human disturbance management;
- Definition and programming of maintenance tasks;
- Installation methods;
- Identification of sources for revegetation stock;
- Preparation of an overview costing; and
- Description of the maintenance period monitoring and reporting.

1.2 Plan Purpose and Objectives

The purpose of this VMP is to provide guidelines to assist in the implementation of the necessary work in order to achieve the objectives set out in Table 1.1.

Table 1.1 VMP Purpose and Objectives

OBJECTIVES	ACTIONS	TARGETS
To improve the quality of the riparian vegetation along the identified portion of Hazelton Creek, while maintaining /improving creek bank stability.	• Retain endemic vegetation (where possible) throughout construction and maintenance period. Installation of tree protection fence during construction. • Control all weeds by priority, focusing on noxious and environmental weeds. Ongoing weed control during construction and maintenance period. • Treat weedy trees and shrubs on creek embankment with drill and frill technique used in bush regeneration. This allows the tree/shrub to remain in the soil while it gradually dies and decomposes on site and still provides some degree of soil stability. • Install native species (as listed in table 3.10) in areas shown on landscape plan.	• Installation of protection fence during construction works. • 0–12 months: Monthly maintenance inspections by bush regenerator (remove weeds, reinstate plants etc.). • 12-24 months: Bi-monthly maintenance inspections by bush regenerator (remove weeds, reinstate plants, allow for native vegetation to establish etc) • 24-36 months: maintenance as required to ensure plant density, managing weed encroachment and allowing native vegetation to establish. • 6 half yearly reports prepared by consultant during maintenance period to state development of revegetation planting. • No more than 5% of weed cover within riparian corridor at the end of maintenance period • 80% survival rate of revegetated plant species
To minimise the impacts of the existing and proposed residential development on native vegetation to be retained and areas to be revegetated.	• Install tree protection fence around vegetation to be retained before construction commences. • Visual observations of conditions ongoing during construction and maintenance. Note issues such as pedestrian use or rubbish dumping. • Provide information to residents and visitors regarding EEC (signage).	• Installation of protection fence during construction works. • 0 – 12 months: Monthly maintenance inspections by bush regenerator (evidence of pedestrian use or rubbish dumping. Remove rubbish if evident). • 12-24 months: Bi-monthly maintenance inspections by bush regenerator (Evidence of pedestrian use or rubbish dumping. Remove rubbish if evident). • 24-36 months: maintenance as required to ensure plant density, managing weed encroachment and allowing native vegetation to establish. • Installation of signage.
To maintain and enhance habitat for native flora and fauna and to ensure corridor value is maintained and enhanced.	• Retain native vegetation (where possible) throughout construction and maintenance period. Install native species (as listed in Table 3.6) in areas shown on Landscape Plan. Ongoing maintenance during construction and maintenance period. • Non-weedy vegetation material that has been identified for removal to be used on site (e.g. terracing/stabilisation, habitat creation, creation of plant micro-climates, mulch etc.).	• Installation of tree protection fence. • 0-12 months: Monthly maintenance inspections by bush regenerator (remove weeds, reinstate plants, ensure connectivity between the two revegetation areas etc.). • 12-24 months: Bi-monthly maintenance inspections by bush regenerator (remove weeds, reinstate plants, ensure connectivity between the two revegetation areas etc.) • 24-36 months: maintenance as required to ensure plant density, managing weed encroachment and allowing native vegetation to establish. • 6 half yearly reports prepared by consultant during maintenance period to state development of revegetation planting. • No more than 5% of weed cover within riparian corridor at the end

		of maintenance period. • 80% survival rate of revegetated plant species.
To conserve and enhance the scenic quality of the site.	• Retain endemic vegetation (where possible) throughout construction and maintenance period. • Removed endemic plant material to be mulched on site and used within revegetated areas. All weed material to be removed from site. • Control all weeds by priority, focusing on noxious and environmental weeds. • Install native species (as listed in Table 3.10) in areas shown on Landscape Plan.	• Installation of tree protection fence. • 0–12 months: Monthly maintenance inspections by bush regenerator (remove weeds, reinstate plants etc.). • 12-24 months: Bi-monthly maintenance inspections by bush regenerator (remove weeds, reinstate plants etc.) • 24-36 months: maintenance as required to ensure plant density, managing weed encroachment and allowing native vegetation to establish. • No more than 5% of weed cover within riparian corridor at the end of maintenance period • 80% survival rate of revegetated plant species.
To manage vegetation to minimise potential bush fire risk. (Management Area 1)	• Selection of species that do not readily burn. • Reduction of fine fuels (no weedy shrubs).	• Landscaping to be in accordance with *Planning for Bushfire Protection 2019.* • Landscaping be carried out in order to address the requirements of Section 63 of the Rural Fires Act 1997. • Application of the following requirements: o Grass should be kept mown to a height of less than 100mm; and o Leaf and other debris should be removed.
To manage vegetation to minimise potential bush fire risk. (Management Areas 2, 3 and 4)	• Undertake ecological and hazard reduction burn.	• Burns to be carried out in order to address the requirements of Section 63 of the Rural Fires Act 1997. • Areas to be burnt in accordance with the Bush Fire Environmental Assessment Code and the Threatened Species Hazard Reduction Lists with application of the following: o No fire more than once every 5 years for grassy woodland sub-community, and no more than once every 25 years for the moist forest sub-community.
To ensure that the development is integrated with the landscape value of the area in a manner that is consistent with ecological sustainable development; and to encourage the community to participate in the protection and ongoing restoration for the conservation of their local vegetation.	• Use local endemic species for revegetation. • Inform residents and visitors about Riparian Corridor and EEC and liaise with local bushcare groups.	• Provide certificate stating propagative material is from within the local botanical area. • Liaise with bushcare groups.

Source: Siteplus 2020

1.3 Previous Studies and Investigations

During the preparation of this VMP, a number of documents for the proposed subdivision site and locality were reviewed including:

- Bushfire Protection Assessment Report.
- Biodiversity Development Assessment Report.
- Department of Planning, Industry and Environment documents.

1.4 Companion Documents

This VMP should be read and assessed in conjunction with the following documents:

1. Ravenswood Estate Stage 9
   Development Application Civil Works Plans
   Prepared by Site Plus Pty Ltd (February 2020)

2. Bushfire Protection Assessment
   For the proposed Stage 9 Residential Subdivision of Lot 711 in DP 1236947 & Lot 3 in DP 1214606, Illawarra Highway, Tullimbar
   Prepared by Australian Bushfire Protection Planners Pty Ltd (February 2020)

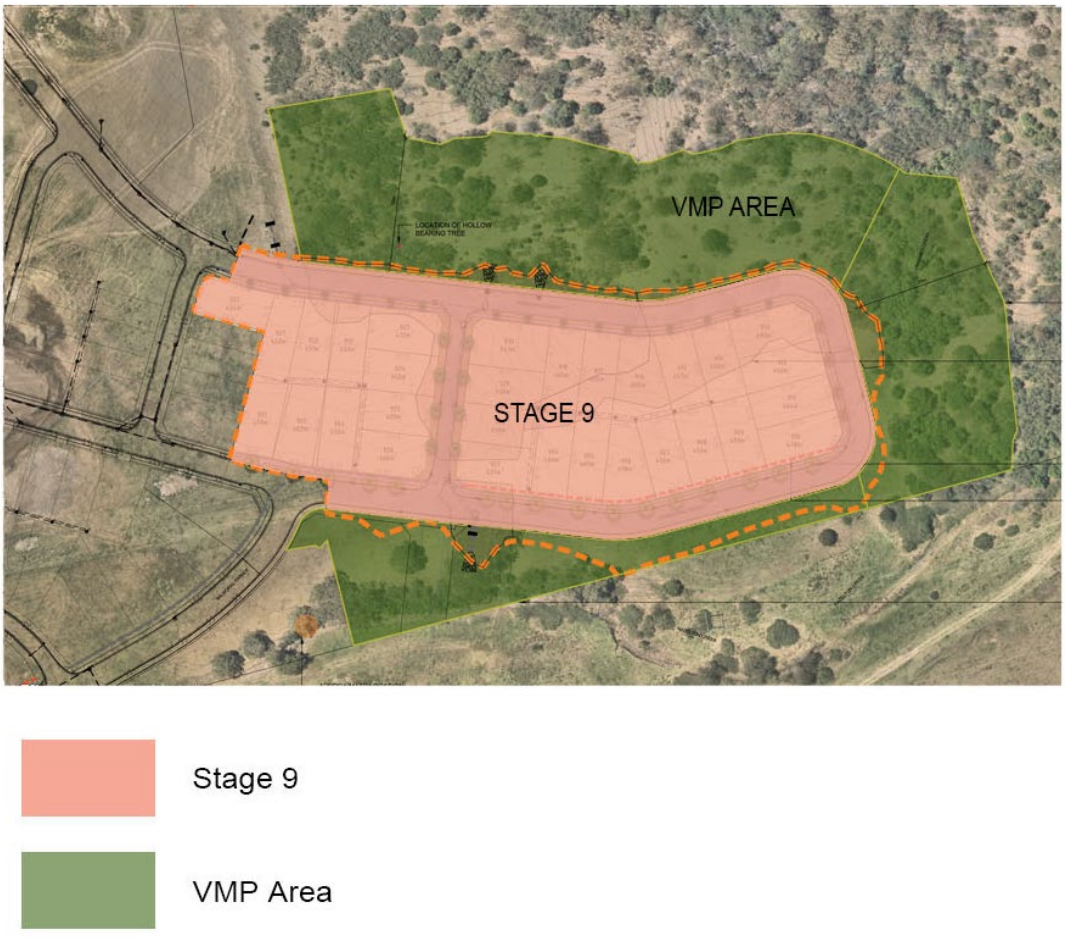
3. Biodiversity Development Assessment Report
   Prepared by Niche Environment and Heritage (February 2020)

2.0 EXISTING SITE FEATURES

2.1 Topography

The natural ground surface within the Ravenswood Estate Stage 9 area falls predominantly towards the existing Hazelton Creek. The Stage 9 development ranges in elevation from approximately RL 51.0 in the eastern corner to RL 33.0 in the western area. The VMP area ranges in elevation from approximately RL 63.0 in the eastern corner to RL 30.0 in the western Hazelton Creek area.

Figure 2.1 Subject Site Plan



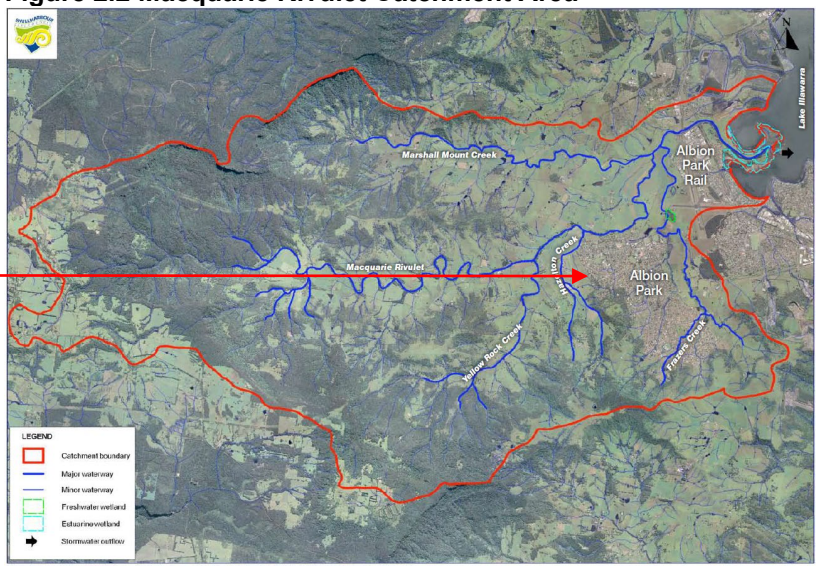
Source: Siteplus 2020

2.2 Watercourses

Hazelton Creek runs along the western boundary of the Stage 9 development.

The subject site forms part of the Macquarie Rivulet Catchment Area as shown in Figure 2.2.

Figure 2.2 Macquarie Rivulet Catchment Area



Source: Shellharbour City Council

2.3 Climate

The Shellharbour LGA experiences a mild, and generally warm and temperate climate. Shellharbour has a significant amount of rainfall during the year. In Shellharbour, the average annual temperature is 17.2°C. In a year, the average rainfall is 1377mm.

2.4 Vegetation Communities & Current Site Condition

A comprehensive Flora and Fauna Assessment for the site has previously been undertaken and described by Niche Environment and Heritage. Further site inspections were carried out by Siteplus.

The VMP and site inspection sought to identify:

- Categories of plant species present on site as follows:
  - Locally indigenous species.
  - Exotic species.

- The plant communities present on the site.
- The level of degradation of the existing vegetation.
- The presence of any immediately obvious threatened species, populations or communities as listed under the Threatened Species Conservation Act, 1995 (TSC Act).
- Probable pre-disturbance plant communities.
- A site specific rehabilitation strategy.

The majority of the area of Stage 9 has been extensively cleared and primarily supports an exotic grassland. The vegetation bordering to the east and wets and a fragment within the proposed development comprises a degraded native plant community which is conservatively considered to represent a remnant patch of the *Illawarra Lowlands Grassy Woodland* which is listed as endangered under the *Threatened Species Conservation Act* (TSC Act) and mapped under the NSW Biodiversity Values Map. The creek lines are vegetated.

This VMP has been prepared to provide guidelines to minimise the impact of the proposed Stage 9 subdivision to the adjacent area of the *Illawarra Lowlands Grassy Woodland* and to enhance and ameliorate the Riparian Area along the creeks.

2.5 Weeds and Weed Sources

There are a number of common environmental weeds present on the site. The suite of weeds identified on site is comprised of common opportunistic species typical of disturbed sites and includes both annual and perennial plants.

Table 2.1 identifies the most significant weed species within the subject area.

Table 2.1 Weed Species

Common Name of Weed	Scientific Name of Weed	High Threat Weed Species	Description of Infestation (e.g intensity & location)
Common Lantana	Lantana camara	Yes	60
Panic Veldtgrass	Ehrharta erecta	Yes	5
Rhodes Grass	Chloris gayana	Yes	1
Mickey Mouse Plant	Ochna serrulata	Yes	0.1
Fireweed	Senecio madagascariensis	No	0.1
Paddy's Lucerne	Sida rhombifolia	No	0.2
Cobbler's Pegs	Bidens pilosa	No	0.1

It is recommended that by introducing diverse native easily self seeded grasses and groundcovers back into the Area of Impact through the revegetation program, some native competition with weed species will be encouraged.

2.6 Habitat and Corridor Value

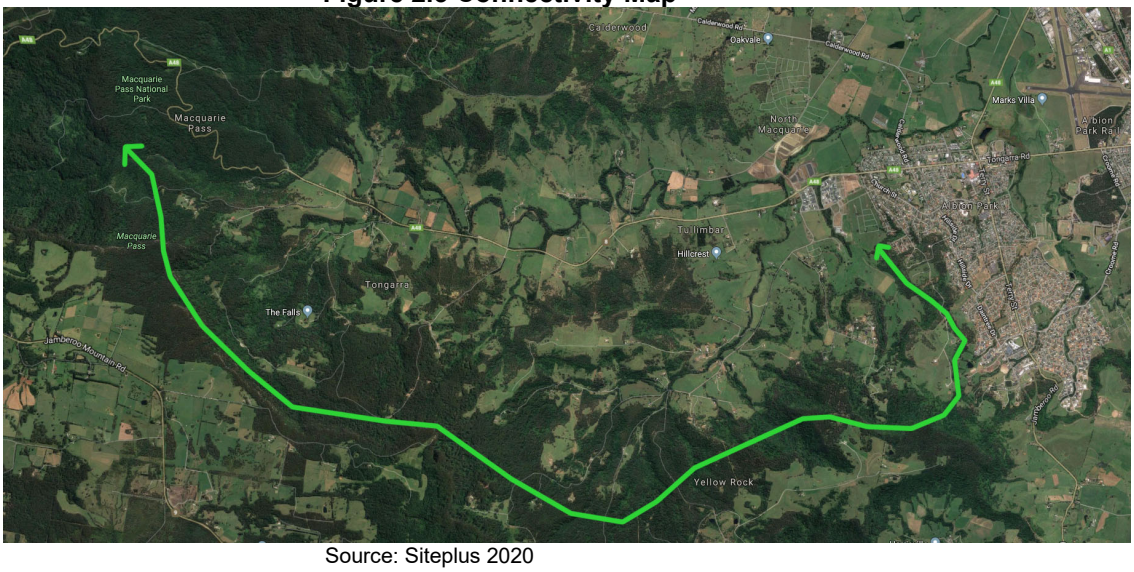
The majority of the Stage 9 outline constitutes exotic pasture. There is, however, a fragment of existing native vegetation identified as *Illawarra Lowlands Grassy Woodland* Endangered Ecological Community that will be cleared.

The existing flora is typical of a disturbed landscape mixing native, exotic and weed species however with rehabilitation opportunities for future flora habitat will be established.

Threatened fauna habitat is generally limited to mobile species such as bats and birds.

The Riparian Area along the creeks and the Area of Impact will form a connection between existing vegetation communities and provide limited connectivity with a large vegetation network as shown in Figure 2.2 below and provides intermittent connectivity to Macquarie Pass National Park and Budderoo National Park.

Figure 2.3 Connectivity Map



Source: Siteplus 2020

2.7 Stock and Herbivore Access

The majority of the Stage 9 area was previously used for farming purposes. However, this land use has ceased and livestock are not a management issue on this site.

It is assumed that deer and rabbit populations may be present on site. Therefore, it is recommended, to use tree guards and stakes for revegetation plantings.

The woodland area including the Area of Impact will be fenced to control access.

2.8 Drainage and Stormwater

The Stage 9 site generally slopes towards the West and North West. The existing Tullimbar Village is located to the North West and downstream of the site. Located within the Village is the Hazelton Creek Wetlands system. All stormwater from the site drains to this wetland system which has been sized to cater for all the development within the subject site. Only a few drainage lines will discharge into the area of impact and into Hazelton Creek.

The stormwater and drainage measures are detailed in the engineering drawing and reports.

The majority of water quality requirements for the site are managed within this downstream wetland.

2.9 Potential Bushfire Risk

Australian Bushfire Protection Planners Pty Ltd (ABPP) assessed the potential bushfire risk for the proposed development.

As per Planning for Bush Fire Protection guide the following requirements apply for vegetation management within Management Area 1:

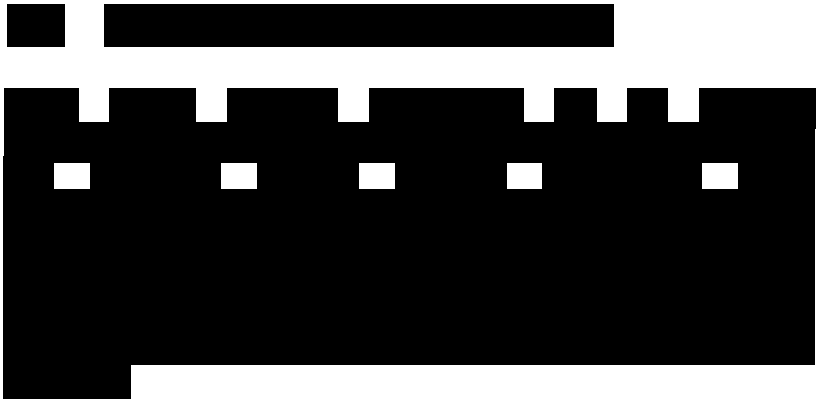
- Grass should be kept mown to a height of less than 100mm; and
- Leaf and other debris should be removed.

In order to address the requirements of Section 63 of the Rural Fires Act 1997, Management Areas 2, 3 and 4 should be actively burnt in accordance with the Bush Fire Environmental Assessment Code and the Threatened Species Hazard Reduction Lists.

In regard to *Illawarra Lowlands Grassy Woodland* the Threatened Species Hazard Reduction List for Threatened Ecological Communities (TEC) states:

- No fire more than once every 5 years for grassy woodland sub-community, and no more than once every 25 years for the moist forest sub-community.

The management of fire on the residual lot should be maintained and managed in perpetuity to ensure ongoing protection from the impact of bush fires and will remain the obligation of the current or any future land owner.



3.0 PROJECT TASKS

3.1 Management Strategies

This VMP outlines the management strategies and major activities to promote native vegetation restoration during the works and for a 36 month period after practical completion.

The VMP area has been divided into three management areas:

- Management Area 1: Rehabilitation Strip (1m strip along the edge between the VMP area and the Stage 9 development).
- Management Area 2: Assisted Natural Regeneration Weeds to be removed and natural regeneration to be promoted within existing *Illawarra Lowlands Grassy Woodland* EEC (50m buffer from edge of development as shown in Figure 2.1).
- Management Area 3: Riparian Area along Hazelton Creek
- Management Area 4: Riparian Area along Unnamed Creek running east to west

3.1.1 Management Strategies – Management Area 1

The aims of the Native Vegetation Restoration Programme for Management Area 1 are set out in Table 3.1.

Table 3.1 Aims of Native Vegetation Restoration Programme – Management Area 1

OBJECTIVES	ACTIONS	TARGETS
Promote a sustainable healthy and diverse vegetation community based on naturally occurring vegetation types.	• Install plant species native to the area. Collection of propagative material from within the local botanical. • Monitor and maintain VMP area as described in Section 5.0 of this VMP.	• No more than 5% of weed coverage within Management Area 1 at the end of maintenance period. • Provide certificate to state propagation material is from within the local botanical area. • Minimum of 80% native plant coverage within Management Area 1 at the end of maintenance period.
Promote security and safety for all users of the site and adjoining lands.	• No planting of large shrubs directly adjacent to walkways. Planting of groundcover and small to medium shrubs (in ascending height order from footpath).	• Safer by Design. • Reinforce natural surveillance and clear sightlines.

Source: Siteplus 2020

The objectives for restoring the vegetation community within Management Area 1 are set out in Table 3.2.

Table 3.2 Primary Objectives – Management Area 1

OBJECTIVES	ACTIONS	TARGETS
No exotic vegetation.	• Install local native plant material. • Manage weeds. Refer to Section 3.3 and Appendix B of this VMP.	• Maximum of 5% weed species within Management Area 1 at the end of maintenance period. • 0–12 months: Monthly maintenance inspections by landscaper (remove weeds, reinstate plants etc.). • 12-24 months: Bi-monthly maintenance inspections by landscaper (remove weeds, reinstate plants etc.) • 24-36 months: maintenance as required to ensure plant density, managing weed encroachment and allowing native vegetation to establish. • 6 half yearly reports prepared by consultant during maintenance period to state development of revegetation planting to be submitted to Shellharbour City Council (Certifying Authority).
Permit natural regeneration to occur.	• Install local native plant material as shown on Landscape Plan.	• Do not prune installed native plant species.
Ensure that weed growth does not re-establish once removed.	• Monitor and maintain VMP Area as described in Sections 3.12 and 5.0 of this VMP. • Installation of mulch.	• Maximum of 5% weed species within Management Area 1 at the end of maintenance period. • 0–12 months: Monthly maintenance inspections by landscaper (remove weeds, reinstate plants etc.). • 12-24 months: Bi-monthly maintenance inspections by landscaper (remove weeds, reinstate plants etc.) • 24-36 months: maintenance as required to ensure plant density, managing weed encroachment and allowing native vegetation to establish. • 6 half yearly reports prepared by consultant during maintenance period to state development of revegetation planting to be submitted to Shellharbour City Council (Certifying Authority).

Manage vegetation to minimise potential fire risk.	• Selection of species that do not readily burn.
	• Reduction of fine fuels (no weedy shrubs).
		• Landscaping to be in accordance with *Planning for Bushfire Protection 2019.*
		• Landscaping be carried out in order to address the requirements of Section 63 of the Rural Fires Act 1997.
		• Application of the following requirements:
		  ○ Grass should be kept mown to a height of less than 100mm; and
		  ○ Leaf and other debris should be removed.

Source: Siteplus 2020

The targets of the vegetation restoration and management works for Management Area 1 will include the following:

- Installation of locally native plant material as tubestock in areas shown on Landscape Plan. Revegetation plantings will be monitored and maintained during the maintenance period to ensure establishment of plant material and suitable long term plant densities (refer section 3.12). The coverage of native vegetation shall be a minimum of 80%. Planting methods to be in accordance with section 3.7 of this VMP. Species selection of installed plant material to be according with Section 3.8 Table 3.10.
- Installation of mulch in revegetation areas.
- Treatment or removal of weeds during maintenance period. Treatment as described in Sections 3.3 and Appendix B of this VMP. Result shall be maximum of 5% weed coverage at the end of the maintenance period.
- Manage vegetation to minimise bush fire risk as per Section 2.9

Landscaping and weed removal is to be carried out by professional landscape contractors or bush regenerators that have experience in the best methods of planting and weed removal techniques.

3.1.2 Management Strategies – Management Area 2

The aims of the Native Vegetation Restoration Programme for Management Area 2 are set out in Table 3.3.

Table 3.3 Aims of Native Vegetation Restoration Programme – Management Area 2

OBJECTIVES	ACTIONS	TARGETS
Promote a sustainable healthy and diverse vegetation community based on naturally occurring vegetation types.	• Monitor and maintain Management Area 2 as described in Section 5.0 of this VMP. • Remove weeds within Management Area 2 and install plant native species in areas that were weeded. Collection of propagative material from within the local botanical.	• Provide certificate to state propagation material is from within the local botanical area.

Source: Siteplus 2020

The objectives for restoring the vegetation community within Management Area 2 are set out in Table 3.4.

Table 3.4 Primary Objectives – Management Area 2

OBJECTIVES	ACTIONS	TARGETS
Remove exotic vegetation.	• Control all weeds by priority, focusing on high threat weeds. Refer to Section 3.3 and Appendix B of this VMP.	• 0–12 months: Monthly maintenance inspections by bushregenerator (remove weeds, reinstate plants etc.). • 12-24 months: Bi-monthly maintenance inspections by bushregenerator (remove weeds, reinstate plants etc.) • 24-36 months: maintenance as required to ensure plant density, managing weed encroachment and allowing native vegetation to establish. • 6 half yearly reports prepared by consultant during maintenance period to state development of revegetation planting to be submitted to Shellharbour City Council (Certifying Authority).
Permit natural regeneration to occur.	• Retain existing native vegetation. • Install local native plant material to augment existing native vegetation in areas that were weeded.	• Do not remove existing native vegetation. • Do not prune installed plant species.
Ensure that weed growth does not re-establish once removed.	• Monitor and maintain Area of Impact as described in Sections 3.12 and 5.0 of this VMP.	• 0–12 months: Monthly maintenance inspections by bushregenerator (remove weeds, reinstate plants etc.). • 12-24 months: Bi-monthly maintenance inspections by bushregenerator (remove weeds, reinstate plants etc.) • 24-36 months: maintenance as required to ensure plant density, managing weed encroachment and allowing native vegetation to establish. • 6 half yearly reports prepared by consultant during maintenance period to state development of revegetation planting to be submitted to Shellharbour City Council (Certifying Authority).
Manage vegetation to minimise potential fire risk.	• Undertake ecological and hazard reduction burn.	• Burns to be carried out in order to address the requirements of Section 63 of the Rural Fires Act 1997. • Areas to be burnt in accordance with the Bush Fire Environmental Assessment Code and the Threatened Species Hazard Reduction Lists with application of the following: ○ No fire more than once every 5 years for grassy woodland sub-community, and no more than once every 25 years for the moist forest sub-community.

Source: Siteplus 2020

The targets of the vegetation restoration and management works for Management Area 2 will include the following:

- Retention of healthy mature and regenerating endemic trees and vegetation. Provide tree/vegetation protection during construction stages.
- Treatment or removal of weeds during construction and maintenance period. Treatment as described in Sections 3.3 and Appendix B of this VMP.
- Installation of locally native plant material as tubestock in areas that were weeded. Existing vegetation and revegetation plantings will be monitored and maintained during the maintenance period to ensure establishment of plant material and suitable long term plant densities (refer section 3.12). Planting methods to be in accordance with section 3.7 of this VMP. Species selection of installed plant material to be according with Section 3.8 Table 3.10.
- Ongoing treatment of weeds to facilitate long term eradication.

Landscaping and weed removal is to be carried out by professional landscape contractors or bush regenerators that have experience in the best methods of planting and weed removal techniques.

3.1.3 Management Strategies – Management Area 3

Note: The Riparian Area along Hazelton Creek will need to be coordinated as a collaboration between adjoining land developers (Allam Property Group and Dahua Group) and therefore may need to be reviewed and refined.

Table 3.5 Aims of Native Vegetation Restoration Programme – Management Area 3

OBJECTIVES	ACTIONS	TARGETS
Promote a sustainable healthy and diverse vegetation community based on naturally occurring vegetation types.	• Install plant species native to the area. Collection of propagative material from within the local botanical. • Monitor and maintain Riparian Area as described in Section 5.0 of this VMP.	• No more than 5% of weed coverage within Management Area 3 at the end of maintenance period. • Provide certificate to state propagation material is from within the local botanical area. • Minimum of 80% native plant coverage within Management Area 3 at the end of maintenance period.

Promote security and safety for all users of the site and adjoining lands.	• No planting of large shrubs directly adjacent to walkways. Planting of groundcover and small to medium shrubs (in ascending height order from footpath).	• Safer by Design. • Reinforce natural surveillance and clear sightlines.

Source: Siteplus 2020

Table 3.6 Primary Objectives – Management Area 3

OBJECTIVES	ACTIONS	TARGETS
Remove exotic vegetation	• Control all weeds by priority, focusing on noxious and environmental weeds. Refer to Section 3.3 and Appendix B of this VMP.	• Maximum of 5% weed species within riparian corridor at the end of maintenance period. • 0–12 months: Monthly maintenance inspections by bushregenerator (remove weeds, reinstate plants etc.). • 12-24 months: Bi-monthly maintenance inspections by bushregenerator (remove weeds, reinstate plants, allow for native vegetation to establish etc.). • 24-36 months: maintenance as required to ensure plant density, managing weed encroachment and allowing native vegetation to establish. • 6 half yearly reports prepared by consultant during maintenance period to state development of revegetation planting to be submitted to Shellharbour City Council (Certifying Authority).
Permit natural regeneration to occur.	• Retain existing native vegetation. • Install local native plant material to augment existing native vegetation in areas as shown on Landscape Plan.	• Do not remove existing native vegetation. • Do not prune installed plant species.
Ensure that weed growth does not re-establish once removed.	• Monitor and maintain riparian corridor as described in Sections 3.12 and 5.0 of this VMP. • Installation of fibremulch and/or mulch depending on embankment gradients.	• Maximum of 5% weed species within riparian corridor at the end of maintenance period. • 0–12 months: Monthly maintenance inspections by bushregenerator (remove weeds, reinstate plants etc.). • 12-24 months: Bi-monthly maintenance inspections by bushregenerator (remove weeds, reinstate plants,etc.) • 24-36 months: maintenance as required to ensure plant density, managing weed encroachment and allowing native vegetation to establish. • 6 half yearly reports prepared by consultant during maintenance period to state development of revegetation planting to be submitted to Shellharbour City Council (Certifying Authority).
Manage vegetation to minimise potential fire risk.	• Undertake ecological and hazard reduction burns.	• Burns to be carried out in order to address the requirements of Section 63 of the Rural Fires Act

		1997. • Areas to be burnt in accordance with the Bush Fire Environmental Assessment Code and the Threatened Species Hazard Reduction Lists with application of the following: No fire more than once every 5 years for grassy woodland sub-community, and no more than once every 25 years for the moist forest sub-community.

Source: Siteplus 2020

3.1.4 Management Strategies – Management Area 4

The aims of the Riparian Area along the Unnamed Creek are set out in Table 3.7.

Table 3.7 Aims of Native Vegetation Restoration Programme – Management Area 4

OBJECTIVES	ACTIONS	TARGETS
Promote a sustainable healthy and diverse vegetation community based on naturally occurring vegetation types.	• Install plant species native to the area. Collection of propagative material from within the local botanical. • Monitor and maintain Riparian Area as described in Section 5.0 of this VMP.	• No more than 5% of weed coverage within Management Area 3 at the end of maintenance period. • Provide certificate to state propagation material is from within the local botanical area. • Minimum of 80% native plant coverage within Management Area 3 at the end of maintenance period.

Source: Siteplus 2020

Table 3.8 Primary Objectives – Management Area 4

OBJECTIVES	ACTIONS	TARGETS
Remove exotic vegetation	• Control all weeds by priority, focusing on noxious and environmental weeds. Refer to Section 3.3 and Appendix B of this VMP.	• Maximum of 5% weed species within riparian corridor at the end of maintenance period. • 0–12 months: Monthly maintenance inspections by bushregenerator (remove weeds, reinstate plants etc.). • 12-24 months: Bi-monthly maintenance inspections by bushregenerator (remove weeds, reinstate plants, allow for native vegetation to establish etc.). • 24-36 months: maintenance as required to ensure plant density, managing weed encroachment and allowing native vegetation to establish. • 6 half yearly reports prepared by consultant during maintenance period to state development of revegetation planting to be submitted to Shellharbour City Council (Certifying Authority).
Permit natural	• Retain existing native	• Do not remove existing native

regeneration to occur.	vegetation. • Install local native plant material to augment existing native vegetation in areas as shown on Landscape Plan.	vegetation. • Do not prune installed plant species.
Ensure that weed growth does not re-establish once removed.	• Monitor and maintain riparian corridor as described in Sections 3.12 and 5.0 of this VMP. • Installation of fibremulch and/or mulch depending on embankment gradients.	• Maximum of 5% weed species within riparian corridor at the end of maintenance period. • 0–12 months: Monthly maintenance inspections by bushregenerator (remove weeds, reinstate plants etc.). • 12-24 months: Bi-monthly maintenance inspections by bushregenerator (remove weeds, reinstate plants,etc.) • 24-36 months: maintenance as required to ensure plant density, managing weed encroachment and allowing native vegetation to establish. • 6 half yearly reports prepared by consultant during maintenance period to state development of revegetation planting to be submitted to Shellharbour City Council (Certifying Authority).
Manage vegetation to minimise potential fire risk.	• Undertake ecological and hazard reduction burn.	• Burns to be carried out in order to address the requirements of Section 63 of the Rural Fires Act 1997. • Areas to be burnt in accordance with the Bush Fire Environmental Assessment Code and the Threatened Species Hazard Reduction Lists with application of the following: No fire more than once every 5 years for grassy woodland sub-community, and no more than once every 25 years for the moist forest sub-community.

Source: Siteplus 2020

3.2 Preconstruction Phase

Tree/vegetation protection zones must be established for any native vegetation that is in the vicinity of the proposed subdivision work to ensure that there is no unnecessary disturbance. This will be assisted by a briefing to all contractors who will be carrying out construction. It must be clearly understood that minimal disturbance to the tree root zones and canopies is achieved.

3.3 Integrated Weed Management and Control of High Threat Weeds

Weeds will pose a definite threat across the Area of Impact due to the diversity of species. As well budget and time constraints will mean the methods of weed control will vary.

High threat weeds will be prioritised. Table 3.7 below recommends weed treatment methods for high threat weeds in the VMP Area. Implementation of a long term weed management strategy is important to control exotic species within the area.

Table 3.9 Methods of Weed Control

Scientific Name	Common Name	Method of Weed Control
Lantana camara	Common Lantana	Hand remove tap root, cut and paint with 100% glyphosate
Ehrharta erecta	Panic Veldtgrass	Hand remove, spray with 1:100 glyphosate
Chloris gayana	Rhodes Grass	Spray 1:100 glyphosate
Ochna serrulata	Mickey Mouse Plant	Scrape and paint with 100% gyphosate
Senecio madagascariensis	Fireweed	Spray 1:100 glyphosate
Sida rhombifolia	Paddy's Lucerne	Spray 1:100 glyphosate
Bidens pilosa	Cobbler's Pegs	Bag seeds, shade out, spray with 1% glyphosate

Source: Niche & Siteplus 2020

Lantana is easily removed through the cut and paint method where the biomass of the plant is cut into manageable pieces with the use of a brush cutter, loppers or a machete and the base of the plant is painted with a 100% concentrate of glyphosate. It is important that this woody waste is removed from site as this plant can reproduce vegetatively.

Spot spraying with the appropriate herbicide will be used to control weeds that are located within a safe spraying distance of natives (approximately 1m buffer). Weeds that are growing amongst sensitive natives, that are sensitive to spray, will be hand removed to prevent regenerating natives being damaged.

The contracted Bush Regenerators will conduct site assessments to assess the extent of weeds within the Area of Impact and Riparian Area to determine the priorities of the work to be completed and best methods of weed control during each visit over the course of the maintenance period.

3.4 Native Vegetation Management and Landscape Rehabilitation

3.4.1 Rehabilitation Strip: Management Area 1

After the road construction works there will be areas that will need assistance in regeneration due to large areas being cleared from cutting and filling of batters and the disturbance

of soils. Revegetation will be necessary especially in areas that have a high chance of eroding such as road embankments.

Table 3.10 in Section 3.8 contains a species list recommended for installation.

3.4.2 Assisted Natural Regeneration: Management Area 2

Assisted natural rehabilitation is a management tool used by bush regenerators to encourage natural regeneration from native vegetation and the seed bank of the surrounding area. The aim of this method is to initially stimulate the germination and growth of native propagates already present on site and to manage the area in such a way as to allow natural processes to occur.

Assisted natural regeneration will occur through the following stages.

- ***Primary treatment***
  This involves the initial clearing of weeds. Primary weeding is usually limited to a single comprehensive removal of weeds.

- ***Secondary treatment (follow up)***
  Following primary treatment, it is important that follow up weeding is undertaken to remove the weed species that start to establish after the initial clearing. Follow up weeding occurs over a prolonged period. In the case of this VMP follow up weeding will be for a period of 12 months from practical completion date.

- ***Long Term Maintenance***
  Long term maintenance will be undertaken after the completion of the 12 month maintenance requirement. Maintenance work that will be conducted over longer time frame requires a smaller amount of labour hours.

3.4.3 Riparian Area - Hazelton Creek: Management Area 3

Areas that were previously used as pastures will require revegetation.

Table 3.10 in Section 3.8 contains a species list recommended for installation within these areas.

Assisted natural regeneration will occur in areas closer to the creek line which have an existing vegetation coverage.

3.4.4 Riparian Area – Unnamed Creek: Management Area 4

Assisted natural rehabilitation is a management tool used by bush regenerators to encourage natural regeneration from native vegetation and the seed bank of the surrounding area. The aim of this method is to initially stimulate the germination and growth of native propagates already present on site and to manage the area in such a way as to allow natural processes to occur.

Assisted natural regeneration will occur through the following stages.

- ***Primary treatment***
  This involves the initial clearing of weeds. Primary weeding is usually limited to a single comprehensive removal of weeds.

- ***Secondary treatment (follow up)***
  Following primary treatment, it is important that follow up weeding is undertaken to remove the weed species that start to establish after the initial clearing. Follow up weeding occurs over a prolonged period. In the case of this VMP follow up weeding will be for a period of 12 months from practical completion date.

- ***Long Term Maintenance***
  Long term maintenance will be undertaken after the completion of the 12 month maintenance requirement. Maintenance work that will be conducted over longer time frame requires a smaller amount of labour hours.

3.5 Management of Human Disturbance

Installation of a post and wire fence around the woodland area adjacent to the Subdivision Site is reasonable (Refer to Appendix A - Landscape Plan) to control access to revegetation and EEC area. Signage informing the public of the EEC and its important conservation status will be installed along the boundary of the remnant vegetation. A tree protection / native vegetation protection fence will be installed before construction work commences.

3.6 Sediment and Erosion Control

Establishment and regular maintenance of erosion and sediment controls during construction will be implemented and remain until excavated areas are vegetated. Sediment and erosion control is specified on the engineering drawings.

All development is to minimise the impacts from surface run-off and all stormwater movement is to mimic natural conditions. All structures need to be monitored for success during the works, especially after periods of heavy rainfall.

3.7 Planting Programme and Methods

Revegetation planting will occur in Management Area 1 in areas that were cleared to allow for road construction. In Management Area 2 revegetation planting will only be installed in areas that were cleared due to weed removal. Revegetation planting will act to complement any natural regeneration, which may occur after the removal of the weed species. In Management Area 3 a mix of revegetation planting (former pasture areas) and assisted natural regeneration (existing vegetated creek lines) is required.

The following sequence will be applied to any planting:

- Weed removal;
- Ground preparation as required;
- Soil amelioration as required;
- Application of mulch to a depth of 75mm where appropriate.
- Installation of tubestock:
    - Prepare planting hole 100mm deeper and wider than plant pot;
    - Install soil conditioner to manufacturer's specification;
    - Remove plant from container;
    - Apply water to moisten soil for depth of plant root zone;
    - Install plant, backfill, consolidate backfill material and form water retention ring around plant;
    - Apply water to water retention ring to establish good root to soil contact.

The aim of revegetation works is to establish vegetation in areas that have been cleared due to construction and to reinstate vegetation to that of a typical *Illawarra Lowlands Grassy Woodlands* Ecological Community and to reinstate

vegetation communities typical for Riparian Areas along the creek lines. In doing this, species that are not occurring on site but have the potential to be found in this ecological community, will be reintroduced increasing diversity of the ecosystem and attempts to increase the natural resilience of surrounding areas.

In areas that will be cleared due to road construction works, it is recommended that grasses be planted out. This is to form a dense ground coverage to prevent the re colonisation of weeds and to minimise erosion.

3.8 Species Composition

Table 3.10 includes the plant species suitable for installation into the site. Planting locations and species are shown on the Landscape Plan in Appendix A. The ground cover species are fast growing and will become thick and dense and outcompete weed species. Trees would begin to form a canopy layer within an estimated period of approximately two years.

The list is comprised of endemic species that are a mix of fast growing and slower growing, longer lasting species. The fast growing species are useful as nurse plants. The slower growing hardy endemic species will promote species diversity.

Table 3.10 Plant Species List

SPECIES NAME	COMMON NAME
TREES	
Backhousia myrtifolia	Grey Myrtle
Eucalyptus bosistoana	Coast Grey Box
Eucalyptus eugenioides	Thin-leaved Stringybark
Eucalyptus longifolia	Woollybutt
Eucalyptus tereticornis	Forest Red Gum
Melaleuca decora	White Feather Honeymyrtle
Melaleuca styphelioides	Prickly Paperbark
SHRUBS	
Acacia implexa	Hickory Wattle
Boronia anemonifolia	Sticky Boronia
Bursaria spinosa	Blackthorn
Dodonaea viscosa subsp. angustifolia	Hopbush
Neolitsea dealbata	White Bolly Gum
Rubus parvifolius	Native raspberry
Wilkiea huegeliana	Veiny Wilkiea
GROUNDCOVER / GRASSES	
Dichondra repens	Kidney Weed

Eragrostis leptostachya	Paddock Lovegrass
Glycine clandestina	Twining Glycine
Hibbertia aspera	Rough Guinea Flower
Lomandra multiflora	Many flowered Mat Rush
Poa labillardieri	Tussock Grass
Pratia purpurascens	Whiteroot
GRASSES, RUSHES AND SEDGES	
Baumea articulate	Jointed Rush
Carex apressa	Tall Sedge
Dianella longifolia	Blue Flax Lily
Dichondra repens	Kidney Weed
Juncus usitatus	Common Rush
Lomandra multiflora	Many flowered Mat Rush
FORBES	
Adiantum formosum	Giant Maidenhair Fern
Alocasia brisbanesis	Spoon Lily
Gymnostachys anceps	Settler's Flax
Pseuderanthemum variabile	Pastel Flower

Source: Siteplus 2020

3.9 Seed Collection and Propagation

Collection of propagative material including seed and vegetative material must occur from within the local botanical area.

The following nurseries have been employed by local Bushcare previously. They are able to produce a supply of local plant species and are also able to grow plant stock to order.

Shellharbour City Council Nursery
132 Industrial Road
Oak Flats NSW 2529
Ph: (02) 4221 6191

Jamberoo Native Nursery
127 Curramore Road
Jamberoo NSW 2500
Ph: (02) 4236 0445

3.10 Site Preparation

Existing native vegetation cover will be retained. A vegetation protection fence will be installed prior the start of any weed removal works.

The above ground parts of exotic trees, shrubs and groundcovers would be removed using appropriate machinery, removed from site and disposed of in accordance with relevant requirements. Where vehicular access is not possible, herbicide and hand held machinery will be used to eradicate weeds. Safe herbicide application and effective application methods are outlined in Appendix B.

Follow up applications of herbicide would be employed to prevent the re-establishment of weed species. Long term maintenance would utilise herbicide and hand removal to control regenerating weeds and to remove germinating weed plants.

It may not be possible to water the planting area over a long period, therefore the planting program should be planned to coincide with the period of maximum (and regular) rainfall. Optimal planting times are spring and autumn. However, if irrigation is available, planting may be carried out at other times.

It is important to ensure adequate watering at planting, applying 1-1.5 litres of water to each new plant. Additionally, the use of a water-retaining compound and surface mulch/jutemat are strongly recommended to retain soil moisture and decrease the need for on-going watering.

Plants need to be soaked for at least 30 minutes prior to planting (before being removed from their pots), watered thoroughly at planting and thereafter, watered once each week for a period of four weeks.

3.11 Work Priorities

The following key tasks are listed in order of priority:

- Appoint a Bush Regeneration contractor or Landscaper to undertake on-ground weed control and re-vegetation during final stages of road construction development.
- Commence the initial targeted weed control.
- Ensure plants are available for commencement of re-vegetation and over the lifetime of the project (to allow for sequential planting and for replacement of losses).
- Obtain tubestock from local area.
- Undertake planting.
- Carry out regular site inspections and assessment.

3.12 Maintenance of Site and Vegetation

Ongoing maintenance weeding is the most important aspect of any restoration work in natural areas. Primary (initial) weeding of a site is just the beginning of the process, there is always the need to regularly monitor a site to schedule secondary or maintenance weeding to take place.

Once the initial weed infestation has been removed there will inevitably be a second suite of weeds, which germinate in the cleared area. If this second invasion is not removed, the whole site will revert to weed once again, putting the planted species at risk.

Long term tertiary weeding will then be required to keep the site in a relatively weed-free state. As the native plant stock develops, the maintenance required will gradually decrease as the planted species begin to shade out the annual weeds.

The selected contractor should visit the site during the month immediately after planting as required to ensure the plant root zones are sufficiently moist and to ensure initial plant establishment. The amount of water required will be dependant upon the environmental conditions experienced around the time of planting eg. temperatures, wind and rainfall received and should be tailored to ensure the establishment of the young plants.

The contractor will then visit the site once per month during the warmer growing periods from October to April and once per two months for the cooler dormant periods from May to September throughout the maintenance period. At these visits, the contractor should apply water, remove and dispose of rubbish, treat weed growth, treat insect or disease infestation, repair any erosion rills and reinstate mulch to the specified depth where vegetative cover had not yet reached sufficient density to protect the ground surface. Where plant losses had occurred, the supervisor should direct the contractor as to the appropriate reinstatement of the plant material.

4.0 SITE PERSONNEL

The works described in this report should be carried out under the direct supervision of appropriately qualified and experienced Landscape or Bush Regeneration contractors.

Any herbicide spraying on site should only be carried out by a person with the required Chemcert herbicide qualification.

Any chain sawing carried out on site should be done by a suitably qualified person.

5.0 MONITORING AND REPORTING PROCESS

Monitoring will become an integral part of the VMP and used for adaptive management. It will be used as a valuable tool to determine the progress and success of the rehabilitation works and if the appropriate techniques are being used. This will be conducted by qualified consultants and should be conducted prior to works, during works and 24 months from practical completion. The monitoring data must be collected in a standard way throughout the period to allow temporal comparisons. The monitoring process is to be carried out in accordance with Table 5.1.

Table 5.1 Monitoring and Review Process

OBJECTIVES	TARGETS
• If the goals of the VMP are being met.	• Bush regenerator and consultants need to review VMP report and Landscape Plan. • Co-ordinate with Council's bush care officers.
• Embankment stability and the formation of erosion gullies or slumping.	• Note issues during inspections and provide solutions. • Result at end of maintenance period: good slope stability, no formation of gullies or slumping.
• Noting the presence of any weeds regenerating on site by regular site visits.	• Remove weeds. • Result at end of maintenance period: Maximum of 5% weed species within Area of Impact.
• Any adverse effects occurring after development that may or may not have been forecast such as native tree or vegetation death.	• Report to consultant and find resolution. • Regenerate lost vegetation.
• Note the establishment of the plantings including plant loss and current densities.	• Result at end of maintenance period: Minimum of 80% native plant coverage within Area of Impact.
• Note the mulch stability.	• If mulch layer gets thin during plant establishment period: Top up mulch. • Once plants cover most of the ground (no bare ground visible), mulch is less important.
• Note other issues such as pedestrian use or rubbish dumping.	• Note issues during inspections and provide solutions (fencing, signage etc.) Remove rubbish.
• Regular visual observations of conditions by consultants and qualified Bush Regenerators.	• Capturing of images for long term reporting. • Sequential fixed-point photos taken regularly throughout the three year maintenance period. • Photo points to be determined at beginning of maintenance period. • Photos taken from same photo-point at set intervals (e.g. January, April, July, October for three years).

Source: Siteplus 2020

Appropriate action should be taken to rectify any problems identified during the site inspections. Some plant loss should be anticipated. This should be evaluated in the light of the following criteria:

- appropriate plant densities for the long term health of the vegetation community type (minimum of 80% coverage),
- prevention of inappropriate levels of plant competition,
- soil stability,
- prevention of weed establishment (minimum of 5% weed species).

The half-yearly reports must include sequential fixed-point monitoring photos taken regularly throughout the three year maintenance period at marked and representative locations. This is in order to visually demonstrate that the progress / objectives on site are being achieved and that this is being properly documented. The number of photo points and frequency of photographs should be in accordance with standard protocols (e.g. same photo point in January, April, July, October for three years).

6.0 APPROXIMATE COSTING GUIDE

An initial estimate of the tasks involved and broad costing is included below. Cost estimates may vary from actual costs and are only to be used as a guide as summarised below.

Table 6.1 Summary Costing Guide

Costing Guide		
NO.	**ITEM**	**COST**
1	Weed removal	$35,000
2	Soil preparation & amelioration	$36,000
3	Supply and install tubestock	$35,000
5	Supply and install mulch	$30,000
7	Plant protectors and stakes	$17,000
8	Monitoring and reporting	$20,000
9	Contingency 8%	$13,840
	Total ex GST	**$186,840**

Source: Siteplus 2020

7.0 REFERENCES

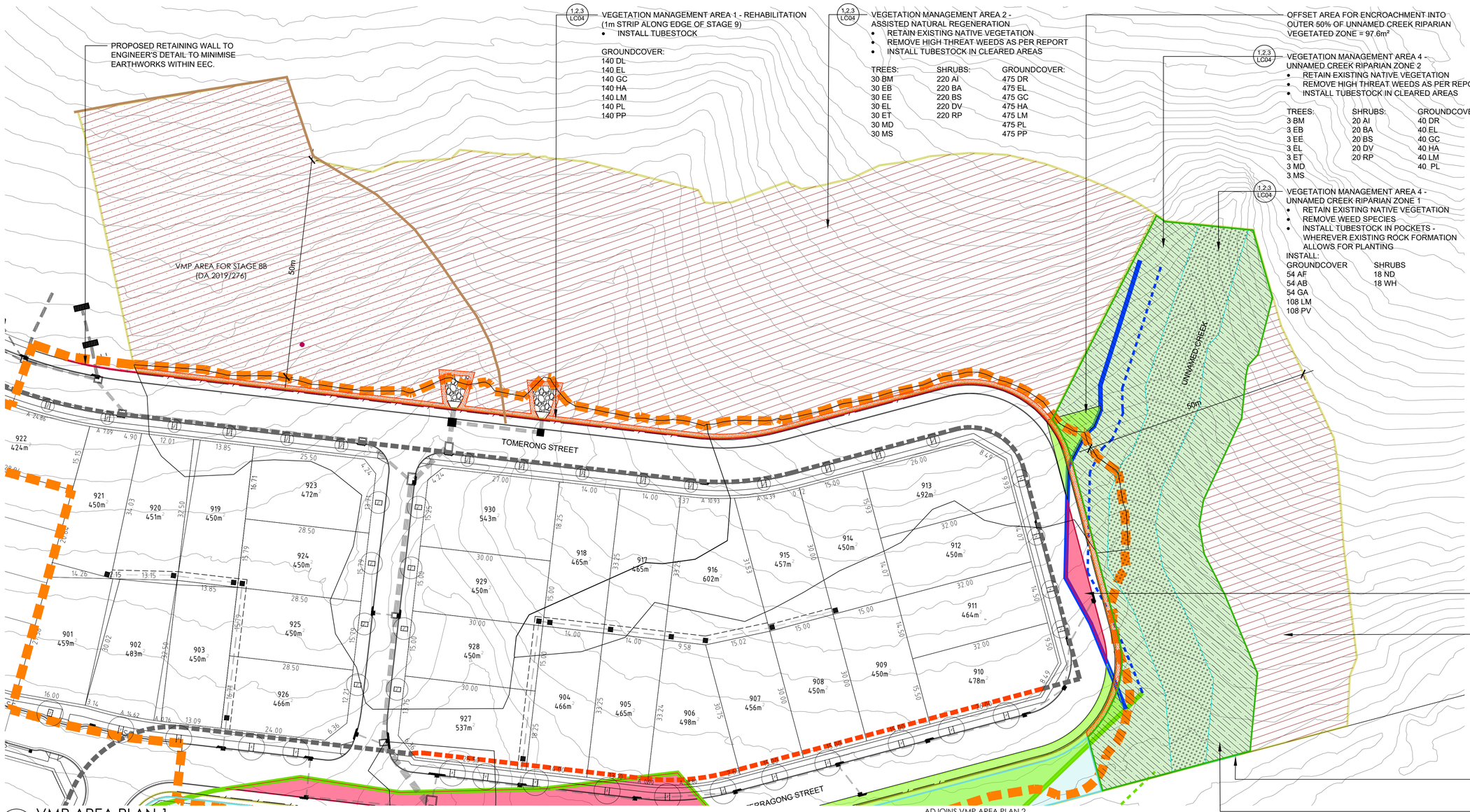
Fairley, A and Moore, P (2010). *Native Plants of the Sydney Region,* Jacana Books, Crows Nest

Primary Agricultural Industries, NSW Government Industry and Investment (2005). Noxious Weed Declarations. Available online; http://www.dpi.nsw.gov.au/agriculture/pests-weeds/weeds/noxweed/noxious-app?sq_content_

Richardson, F.J., Richardson, R.G. and Shepherd, R.C.H. (2007). Weeds of the Southeast. An identification Guide for Australia, Everbest Printing Co. Ltd, China

Robinson, L (2003). *A Field Guide to the Native Plants of Sydney*. *Revised 3rd Edition.* Kangaroo Press, Pymble

APPENDIX A
Landscape Plan
By Siteplus



VMP AREA PLAN 1
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PLANT SCHEDULE - VEGETATION MANAGEMENT AREA 2

NUMBER	SYMBOL	BOTANICAL NAME	COMMON NAME	POT SIZE	SPACING
TREES					
34	BM	Backhousia myrtifolia	Grey Myrtle	TUBE	1/5m²
34	EB	Eucalyptus bosistoana	Coast Grey Box	TUBE	1/5m²
34	EE	Eucalyptus eugenioides	Thin-leaved Stringybark	TUBE	1/5m²
34	EL	Eucalyptus longifolia	Woollybutt	TUBE	1/5m²
34	ET	Eucalyptus tereticornis	Forest Red Gum	TUBE	1/5m²
34	MD	Melaleuca decora	White Feather Honeymyrtle	TUBE	1/5m²
34	MS	Melaleuca styphelioides	Prickly Paperbark	TUBE	1/5m²
SHRUBS					
250	AI	Acacia implexa	Hickory Wattle	TUBE	1/m²
250	BA	Boronia anemonifolia	Sticky Boronia	TUBE	1/m²
250	BS	Bursaria spinosa	Blackthorn	TUBE	1/m²
250	DV	Dodonaea viscosa subsp. angustifolia	Hopbush	TUBE	1/m²
250	RP	Rubus parvifolius	Native Raspberry	TUBE	1/m²
GROUNDCOVER / GRASSES					
535	DR	Dichondra repens	Kidney Weed	TUBE	3/m²
535	EL	Eragrostis leptostachya	Paddock Lovegrass	TUBE	3/m²
535	GC	Glycine clandestina	Twining Glycine	TUBE	3/m²
535	HA	Hibbertia aspera	Rough Guinea Flower	TUBE	3/m²
535	LM	Lomandra multiflora	Many-flowered Mat-rush	TUBE	3/m²
535	PL	Poa labillardieri	Tussock Grass	TUBE	3/m²
535	PP	Pratia purpurascens	Whiteroot	TUBE	3/m²

PLANT SCHEDULE - VEGETATION MANAGEMENT AREA 4 UNNAMED CREEK RIPARIAN ZONE 2

NUMBER	SYMBOL	BOTANICAL NAME	COMMON NAME	POT SIZE	SPACING
TREES					
5	BM	Backhousia myrtifolia	Grey Myrtle	TUBE	1/5m²
5	EB	Eucalyptus bosistoana	Coast Grey Box	TUBE	1/5m²
5	EE	Eucalyptus eugenioides	Thin-leaved Stringybark	TUBE	1/5m²
5	EL	Eucalyptus longifolia	Woollybutt	TUBE	1/5m²
5	ET	Eucalyptus tereticornis	Forest Red Gum	TUBE	1/5m²
5	MD	Melaleuca decora	White Feather Honeymyrtle	TUBE	1/5m²
5	MS	Melaleuca styphelioides	Prickly Paperbark	TUBE	1/5m²
SHRUBS					
28	AF	Acacia implexa	Hickory Wattle	TUBE	1/m²
28	BA	Boronia anemonifolia	Sticky Boronia	TUBE	1/m²
28	BS	Bursaria spinosa	Blackthorn	TUBE	1/m²
28	DV	Dodonaea viscosa subsp. angustifolia	Hopbush	TUBE	1/m²
28	RP	Rubus parvifolius	Native Raspberry	TUBE	1/m²
GROUNDCOVER / GRASSES					
57	DR	Dichondra repens	Kidney Weed	TUBE	3/m²
57	EL	Eragrostis leptostachya	Paddock Lovegrass	TUBE	3/m²
57	GC	Glycine clandestina	Twining Glycine	TUBE	3/m²
57	HA	Hibbertia aspera	Rough Guinea Flower	TUBE	3/m²
57	LM	Lomandra multiflora	Many-flowered Mat-rush	TUBE	3/m²
57	PL	Poa labillardieri	Tussock Grass	TUBE	3/m²
57	PP	Pratia purpurascens	Whiteroot	TUBE	3/m²

PLANT SCHEDULE - VEGETATION MANAGEMENT AREA 1

GROUNDCOVER / GRASSES					
140	DR	Dichondra repens	Kidney Weed	TUBE	3/m²
140	EL	Eragrostis leptostachya	Paddock Lovegrass	TUBE	3/m²
140	GC	Glycine clandestina	Twining Glycine	TUBE	3/m²
140	HA	Hibbertia aspera	Rough Guinea Flower	TUBE	3/m²
140	LM	Lomandra multiflora	Many-flowered Mat-rush	TUBE	3/m²
140	PL	Poa labillardieri	Tussock Grass	TUBE	3/m²
140	PP	Pratia purpurascens	Whiteroot	TUBE	3/m²

PLANT SCHEDULE - VEGETATION MANAGEMENT AREA 4 UNNAMED CREEK RIPARIAN ZONE 1

NUMBER	SYMBOL	BOTANICAL NAME	COMMON NAME	POT SIZE	SPACING
FORBES AND GRASSES					
54	AF	Adiantum formosum	Giant Maidenhair Fern	TUBE	1/m²
54	AB	Alocasia brisbanesis	Spoon Lily	TUBE	1/m²
54	GA	Gymnostachys anceps	Settler's Flax	TUBE	1/m²
108	LM	Lomandra multiflora	Many-Flowered Mat Rush	TUBE	2/m²
108	PV	Pseuderanthemum variabile	Pastel Flower	TUBE	2/m²
SHRUBS					
18	ND	Neolitsea dealbata	White Bolly Gum	TUBE	1/3m²
18	WH	Wilkiea huegeliana	Veiny Wilkiea	TUBE	1/3m²

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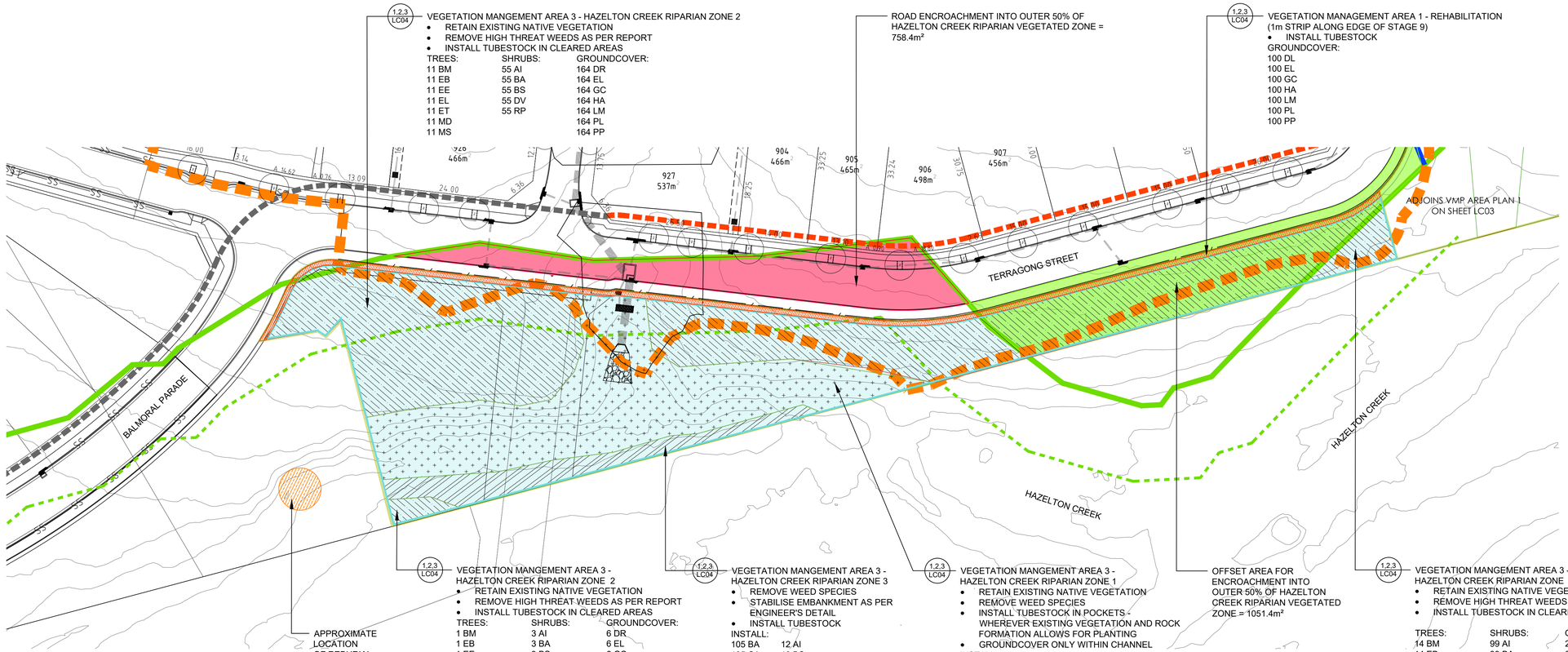
issue	issue date	issue description	des	dwn	app
C	20.07.20	DA Submission	KM	KM	AC
	2. Amended to Council comments - outer perimeter road street trees removed				
B	11.06.20	for coordination	KM	KM	AC
	1. Amended to Council comments				
A	13.02.20	DA Submission	KM	KM	AC

scale	project	dwg title	
AS SHOWN AT A1	PROPOSED RESIDENTIAL SUBDIVISION RAVENSWOOD ESTATE STAGE 9	LANDSCAPE CONCEPT PLAN VMP AREA PLAN 1	
date	client	dwg no.	project no.
23.07.2018	BALMORAL PARADE PTY LTD	LC03/06	1501.D4



VMP AREA PLAN 2
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PLANT SCHEDULE - VEGETATION MANAGEMENT AREA 1

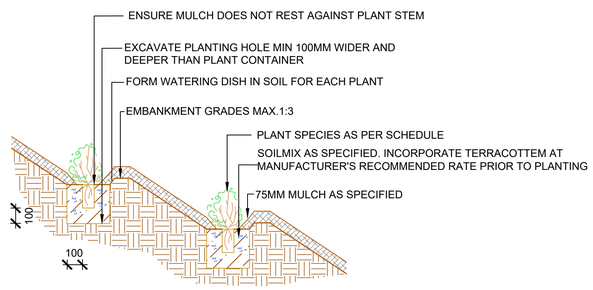
GROUNDCOVER / GRASSES					
100	DR	Dichondra repens	Kidney Weed	TUBE	3/m²
100	EL	Eragrostis leptostachya	Paddock Lovegrass	TUBE	3/m²
100	GC	Glycine clandestina	Twining Glycine	TUBE	3/m²
100	HA	Hibbertia aspera	Rough Guinea Flower	TUBE	3/m²
100	LM	Lomandra multiflora	Many-flowered Mat-rush	TUBE	3/m²
100	PL	Poa labillardieri	Tussock Grass	TUBE	3/m²
100	PP	Pratia purpurascens	Whiteroot	TUBE	3/m²

PLANT SCHEDULE - VEGETATION MANAGEMENT AREA 3 HAZELTON CREEK RIPARIAN ZONE 2

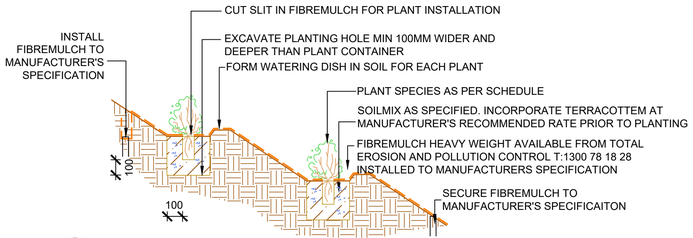
NUMBER	SYMBOL	BOTANICAL NAME	COMMON NAME	POT SIZE	SPACING
TREES					
26	BM	Backhousia myrtifolia	Grey Myrtle	TUBE	1/5m²
26	EB	Eucalyptus bosistoana	Coast Grey Box	TUBE	1/5m²
26	EE	Eucalyptus eugenioides	Thin-leaved Stringybark	TUBE	1/5m²
26	EL	Eucalyptus longifolia	Woollybutt	TUBE	1/5m²
26	ET	Eucalyptus tereticornis	Forest Red Gum	TUBE	1/5m²
26	MD	Melaleuca decora	White Feather Honeymyrtle	TUBE	1/5m²
26	MS	Melaleuca styphelioides	Prickly Paperbark	TUBE	1/5m²
SHRUBS					
157	AI	Acacia implexa	Hickory Wattle	TUBE	1/m²
157	BA	Boronia anemonifolia	Sticky Boronia	TUBE	1/m²
157	BS	Bursaria spinosa	Blackthorn	TUBE	1/m²
157	DV	Dodonaea viscosa subsp. angustifolia	Hopbush	TUBE	1/m²
157	RP	Rubus parvifolius	Native Raspberry	TUBE	1/m²
GROUNDCOVER / GRASSES					
382	DR	Dichondra repens	Kidney Weed	TUBE	3/m²
382	EL	Eragrostis leptostachya	Paddock Lovegrass	TUBE	3/m²
382	GC	Glycine clandestina	Twining Glycine	TUBE	3/m²
382	HA	Hibbertia aspera	Rough Guinea Flower	TUBE	3/m²
382	LM	Lomandra multiflora	Many-flowered Mat-rush	TUBE	3/m²
382	PL	Poa labillardieri	Tussock Grass	TUBE	3/m²
382	PP	Pratia purpurascens	Whiteroot	TUBE	3/m²

PLANT SCHEDULE - VEGETATION MANAGEMENT AREA 3 HAZELTON CREEK RIPARIAN ZONE 1 (ALONG CHANNEL) AND RIPARIAN ZONE 3 (ON STABILISED EMBANKMENT)

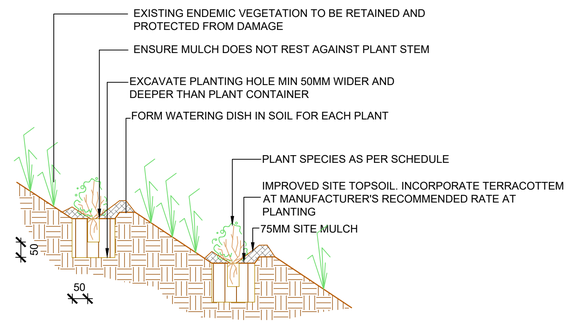
NUMBER	SYMBOL	BOTANICAL NAME	COMMON NAME	POT SIZE	SPACING
GRASSES, RUSHES AND SEDGES					
210	BaAr	Baumea articulata	Jointed Rush	TUBE	3/m²
210	CA	Carex apressa	Tall Sedge	TUBE	3/m²
210	DL	Dianella longifolia	Blue Flax Lily	TUBE	3/m²
210	DR	Dichondra repens	Kidney Weed	TUBE	3/m²
210	JU	Juncus usitatus	Common Rush	TUBE	3/m²
210	LM	Lomandra multiflora	Many-flowered Mat Rush	TUBE	3/m²
SHRUBS					
45	AI	Acacia implexa	White Sally Wattle	TUBE	1/m²
45	BS	Bursaria spinosa	Blackthorn	TUBE	1/m²
45	DV	Dodonaea viscosa subsp. angustifolia	Hopbush	TUBE	1/m²



1 EMBANKMENT PLANTING - EMBANKMENT MAX 1 IN 3 GRADE
1:20



2 EMBANKMENT PLANTING - STEEPER THAN 1 IN 3 GRADE
1:20



3 PLANTING INTO EXISTING VEGETATION
NTS

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issue	issue date	issue description	des	dwn	app
C	20.07.20	DA Submission 2. Amended to Council comments - outer perimeter road street trees removed	KM	KM	AC
B	11.06.20	for coordination 1. Amended to Council comments	KM	KM	AC
A	13.02.20	DA Submission	KM	KM	AC

scale: AS SHOWN AT A1	project: PROPOSED RESIDENTIAL SUBDIVISION RAVENSWOOD ESTATE STAGE 9	dwg title: LANDSCAPE CONCEPT PLAN VMP AREA PLAN 2
date: 23.07.2018	client: BALMORAL PARADE PTY LTD	dwg no.: LC04/06 project no.: 1501.D4

APPENDIX B
Weed Removal Techniques

Appendix 4: Weed removal techniques

[The information in this appendix has largely been sourced with permission from the Bush Regenerators' Handbook *by the National Trust of Australia (NSW) (1991). The illustrations have been supplied by the Australian Association of Bush Regeneration (AABR) and the National Trust of Australia (NSW).]*

Hand removal

Weeds with shallow roots

Weed examples: Crofton Weed, Cobbler's Peg, Fleabane, Purple Top, small grasses and most seedlings

Small soft weeds and seedlings, annuals and tufted grasses that root directly from the base usually have shallow roots. These plants can be pulled out by hand. Even tough perennials like Paddy's Lucerne can be removed this way. Be warned, however, that if some of the rootstock stays in the ground, a different method will be needed.

For seedlings and small plants, take hold of the plant at ground level and pull. If you pull at any higher point on the stem, it may break and the plant re-shoot.

For larger plants, take hold of the stem at ground level and gently rock the plant back and forth until it comes away cleanly. If the plant has a spreading root system, it may be necessary to pull individual lateral roots. Always pull roots horizontally through the soil towards the stem of the plant. This causes the least disturbance to the soil and reduces the chance that the root will break. Never pull large lateral roots upwards as they may break and will then need to be dug out.

Replace any disturbed soil and lightly sweep the mulch back over the spot. All weed debris should be removed. If this is not possible, seedlings and most soft, leafy weeds can be left lying on the ground. Larger plants with substantial roots should be placed upside down on a rock or propped up so that the roots do not make contact with the soil. Ensure that all weeds that are left on-site cannot set seed.

Note: Annual weeds can be sprayed with herbicide before flower and fruit set. If annuals are treated while in flower, there may be enough stored food in the plant to allow the plant to set seed before it dies. Seedling perennials can be sprayed with herbicide as long as the plant contains enough green tissue to absorb the poison. Grasses are best treated with herbicide when the plant is actively growing.

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Weeds with brittle or readily fragmented stems

Weed example: Wandering Jew

Each of the weeds in this group needs careful weeding and regular follow-up. Any fragmented piece of stem that bears a node can regenerate, so all plants must be bagged and removed from the site.

Hand pulling

Use this method if you are working entirely by hand.

1. Take hold of one runner and pull it gently along the ground towards you.
2. When the runner disappears under vegetation or mulch, stop pulling and scrape back the mulch until you get another grip further along the stem. Continue to pull gently until the runner comes away from the soil, then bag it immediately. If the runner breaks, trace it out.

This method is suitable for isolated or moderate infestations, particularly those which are tangled with more desirable species. If the infestation is dense, however, several more efficient methods are available.

Rolling

When Wandering Jew is growing thickly on a hard surface, such as a rock-face or compacted soil, the weed can be rolled up like a carpet.

1. Locate a convenient starting point and two side boundaries. Use a sharp knife to cut along these three sides. This weed has very shallow roots which hold little soil so it is possible to roll the carpet up into convenient lengths.
2. Cut the roll off and bag the lot. Continue in this manner until the weed is completely removed.

If necessary, return to the site and hand-pull all the small pieces that were missed or broken off. A stiff broom will finish the job.

Raking

If no native groundcover plants are present, large infestations can be raked up and bagged. This method is probably the most efficient for large infestations on a base of soil. It is important to return to the site several times and remove the small portions that were passed over. Maintenance and perseverance are the key to eradicating this weed.

Note: Other weed species growing among Wandering Jew should be removed using the appropriate method.

Removal using a knife or trowel

Weeds with large root systems

Weed examples: Plantain, Dock, Cat's Ear, Flatweed

This technique is useful for small soft leafy plants with a larger root system or tap roots or hardy perennials which rely on a swollen root system.

1. With your right hand push a narrow trowel or knife into the soil next to the plant (the knife should be pushed in with the side of the blade towards the plant). Push the handle towards the plant and pull the blade out of the soil.
2. Repeat at right angles, then carefully remove the plant. If the plant does not move, repeat the action around the other side of the plant, remembering to push the knife towards the plant. Repair any disturbance to the soil or mulch.

Weeds with below-surface crowns

Weed examples: Paspalum, Pampas Grass, Ginger Plant, Asparagus Fern, Bamboo

This is useful for weeds which have their growing points below the surface (crowns, corms, rhizomes and clumped or tufted fibrous root systems).

1. Grasp the leaves or stems and hold them tightly so that the base of the plant is visible. Plants with sharp leaves or stems should be cut back first, before you attempt to get in close to the base.
2. Insert the appropriate tool (either knife or lever) close to the base of the plant at a slight angle, with the tip well under the root system.
3. Cut through the roots close to the crown or rhizome. Depending on the size of the plant, two or more cuts may be needed to sever all the roots.
4. Remove the plant. Make sure the hard crown, or base of the plant where the roots begin, is completely removed. If part of this is left in the ground, it will usually re-shoot.

Note: The water tubers of Asparagus Fern can be left in the ground once the crown has been removed, as they contain no food and cannot reproduce.

National Trust (NSW)/V. Bear

Weeds with bulbs or tubers

Weed examples: Oxalis, Onion Weed, Watsonia, Turkey Rhubarb

Plants with bulbs, corms or small tubers must be completely removed from the soil. These reproductive parts can form small off-shoot bulbs or growing points which can form a new plant if broken off.

1. Prepare the area by moving back mulch and other vegetation. Using a trowel or larger spade, dig a narrow channel next to the stem until the main bulb is reached.
2. Check the soil for adjoining bulblets. If present, they must be removed with a substantial quantity of soil, and the whole lot bagged.
3. Periodically check for regrowth.

Plants which form underground tubers are especially difficult to eradicate as they may have several tubers connected by thin roots. Although you might remove the plant body and some tubers from the soil, other tubers which remain in the soil can re-establish the plant. These secondary tubers can develop even when buried deep in the soil.

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Weeds with surface or climbing runners

Weed examples: Honeysuckle, Morning Glory, Jasmine, Cape Ivy

The stems of many climbers or scramblers develop roots and new shoots from the nodes, so broken portions should not be left in or on the ground.

1. Take hold of one runner and gently pull it along the ground towards you. Follow the runners until the main root system is located. Either remove it manually or cut and paint it with herbicide.
2. Continue until all the runners have been removed. Small fibrous roots growing from the nodes along the runners can be cut with a sharp knife as long as there is no stem tissue attached.
3. Check for broken pieces of stem and large roots which may have been overlooked. Replace the mulch.
4. Follow up regularly. Regrowth from underground roots can be sprayed with herbicide or removed manually.

Note: Rampant vines such as Honeysuckle often have several major nodes with numerous runners branching in all directions. All of these runners must be removed. Major infestations of rampant vines can be sprayed with herbicide as long as no native species are present.

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Herbicide treatment

Method 1: Cut and paint

This is useful for all small- to medium-sized woody weeds, and some soft, leafy perennials such as Privet, Ochna, Lantana, Wild Olive, Cotoneaster, Camphor Laurel, Ginger, Bamboo and Arundo.

For larger specimens remove the top of the plant for easy access.

1. With an appropriate tool (secateurs, loppers or bush-saw), cut the base of the plant close to the ground with a straight, flat cut. The cut must be horizontal so that the herbicide rests on the cut area while being absorbed, rather than running away down the side of the stem. The cut should be as close as possible to the ground as stumps are unsightly and dangerous.
2. Immediately spray and paint herbicide solution onto the exposed surface (less than 10 seconds for water-based solutions and 1 minute for diesel solutions), as the sap ceases to flow once the tissues are severed. For convenience, use a paintbrush, eye dropper or small squeeze bottle. For larger specimens, wipe the poison around the outer rim of the cut only.

Note: If plants re-shoot, repeat the method. Ochna is especially difficult, but it has been successfully poisoned by scraping each side of the stem just below the cut. Plants growing in damp areas may require special attention as they are likely to re-shoot.

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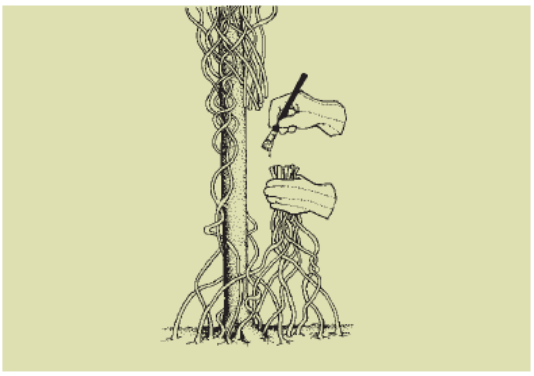
Method 2: Cut and swab

This method is similar to Method 1, but is suited to vines and multi-stemmed shrubs.

Here the plant stems are cut through completely, close to the ground. Herbicide is then applied immediately to the cut surface emerging from the ground, via spray or brush.

Some vines, such as Morning Glory, Balloon Vine or Moth Vine, have many stems which climb into the canopy. Handfuls of stems can be cut and painted with herbicide. The vines which remain in the canopy will soon die and decompose, and do not need to be removed.



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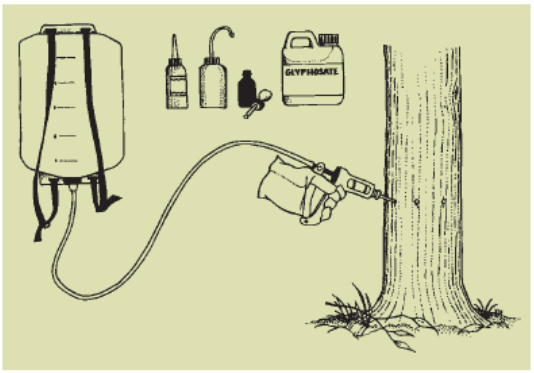
Method 3: Tree injection

Tree injection and frilling and chipping (see below) are used for trees and woody weeds with stems or trunk greater than five centimetres in circumference. They are also used on inaccessible sites where rubbish removal is a problem, or where the dead tree is going to be left for habitat.

1. Drill holes at an angle into the sapwood approximately five centimetres apart around the tree, using a cordless drill or brace and bit.
2. Place the correct dose of herbicide into each hole as it is cut. If necessary, wait until the liquid subsides then apply the remainder. It is important to follow the manufacturer's recommendations for the correct dose.

Note: Best results are achieved with plants which are actively growing. The success of any systemic herbicide relies on the plant's normal physiological activities to move the chemical through its tissue.



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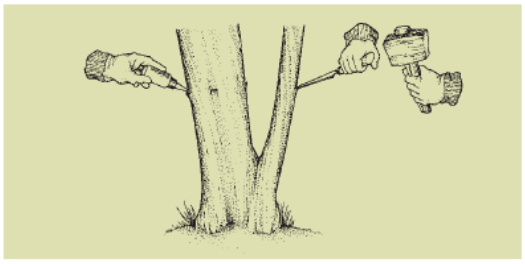
Method 4: Frilling or chipping

This technique is used when a cordless drill is not available for tree injection.

1. With a sharp chisel or axe, make a deep horizontal cut into the sapwood at regular intervals (no farther than three centimetres apart) around the base of the tree. Take care not to ringbark the plant.
2. Immediately apply herbicide as described in Method 3 above.

Note: For multi-stemmed plants, inject or chip below the lowest branch or treat each stem individually.



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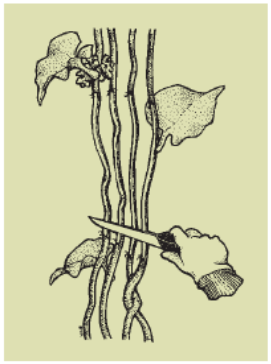
Method 5: Stem scrape and paint

This is a technique used on many vines, such as Madeira Vine, which has aerial, not underground, tubers. Instead of producing seeds, in the Sydney region the plant drops thousands of these tubers or small 'potatoes' which develop along the stems. These fall to the ground and establish new plants.

1. For seedlings and small plants without aerial tubers, use the hand removal technique (above).
2. For mature vines with aerial tubers, scrape a very thin layer of bark from a 15 to 30 centimetre section of the stem and apply herbicide. The aerial tubers will slowly rot, so do not disturb the vine until all the tubers have shrivelled and fallen. This may take weeks or even months. Do not remove the roots from the soil, as this will prevent the herbicide from circulating through the whole plant.



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Method 6: Foliar spraying

Foliar spraying is the use of herbicide diluted with water or diesel at a specific rate, and sprayed over the foliage to the point where every leaf is wet, but not dripping. This method is most suited to shrubs, grasses and dense vines less than six metres tall. Foliar spraying can be done in a number of ways, depending on the size of the plant or infestation.

1. Blanket spraying using a boom spray mounted from a tractor or 4WD can be used to treat large areas completely infested with weeds.
2. For large infestations that need targeted applications of herbicide, a hose and handgun can be used to spray herbicide from a tractor or tank mounted on a 4WD.
3. Smaller infestations can be spot-sprayed using a backpack spray unit. Spot-spraying is used to treat individual weed plants or areas that have only small clumps of weeds.

Method 7: Spraying of bulbous plants

Bulbous plants should be treated between flower and fruit set. The herbicide will enter the plant's underground storage organ, reducing its ability to store food for the next growing season. Spraying is useful for treating dense infestations of Blackberry.

1. Spray the plant when it is actively growing. Spraying in general should be undertaken between late summer and early autumn, between the flowering and the setting of fruit.
2. When the plant appears dead, remove it from the site using a McLeod tool, rake or brush hook if required.
3. Check for regrowth and treat it using one of the following methods: cut and paint the main stem again; spray the regrowth with herbicide; paint a few leaves directly with herbicide; or remove it manually.

Note: Wandering Jew has been successfully controlled with herbicide. The results vary greatly according to light intensity, season, chemical dosage rate and coverage.

Method 8: Basal bark application

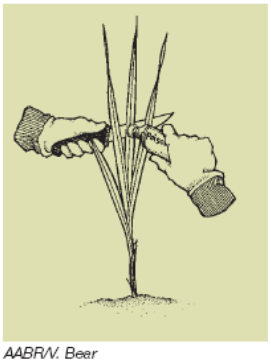
[The information on this method and Method 9 have been sourced from the Noxious and Environmental Weeds Control Handbook *by NSW Agriculture (2004).]*

This method involves mixing an oil-soluble herbicide in diesel and spraying the circumference of the trunk or stem of the plant. It is suitable for thin-barked woody weeds, undesirable trees, saplings, regrowth and multi-stemmed shrubs and trees.

The full circumference of the stem or trunk should be sprayed with herbicide solution from the ground to a height of 30 centimetres. It is important to saturate right around the trunk.

Method 9: Rope/wick applicators and stem swiping

This method consists of a wick or rope soaked in herbicide from a reservoir attached to a handle or pumped to the wick. The wetted wick is used to wipe or brush herbicide over the weed. It is sometimes necessary to provide some resistance for the wiper when the weed leaf or stem is soft. Stem swiping involves using a knife to provide resistance down the back of the stem or leaf, while wiping herbicide down the front.



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