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Vegetation Management Plan

(Amended October 2011)

Lot 2 DP 1031968

The Pines Estate and Waterside Cabins

Hearnes Lake Road, Woolgoolga.

October 2011

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The report relies on information supplied by the client and on findings obtained using accepted survey and assessment methodology. While due care was taken during field survey and report preparation, Coffs Harbour Bushland Regeneration Group accepts no responsibility for any omissions that may have occurred due to the nature of the survey methodology.

Conclusions to the report are professional opinions and Coffs Harbour Bushland Regeneration Group cannot guarantee acceptance or consent of the relevant determining/ consent authorities. Subsequent requests for further work or information will be subject to additional fees.

Client Issue							
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		Name	**Initials**	**Name**	**Initials**
DRAFT	12/10/11	K Hely	KW	B hELY	BH

This Vegetation Management Plan was prepared by John Ross and Kristine Grace-Hely, of Coffs Harbour Bushland Regeneration Group Pty Ltd, accredited member of the Australian Association of Bushland Regenerators (AABR)
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Contents

Introduction

Aim

To satisfy the Department of Planning NSW Part 3A requirements of the EP&A Act, together with the Coffs Harbour City Council (CHCC) Vegetation Conservation DCP in relation to the clearing of native vegetation to facilitate a proposed 53 lot extension to The Pines Estate and Waterside Cabins.

Objectives of this Report

- To determine appropriate species of indigenous local provenance seedlings for planting in the proposed 50m conservation buffer zone protecting Hearnes Lake.
- To determine the location placement and species selection of required offsets for native vegetation that is to be removed from the site during the proposed construction phase.
- Detail revegetation planting techniques and plant spacings.
- To identify all noxious and environmental weeds and outline the methodology for the removal and management of all such listed weeds.
- To outline the methodology for Initial and Follow up Maintenance Works required.
- To ensure all newly planted areas have a plan of management that ensures these areas become self-sustaining.
- Provide table of costing for all works.

Background

This Vegetation Management Plan (VMP) has been prepared following a request from Mr. Tony Tuxworth of Urban Group Australia Pty Ltd.

This VMP is an amended version of the original VMP(*Vegetation Management Plan Part B* May 2010) prepared for the site. Amendments have been required as the proposed extension to the site has been reduced from 60 lots to 53 lots.

Site Assessment

Methods

A field inspection of the site was carried out on 17 February 2010 with Ms. Rachel Binskin of CHCC and subsequently with Mr. Michael Howe, Manager of Pines Estate. This focused on determine the areas in which compensatory plantings are to be made.

A further more detailed site inspection was carried out in the southern portion of the site on the 10th March 2010.

“Vegetation management zone” boundaries were confirmed. Native and weed plant species were identified (Appendices 4 and 5).

The location, extent and condition of the native vegetation were assessed and a *Works Schedule* developed for each “vegetation management zone”.

Overview

- A detailed *Part 3A Response Report* has been prepared by SLR Ecology (2011) for the proposed Southern Precinct Upgrade which includes weed removal and rehabilitation of all land between the outer edge of the Asset Protection Zone (APZ) and the southern boundary, as well as the use of native species in the APZ
- This VMP has been prepared specifically to facilitate these proposed offsets and to aid in the creation of the required 50m vegetated buffer to Double Creek Crossing.
- Six monthly monitoring reports and a statement of completion will be provided on successful completion of the Initial Works as set out in this Plan.

Control of environmental and noxious weeds –overview

All environmental and noxious weeds shall continue to be controlled in accordance with the methods described in this plan beyond the five year period outlined until such a time as the Development Consent approval applying to the land is replaced by another approval.

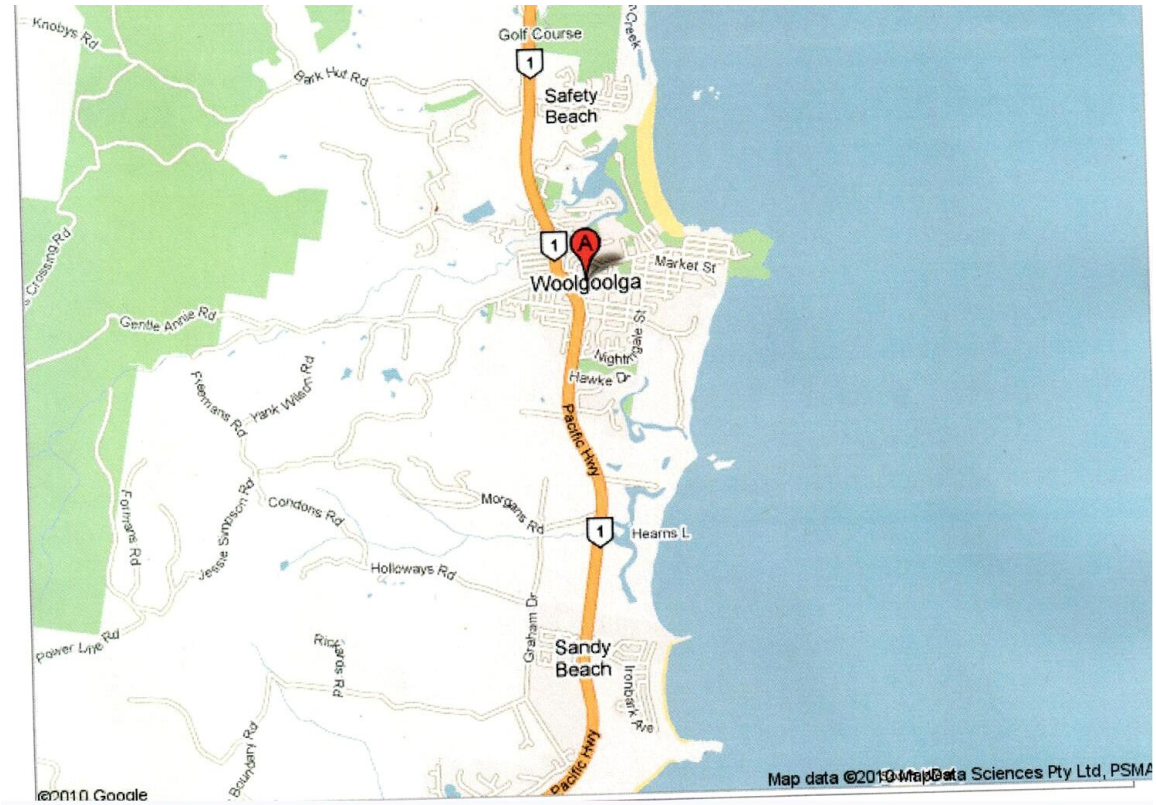
Due to the presence of native vegetation environmentally sensitive weed control techniques are required.

Powersprays shall not be used for the control of weeds at this site.

Site Description

Site Location

The subject site comprising part of Lot2 DP1031968 is located in approximately 2 Km south of the township of Woolgoolga and is bounded on the west by the Pacific Highway to the north by Hearnes Lake Road and to the east and south by Hearnes Lake and Double Crossing Creek. The subject site is located within the Local Government Area (LGA) of Coffs Harbour.



Site Description

Soil Type

The site/property is mapped as soil landscape classified as *Megan*, in Milford (1999). The *Megan* soil landscapes possess the following qualities:

Topography: Rolling low hills to hills with moderately broad crests (100-300m) and moderately long to long slopes (100-500m).

Soils: Moderately deep to deep (>100cm), well-drained structured Red, Brown earths, Brown Podzolic Soils and red Podzolic Soils with moderately deep to deep structured Yellow Earths and Yellow Podzolic soils in the drier situations, and moderately deep to deep well drained Krasnozems in the moistest sites.

Vegetation

The vegetation on the site is mapped as containing the following vegetation types under the Vegetation Classification system adopted by the CHCC (Fisher *et al* 1996):

- Dry Blackbutt Open Forest N2a
- Swamp Mahogany (*Eucalyptus robusta*) N52

The vegetation in the southwestern corner is mapped as N52 Swamp Mahogany which is also listed as the following Ecologically Endangered Habitat:

- Swamp Sclerophyll Forest

The vegetation communities mapped as Swamp Mahogany (N52a) and Blackbutt Open Forest (N2a) are also mapped as tertiary Koala Habitat (CHCC Draft Koala Plan of Management 2009).

Recent and detailed ecological surveys of the site, however, (SLR 2011) have determined that the site is vegetated by a scattered canopy of Blackbutts with a few Forest Red Gums, Northern Grey Ironbarks, Small Fruited Grey Gums and Tallowood, and does not constitute an *Endangered Ecological Community*(EEC)

Most of the Estate site, including the area that shall be cleared under the proposed *Southern Precinct Upgrade* ,has been cleared of native vegetation with scattered remnant tress only remaining and an understory of predominantly exotic grasses.

Outline

Vegetation to be removed for the *Southern Precinct Upgrade* consists largely of scattered Eucalypts, dominated by *Eucalyptus tereticornis* (Forest Red Gum),*Eucalyptus pilularis*(Blackbutt), *Eucalyptus siderophloia* (Northern Grey Ironbark) and *Eucalyptus propinqua* (Small Fruited Grey Gum) with a mown understorey of exotic grasses, in particular Broad-leaf Paspalum.

The proposal also shall require the removal of a water storage dam and three effluent dams.

The *Hearnes Lake/ Sandy Beach Development Control Plan (Amended 2008)* stipulates '…*A minimum of 50m from an RL Level of 3.5 around Hearnes Lake and Double Crossing Creek…'*

The lot layout of the proposed development has been altered with a reduction in the number of proposed lots enabling a 50m vegetated buffer to be created, without the need for revegetation in the adjacent public reserve as described in the VMP dated May 2010.

A total of 58 mature native trees shall be removed from the area mapped by Coffs Harbour City Council (CHCC) as tertiary Koala Habitat. CHCC Biodiversity Guideline 4 Compensatory Planting Advice stipulates removal of tertiary Koala Habitat requires a replacement ration of 1:4. This equates to the planting of 232 native species.

The Part 3A Response Report (SLR 2011) provides detailed analysis of the vegetation on the site, and determines that this vegetation does not constitute 'Koala Habitat' and that the requirement to offset with planting at a ratio of 1:4 is excessive. Nonetheless, these replanting ratios are met by the planting outlined in this VMP as 711 trees (including 265 Koala forage species) are to be planted.

Furthermore the removal of an additional 94 native trees shall require a replacement ration of 1:2 (defined as 'other' in the Biodiversity Guideline 4 Compensatory Planting Advice). This equates to the planting of 188 native species.

The site has been divided into five management zones.

Fencing and Tree protection

Long term Protective fencing

Fencing of the edge of the revegetation area shall be undertaken to prevent mowing within the revegetation area. Fencing shall be constructed with treated Pine posts and have two strands of Bayco wire. Suitable signs shall be erected informing that the site is a revegetation area. Location of the fence line is shown on the plan of the Regeneration Area in Appendix 1.

Existing fence line bordering public reserve contains some strands that are barbed wire. These strands of barbed wire should be replaced by smooth wire as they present a serious hazard to native fauna that may become entrapped/ injured on the barbs

Photo1: Example of Appropriate Signage for Revegetation Areas

Short term Protective fencing

Short term protective fencing shall be installed to delineated retained vegetation and prevent destructive activities during the construction (earthworks) phase of the development

Vegetation Management Zones

Zone 1

This zone consists of the Asset Protection Zone (APZ) Inner Protection Area (IPA) as shown in Appendix 1.

Most of this area will be subject to substantial earthworks with the infilling of the Water Storage Dam and Effluent Dams currently present and as such most of the vegetation present (scattered native canopy trees and predominantly weedy mid and understory) shall be removed.

Initial Works

After all earthworks have been completed the area shall be sown with couch grass and/ or native grasses. The following grass seeding rates, as recommended by Coffs Harbour City Council shall be used:

- Hulled Couch 50 – 100 kg/ ha sow October to March

The zone shall be maintained by regular slashing/ mowing.

Zone 2

This zone consists of the Asset Protection Zone (APZ) Outer Protection Area (OPA) as shown in Appendix 1.

Much of this area will be subject to substantial earthworks with the infilling of the Water Storage Dam and Effluent Dams currently present and as such most of the vegetation present (scattered native canopy trees and predominantly weedy mid and understory) shall be removed.

There are several canopy species present that shall be retained .These trees shall require a tree protection measures with a Tree Protection Zone (TPZ) being established no less than one metre from the outer drip line of the retained canopy trees . The TPZ should be secured to restrict access with edges being defined with a 'Flag on Line' supported with star pickets and tree protection signs attached. Fencing should be erected prior to any machinery or materials are brought on to the site and prior to the commencement of works.

The *Standards for Asset Protection Zones* (NSW Rural Fire Service) document states that tree crowns must be separated by two to five metres and those native trees should cover no more than 20% of the area. *Australian Bushfire Assessment Consultants* have advised that this relates to the IPA with the OPA being able to be vegetated with canopy species as long as the understory is keep clear to reduce ground fuel levels.

Initial Works

The OPA shall be planted with native indigenous tree species with the understory being maintained by mowing. Plantings shall be appropriately spaced from existing retained canopy trees as indicated in Appendix 1. The required tree species and numbers of trees required are provided in Table 1:

No.	***Botanical Name***	**Common Name**
5	*Corymbia intermedia*	Bloodwood
5	*Eucalyptus siderophloia*	Northern Grey Ironbark
5	*Eucalyptus pilularis*	Blackbutt
5	*Eucalyptus resinifera*	Red Mahogany
5	*Eucalyptus tereticornis*	Forest Red Gum
5	*Syncarpia glomerulifera*	Turpentine
5	*Eucalyptus microcorys*	Tallowwood

Table 1: Canopy Species Zone 2

These native indigenous species shall be:

- tubestock grown from local provenance seed (i.e. seed collected within a 50 kilometres radius of Coffs Harbour)
- planted using slow release fertilizer and water retention crystals
- have jute weed mats for weed control
- large plastic tree guards for protection against Wallaby predation and spray drift when carrying out follow up weed control
- be watered on installation and depending on the soil moisture during the plant establishment phase, additional watering may be required.
- Any plants that die within the 5 year period shall be replaced at the owners expense

Detailed site preparation and planting requirements are given in Appendix 7. The Restoration Works Schedule in Appendix 3 outlines the estimated labour hours and costs of the planting.

Follow Up work

This shall involve the periodic manual removal and spot spraying of weeds (before seed set). Follow up work shall involve regular weed control and this shall take place every 8 weeks for 2 years and thereafter every 16 weeks for the following 3 years as shown in the Restoration Works Schedule in Appendix 3.

Particular attention is required within a metre diameter of the new plantings to ensure exotic grass species do not become established and compete with the establishing plants for moisture and nutrients.

The remainder of the zone shall be maintained by regular slashing/mowing

In the first twelve months after planting supplementary watering shall be required in periods of extended dry and hot climatic conditions. **Any plantings that do not survive shall require replacement at the property owner's expense.**

Zone 3

Zone 3 has an approximate area of 2300m².

Parts of this zone will be subject to substantial earthworks with the infilling of the Water Storage Dam and Effluent Dams currently present and as such most of the vegetation present (scattered native canopy trees and predominantly weedy mid and understory) shall be removed.

After earthworks have been completed the entire zone shall be revegetated with canopy, midstory and groundlayer species with plantings congruent with the Dry Blackbutt Open forest community.

Initial Works

Revegetation works shall be undertaken following the removal of any noxious and environmental weeds that may be still present on the site following earthworks.

Canopy and midstorey species as listed in Table 2 shall be planted at three metre centres across the entire zone. Groundlayer species as shown in Table 2 shall be planted at 1 metre centres.

Canopy Species		
No.	***Botanical Name***	**Common Name**
15	*Corymbia intermedia*	Bloodwood
20	*Eucalyptus siderophloia*	Northern Grey Ironbark
20	*Eucalyptus pilularis*	Blackbutt
20	*Eucalyptus resinifera*	Red Mahogany
20	*Eucalyptus tereticornis*	Forest Red Gum
20	*Syncarpia glomerulifera*	Turpentine
25	*Eucalyptus microcorys*	Tallowwood
Midstorey Species		
No.	***Botanical Name***	**Common Name**
15	*Acacia myrtifolia*	Myrtle Wattle
15	*Banksia oblongifolia*	
15	*Breynia oblongifolia*	
15	*Leucopogon lanceolatus*	
15	*Persoonia stradbrokensis*	Geebung
15	*Pultenaea villosa*	Pultena
15	*Psychotria loniceroides*	Hairy Psychotria
Understorey Species		
	Botanical Name	**Common Name**
25	*Cymbopogan refractus*	Barbed Wire Grass
25	*Dianella caerulea*	Blue Flax Lily
25	*Eustrephus latifolius*	
25	*Goodenia rotundifolia*	
25	*Geitonplesium cymosum*	
25	*Lomandra longifolia*	Mat Rush
25	*Oplis menus* sp.	
25	*Polymeria calcyna*	
25	*Smilax glyciphylla*	
25	*Themeda australis*	Kangaroo Grass

These native indigenous species shall be:

- tubestock grown from local provenance seed (i.e. seed collected within a 50 kilometres radius of Coffs Harbour)
- planted using slow release fertilizer and water retention crystals
- have jute weed mats for weed control
- large plastic tree guards for protection against Wallaby predation and spray drift when carrying out follow up weed control
- be watered on installation and depending on the soil moisture during the plant establishment phase, additional watering may be required.
- Any plants that die within the 5 year period shall be replaced at the owners expense

Detailed site preparation and planting requirements are given in Appendix 7. The Restoration Works Schedule in Appendix 3 outlines the estimated labour hours and costs of the planting.

Follow Up work

This shall involve the periodic manual removal and spot spraying of weeds (before seed set). Follow up work shall involve regular weed control and this shall take place every 8 weeks for 2 years and thereafter every 16 weeks for the following 3 years as shown in the Restoration Works Schedule in Appendix 3.

Particular attention is required within a metre diameter of the new plantings to ensure exotic grass species do not become established and compete with the establishing plants for moisture and nutrients.

The revegetation areas will require regular spot spraying of weeds to allow the newly establishing plants unrestricted growth until surrounding weeds are suppressed. Once this stage is reached only periodic hand weeding shall be required to allow natural regeneration to occur. The spot spraying shall be carried out with glyphosate as per manufacturer's recommendations.

In the first twelve months after planting supplementary watering shall be required in periods of extended dry and hot climatic conditions. **Any plantings that do not survive shall require replacement at the property owner's expense.**

Zone 4

Total area of approximately 2500 m² consisting primarily of a mown grassland dominated by exotic species especially Broad-leaf Paspalum. These areas also have scattered trees with *Eucalyptus pilularis* (Blackbutt) the dominant species.

Also contains a drainage line dominated by mid layer weeds especially Lantana with canopy species including *Eucalyptus siderophlioa* (Grey Iron Bark), *Eucalyptus intermedia* (Pink Bloodwood) and *Lophostemon suaveolens* (Swamp Box). In lower drainage areas *Melaleuca quinquenervia* (Broad-leaved Paperbark) and *Casuarina glauca* (Swamp Oak).

All areas of Zone 4 are currently moderately to seriously weed infested.

Mown areas are dominated by Broad-leaf Paspalum; this weed will readily invade the adjacent bushland in the Public Reserve. This is already occurring. Broad-leaf Paspalum dominates the ground layer preventing natural regeneration. Its eradication from this conservation area is essential.

Initial Works

Initial works required includes weed removal and revegetation works over the entire zone.

The Restoration Works Schedule in Appendix 3 outlines the estimated labour hours and costs of the initial weed control and planting.

Weed Control

This will involve the removal of all environmental/noxious weeds in this zone as listed in Appendix 5.

This will involve:

- Spray with Glyphosate herbicide :Broad Leaved Paspalum, Blue Billygoat Weed, Crofton Weed, Carpet Grass, Giant Paspalum, Rhodes Grass, Pigeon Grass
- Spray with Metsulfuron-methyl herbicide and Pulse penetrant: Kahili Ginger, Ground Asparagus
- Cut and Paint with Glyphosate herbicide: Lantana, Senna, Groundsel Bush, Bitou Bush, Aerial Yam
- Hand Removal: Fleabane, Mile a Minute, Monstera deliciosa, Passionfruit, White Passionflower, Corky Passionfruit, Paddy's Lucerne, Purple Top

All initial weed control work shall be carried out before the revegetation works described below.

The bushland regeneration weed control techniques are given in Appendix 6.

Revegetation Works

Revegetation works shall be undertaken over the entire zone, excluding the drainage line areas that are currently vegetated with native canopy and midstorey species that are shown in Appendix 1.

A total area of approximately 2000m² requires revegetation:

- 1950 m² of mown grassland dominated by Broad-leaf Paspalum
- 50 m² where weed removal has been undertaken adjacent to native vegetation on drainage lines.

This shall involve the planting of 222 indigenous native canopy and mistorey species at plant spacings of 3 metre centres as provided in table 3. Groundlayer species shall be planted within the second year follow up works program after the Broadleaf Paspalum has been eliminated from the area.

Planting shall be done following weed control as described above and blanket spraying of the mown pasture areas with a glyphosate herbicide.

The following lists are species occurring on the site or nearby from which the compensatory plantings shall be chosen. All tubestock shall be local provenance (i.e. from locally collected seed)

Canopy Species		
No.	***Botanical Name***	**Common Name**
5	*Corymbia intermedia*	Bloodwood
10	*Eucalyptus pilularis*	Blackbutt
10	*Eucalyptus resinifera*	Red Mahogany
10	*Eucalyptus robusta*	Swamp Mahogany
10	*Eucalyptus tereticornis*	Forest Red Gum
5	*Lophostemon suvaloeons*	Swamp Box
5	*Melaleuca quinquenervia*	Broad-leaved Paperbark
10	*Syncarpia glomerulifera*	Turpentine
10	*Eucalyptus microcorys*	Tallowwood
Midstorey Species		
No.	***Botanical Name***	**Common Name**
15	*Acacia myrtifolia*	Myrtle Wattle
15	*Banksia oblongifolia*	
15	*Banksia spinulosa*	Hair Pinned Banksia
15	*Pittosporum revolutum*	Hairy Pittosporum
15	*Pultenaea villosa*	Pultena
11	*Psychotria loniceroides*	Hairy Psychotria
15	*Acacia melanoxyln*	Blackwood
15	*Banksia integrifolia*	Coastal Banksia
15	*Casuarina glauca*	Swamp Oak
15	*Eleocarpus reticulatus*	Blueberry Ash

Table 3: Revegetation Species Zone 4

These native indigenous species shall be:

- tubestock grown from local provenance seed (i.e. seed collected within a 50 kilometres radius of Coffs Harbour)
- planted using slow release fertilizer and water retention crystals
- have jute weed mats for weed control
- large plastic tree guards for protection against Wallaby predation and spray drift when carrying out follow up weed control
- be watered on installation and depending on the soil moisture during the plant establishment phase, additional watering may be required.
- Any plants that die within the 5 year period shall be replaced at the owners expense

Detailed site preparation and planting requirements are given in Appendix 7.

Follow Up work

This shall involve the periodic manual removal and spot spraying of weeds (before seed set). Follow up work shall involve regular weed control and this shall take place every 8 weeks for 2 years and thereafter every 16 weeks for the following 3 years as shown in the Restoration Works Schedule in Appendix 3.

Particular attention is required within a metre diameter of the new plantings to ensure exotic grass species do not become established and compete with the establishing plants for moisture and nutrients.

The revegetation areas will require regular spot spraying of weeds to allow the newly establishing plants unrestricted growth until surrounding weeds are suppressed. Once this stage is reached only periodic hand weeding shall be required to allow natural regeneration to occur. The spot spraying shall be carried out with glyphosate as per manufacturer's recommendations.

In the first twelve months after planting supplementary watering shall be required in periods of extended dry and hot climatic conditions. **Any plantings that do not survive shall require replacement at the property owner's expense.**

Ground layer/understorey species shall be installed in year two of the follow up works program. This is to allow for exotic grass eradication prior to planting of the groundlayer and to assess the extent of the natural regeneration that has taken place to determine exact planting ratios/ spacings required.

Suggested understorey species are provided in Table 4.

	Botanical Name	**Common Name**
25	*Cymbopogan refractus*	Barbed Wire Grass
25	*Dianella caerulea*	Blue Flax Lily
25	*Eustrephus latifolius*	
25	*Goodenia rotundifolia*	
25	*Geitonplesium cymosum*	
25	*Lomandra longifolia*	Mat Rush
25	*Oplis menus* sp.	
25	*Polymeria calcyna*	
25	*Smilax glyciphylla*	
25	*Themeda australis*	Kangaroo Grass

Table 4: Understory Supplementary planting Species

Zone 5

- Drainage line dominated by mid layer weeds especially Lantana with canopy species including *Eucalyptus siderophloia* (Northern Grey Iron Bark), *Eucalyptus intermedia* (Pink Bloodwood) and *Lophostemon suaveolens* (Swamp Box). In lower drainage areas *Melaleuca quinquenervia* (Broad-leaved Paperbark) and *Casuarina glauca* (Swamp Oak).
- This zone is mapped as N52 Swamp Mahogany and is listed as a Ecologically Endangered Habitat: Swamp Sclerophyll Forest.

Photo2: Edge of vegetation along drainage line is seriously weed infested and shall require revegetation following weed control

Weed Control

This will involve the removal of all environmental/noxious weeds in this zone as listed in Appendix 5.

This will involve:

- Spray with Glyphosate herbicide :Broad Leaved Paspalum, Blue Billygoat Weed, Crofton Weed, Carpet Grass, Giant Paspalum, Rhodes Grass, Pigeon Grass
- Cut and Paint with Glyphosate herbicide: Lantana, Senna, Groundsel Bush,

All initial weed control work shall be carried out before the revegetation works described below.

The bushland regeneration weed control techniques are given in Appendix 6.

Revegetation Works

Revegetation works shall be undertaken:

- In the northern portion of the drainage line that is currently vegetated with native canopy but consists of a weedy mid and groundlayer.
- The western portion of the zone that currently has a mown understory.

This shall involve the planting of 200 indigenous mistorey species at plant spacings of 3 metre centres. Groundlayer species shall be planted within the second year follow up works program after the Broadleaf Paspalum has been eliminated from the area.

Planting shall be done following weed control as described above and blanket spraying of the mown pasture areas with a glyphosate herbicide.

The following lists are species occurring on the site or nearby from which the compensatory plantings shall be chosen. All tubestock shall be local provenance (i.e. from locally collected seed)

Midstorey Species

No.	***Botanical Name***	**Common Name**
15	*Acacia myrtifolia*	Myrtle Wattle
15	*Banksia oblongifolia*	
15	*Banksia spinulosa*	Hair Pinned Banksia
20	*Pittosporum revolutum*	Hairy Pittosporum
20	*Pultenaea villosa*	Pultena
20	*Psychotria loniceroides*	Hairy Psychotria
15	*Acacia melanoxyln*	Blackwood
30	*Casuarina glauca*	Swamp Oak
15	*Eleocarpus reticulatus*	Blueberry Ash
15	*Cupaniopsis anarcardioides*	Tuckeroo
15	*Endiandra sieberi*	Corkwood
15	*Guioa semiglauca*	Guioa

Table 5: Midstorey Plantings Zone 5

These native indigenous species shall be:

- tubestock grown from local provenance seed (i.e. seed collected within a 50 kilometres radius of Coffs Harbour)
- planted using slow release fertilizer and water retention crystals
- have jute weed mats for weed control
- large plastic tree guards for protection against Wallaby predation and spray drift when carrying out follow up weed control
- be watered on installation and depending on the soil moisture during the plant establishment phase, additional watering may be required.
- Any plants that die within the 5 year period shall be replaced at the owners expense

Detailed site preparation and planting requirements are given in Appendix 7.

Follow Up work

This shall involve the periodic manual removal and spot spraying of weeds (before seed set). Follow up work shall involve regular weed control and this shall take place every 8 weeks for 2 years and thereafter every 16 weeks for the following 3 years as shown in the Restoration Works Schedule in Appendix 3.

Particular attention is required within a metre diameter of the new plantings to ensure exotic grass species do not become established and compete with the establishing plants for moisture and nutrients.

The revegetation areas will require regular spot spraying of weeds to allow the newly establishing plants unrestricted growth until surrounding weeds are suppressed. Once this stage is reached only periodic hand weeding shall be required to allow natural regeneration to occur. The spot spraying shall be carried out with glyphosate as per manufacturer's recommendations.

In the first twelve months after planting supplementary watering shall be required in periods of extended dry and hot climatic conditions. **Any plantings that do not survive shall require replacement at the property owner's expense.**

Ground layer/ understorey species shall be installed in year two of the follow up works program. This is to allow for exotic grass eradication prior to planting of the groundlayer and to assess the extent of the natural regeneration that has taken place to determine exact planting ratios/ spacings required.

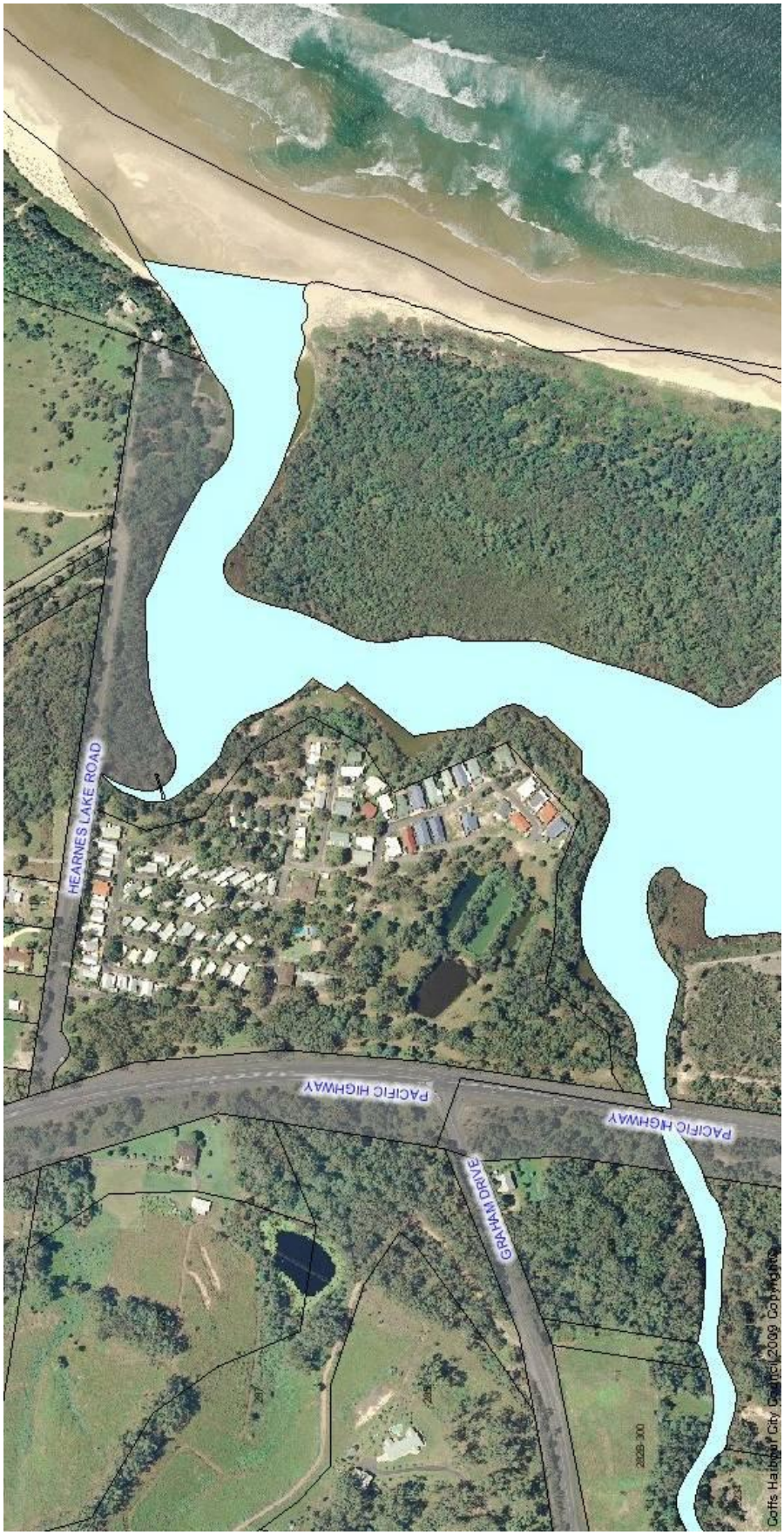
Suggested understorey species are provided in Table 6.

	Botanical Name	**Common Name**
25	*Cymbopogan refractus*	Barbed Wire Grass
25	*Dianella caerulea*	Blue Flax Lily
25	*Eustrephus latifolius*	
25	*Goodenia rotundifolia*	
25	*Geitonplesium cymosum*	
25	*Lomandra longifolia*	Mat Rush
25	*Oplis menus* sp.	
25	*Polymeria calcyna*	
25	*Smilax glyciphylla*	
25	*Themeda australis*	Kangaroo Grass

Table 6: Understory Supplementary Planting Species

Appendix 1: Regeneration Area

Appendix 2: Aerial Photograph



Appendix 3: Restoration Works Schedule

Initial Works Zones 2-5

Item	Sub-Item	Labour	Materials	Cost $
Weed Control		110 hours @ $40 p/h	Chemicals $200	4600.00
Planting				
	Plant Purchasing	4 hr @ $40 p/h	712 plants @ $2.50 each	1940.00
	Planting	100 hours@ $40 p/h		4000.00
	Weed Mats	incl. in planting costs	712 jute mats @ $1 each	712.00
	Fertilizer & Water crystals	incl. in planting costs	712 tree tablets + water crystals @ $0.25 each	730.00
	Tree Bags& stakes	incl. in planting costs	712 bags +2136 stakes	2848.00
Revegetation Fencing	Treated Pine Posts & Bayco Wire (2 strands)	210 hours@ $36 p/h	140 posts@ $12 each 1100m Bayco Wire @ $600	9840.00
			Total Cost (does NOT include GST)	**$24 670.00**

This is a cost estimate only

Follow Up Works- Zones 1, 2 & 4

Years 1-2

Treatment Frequency	Year 1	Year 2*	Total $
28 hrs every 2 months	$ 6048.00	$ 6350.00	**12 398.00**

***5% CIP Increase** **Totals do NOT include GST**

This is a cost estimate only

Years 3- 5

Treatment Frequency	Year 3*	Year 4*	Year 5*	Total $
14 hrs every 4 months	$1667.00	$1750.00	$1837.00	**5254.00**

***5% CIP Increase** **Totals do NOT include GST**

This is a cost estimate only

All prices are estimation only. Base hourly rates are current at time of VMP preparation

Appendix 4: Native Vegetation Species List

Botanical Name	***Common Name***	***Frequency***	***Habit***
Acacia melanoxyln	Sally Wattle	O	Tree
Acacia myrtifolia	Red Stemmed Wattle	O	Shrub
Acacia suaveolens	Sweet Wattle	R	Shrub
Adiantum sp.	Maidenhair Fern	R	Fern
Aegiceras corniculatum	Mangrove	O	Tree
Allocasuarina littoralis	Black Sheoak	O	Tree
Banksia oblongifolia		R	
Banksia spinulosa		R	
Breynia oblongifolia	Breynia	R	Shrub
Cassytha sp.		O	Vine
Casuarina glauca	Swamp Oak	C	Tree
Centella asiatica	Gotu Kola	C	Herb
Commelina cyanea	Commelina	O	Herb
Corymbia intermedia	Pink Bloodwood	O	Tree
Cupaniopsis anacardioides	Tuckeroo	R	Tree
Cymbopogon refractus	Barbed Wire Grass	O	Grass
Desmodium sp.		O	Herb
Dianella caerulea	Blue Flax Lily	O	Herb
Dodonea triquetra	Hop Bush	R	Shrub
Elaeocarpus reticulatus	Blueberry Ash	O	Tree
Entolasia marginata	Bordered Panic	C	Grass
Epacris pulchella		R	Shrub
Eucalyptus microcorys	Tallowood	O	Tree
Eucalyptus pilularis	Blackbutt	C	Tree
Eucalyptus propinqua	Grey Gum	O	Tree
Eucalyptus resinifera	Red Mahogany	O	Tree
Eucalyptus robusta	Swamp Mahogany	R	Tree
Eucalyptus siderophloia	Grey Ironbark	O	Tree
Eucalyptus tereticornis	Forest Red Gum	O	Tree
Eustrephus latifolius	Wombat Berry	R	Vine
Ficus coronata	Creek Sandpaper Fig	R	Tree
Geitonoplesium cymosum	Scrambling Lily	O	Vine
Glochidion ferdinandi	Cheese Tree	O	Tree
Hypolepsis glandulifera	Ground Fern	O	Fern
Imperata cylindrica	Blady Grass	C	Grass
Leucopogon lanceolatum		O	
Lomandra longifolia	Mat Rush	O	Herb
Lophostemon suaveolens	Swamp Turpentine	O	Tree
Melaleuca quinquenervia	Broad Leaved Paperbark	C	Tree
Microlena stipoides	Weeping Grass	C	Grass
Morinda jasminoides	Morinda	R	Vine

Botanical Name	***Common Name***	***Frequency***	***Habit***
Notelaea ovata		C	Shrub
Omalanthus populifolius	Bleeding Heart	O	Shrub
Oplismenus aemulus	Creeping Beard Grass	C	Grass
Oplismenus imbecillus	Creeping Beard Grass	C	Grass
Pandorea pandorana	Wonga Vine	R	Vine
Pararchidendron pruinosum	Snowwood	R	Tree
Parsonsia straminea	Common Silkpod	C	Vine
Pittosporum revolutum	Hairy Pittosporum	R	Shrub
Poa sieberiana var. sieberiana	Snowgrass	O	Grass
Polymeria calycina		R	Herb
Polyscias sambucifolius	Elderberry Panax	R	Shrub
Pratia purpurascens		C	Herb
Psychotria loniceroides	Hairy Psychotria	O	Shrub
Rubus moluccanus	Molucca Bramble	O	Vine
Smilax australis	Smilax	O	Vine
Smilax glyciphylla	Sweet Sarsaparilla	O	Vine
Stephania japonica	Snake Vine	O	Vine
Syncarpia glomulifera	Turpentine	R	Tree
Themeda australis	Kangaroo Grass	O	Grass
Viola banksii	Native Violet	C	Herb

Key:

R	Rare
O	Occasional
C	Common

Appendix 5: Weed Species List

Occurrence Code	
Rare	R
Occassional	O
Common	C

Common Name	**Botanical Name**	**Frequency**	**Noxious**
Ageratina adenophora	Crofton Weed	O	Class 4
Ageratum houstonianum	Blue Billy Goat Weed	O	
Axonopus affinis	Carpet Grass	C	
Baccharis halimifolia	Groundsel Bush	O	Class 3
Bidens pilosa	Farmers Friends	R	
Chrysanthemoides monilifera subsp. *rotundata*	Bitou Bush	O	Class 3
Cloris gayana	Rhodes Grass	R	
Conyza albida	Fleabane	R	
Dioscorea bulbiferum	Aerial Yam	R	
Hedychium gardnerianum	Kahili Ginger	R	
Ipomoea cairica	Mile a minute	C	
Lantana camara	Pink & Red Lantana	C	Class 3
Monstera deliciosa	Fruit Salad Plant	R	
Paspalum urvillei	Giant Paspalum	O	
Paspalum wettsteinii	Broadleaf paspalum	C	
Passiflora edulis	Passionfruit	R	
Passiflora subpeltata	White Passionflower	R	
Passiflora suberosa	Corky passionfruit	R	
Protasparagus aethiopicus	Ground Asparagus	R	
Senna pendula	Eastern Cassia	C	
Setaria sp.	Pigeon Grass	O	
Sida rhombifolia	Paddy's Lucerne	R	
Solanum mauritianum	Tobacco Bush	O	
Verbena sp.	Purple Top	O	

Appendix 6: Environmental Weed Profiles and Control Techniques

The weed species shown in Appendix 9 include those that are currently present on the site as well as those species that are not present at this point in time, but that do occur in the local area.

Weed Profiles

*Weeds marked with an * although not currently listed on the CHCC environmental weed list are recognized as being bushland weeds by bushland regenerators/ ecologists.*

***Ageratina adenophora* (Crofton Weed)** erect multi stemmed perennial herbs up to 1-2 metres high grows in full sun or shade but enjoys moist sites especially, and bare soil. Wind dispersed seeds. Forms dense cover inhibiting natural regeneration. **Class 4 noxious weed**
Control: manually remove or; spray seedlings with glyphosate; mature plants can be sprayed with Grazon (following manufacturers recommendations). Metasulfuron-methyl is also effective and results in less off target damage but is not registered for this weed.

***Ageratina riparia* (Mistflower)**

A scrambling perennial groundcover to 1m in height. White “mists” of flowers. Narrow, opposite toothed leaves. Mostly found in wet areas but not restricted to any soil or aspect. Forms dense mats preventing regeneration of native species. Leachate from leaves and plant litter have a harmful effect on other plants (Alleopathic). The many seeds are easily spread by wind and water. Roots form when stems hit the ground, forming a dense mat. Also spread by contaminated produce. **Class 4 noxious weed**
Control Methods: manually remove ; spray seedlings with glyphosate; mature plants can be sprayed with Grazon (following manufacturers recommendations). Metsulfuron-methyl is also effective and results in less off target damage but is not registered for this weed.

***Ageratum houstonianum* (Blue Billy Goat Weed)** erect or decumbent annual herb to 1 metre in height. Likes wet sites. Dispersal mechanisms wind, water, animals, machinery. Forms dense cover inhibiting natural regeneration. Mulch / plant out to reduce germination of seed
Control manual removal or spray with glyphosate requires follow up.

Andropogon virginicus *Whiskey Grass* *A tufted erect brownish perennial grass with solid stems. Flower/ seed heads are long and narrow.*
Control Methods: Spray (100:1)/ wick-wipe with glyphosate.

***Anredera* cordifolia(Madeira Vine)** Climber with soft fleshy leaves, aerial tubers forms on stems, flowers small greenish/ white and fragrant. Spreads when tubers drop to ground and regrow. Forms very thick infestations, often smothering trees, particularly in rainforest.
Control: Small plants spray with Metsulfuron-methyl and surfactant. Large plants need to be carefully scrape and painted with Metsulfuron-methyl (1g to 1 litre) or Glyphosate. Care needs to be taken as severing the stems will result in the drop of all aerial tubers. Large plants can also be treated by scraping and painting at ground level and then inserting the scraped portion of the stem into a small container of Metsulfuron-methyl (1g to 1 litre) and leave for several days.

***Araujia hortorum* (Moth Vine)**Climber with twining stems, 5-10m in height. Large grayish green leaves. White milky sap. White flower. Produces choko like fruit encasing feathery (airborne) seeds. Seed longevity high. Smothers native vegetation. Can be confused with the native moth vine (Marsdenia sp.) one of which is on the threatened species list.
Control: Hand remove ensuring all roots removed. Cut /scrape and paint with glyphosate. Bag and remove any fruit.

***Ardisia crenata* (Ardisia)** Small shrub. Lanceolate oblong dark glossy green leaves with slightly wavy margins. White sweet scented flowers followed by bright red berries. Can grow in full shade.
Control Can be difficult to remove manually due to long taproot. Cut and paint with glyphosate.

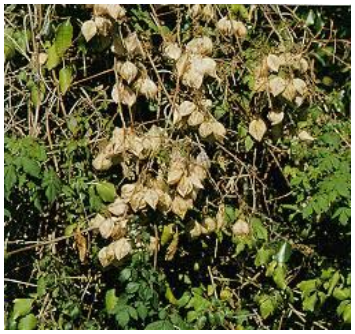
***Baccharis halimifolia* (Groundsel Bush)** Shrub or small tree. Wind dispersed seeds over short distance. **Class 3 noxious weed**
Control Methods: small plants manual removal larger specimens cut and paint with glyphosate. Spray with Grazon at manufacturers recommended rate

***Bidens pilosa* (Farmers Friends)** slender tall annual (or short lived perennial) herb of disturbed areas. Produces large amounts of seed with high longevity. Only germinates on bare soil mulch or plant out to reduce.
Control Methods: Manual removal or spray with glyphosate.

***Bromelia* sp.** Evergreen garden plant. Stem short and tubular. Leaves pale green arching form.
Control Methods Hand Remove.

***Canna indica* (Canna Lily)** Perennial erect herb with a rhizome. Large light green sheathing leaves. Red flower followed by viable black capsule.
Control Manually remove all of rhizome (difficult). Spray with Metsulfuron-methyl.

***Cardiospernum grandiflorum* (Balloon Vine)**



A climber with tendrils and stems up to 10m long. Leaves are bright green with 'biternate' arrangement with 3 sets of 3 leaves on each leaf stem. The stems and leaves are covered with soft hairs with the stem often having reddish ribs. Small, white flowers are present summer to autumn. The fruit/seed is a green, papery, inflated capsule, and is produced any time of year. Can grow vegetatively from stem fragments. Vigorous climber that can smother and kill native trees.
Control Methods: Seedlings can be manually removed. For more mature plants cut, scrape and paint with herbicide (glyphosate). Alternatively cut stems allow to reshoot and then spray the regrowth with glyphosate.

***Celtis sinensis* (Chinese Celtis)** Deciduous tree to 15 metres. Green serrated leaves. Small reddish brown fruit. Serious environmental weed declared **Class 3 noxious weed** .

Control: Large specimens direct inject with glyphosate. Saplings cut and paint with glyphosate. Small plants hand remove.

***Cestrum parqui* (Green Cestrum)** Woody shrub up to 3 metres tall. Deep green glossy leaves. Flower greenish to yellow. Fruit a black berry. **Class 3 noxious weed**

Control methods: Hand weed small plants. Cut and paint larger specimens with glyphosate.

***Cinnamomum camphora* (Camphor Laurel)** large trees of spreading habit can grow up to 25-30 metres. Abundant seed production dispersed mainly by birds. Can also form dense stands by suckering
Control Methods Direct injection/ cut and paint with glyphosate.

***Chloris gayana* (Rhodes Grass)** erect tufted stoloniferous grass to 1.2 m high, perennial
Control Methods crown tuft with knife or mattock. Remove stolon, glyphosate in late spring early summer.

***Coffea arabica* (Coffee Plant)** Large shiny green leaves with wavy margins forms red berries (from which Coffee is produced). Seedlings germinate prolifically.
Control Manually remove or cut and paint with glyphosate.

***Colocasia esculenta* cv. Fontanesii (Ornamental Taro):**Robust herb to 1m , large purple leaves (60 cm long 30 cm wide). Large underground tubers. Likes wet open sites. Can colonize sites densely and rapidly.
Control: manual removal (must remove all underground tubers). Can control with herbicide by spraying or injecting with Glyphosate & Metasulfuron-methyl mix ('Cut out'), but this is problematic as species usually inhabits areas that are waterways or wetlands.

***Conyza albida* (Fleabane)** Single stem, erect annual herb up to 1.5m high. On disturbed sites. Control methods Manual removal or spray with glyphosate.

***Cortaderia selloana* (Pampas Grass)** Large tussock grass to 2 metres width to 1 metre. Leaves to 2 metres in length and to 3.5cm wide, blue green above darker green below. Flower stem to 6 metres, large silvery white panicle to 80cm. Dense infestations can invade and replace native communities and also provide heavy fuel load for fires.
Control methods: Spray with glyphosate (75:1) with surfactant added. Alternatively to reduce risk of fire, brushcut then manually remove rhizome or spray regrowth

***Delairea odorata* (Cape Ivy)** vigorous, twining perennial herb with succulent stems many metres long. Forms dense mats smothering low vegetation. Spreads vegetatively, does not set seed in northern NSW.
Control Methods Manual removal or spray with Metasulfuron-methyl.

***Desmodium uncinatum* (Velcro Weed)**
Herb/scrambler that forms dense smothering mass. Trifoliate leaves. Leaves hairy upper surface with a silver stripe. Stem is densely hairy with hooked hairs. Flowers pink to mauve or white. Seeds contained in pods covered with hooked hairs.

Control Methods Hand remove minor infestations (including root system) bag and remove from site if seeding. Major infestations spray with Metasulfuron-methyl (*Brush-off)*

.

***Eriobotrya japonica* (Loquat)** Evergreen tree with dark glossy green foliage, hairy underneath. Fragrant yellow/white flowers borne on stiff woolly panicles. Yellow fruit.
Control Manually remove small seedlings. Mature specimens cut and paint or direct inject with glyphosate.

***Erythrina crista-galli* (Cockscomb Coral Tree)** Deciduous tree up to 6 metres in height. Prickles on trunks and branches. Flowers scarlet tube shaped held in clusters. Problem weed in north of NSW and Queensland.
Control Methods direct injection with glyphosate. Cut and paint saplings with Glyphosate. Spray seedlings with Glyphosate and surfactant.

***Erythrina* x *sykesii* (Coral Tree)** Deciduous tree, hybrid up to 15 metres in height. Easily re grows from sections of stem/ branches, suckers from large sections of roots.
Control Methods direct injection with glyphosate.

***Eucalyptus torelliana* (Cadaghi)** A native of North Queensland that has been planted for horticultural / plantation purposes in NSW where it has become an invasive species.
Control Methods: Large specimens direct inject (or remove totally in areas where falling branches may create a public safety issue). Seedlings may be sprayed with glyphosate or hand weeded.

***Gleditsia tricanthos* (Honey Locust)**
Deciduous tree to 10 metres. Flowers in spring producing golden yellow flowers. Stout spines present on branches and trunk. Compound bipinnate leaves. Seed pods 15-40 cm long enclosing large dark brown seeds. Grows readily from seed/ cuttings and suckers freely forming dense thickets. **Class 3 noxious weed**
Control Methods: Direct inject with undiluted glyphosate/ cut and paint smaller specimens.

***Gomphocarpus fruitcosus* (Cotton Bush)** erect perennial shrub with narrow dull green leaves. Exudes milky sap when damaged. Large green ovoid fruit covered in long silky hairs.
Control Manually remove. Cut and paint/ spray with glyphosate.

***Hedychium gardnerianum (*Kahili Ginger)** perennial herb to 2.5 metres high. Prefers damp areas on good soil. Large yellow orange flower with red filaments. Produces seed attractive to birds. Thick fleshy rhizome near soil surface.

Freckle Face/Polka Dot Plant herbaceous garden/indoor plant that rapidly infests areas. Long thin dark green leaves with pink spots.
Control Methods Difficult to completely manually remove. Spray with Metasulfuron-methyl

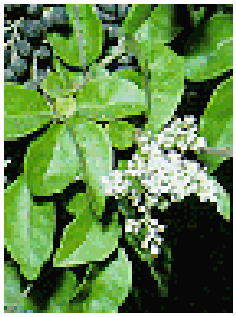
Ice-Cream Bean (I*nga paterna*) Evergreen tree to a height of 17 metres. Leaves compound and pinnate with 6-8 leaflets 15cm long with woolly undersurface. Flowers are white & pea shaped. The fruit are pods 15 cm long.
Control Methods: Hand remove small seedlings; cut and paint saplings; direct inject /frill larger specimens.

***Ipomea cairica* (Mile a Minute)** Vigorous, perennial with trailing and twining stems. Palmate shaped leaf with pink- purple flowers. Produces seed spread by wind/ gravity, also spreads vegetatively
Control Methods Manual removal by gently pulling up runners, cut and paint larger stems. Spray with glyphosate during period of rapid growth.

***Ipomea indica* (Morning Glory)** A vigorous vine which can smother trees and whose stolons can penetrate and establish metres into native vegetation. It is widely naturalized in coastal districts of N.S.W.
Control Methods Manual removal by gently pulling up runners, scrape and paint larger stems. Spray with Glyphosate during period of rapid growth.

Koelreuteria paniculata **(Golden Rain Tree)** Deciduous tree with long pinnate leaves and large terminal panicles of yellow flowers.
Control Methods Cut and paint or direct inject with glyphosate.

Lantana camara **(Pink/ Red Lantana)** Perennial, scrambling thicket forming shrub to 3m high. Stems multi branched sprawling to 5m long with prickles. Can be vine like and climb trees. Grows best in fertile moist disturbed sites. Black fruit spread by birds. Red flowering form **Class 3 noxious weed** .
Control methods Manual removal of taproot, mechanical removal with follow up. Stems lying on ground may re shoot. Cut and paint base with glyphosate. Spray with glyphosate (Red form needs penetrant added)



Ligustrum lucidum **(Large leaf Privet)** can grow to large tree. Likes fertile moist sites. Can dominate rainforest and wet sclerophyll forest. Produces masses small berries spread by birds or water. Germinate in even shady conditions. Coppices from base. **Class 4 noxious weed**
Control methods small seedlings manually remove or spray with Metasulfuron-methyl. Cut and paint mature specimens with glyphosate. Direct inject mature specimens with glyphosate.

Ligustrum sinense **(Small Leaf Privet)** Large shrub small tree to 4m high. Moist fertile sites. Can slowly establish on undisturbed sites in shady conditions. Small berry with short viability spread by birds and water. Coppices from base and suckers from roots **Class 4 noxious weed**
Control methods small seedlings manually remove or spray with Metsulfuron-methyl. Cut and paint mature specimens with glyphosate. Direct inject mature specimens with glyphosate.

Lonceria japonica **(Japanese Honeysuckle)** Woody twining climber or small shrub with a dense smothering habit. Leaves dark green above lighter below. Flowers tubular 30mm long, white tuning yellow, sweetly fragrant. Fruit is a small black shiny berry, spread by birds. Can regrow from stem nodes.
Control methods Manual removal with care to remove all root forming nodes. Cut and paint or scrape and paint with glyphosate. Spray with herbicide (Metasulfuron-methyl) where no desirable vegetation may be damaged (or cut back then spray regrowth). Follow up needed for all techniques.

Macfadyena unguis-cati **Cats Claw Creeper**
Large woody vine to 30m+, distinguished by three tiny hooked claws on the end of tendrils. Leaves dark green with new foliage being red. From spring to summer, bright yellow flowers with orange lines are present. Produces seed capsule 15-45cm long containing winged seeds that are wind and water dispersed. Can germinate and grow in shade so can easily invade undisturbed bushland. Forms underground tubers. Grows rapidly and totally smother and kill mature trees.
Control Methods: Spray seedlings with glyphosate (100:1). Cut stems and apply glyphosate (undiluted), or pull young stems from tree and spray with glyphosate (100:1)can also drill an inject large stems with glyphosate (undiluted).

***Macroptilium atropurpureum* (Sirato)** Twining herb with stems 2-3 metres long. Dark purple pea like flower with long slender pods.
Control Methods Care must be taken when removing by hand due to large root system. Seed pod collection and disposal is important to ensure eradication. Scrape and paint with glyphosate is effective.

Monstera deliciosa *(Fruit Salad Plant) *Evergreen vine to a height of 5 metres. Glossy large green perforated leaves with deeply incised margins. Flowers are greenish similar to that of an Arum Lily. Fruit are edible cob like spikes.*
Control methods: Hand remove

***Nephrolepis cordifolia* (Fishbone Fern)** endemic to the far north coast of NSW and Queensland but has become an invasive species that develops dense infestations excluding endemic native vegetation. Erect fronds covered with brown spores on the back. Rhizomes are connected by wiry stolons.
Control Methods Manually remove by digging up entire plant including rhizomes and bag and remove from site (dispose of responsibly -garden waste dumping of this weed in bushland is a serious problem). Large infestations may be sprayed with Metasulfuron methyl.

***Ochna serrulata* (Mickey Mouse Plant)** Shrub 2-3 metres high. Dark green-toothed oblong leaves, new foliage bronze coloured. Conspicuous fruit with bright red sepals holding 5 glossy green fruit that ripens to black. Well-developed taproot, which can reshoot from considerable depth, makes control difficult.
Control Methods Hand remove small specimens (only when soil is moist to prevent root snapping. Scrape and Paint (glyphosate) is generally more effective than cut and paint. Better results achieved by painting bottom third of plant around entire circumference of stem with Starane mixed with diesel @ 5ml Starane to 100ml diesel. Small seedlings can be sprayed with Starane @ 65ml to 10L water.

****Paspalum urvillei* (Giant Paspalum)** tufted perennial grass, large up to 2.5m high. Distinguished by its long (up to 12cm) and more numerous racemes (12-20)
Control methods Manual removal for minor infestations/ major infestations spray with glyphosate.

****Paspalum wettsteinii* (Broad Leaf Paspalum)**tufted perennial, which can grow in moderately shady conditions. Can form extensive dense infestations inhibiting or preventing regeneration.
Control methods manual removal (remove crown and adventitious roots) for minor infestations or those surrounding young native specimens. For major infestations spray with glyphosate and follow up with mulching and planting's.

***Passiflora edulis* (Edible Passionfruit)** A climber with auxillary tendrils glossy green leaves trifoliate shape. Produces edable back/ purple/yellow fruit.
Control methods large specimens manually remove or cut and paint with glyphosate.

Passiflora subpeltata (White Passionflower) A climber with axillary tendrils. Smothers plants and trees in forest edges and gaps, as well as disturbed sites. Grey/green leaves with waxy coating. Fruit spread by birds and animals. Reshoots from any root part left in ground.
Control methods large specimens manually remove or cut and paint with glyphosate. Spray with penetrant when young or cut and spray when reshoots

***Pennisetum clandestinum* (Kikuyu)** Rhizomatous and stoloniferous aggressive, creeping coarse perennial grass often mat-forming. Inhibits seedling growth and prevents regeneration.
Control methods Spray with weak rate glyphosate.

***Pennisetum purpureum* (Barner Grass)** A robust stoloniferous, perennial grass forming large bamboo like clumps to 7m high.

***Phoenix dactylifera* Date Palm** characterized by numerous bright yellow spines that arm the short frond stalk.
Control Methods Cut and paint with glyphosate when small. Direct inject larger specimens

***Pinus* sp. (*P. radiata, P. elliottii*) Pine Tree** Evergreen with alternate needle like spreading leaves. Forms cones.
Control Methods Cut tree down or ringbark as cannot regrow from stump.

***Protasparagus aethiopicus* Ground Asparagus** dense ground smothering spiny herb, preventing or discouraging regeneration. Can reach size of up to 2 metres wide Grows in dense shade but prefers areas of higher light. Prefers sandy soils of littoral rainforest. Short thick rhizome and forms mat of tuberous roots- can regrow from rhizome but not from tuberous roots. Produces long-lived bird attractive seed

Control Methods Hand pull small seedlings; manually remove larger plants by removing rhizome from plant no need to remove tuberous roots. Spray with Metsulfuron-methyl.

***Protasparagus plumosus* Climbing Asparagus** climber with wiry stems, forms dense layer, which smother plants and inhibit regeneration. Produces bird attractive fruit and has woody rhizome that regrows.
Control Methods small infestation handpull seedlings, larger plants manually remove all rhizomes. Larger infestations cut and paint or cut and allow to reshoot before spaying regrowth. Spray with Metsulfuron-methyl

***Psidium cattleianum* Cherry Guava** Shrub or tree to 6 metres. Purplish red fruit. Has the ability n invade undisturbed native vegetation.
Control: Hand remove small seedlings. Cut and paint larger specimens with glyphosate (cutting close to the ground as possible).

Rhaphiolepis indica *Indian Hawthorn*

Shrub 1 to 1.5 high. Dark green leathery leaves, slightly toothed. Small white flowers with red centers. Small bluish fruit.

Control Methods: Hand pull small seedlings. Cut and paint larger specimens with undiluted glyphosate.

***Rivina humilis* Coral Berry**
small shrub to 1 metre high. Dark green leaves. Produces small red globular berries
Control Manually remove or cut and paint with glyphosate (remove and bag any berries present). Spray with glyphosate.

***Rubus fruticosus* Blackberry**

A perennial scrambling shrub to 3m high. **Class 3 noxious weed** Hook-spined canes grow to 6m long. New plants form when they meet the ground. Fruit a segmented red berry ripening to black. The many fruits are eaten and spread by birds and foxes. May be confused with native *Rubus* species which are distinguished by lighter green leaves and finer thorns.

Control Methods: Spray with Metsulfuron-methyl at the manufacturer's recommended rate.

***Schefflera actinophylla* Umbrella Tree** Native of North Queensland, tree to 10m high often multi stemmed and sometimes epiphytic. Red fruit dispersed by birds. Adventitious roots form readily from stem segments left in contact with ground.
Control methods Cut and paint or direct inject with glyphosate.

***Schinus terebinthifolia* Broad-leaf Pepper Tree**
Tree to 16m in height with dense spreading crown. Dark glossy green leaves with

prominent cream venation. Produces masses of red/pinkish berries in winter/spring. Leaves have a peppery smell when crushed. Has been known to cause allergic reactions in some people care needs to be taking when removing trees as to avoid inhaling toxins that may be released when cutting or wood chipping trunk and branches. Significant environmental weed with a serious large infestation at Sapphire. **Class 3 noxious weed**
Control Methods: Manually remove small seedlings, cut and paint saplings with glyphosate, larger trees direct inject with glyphosate.

***Senecio madagascariensis* (Fireweed)** Spreading herb up to 50cm high with bright yellow daisy like flowers present spring to autumn. Produces numerous white fluffy seeds. Commonly mistaken for a native fireweed *Senecio lautus*, which is found more commonly on dunes. Identiofication between the two involves counting the involucral bracts. Generally *S. madagaascariensis* has 20-21 bracts and *S. lautua* has 15-18 bracts.
Control Methods: Manually remove taking care not to place on ground as will re root(bag and remove from site). Spray with Bromoxynil 1.4-2.8L in 110-220L of water per hectare. Spray young, actively growing plants during autumn/winter. Use low rate before flower budding, higher rate for early flowering. Will not be effective on mature plants in full flower.

***Senna pendula* var. *glabrata* (Eastern Cassia/Senna)** Large shrub to 3m. Can regrow from larger sections of taproot and main laterals. Seeds dispersed by birds, water, and gravity, germinate prolifically.
Control methods Cut and paint with glyphosate, direct inject larger specimens, spray large infestations of seedlings with glyphosate 9 hand remove small infestations)

***Sida rhombifolia* Paddy's Lucerne** Perennial erect herb to 1m. Grows in sunny or disturbed areas and on compacted soils. Strong deep taproot.
Control methods difficult to remove by hand especially in heavy soils. Cut and paint or spray with glyphosate.

***Setaria palmifolia* Palm Grass** Tufted perennial grass to 1.5 metres high. Leaves 'pleated'. Flower a creamy white/yellow silky panicle to 80 cm long. Forms dense infestations especially near water courses.
Control: Small infestations dig out plant with mattock. Larger infestations spray with glyphosate. Care must be taken not to pollute watercourses

***Solanum mauritianum* Tobacco Bush** Perennial shrub or small tree to 4m, densely tomentose especially under surface, Produces fruits which are eaten by many native fauna. High seed longevity requires light for germination. In many cases can be left as part of a rainforest regeneration process as; provides shade which represses many annual weeds but allows growth of third stage pioneer species and attracts birds and bats which bring in native seeds from other areas.
Control Methods if removal is necessary cut and paint with glyphosate.

Solanum seaforthianum Brazillian Nightshade *Sprawling vigorous climber with light green divided leaflets. Flowers violet in colour with typical form of those in the Solanum family (e.g. similar to tomato/ potato flower). Produces masses of bright red berries that hang in bunches. Berries are bird attractive and this plant is therefore spread easily. Aggressively smothers native vegetation.*

Control Methods: Hand remove or for larger vines scrape and paint with glyphosate.

***Sphagneticola trilobata* Singapore Daisy** A perennial creeper found on the edges of rainforests and coastal dunes. It has coarse bright green leaves. Flowers are yellow and daisy like. This weed re-shoots very easily and when well established can smoother other plants.
Control Method: Hand-pull small plants. Be sure to remove all parts of this plant from the site as they will re-shoot. Spray with metasulfuron-methyl.

***Sporobolus indica* var. *major* (Giant Parramatta Grass)** tufted perennial growing on poor or compacted soils and disturbed sites. Seed adheres to animals, vehicles, and water. **Class 3 noxious weed**
Control Methods small infestations hand remove or spot spray with glyphosate.

***Syagrus romanzoffianam* Cocos Palm** Large Palm with drooping feathery type fronds. Produces masses of orange coloured fruit that hang in large panicles. Very attractive to fruit Bats which aid in the spread of the seed. Germinates readily.
Control Methods Larger specimens can be felled with no need to apply herbicide, as they will not regrow, direct injection with herbicide for specimens that are to be left in situ. Smaller specimens and seedlings need to be either cut and painted or manually removed (including the root system) as spraying herbicide is not effective.

***Syngonium* sp. Prayer Plant/ Arrowhead Vine**
Vigorous climber to 3 metres. Glossy spear shaped leaves dark to light green in colour (dependant on light levels where it grows). Can also have variegated leaves with a creamy colour towards the centre with light green edges. Forms roots at nodes. Can produce seedpods encasing bright red seeds when well established up a tree etc (not known if these are viable). Difficult to control due to its resistance to most herbicide sprays.
Control Methods: Spray with glyphosate at a rate of 50:1 with LI 700

***Tagetes minuta* Stinking Roger** Very erect annual herb, strongly aromatic, which grows on disturbed sites. Flowers February –April.
Control methods Small infestations hand remove, larger ones spray with glyphosate.

***Tecoma stans* Yellow bells** A shrub or small tree, often to 4m in height. Widely grown for its bright yellow trumpet-like flowers. Flowers between spring and summer producing yellow flowers with reddish lines at the base. Large pods contain many seeds that are easily spread by wind **Class 3 noxious weed**

Control Method: Hand-pull or foliar spray seedlings with herbicide. Cut and paint saplings. Frill or stem inject herbicide into sapwood of mature trees.

***Tithonia diversifolia* Japanese Sunflower** tall perennial herb 2-5 metres tall, large toothed leaves. Flowers April- June. Wind dispersed seeds long seed longevity.
Control Methods manually remove smaller plants. Cut and paint larger specimens (low to ground to avoid plant re shooting) or preferably drill and apply herbicide. Care must be taken as stems placed directly on the ground will commonly grow roots from nodes.

***Tradescantia flumensis* Tradescantia (Wandering Jew)**
Perennial creeping succulent herb rooting well from well-defined nodes. Invasive weed grows vigorously, smothering low growing shrubs herbs and seedlings of native species, inhibits regeneration. Likes moist fertile sites can grow in dense shade or full sun. Spreads vegetatively.
Control methods manually rake and roll with repeated maintenance. Spray with glyphosate-repeated follow up required.

***Triadica sebera* (Chinese Tallow)**
A deciduous tree growing to a height of 12 metres. Flowers are yellowish and occur in elongated clusters. The fruit is a splitting capsule that exposes large, white seeds.
Control Methods: Hand-pull or foliar spray seedlings with herbicide. Cut and paint saplings (glyphosate). Direct inject mature trees (glyphosate).**Class 3 noxious weed**

***Verbena* sp. Purple Top** Tall, erect, perennial herb of sunny disturbed areas. Purple flower and square stem.
Control methods Weed manually infestations (rarely dense).

Weed Control Techniques

1) ***Cut and paint:*** *This method applies to all woody shrubs, trees and some vines.*

   1.1 *cutting stem of plant as close to the ground as possible, also scraping sides lightly to reveal green tissue*

   1.2 *apply chemical(usually undiluted glyphosate) immediately (within 15 seconds)*

2) **Scrape and Paint** This method is applicable to many species of vines where it is desirable to treat the vine intact, particularly those with aerial tubers (e.g. Madeira Vine) or those that will propagate from segments.
   - **i.** Scrape the stem **on one side of the stem only** for 20- 30 cm if possible
   - **ii.** Apply herbicide immediately.

3) **Direct Inject** This method applies to all woody trees and shrubs with a diameter of about 6- 10cm or greater

i. Make cuts into the trunk (as low down as possible) with a tomahawk. Make cuts the width of the blade at a slight angle. Or preferably make drill holes with cordless drill. Holes or cuts shall be angled downwards into the trunk to prevent herbicide escape.
ii. Apply herbicide immediately into the cut or hole
iii. Repeat this pattern in brickwork pattern around the circumference of the tree, or if using a drill holes approximately 10 cm apart 25mm deep.
iv. Treat any visible lateral roots as per **i.**

4) **Spot Spraying** should be carried out using a knapsack sprayer to keep pressure/volume to a minimum. This is to ensure newly planted tubestock/ germinating natives are not affected by spray drift. Glyphosate is the main herbicide used, though some weed species require Metsulfuron methyl (*Brush-off*) for treatment. A combination of the two herbicides can be used for treatment in areas where there area combination of species that are susceptible to either glyphosate or Metsulfuron methyl. A marker dye and surfactant will improve control results.
5) **Chemical Crowning** This applies to those species which have a fleshy root system such as a rhizome or large bulbs (e.g. Asparagus Fern, Canna Lily)
   i. Gouge out sections of fleshy base with a knife
   ii. Apply undiluted herbicide.

6) **Manual Removal** Is the preferred method of control if practical. Especially useful in follow up work as mitigates any risk of off target damage to germinating or young native species
   i. **Hand pulling** removal by hand (or with a mattock etc) of the plant including all tap and lateral roots. Is especially useful for smaller specimens; species with a bulb, corm or tuber; isolated grass specimens amongst native species.
   ii. **Crowning** This method is applicable to weeds which have their growing points below the surface of the ground (corms, bulbs, rhizomes, clumped or fibrous root systems etc e.g. grasses, Asparagus Fern)
      1. Grasp the stems or leaves and hold them tightly so that the base of the plant is visible
      2. Insert a knife 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 base
      4. Remove the plant ensuring that the base of the plant where the roots begin is completely removed.

Noxious Weed Categories

Class 1: **State Prohibited Weeds**	These are noxious weeds that pose a potentially serious threat to primary production or the environment and are not present in the State or are present only to a limited extent. These are noxious weeds which must be eradicated from the land and the land must be kept free of the plant.
Class 2: **Regionally Prohibited Weeds**	These are noxious weeds that pose a potentially serious threat to primary production or the environment of a region to which the order applies and are not present in the region or are present only to a limited extent. These are noxious weeds which must be eradicated from the land and the land must be kept free of the weed.
Class 3: **Regionally Controlled Weeds**	These are noxious weeds which pose a serious threat to primary production or the environment of an area to which the order applies, are not widely distributed in the area and are likely to spread in the area or to another area. These are noxious weeds which must be fully and continuously suppressed and destroyed.
Class 4: **Locally Controlled Weeds**	These are noxious weeds that pose a threat to primary production, the environment or human health, are widely distributed and are likely to spread in the area or to another area. The growth and spread of these noxious weeds must be controlled according to the measures specified in the relevant management published by Council.
Class 5: **Restricted Plants**	These are noxious weeds that are likely, by their sale or sale of their seeds or movement within the State or an area of the State, to spread either within or outside the State. These noxious weeds are prohibited from sale.

Appendix 7: Revegetation Techniques

Revegetation Techniques

Clear away weed and exotic grass growth within a 500mm radius area where the plant is to be placed, by spot spraying with *Glyphosate* (following manufacturer's directions).

Dig and loosen soil (150mm deep and 75mm wide) to place tubestock in. Plant sun-hardened tubestock ensuring root system is **well below ground level**.

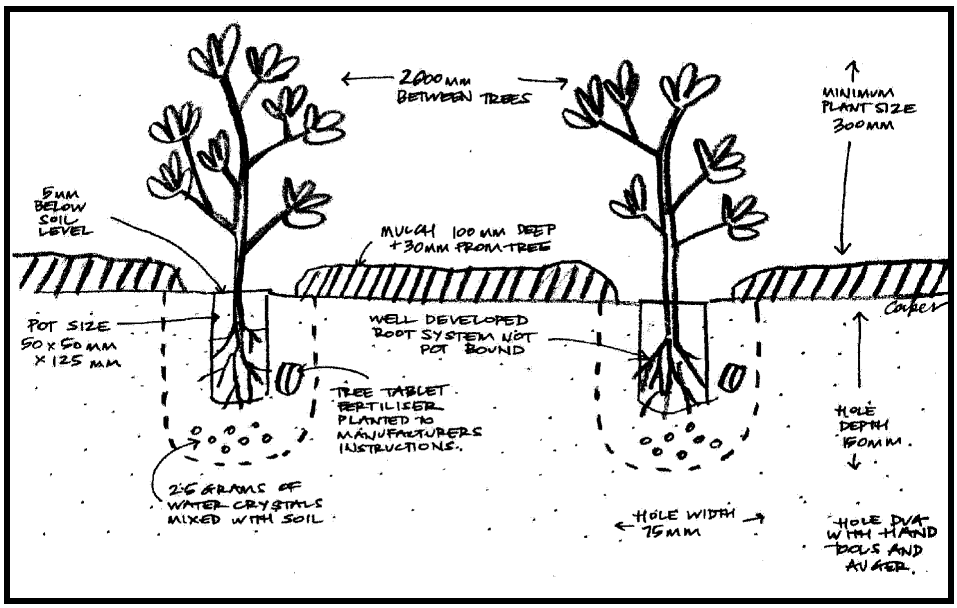
It is best to also use slow release fertiliser and "*rainsave"* water crystals (following manufacturer's recommendations).

Course grade hardwood chips shall be used for mulch (minimum size of 20mm x 20mm x 3mm). Hardwood chips would need to be 100mm deep with a radius of 500mm.Jute weed mat can be used instead of woodchip to mulch the plants. Mulch is for weed control and moisture retention while the plant is becoming established.

To maximize survival rates, planting should be under taken in the "wet season" (end of February to beginning May). Generally, spring and early summer are too hot and dry for undertaking revegetation on the NSW north coast.

Plants will require watering directly after planting if the weather conditions are dry. Follow up watering will also be required dependant on prevailing weather conditions.

Planting Diagram



Note: Although plant spacing is depicted as being at 2 metre intervals, this is only a general guide and the requirements for each site may vary.

Appendix 8: Revegetation Suppliers

Possible Suppliers for the Planting Program

- Cares Native Nursery Tel: 66536781
- Lacebark Native Nursery Tel: 6654 4373
- Local Adaptations Native Nursery Tel: 0402515511
- Hastings Horticultural Supplies Tel: 6585 3230
- Challenge Foundation (hardwood stakes) Tel: 6652 6066
- Bluedale Nursery (Lomandra) Tel: 6586 0100

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Acknowledgement:

Planting Diagram in Appendix 10 was supplied by Kirsty Cooper of Emerald Environmental.