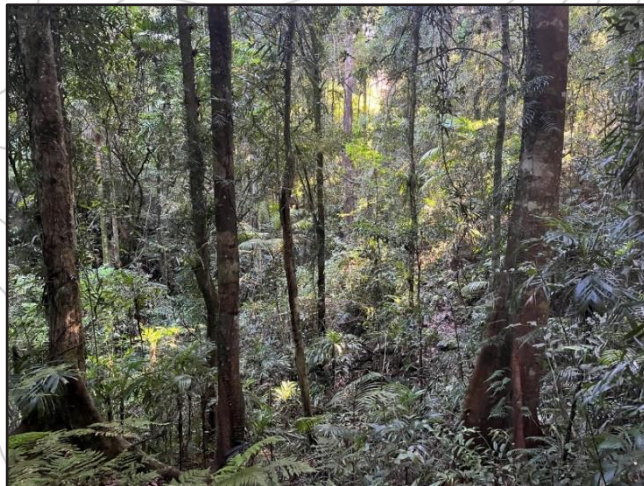


# Bellingen Waste Management Transfer Station - Vegetation Management Plan

**Bellingen Shire Council**



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Template 2.8.1

# Contents

<b>1. Introduction .....</b>	<b>6</b>
1.1. Background.....	6
1.1.1. Reserve condition / features .....	7
1.2. Objectives of the Vegetation Management Plan .....	7
1.3. Preparation and implementation of this plan.....	8
1.3.1. Duration .....	9
1.4. Key terms.....	9
<b>2. Description of the environment .....</b>	<b>11</b>
2.1. Location, topography and hydrology .....	11
2.2. Vegetation communities.....	11
2.2.1. PCT 3021: Northern Lowland Subtropical Rainforest .....	11
2.2.2. PCT 3167: Northern Hinterland Blackbutt-Forest Oak Wet Forest.....	13
2.2.3. PCT 3169: Northern Hinterland Tallowwood-Brush Box Wet Forest.....	14
2.2.4. PCT 3248: Northern Blackbutt-Turpentine Shrubby Forest.....	15
2.3. Weeds.....	17
<b>3. Vegetation management works .....</b>	<b>22</b>
3.1. VMP management zones.....	22
3.1.1. VMP management zone actions.....	25
3.2. Weed control.....	33
3.2.1. Primary and secondary weed control.....	33
3.2.2. Maintenance .....	33
3.3. Mulching.....	33
3.4. Regeneration .....	34
3.5. Revegetation.....	34
<b>4. Implementation schedule.....</b>	<b>37</b>
4.1. Implementation schedule.....	37
4.2. Adaptive management .....	37
4.3. VMP area management after the initial five-year period (in perpetuity) .....	37
<b>5. Monitoring and reporting.....</b>	<b>39</b>
5.1. Baseline Vegetation Monitoring .....	39
5.1.1. Photo monitoring points (PMPs) .....	39
5.1.2. Vegetation monitoring surveys .....	40

5.2. Progress reports .....	40
5.3. Performance criteria.....	41
<b>6. Approximate Hours .....</b>	<b>44</b>
6.1. Vegetation management works.....	44
6.1.1. Weed control techniques .....	44
6.1.2. Revegetation treatments .....	44
6.1.3. Monitoring and reporting.....	44
<b>7. References .....</b>	<b>46</b>
<b>Appendix A Flora list .....</b>	<b>47</b>
<b>Appendix B Riparian buffer guidelines .....</b>	<b>50</b>
<b>Appendix C Recommended Planting List .....</b>	<b>51</b>
<b>Appendix D Weed Control, Techniques and Specifications.....</b>	<b>53</b>
<b>Appendix E Photo Monitoring Points .....</b>	<b>57</b>
<b>Appendix F Progress Report Templates.....</b>	<b>69</b>

## List of Figures

Figure 1: Location.....	10
Figure 2: Vegetation Communities .....	16
Figure 3: Vegetation Management Zones.....	24
Figure 4: Site Features.....	36

## List of Tables

Table 1: VMP objective .....	8
Table 2: A list of priority weeds and Weeds of National Significance identified within Bellingen WMTS Reserve.....	17
Table 3: Bellingen WMTS vegetation zones and conditions within VMP area. ....	22
Table 4: Management Actions for VMP Management Zones.....	25
Table 5: Assumed revegetation areas and mulch requirements within VMP area .....	35
Table 6: Indicative revegetation densities by ELA.....	35
Table 7: Implementation schedule .....	38
Table 8: Photo monitoring points .....	39
Table 9: Performance criteria .....	42
Table 10: General benchmark conditions for each PCT within the VMP area .....	43
Table 11: Implementation hours.....	45
Table 12: Recommended planting list for PCT 3021 .....	51

## Abbreviations

Abbreviation	Description
AABR	Australian Association of Bush Regenerators
BAM	Biodiversity Assessment Method
BC Act	Biodiversity Conservation Act 2016
BSC	Bellingen Shire Council
CEEC	Critically Endangered Ecological Community
DA	Development Application
DPE	NSW Department of Planning and Environment
DPI	NSW Department of Primary Industries
EEC	Endangered Ecological Community
ELA	Eco Logical Australia
EPBC Act	Environmental Protection and Biodiversity Conservation Act 1999
GBD	General Biosecurity Duty
LGA	Local Government Area
NCSWMP	North Coast Regional Strategic Weed Management Plan
NRAR	NSW Natural Resources Access Regulator
PMP	Photo Monitoring Point
TEC	Threatened Ecological Community
VMP	Vegetation Management Plan
VMZ	Vegetation Management Zone
WM	Water Management Act (2000)
WMTS	Waste Management Transfer Station
WoNS	Weed of National Significance

# 1. Introduction

This Vegetation Management Plan (VMP) has been prepared by Eco Logical Australia Pty Ltd (ELA) on behalf of Bellingen Shire Council (BSC) and relates to the Reserve lands associated with Bellingen Waste Management Transfer Station (WMTS) located in the Bellingen LGA in NSW (Figure 1). The WMTS Reserve, which is managed by BSC, is located approximately 1.5 km to the south west of the Bellingen town centre.

This VMP focuses primarily on mapped 'Lowland Rainforest' areas which are located within Bellingen WMTS, comprising Lot 7025 DP1053963 and Lot 7007 DP1054045. Lowland Rainforest, as represented on the site, is listed as an Endangered Ecological Community (EEC) in NSW under the *Biodiversity Conservation Act 2016* (BC Act) and Critically Endangered Ecological Community (CEEC) (nationally) under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act). This will be referred to as the Threatened Ecological Community (TEC) throughout the report.

Recommendations provided in this VMP are subject to availability of funding and resources. To ensure that this VMP is representative of changing needs, it should be reviewed and revised to satisfy legislative, administrative, environmental and community requirements every five years.

## 1.1. Background

Bellingen WMTS is a Crown Reserve with BSC as the corporate land manager, who is responsible for the management of this Reserve. Crown Reserves are managed in accordance with the principles as presented in the *Crown Land Management Act 2016*. The principles are:

- that environmental protection principles be observed in relation to the management and administration of Crown land
- that the natural resources of Crown land (including water, soil, flora, fauna and scenic quality) be conserved wherever possible
- that public use and enjoyment of appropriate Crown land should be encouraged
- that, where appropriate, multiple use of Crown land should be encouraged
- that, where appropriate, Crown land should be used and managed in such a way that both the land and its resources are sustained in perpetuity
- that Crown land be occupied, used, sold, leased, licensed, or otherwise dealt with in the best interests of the State consistent with the above principles.

This VMP aims to provide direction for the ongoing land management issues for Bellingen WMTS Reserve for an initial five year period, with a focus on the mapped Lowland Rainforest TEC areas within the Reserve. Bellingen Shire Council High Environmental Values Vegetation Mapping and Field Validation Report (ELA 2022) has been reviewed in the preparation of this VMP.

Bellingen WMTS is zoned as C3 Environmental Management under the *Bellingen Local Environmental Plan* (BLEP 2010). Objectives of this zoning are:

- To protect, manage and restore areas with special ecological, scientific, cultural or aesthetic values.

- To provide for a limited range of development that does not have an adverse effect on those values.

**NB:** Any future development of the Reserve must take into consideration and protect the high environmental value vegetation assets according to current legislation.

### 1.1.1. Reserve condition / features

The Reserve is 41 ha with an elevation ranging from approximately 35 m -130 m above sea level (ASL). The topography of the site consists of moderate to steep gradient with a generally south aspect and vegetation transitioning from Wet Sclerophyll Forest on the upper slopes to Subtropical (Lowland) Rainforest in the gullies. Multiple gullies and several drainage lines occur throughout the Reserve, eight 1<sup>st</sup> Order Strahler and two 2<sup>nd</sup> Order Strahler, most abutting the Lowland Rainforest. Multiple fire trails occur throughout the Reserve and will be maintained for the purposes of fire management. Fencing occurs around the WMTS itself; however no other fencing was observed.

Parts of the Reserve have been heavily disturbed by activities associated with waste management, and most of the Reserve has likely been historically selectively logged; however, some impressive old growth trees remain (e.g. a stand of large hollow-bearing Blackbutts south of the roundabout on Bowraville Road). The Reserve is characterised by highly disturbed edges from past and current waste management practices where weed incursion is greatest, however over time, weed species have also infiltrated the major vegetation communities, via various vectors (e.g. animals, vehicles, pedestrians or water). In particular, the Lowland Rainforest is thick with Lantana (*Lantana camara*) and other woody weeds. It is important to manage the natural assets of the Reserve to maintain habitat for native fauna as well to maintain integrity of the vegetation communities within it.

The eucalypt forest of the site is considered potential Koala (*Phascolarctos cinereus*) habitat, with Koala feed trees (e.g. *Eucalyptus microcorys* (Tallowwood) and *Eucalyptus grandis* (Flooded Gum) common throughout. Additionally, the prevalence of important nectar-producing species such as *Corymbia intermedia* (Pink Bloodwood), *Eucalyptus grandis* and *Eucalyptus pilularis* (Blackbutt) indicates that the eucalypt forest is high quality habitat for nectar-feeding species including the threatened Grey-headed Flying-fox (*Pteropus poliocephalus*). The rainforest contains many fleshy-fruited species that are food sources for the Grey-headed Flying-fox and other threatened frugivorous birds such as the Wompoo Fruit Dove (*Ptilinopus magnificus*), Superb Fruit Dove (*Ptilinopus superbis*) and Rose-crowned Fruit Dove (*Ptilinopus regina*). Several *Rhodamnia rubescens* (Scrub Turpentine) were observed at the site during fieldwork; this species, which was common regionally a decade ago, has been decimated by Myrtle Rust fungus and is now listed as Critically Endangered under both the BC Act and EPBC Act.

## 1.2. Objectives of the Vegetation Management Plan

The overall aim of the VMP is to:

- re-establish native species cover and density along the four riparian corridor areas
- enhance the VMP target areas (i.e. Lowland Rainforest) via revegetation works and to assist in the natural regeneration by weed control works.

The VMP area will be managed in perpetuity. This VMP covers the initial five-year period, or until the objectives and performance criteria outlined in this VMP are met. The objective for the VMP is summarised in Table 1.

**Table 1: VMP objective**

Objective	Approach
Protect and enhance TEC (Lowland Rainforest) & Koala and Grey-headed Flying Fox foraging habitat from weeds	<ol style="list-style-type: none"> <li>1) Use a mixture of natural regeneration and assisted regeneration techniques.</li> <li>2) Protect existing native vegetation. Control weeds and prevent new outbreaks – particularly priority weeds.</li> <li>3) Reduce edge effects on TEC, particularly from vehicle tracks, and active WMTS lands.</li> <li>4) Collect native seed from within remnant native vegetation in Bellingen WMTS Reserve.</li> <li>5) Use locally indigenous species from local seed and / or plant material sourced from local nurseries.</li> <li>6) Where needed assist in the natural regeneration of species across the VMP area through suitable plantings.</li> <li>7) Increase native flora species cover and diversity to provide native fauna habitat.</li> </ol>

### 1.3. Preparation and implementation of this plan

This VMP has been prepared by Senior Ecologist Phoebe Smith and Graduate Ecologist Samantha Patch and overseen by experienced Restoration Ecologist Gordon Patrick.

Gordon Patrick has over 26 years of experience as a consultant botanist / ecologist, bushland manager and an environmental teacher. As part of his current position within ELA and his General Manager role at a Landcare organisation he has implemented and managed numerous environmental restoration and bushland regeneration projects (both on a commercial and voluntary basis) of various sizes and complexities for many clients. In addition to project management, he undertook the overall coordination of the organisation, including various volunteer and education programs, a locally indigenous plant nursery, budgeting and managing over 20 staff and many more volunteers. Gordon has a Bachelor of Environmental Science (Env Mgnt).

Samantha Patch has two years of experience working in environmental management and assessment within the Coffs Harbour Region. Samantha has a Bachelor of Environmental Science/Marine Science and Management.

Phoebe Smith has over seven years experience in environmental restoration, and environmental management and assessment including 3 years restoration work and 4 years of biodiversity assessment and monitoring primarily in NSW North Coast and Hunter Valley. Phoebe Smith has a Bachelor of Environmental Science & Management and a Master in Environmental Management & Sustainability.

Suitably qualified and experienced bush regeneration contractor/s are required to implement this VMP. They should be a member of the Australian Association of Bush Regenerators (AABR) or should possess the required qualifications and experience for membership. In addition to this, team leaders should



have, as a minimum, a *Certificate III in Conservation & Land Management* or equivalent. The contractor will need to carry out best practice bush regeneration techniques as described by Buchanan (2000).

#### 1.3.1. Duration

The VMP covers a minimum initial period of 5 years, or until the objectives and performance criteria outlined in this VMP are met. Monitoring of performance criteria throughout this period can be assessed by the Council appointed ecologist to determine if Key Performance Indicators (KPI's) are met early, or if the VMP requires an extension beyond this timeframe.

#### 1.4. Key terms

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

- **Bellingen WMTS Reserve ('Reserve')**: Crown Reserve under BSC management (Figure 1)
- **VMP area**: The proportion of the Reserve to be conserved and managed by this VMP, focusing on TEC Lowland Rainforest remnant vegetation and areas for revegetation and weed control works to protect existing Koala and Grey-headed Flying Fox foraging habitat (Figure 3).

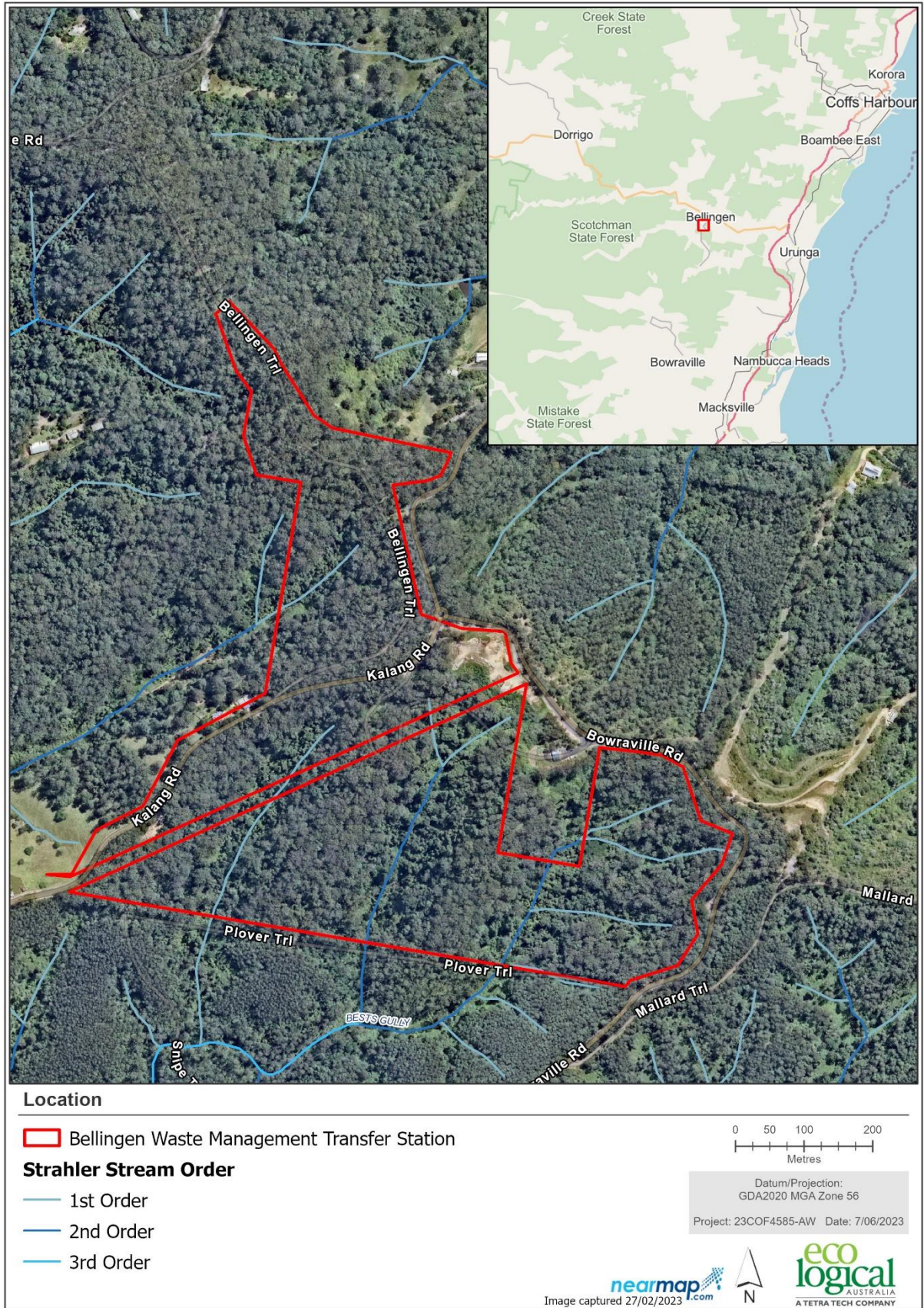


Figure 1: Location

## 2. Description of the environment

### 2.1. Location, topography and hydrology

Bellingen WMTS is situated southwest of the Bellingen township of Bowraville Road, within the Bellingen LGA (Figure 1). The soils in this landscape are metasedimentary in origin and consist of thin, stony gradational loams and sandy loams on the slopes grading to yellow-brown texture-contrast soils on lower slopes and in valleys. The site includes several ridges and gullies located in the catchment of Bests Gully, Kalang River, with elevation ranging from approximately 35 m -130 m a.s.l. and occurs within the lower hills of the Scotchman Range. The site sits within two Mitchell Landscapes of Ingalba Coastal Hills and Macleay Escarpment Foothills. The topography of the site consists of moderate to steep gradient with a generally south aspect and vegetation transitioning from Wet Sclerophyll Forest on the upper slopes to Subtropical (Lowland) Rainforest in the gullies.

### 2.2. Vegetation communities

Three Keith Class types occur within this Reserve; Subtropical Rainforest and two types of Northern Wet Sclerophyll Forests. The vegetation of the site ranges from Subtropical Rainforest in the gullies to drier Blackbutt-dominated forest on the ridgetops. The rainforest is representative of a TEC under both the BC Act and EPBC Act, *Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions* and *Lowland Rainforest of Subtropical Australia* respectively.

Four remnant vegetation communities or Plant Community Types (PCTs) have been mapped as part of the Bellingen Shire Council High Environmental Values Vegetation Mapping and Field Validation (ELA 2022) (Figure 2). A flora species list is provided for these communities in Appendix A. The four PCTs within the Reserve are:

- PCT 3021: Northern Lowland Subtropical Rainforest (Photo 1)
- PCT 3167: Northern Hinterland Blackbutt-Forest Oak Wet Forest (Photo 2)
- PCT 3169: Northern Hinterland Tallowood-Brush Box Wet Forest (Photo 3)
- PCT 3248: Northern Blackbutt-Turpentine Shrubby Forest (Photo 4)

#### 2.2.1. PCT 3021: Northern Lowland Subtropical Rainforest

This vegetation community is mostly young and appears to be regenerating after historic disturbance (clearing/logging). The vegetation community mainly occurs on the lower slopes and gullies within the Reserve.

The upper canopy is dominated by *Lophostemon confertus* (Brush Box), *Diploglottis australis* (Native Tamarind) and *Ficus watkinsiana* (Giant Strangler-fig). The sub-canopy is dominated by *Archontophoenix cunninghamiana* (Bangalow Palm), *Sloanea australis* (Maiden's Blush), *Sloanea woollsii* (Yellow Carabeen) and *Neolitsea dealbata* (Hairy-leaved Bolly Gum). The mid-stratum is characterised by *Cyathea australis* (Rough Tree-fern), *Linospadix monostachya* (Walking-stick Palm) and *Polyscias murrayi* (Pencil Cedar). The epiphytic fern *Platyserium superbum* (Staghorn), climbing aroid *Pothos longipes* (Pothos) and *Flagellaria indica* (Whip Vine) are also common. Groundcover within this community is sparse and consist of *Lomandra longifolia* (Spiny-headed Mat-rush), *Lomandra spicata*, *Alocasia brisbanensis* (Cunjevoi) and native ferns; *Adiantum hispidulum* (Rough Maidenhair Fern) and *Lastreopsis decomposita* (Trim Shield-fern) (ELA 2022).

Weeds are present, predominately on the edges of this community, however high weed cover occurs throughout portions mapped as 'poor condition'. Weeds include Lantana (*Lantana camara*), Coral Tree (*Erythrina x sykesii*), Madeira Vine (*Anredera cordifolia*), Palm Grass (*Setaria palmifolia*), Senna (*Senna pendula* var. *glabrata*), Broadleaf Paspalum (*Paspalum mandiocanum*), Morning Glory (*Ipomoea purpurea*), Castor Oil Plant (*Ricinus communis*), Trad (*Tradescantia fluminensis*), Small-leaved Privet (*Ligustrum sinense*) and Tobacco Bush (*Solanum mauritianum*).

The vegetation is consistent with *Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions* (EEC under NSW BC Act) & *Lowland Rainforest of Subtropical Australia* (CEEC under Commonwealth EPBC Act) (referred to as TEC).



**Photo 1: PCT 3021: Northern Lowland Subtropical Rainforest**

### 2.2.2. PCT 3167: Northern Hinterland Blackbutt-Forest Oak Wet Forest

This vegetation community occurs as one patch on the upper slope within the northern section of the Reserve. This community has drier, open grassy forest characteristics of the Scotchman Range. The canopy is dominated by *Eucalyptus pilularis* (Blackbutt), *Syncarpia glomulifera* (Turpentine) and *Corymbia intermedia* (Pink Bloodwood). Midstorey consists of *Archirhodomirtus beckleri* (Rose Myrtle), *Polyscias sambucifolia* (Elderberry Panax) and *Trochocarpa laurina* (Tree Heath). Groundcover is dominated by *Pteridium esculentum* (Common Bracken Fern), *Imperata cylindrica* (Blady Grass) and *Lobelia purpurascens* (Whiteroot).

Lantana is the primary weed in this community type, mainly occurring in areas of disturbance. Other exotic weeds present include Broadleaf Paspalum occurring on the side of the trails and Senna scattered throughout.



Photo 2: PCT 3167: Northern Hinterland Blackbutt-Forest Oak Wet Forest

### 2.2.3. PCT 3169: Northern Hinterland Tallowwood-Brush Box Wet Forest

This vegetation community covers a large area of the Reserve, occurring on mid to upper slopes. This community occurs on the edge of the Subtropical Rainforest.

The canopy within this patch is dominated by *Eucalyptus microcorys* (Tallowwood), *Eucalyptus saligna* (Sydney Blue Gum) and *Lophostemon confertus*. Native midstorey species include *Synoum glandulosum* (Scentless Rosewood), *Cryptocarya rigida* (Rose Maple) and *Alphitonia excelsa* (Red Ash). Groundcover includes *Blechnum cartilagineum* (Gristle Fern), *Oplismenus aemulus* (Australian Basket Grass) and *Calochlaena dubia* (False Bracken).

Some weed incursion occurs within this vegetation type however weeds predominantly occur along the community edge. Weeds identified within this vegetation include Lantana, Palm Grass (*Setaria palmifolia*), Senna, Broadleaf Paspalum, Morning Glory, Castor Oil Plant, Tobacco Bush (*Solanum mauritianum*), Madeira Vine (*Anredera cordifolia*) and Singapore Daisy (*Sphagneticola trilobata*).

There are some large hollow-bearing eucalypts present in this community; these provide potential nest sites for species such as Forest Owls, Cockatoos and large arboreal mammals. The presence of juvenile Powerful Owls a few hundred metres away in Bellingen over the summer and Autumn of 2022 [records on eBird] suggests that the species may nest nearby.



Photo 3: PCT 3169: Northern Hinterland Tallowwood-Brush Box Wet Forest

#### 2.2.4. PCT 3248: Northern Blackbutt-Turpentine Shrubby Forest

This vegetation community occurs within the north-western side of the Reserve. This vegetation community grades into the more mesic PCT 3167. The canopy is dominated by *Eucalyptus pilularis*, *Syncarpia glomulifera* and *Corymbia intermedia*. Midstorey species include *Archirhodomyrtus beckleri*, *Elaeocarpus reticulatus* (Blueberry Ash) and *Acacia melanoxylon* (Blackwood). The groundcover consists of mainly native ferns *Pteridium esculentum* and *Calochlaena dubia*.

This area is in predominately good condition with moderate weed incursion from edge effects and where informal vehicle tracks occur. Common weeds include Lantana, Palm Grass, Senna, Broadleaf Paspalum, Morning Glory, Castor Oil Plant, Small-leaved Privet and Tobacco Bush. Several garden plants have likely been dumped along the tracks and include Nasturtium (*Tropaeolum majus*), *Strobilanthes* spp., Fruit Salad Plant (*Monstera deliciosa*) and Giant Taro (*Alocasia macrorrhizos*)

A small number of extremely large hollow-bearing *Eucalyptus pilularis* trees occur in this community near the Bowraville Road and Kalang Road roundabout. These trees provide potential nest sites for species such as Forest Owls, Cockatoos and large arboreal mammals.



Photo 4: PCT 3248: Northern Blackbutt-Turpentine Shrubby Forest

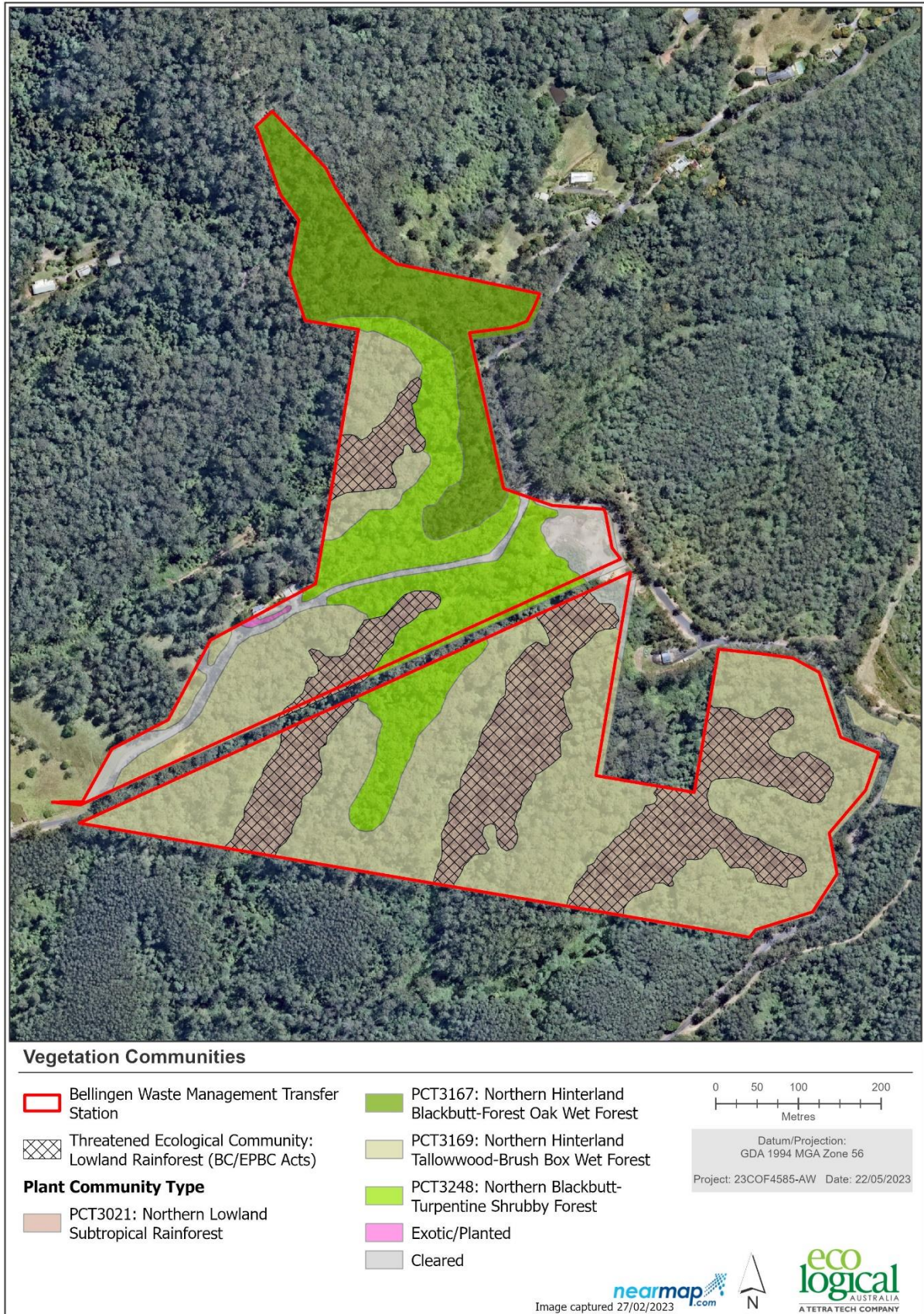


Figure 2: Vegetation Communities



### 2.3. Weeds

The NSW *Biosecurity Act 2015* and regulations provide specific legal requirements for state level priority weeds (**Table 2**). Under the Act all identified weeds are regulated with a general biosecurity duty to prevent, eliminate, or minimise any biosecurity risk they may pose.

Specific legal requirements apply to State determined priorities under the draft *North Coast Regional Weeds Plan 2023 – 2027* (LLS North Coast 2022).

An overall total of 35 weed species were recorded within the Bellingen WMTS Reserve with 18 of these weed species located in the VMP area. The weeds identified during the field survey within the VMP area, include two which are listed as State level priority weeds in addition to both being considered as Weeds of National Significance (WoNS) (Lantana and Madeira Vine). An additional 15 are listed as ‘other weeds of regional concern’ (LLS North Coast 2022). Table 2 provides: weeds present in the VMP area; their priority listing under the Biosecurity Act; the associated asset / value at risk; and whether they are Weeds of National Significance (WoNS). A list of weeds recorded within the Bellingen WMTS Reserve is presented in the flora species list provided in Appendix A. Significant weed infestation areas of the entire Reserve are shown in Figure 4.

**Table 2: A list of priority weeds and Weeds of National Significance identified within Bellingen WMTS Reserve**

Scientific Name	Common Name	Weeds of National Significance (WoNS)	DPI Weed Wise* <sup>^</sup>	North Coast Strategic Weed Management Plan 2023-2027 objective/s <sup>^^</sup>
<b>State level priority weeds (whole of State)</b>				
<i>Anredera cordifolia</i>	Madiera Vine	Yes	General Biosecurity Duty and Prohibition on certain dealings	Containment and/or Asset Protection
<i>Lantana camara</i>	Lantana	Yes	General Biosecurity Duty and Prohibition on certain dealings	Asset Protection
<b>Other weeds of regional concern</b>				
<i>Ageratina adenophora</i>	Crofton Weed	No	General Biosecurity Duty	Additional species of concern
<i>Cardiospermum grandiflorum</i>	Balloon Vine	No	General Biosecurity Duty	Additional species of concern
<i>Cinnamomum camphora</i>	Camphor Laurel	No	General Biosecurity Duty	Additional species of concern
<i>Desmodium uncinatum</i>	Silver-leaved Desmodium	No	General Biosecurity Duty	Additional species of concern
<i>Ipomoea cairica</i>	Coastal Morning Glory	No	General Biosecurity Duty	N/A
<i>Ipomoea indica</i>	Purple Morning Glory	No	General Biosecurity Duty	N/A

Scientific Name	Common Name	Weeds of National Significance (WoNS)	DPI Weed Wise*^	North Coast Strategic Management Plan 2023-2027 objective/s^^	Regional Weed
<i>Ligustrum sinense</i>	Small-leaved Privet	No	General Biosecurity Duty	Additional concern	species of
<i>Passiflora edulis</i>	Common Passionfruit	No	N/A	Additional concern	species of
<i>Ricinus communis</i>	Castor Oil Plant	No	General Biosecurity Duty	N/A	
<i>Senna pendula</i> var. <i>glabrata</i>	Cassia	No	General Biosecurity Duty	Additional concern	species of
<i>Setaria palmifolia</i>	Palm Grass	No	General Biosecurity Duty	N/A	
<i>Solanum mauritianum</i>	Tobacco Bush	No	General Biosecurity Duty	N/A	
<i>Sphagneticola trilobata</i>	Singapore Daisy	No	General Biosecurity Duty	Additional concern	species of
<i>Sporobolus africanus</i>	Parramatta Grass	No	General Biosecurity Duty	Additional concern	species of
<i>Syagrus romanzoffiana</i>	Cocos palm	No	General Biosecurity Duty	Additional concern	species of
<i>Tradescantia fluminensis</i>	Trad	No	General Biosecurity Duty	N/A	
<b>Other weeds</b>					
<i>Ageratum houstonianum</i>	Billy Goat Weed	No	N/A	N/A	
<i>Alocasia macrorrhiza</i>	Giant Taro	No	N/A	N/A	
<i>Ambrosia artemisiifolia</i>	Annual Ragweed	No	General Biosecurity Duty	N/A	
<i>Andropogon virginicus</i>	Whisky Grass	No	N/A	N/A	
<i>Bidens pilosa</i>	Cobblers Pegs	No	N/A	N/A	
<i>Chloris gayana</i>	Rhodes Grass	No	N/A	N/A	
<i>Cucumis sp.</i>	Cucumber	No	N/A	N/A	
<i>Erythrina sykesii</i>	Coral tree	No	N/A	N/A	
<i>Monstera deliciosa</i>	Fruit Salad Plant	No	N/A	N/A	
<i>Paspalum mandiocanum</i>	Broadleaf Paspalum	No	N/A	N/A	
<i>Paspalum urvillei</i>	Vasey Grass	No	N/A	N/A	
<i>Plectranthus sp.</i>		No	N/A	N/A	
<i>Plectranthus ciliatus</i>		No	N/A	N/A	
<i>Setaria sphacelata</i>	South African Pigeon Grass	No	N/A	N/A	

Scientific Name	Common Name	Weeds of National Significance (WoNS)	DPI Weed Wise*^	North Coast Regional Strategic Management Plan 2023-2027 objective/s^^
<i>Strobilanthes sp.</i>		No	N/A	N/A
<i>Tropaeolum majus</i>	Nasturtium	No	N/A	N/A
<i>Verbena sp.</i>		No	N/A	N/A

\*General Biosecurity Duty: All pest plants are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.

^Prohibition on certain dealings: Must not be imported into the state, sold, bartered, exchanged or offered for sale.

^^Refer to the NCRWMP for species specific management objectives and obligations under each management category (LLS North Coast 2022). Weeds listed as ‘other weeds of regional concern’ under the plan warrant resources for local control or management programs and are a priority to keep out of the region. Inclusion in this list may assist Local Control Authorities and/or land managers to prioritise action in certain circumstances where it can be demonstrated the weed poses a threat to the environment, human health, agriculture and the like.

Weed infestation occurs primarily along disturbed interphase areas, particularly where informal vehicle tracks and dumping has occurred. Weeds present long the informal tracks include Lantana and exotic grasses Palm Grass and Broadleaf Paspalum. Dumping of garden plants include Nasturtium, *Strobilanthes* spp., Fruit Salad Plant and Giant Taro.

The dominant weeds within the VMP area are Lantana, Purple Morning Glory, Coral Tree and Castor Oil.

An area of particular concern for overall Reserve weed management is the high threat weed cover surrounding the Belling WMTS Reserve outside of the VMP area (Figure 4). This area is dominated by weeds, in particular Castor Oil Plant, Purple Morning Glory and Lantana (Photo 5 and Photo 6). It is notable that these highly disturbed adjacent areas are providing a source and assisting weed encroachment into the native vegetation within the Reserve. Intensive and ongoing weed management is required to control current weed infestations and prevent the introduction and spread of any biosecurity weeds that are present within the VMP area and surrounding areas.



**Photo 5: High weed infestation surrounding Bellingen WMTS**



**Photo 6: High weed infestation surrounding Bellingin WMTS**

## 3. Vegetation management works

### 3.1. VMP management zones

Bellingen WMTS Reserve covers an area of approximately 41 hectares (ha) with 8.26 ha focused as the VMP area. The VMP vegetation management zones are focused on the identified and mapped TEC remnant vegetation areas. The three identified vegetation management zones are presented in Table 3 and their location is shown in Figure 3. The vegetation management zones have been derived from observed vegetation conditions within the TEC mapped areas within the Reserve e.g. 'Poor' or 'Moderate'.

**Table 3: Bellingen WMTS vegetation zones and conditions within VMP area.**

Zone	Condition	Area within Council Reserve (ha)
1	Poor – (Coral Tree Infestation)	0.11
2	Moderate	3.90
3	Poor – (General Weed Infestation)	4.25
		<b>8.26</b>

Key Points for all management zones:

- Weed control to be undertaken in the 'Moderate' zone should:
  - Use methods such as hand removal, cut and paint and spot spraying only, to minimise harm to native plants and encourage natural regeneration.
  - Limit spot spraying - to be used only if deemed necessary.
  - Undertake sweeps through the native vegetation of these Vegetation Management Zone VMZ's as part of every site visit
  - It is recommended no herbicide spraying is to occur near creek line/s. Bioactive can be used for cut/drill and paint etc. where there is a possibility of impact to waterways.
- Native mulch:
  - If mulch is required, it is to be installed within the cleared ring circles for canopy and shrub plantings in VMP management zones 1 and 3 only. NB: Due to the steepness of the Reserve and access difficulties, transporting large quantities of mulch into some zones may be impracticable.
  - Where possible will be used to suppress weed growth, increase water retention in soils and provide protection against erosion issues that may occur due to the removal of vegetation.
  - Mulch will need approximately 3 to 4 weeks to settle prior to any plantings.
  - Ongoing weed control is to be maintained in mulched areas.

- Revegetation works:
  - If planting is required, it is recommended that planting commence in Autumn, however assisted plant establishment via watering will be at the discretion of the contractor (in consultation with BSC) and with due consideration of seasonality.
  - Although not a requirement, planting of the riparian zone should comply with DPI NRAR *Guidelines for vegetation management plans on waterfront land* (DPI NRAR 2012, p. 1) for best practice (Refer to Appendix B). Public authorities (i.e. BSC) are largely exempt from controlled activity permits for environmental works within the riparian zone. However, BSC should still use the results of the Waterfront land e-tool to keep a record of this viable exemption.

Refer to Figure 3 for locations of each VMP management zone.

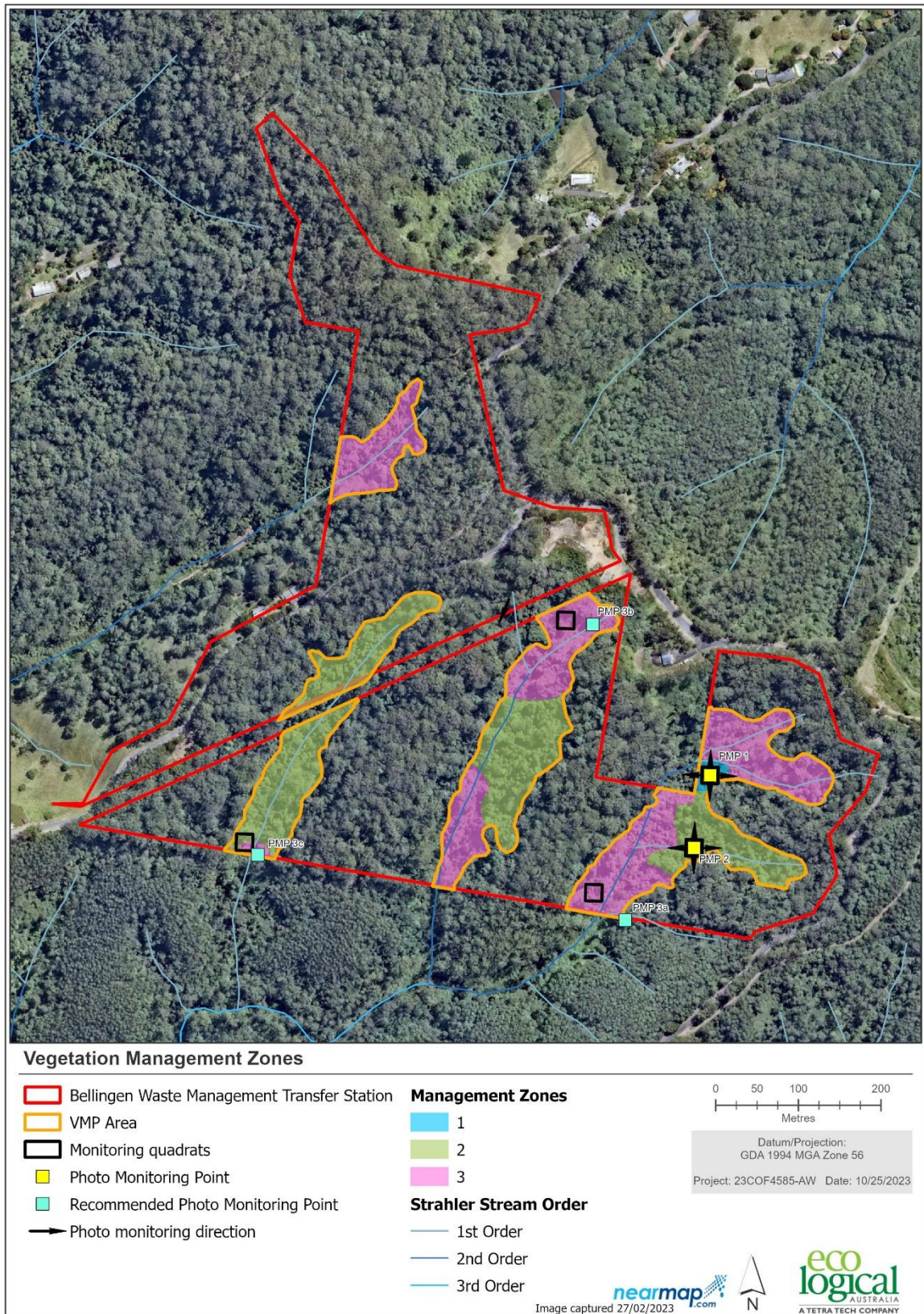


Figure 3: Vegetation Management Zones




### 3.1.1. VMP management zone actions


VMP management zone actions including weed management actions and revegetation recommendations are provided in Table 4. Refer to Figure 3 for locations of each VMP management zone.

**Table 4: Management Actions for VMP Management Zones**

VMP Management Zone	Area (ha)	Description of issues	Weed Management Actions and Revegetation	Photo
<b>Northern Lowland Subtropical Rainforest</b>				
Zone 1: Poor (Coral Tree infestation)	0.11	The vegetation throughout this zone is dominated by Coral Tree with minimal native species (Photo 7). Other weeds recorded within this zone are Madeira Vine, Trad, Lantana and Palm Grass. Rubbish was identified within this zone, potentially from the WMTS uphill.	<p>Primary, secondary and follow-up weed control works are required. Weed management should primarily focus on:</p> <ul style="list-style-type: none"> <li>• Treating woody weeds, in particular mature growth Coral Tree via stem injection techniques.</li> <li>• Madeira Vine should be controlled by digging up tubers and collecting all plant material where practical (Refer to Section 3.2.1). Scrape and paint with undiluted Glyphosate, spot and foliage spray with Metsulfuron-methyl and a half rate dose of Pulse.</li> <li>• Perennial exotic groundcovers will need to be controlled prior to revegetation. Trad can either be raked first and then followed up by hand weeding. Plants can be composted under black plastic in full sun. Palm Grass can be sprayed using a non-selective herbicide (e.g. Roundup Biactive®) in preparation for revegetation works. This will reduce competition with native plantings. Care must be taken to prevent off-target</li> </ul>	

VMP Management Zone	Area (ha)	Description of issues	Weed Management Actions and Revegetation	Photo
			<p>spraying of native groundcovers and regenerating species.</p> <ul style="list-style-type: none"> <li>The edge of the zone should be treated to prevent weed spread further into the intact areas of bushland.</li> <li>Revegetation is only recommended once weed infestations are under control.</li> </ul> <p>Following primary weed control, this area is expected to require revegetation at the canopy and mid stratum layers.</p> <ul style="list-style-type: none"> <li>All species for planting should be sourced from Northern Lowland Subtropical Rainforest community as per the recommended planting list included in Appendix C.</li> <li>Planting densities are to be determined by the Bush Regenerator contractor in consultation with BSC.</li> <li>Plantings are only recommended within this zone if the area does not restore naturally following weed control. Refer to Table 6 for indicative planting densities. Refer to Appendix E for reference photos of this area.</li> </ul>	

VMP Management Zone	Area (ha)	Description of issues	Weed Management Actions and Revegetation	Photo
Zone 2: Moderate	3.90	This zone is in moderate condition with weed cover mainly occurring towards the edges / adjacent interphase zones. Lantana is the weed predominately occurring within this zone.	<ul style="list-style-type: none"> <li>• Hand removal techniques should be utilised to provide minimal disturbances to native species.</li> <li>• No foliage spraying or splattering with herbicide is recommended due to the potential for off target mortality.</li> <li>• Other non-invasive removal techniques are recommended including hand removal, scrape and paint and cut and paint.</li> <li>• Regular follow up sweeps are recommended at the maintenance stage to prevent any recurring specimens from establishing.</li> <li>• Plantings are only recommended on the edges of this zone and if the area does not restore naturally following weed control.</li> </ul>	

VMP Management Zone	Area (ha)	Description of issues	Weed Management Actions and Revegetation	Photo
Zone 3: Poor (General Weed Infestation)	4.25	<p>The vegetation throughout this zone is in poor condition and has high exotic weed cover throughout. Weed species such as Lantana and Purple Morning Glory dominate this vegetation zone. Other weeds occurring with this zone include Coral Tree, Castor Oil, Small-leaved Privet, Senna, Palm Grass, Tobacco Bush, Trad, Crofton Weed, Billy Goat Weed, Broadleaf Paspalum and <i>Cucumis</i> sp. (Cucumber)</p> <p>This vegetation zone occurs close to disturbed areas such as informal vehicle tracks. A number of garden plants were recorded along the tracks.</p>	<p>Primary, secondary and follow-up weed control works are required. Weed management should primarily focus on:</p> <ul style="list-style-type: none"> <li>• Treating woody weeds in particular mature growth Lantana, Purple Morning Glory, Coral Tree (Refer to Zone 1), Castor Oil Plant and Small-leaved Privet (Photo 8 and Photo 9).</li> <li>• Treat perennial groundcovers (Refer to Zone 1).</li> <li>• Weeds to be treated in a mosaic pattern to prevent erosion, and allow natural regeneration of native canopy, shrubs and groundcovers.</li> <li>• The edge of the zone should be treated to prevent weed spread further into the intact areas of bushland.</li> <li>• Revegetation is only recommended once woody weed infestations are under control.</li> </ul> <p>Following primary weed control, this area is expected to require revegetation at the canopy and mid stratum layers.</p> <ul style="list-style-type: none"> <li>• All species for planting must be sourced from Northern Lowland Subtropical Rainforest community as per the recommended planting list included in Appendix C.</li> <li>• Planting densities are to be determined by the Bush Regenerator contractor in consultation with BSC. Refer to Table 7 for indicative planting densities. Refer</li> </ul>	

VMP Management Zone	Area (ha)	Description of issues	Weed Management Actions and Revegetation	Photo
			to Appendix E for reference photos of this area.	



**Photo 7: Infestations of Coral Tree within PCT 3021 - VMZ 1.**



**Photo 8: Highly invasive weeds present within PCT 3021 – VMZ 3 including Purple Morning Glory, Castor Oil Plant and Lantana.**



**Photo 9: High Lantana cover in PCT 3021 - VMZ 3**



## 3.2. Weed control

### 3.2.1. Primary and secondary weed control

All weeds, including woody weeds in the understorey will require treatment. Secondary and follow up weed control will be required following revegetation. During these weed control activities (particularly during any spot spraying) care must be taken to avoid natural regeneration of native species.

Primary and secondary weed control will include woody weed and vine control, specifically the control of Lantana (*Lantana camara*), Madeira Vine (*Anredera cordifolia*), Castor Oil (*Ricinus communis*), Coral Tree (*Erythrina sykesii*), Small-leaved Privet (*Ligustrum sinense*) and Purple Morning Glory (*Ipomoea indica*). Juvenile woody weed and vine weed seedlings can be hand-pulled, provided the whole root is removed. Dense patches of Coral Tree will require stem injection techniques including drill and fill with herbicide. Larger specimens of Small-leaved Privet, Castor Oil and isolated individual Lantana plants can be treated using cut-and-paint method. However, dense thickets of Lantana will require splatter techniques. Larger Purple Morning Glory plants can be treated using the scrape-and-paint method. Canopy growth of these vine species may require using the skirting method, a brush hook or similar tools to bring down the top part of the plant from trees. Madeira Vine should be controlled by digging up tubers and collecting all plant material where practical. Dispose of tubers, leaves and stems, as they will regrow when in contact with the soil or if they are exposed to any sunlight. If there is stress on the host plants, cut and pull the madeira vines from the canopy. When pulling the vines aerial tubers easily fall off the stems. Lay tarps or cloths on the ground to collect the aerial tubers to prevent the infestation from spreading. Cut vines can survive in the tree canopy and continue to drop tubers for up to two years. It is important to remove as much plant material as possible. Scrape and paint (undiluted Glyphosate), spot and foliage spray with Metsulfuron-methyl and a half rate dose of pulse. Chemical and mechanical control techniques will be required in follow-up treatments. Follow-up treatments of woody weeds, including Lantana, Madeira Vine, Coral Tree, Small-leaved Privet seedling/vegetative growth, will be required. For more information on specific weed control techniques refer to Appendix D.

### 3.2.2. Maintenance

Following secondary weed removal and revegetation, all areas will require ongoing maintenance to control weed regrowth from the soil seed bank. Maintenance work is to be undertaken by a qualified bush regeneration contractor(s) as per specifications provided in Appendix D.

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

## 3.3. Mulching

Mulch has been shown to increase the survival rate of plants in soils with poor water holding ability, however excessive (thick) mulching may limit the likelihood of natural regeneration. The following provide a guide to the use of mulch:

- Mulch should be established to a depth of 75mm -100 mm.

- All mulch shall be free of contaminants including plastic waste and in particular weed seeds and propagules.
- Mulch should ideally be derived from local native vegetation. Pine mulch should be avoided as the higher acidity level is not generally suitable for the native vegetation.
- Mulch should be installed soon after weed control activities to allow for mulch to settle into soil.
- Jute mesh or matting is to be used instead of or with mulch in areas of high erosional potential (i.e. steep slopes).

### 3.4. Regeneration

It is recommended natural regeneration be allowed to occur throughout the VMP area. However, if it is evident that natural regeneration is not occurring fast enough to outcompete weeds, assisted regeneration will be required.

*Natural Regeneration:* Existing remnant native vegetation with a good diversity and cover of native species ('Moderate' condition zones) can usually regenerate successfully after the removal of weeds that compete for light, water and nutrients. Existing native vegetation often improves in vigour, flower and set seed following weed removal. Following the disturbance of weed removal, seeds in the soil seed bank may also be stimulated to grow. The aim with this approach is to restore and maintain an ecosystem in which natural regeneration can occur.

*Assisted Regeneration:* Generally carried out in highly disturbed areas ('Poor' condition zones), natural regeneration may occur too slowly to outcompete weed species, prevent erosion, or too few species be represented to replenish native seed banks. Preference for planting species that are suited to the locality and representative of the target PCT will speed the regeneration process.

### 3.5. Revegetation

Revegetation works may be required within 'poor' condition zones if natural revegetation does not occur.

Revegetation works will include planting of primarily native canopy and shrub species using tube stock and Hiko / Viro cells followed by native groundcover species if feasible. Direct seedling may also be used where appropriate, as determined by a qualified bush regeneration contractor(s). It is recommended canopy and shrub plantings are well-established prior to revegetating the groundcover. Groundcover plantings are unlikely to survive if exotic groundcover is left unmanaged.

All plantings are to be sourced from local provenance stock, as per Florabank guidelines (Mortlock, 2000). Naturally occurring remnant vegetation, preferably from the local area, is the best source of seed and/or vegetative material for revegetation. Generally, these plants will have evolved to suit local environmental conditions and assist in the preservation of local provenance / genetic stock. On this basis, native plants for revegetation shall be sourced from suppliers that have obtained their stock by harvesting seed from local populations, however if unavailable, seed or tube stock of appropriate species must be sourced from the Bellingen LGA. More information on revegetation and seed collection specifications is provided in Appendix D.

Table 5 indicates the assumed revegetation areas within each VMP management zone, as well as assumed areas required for mulching. Indicative planting densities for the ‘poor’ management zones are provided in Table 6. Table 6 is best used as a guide only to inform any future grants or funding for the VMP area. The actual on-site revegetation densities for each management zone will be allocated at the discretion of the bushland regeneration contractor in consultation with BSC. A recommended planting list is provided Appendix C.

**Table 5: Assumed revegetation areas and mulch requirements within VMP area**

Zone	Description	Total area (m <sup>2</sup> )	Revegetation Area (%)	Revegetation area (m <sup>2</sup> )	Mulch (%)	Mulch area (m <sup>3</sup> )*
1	Poor – Coral tree infestation	1,100	80	880	30	30
3	Poor – General weed infestation	42,500	70	29,750	30	890
Total		43,600	-	35,980	-	920

\*Based on a maximum of 100 mm depth of mulch

^Rounded to the nearest whole value ?

**Table 6: Indicative revegetation densities by ELA**

Zone	Description	PCT	Revegetation area (m <sup>2</sup> )	Planting densities (plants/per m <sup>2</sup> )				Total
				Trees	Shrubs	Sedges / Grasses	Ferns	
1	Poor (Coral Tree infestation)	Northern Lowland Subtropical Rainforest	880	1/10 (88 individuals)	3/20 (132 individuals)	3 (2,640 individuals)	1 (880 individuals)	3,740
3	Poor (General weed infestation)	Northern Lowland Subtropical Rainforest	29,750	1/10 (2975 individuals)	3/20 (4463 individual)	3 (89,250 individuals)	1 (29,750 individuals)	126,438
<b>Total</b>			<b>30,630</b>	<b>3,063</b>	<b>4,595</b>	<b>91,890</b>	<b>30,630</b>	<b>130,178</b>

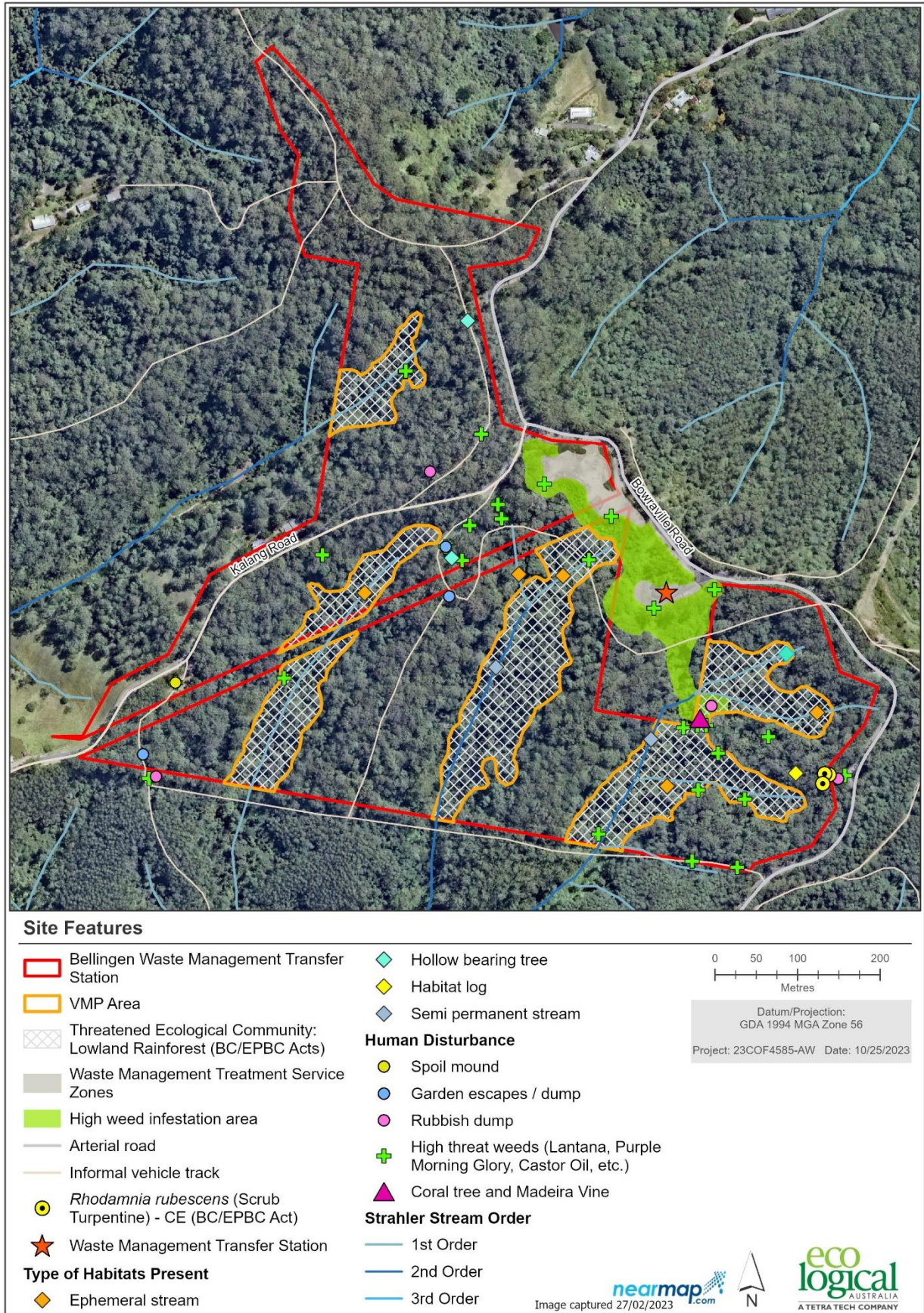


Figure 4: Site Features

## 4. Implementation schedule

### 4.1. Implementation schedule

The VMP areas will be managed in perpetuity with an initial implementation period of 5 years.

An indicative implementation schedule for the initial 5 years has been provided in Table 7.

### 4.2. Adaptive management

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

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

### 4.3. VMP area management after the initial five-year period (in perpetuity)

After the completion of the initial five-year period works as described within this VMP, on-going inspections of the vegetation within the VMP areas is to be carried out at least every three years to ensure the areas meet the ongoing performance criteria.

Areas that do not conform to the performance criteria are required to be reassessed to see if the rehabilitation techniques and goals were realistic using the methods outlined within this VMP. Survey at these inspections is to include both priority and environmental weed populations. A review of the current VMP will be needed at the 5-year completion period to assess its value and update as required.

**Table 7: Implementation schedule**

Treatment	Year 1				Year 2				Year 3				Year 4				Year 5			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
<b>Revegetation</b>																				
Seed collection, cleaning, storage	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Site preparation					■	■	■	■	■	■	■	■	■	■	■	■				
Install jute matting / mulch (where required)					■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Tubestock, supply and install					■	■	■	■	■	■	■	■	■	■	■	■				
Replacement tubestock, supply and install (where required)									■	■	■	■	■	■	■	■	■	■	■	■
Irrigation					■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
<b>Weed control</b>																				
Primary	■	■	■	■	■	■	■	■												
Secondary					■	■	■	■	■	■	■	■								
Maintenance									■	■	■	■	■	■	■	■	■	■	■	■
<b>Other works</b>																				
Monitoring and reporting	■			■				■				■				■				■
VMP review / update																				■

^ Green indicates vegetation management works

^Light green for replacement tubestock/jute matting where required

## 5. Monitoring and reporting

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

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

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

### 5.1. Baseline Vegetation Monitoring

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

#### 5.1.1. Photo monitoring points (PMPs)

Temporary PMPs were established to provide a visual representation of the condition of vegetation at the photo point site. The photos taken at these points will provide a reference to record any disturbance and change over time within *Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions/Lowland Rainforest of Subtropical Australia*. PMPs were established at two locations within the Reserve (Table 8, Figure 3). Four photos were taken at each PMP within each condition zone of: photo direction in the order of north, east, south, and west (Appendix E). Due to poor access into vegetation management zone 3, four PMP options have been provide. The four options for PMP 3 have one photo taken from a view point looking into the vegetation management zone.

**Table 8: Photo monitoring points**

PMP	Condition	Eastings	Northings
1	Poor (Coral Tree)	489402.05	6629498.43
2	Moderate	489382.57	6629410.63
3a	Poor (General weed infestation)	489299.51	6629323.27
3b	Poor (General weed infestation)	489259.89	6629680.97
3c	Poor (General weed infestation)	488854.64	6629402.29

Photo monitoring points are to include:

- Place one star picket (replace the current temporary orange poles currently established).
- Record the location (eastings and northings) of the star picket with a GPS.

- Take a digital photo from the star picket looking north, east, west and south
- Label each digital image with a unique reference number that indicates where the photo was taken (i.e. the photo monitoring point) and the date it was taken (e.g. PMP1 Photo 1 – 10.05.2023 North for a photo taken looking north at the first photo monitoring point on the 10<sup>th</sup> May 2023).

### 5.1.2. Vegetation monitoring surveys

Quadrat data points will be established within the VMP area to monitor changes in the vegetation through time. The quadrat data forms the baseline for monitoring against the performance criteria for the first five years of the duration of the VMP. Floristic plot data is to be collected including species richness, cover and abundance in a quadrat, within a 20m x 20m plot in accordance with Appendix F. The recommended locations for monitoring quadrats are shown in Figure 3.

#### 5.1.2.1. Northern Lowland Subtropical Rainforest: Poor (Coral Tree Infestation) (VMZ 1)

Set up a minimum of one quadrat monitoring plot within the VMP area.

#### 5.1.2.2. Northern Lowland Subtropical Rainforest: Moderate (VMZ 2)

Set up a minimum of one quadrat monitoring plot within the VMP area.

#### 5.1.2.3. Northern Lowland Subtropical Rainforest: Poor (General Weed Infestation) (VMZ 3)

Set up a minimum of one quadrat monitoring plot within the VMP area.

Biodiversity Assessment Method (BAM) benchmark conditions (BioNet 2021) for each PCT are provided in Table 10. These provide a general comparison point for monitoring and how the vegetation is responding to restoration works over time.

## 5.2. Progress reports

Reporting includes the implementation of the monitoring actions specified in Section 5.1 and a description of the works that have been undertaken. Recommended monitoring and record data templates have been provided from BSC to inform the progress reports in Appendix F. Reports will include at a minimum:

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



- any observations made, including new plant species recorded (native and weed species), comments on rates of regeneration and any problems which impact on the implementation of the VMP (per VMP area)
- if applicable, the results of the implementation works in relation to the relevant performance criteria.

### 5.3. Performance criteria

The VMP performance criteria are detailed in Table 9.

Failure to meet these performance criteria will mean that the maintenance period will be extended until they are achieved. Therefore, maintenance must continue until BSC agrees that the objectives and performance criteria have been met and the maintenance period has concluded.

The bush regeneration contractor, in consultation with Council, can adapt these criteria as required in response to the success of rehabilitation works.

The following performance criteria will need to be achieved in perpetuity:

- across the VMP area, <20% priority weeds cover and <30% environmental weeds cover within the 5 years and ongoing as required thereafter.
- minimal infiltration by exotic garden escapes into the VMP area.
- no dumped garden waste within the VMP area.
- no bare areas > 5 m<sup>2</sup> or erosion from exposed surfaces.
- species richness and cover goals after the initial five-year implementation period based on BAM benchmark conditions for each vegetation community present within the VMP area, this benchmark data should be used as a guide and as a reference to achieve desired planting densities (Table 10).

Table 9: Performance criteria

Management Zones	Year 1	Year 2	Year 3 – 4	Year 5
All Zones	<p>Commencement of all tasks outlined in the VMP or evidence of planning for their implementation.</p> <p>Any earthworks completed under the supervision of an ecologist or bush regenerator.</p> <p>All rubbish and debris removed.</p> <p>Vegetation management works:</p> <p>Revegetation is to be undertaken with a minimum of 50% in year 2, 60% in year 3-4 and 70% in year 5 of the benchmark levels for species diversity provided in Table 10.</p> <p>A minimum of 85% survival rate of all vegetation strata planted in each zone (e.g. tree, shrub and groundcover)</p> <p>No area greater than 5 m x 5 m without surviving revegetation.</p> <p>Maintenance replanting is to replace plants by the same species, or where that species is not available, with the same growth form (i.e. tree for tree, etc.) and must not decrease species diversity. Any new species must be from the community being emulated and of local provenance.</p> <p>Treatment of any new weed breakouts.</p> <p>Monitoring and reporting undertaken in accordance with <b>Section 5</b>.</p>			
All Zones	<p>Treat 50% of priority weeds</p> <p>Treat 40% of other weeds</p> <p>Treatment of new weed breakouts</p>	<p>Treat 50% of remaining priority weeds.</p> <p>Treat 40% of remaining other weeds</p> <p>No greater than 50% cover by priority weeds.</p> <p>No greater than 50% cover by other weeds.</p> <p>Suppression of all weeds during revegetation.</p> <p>Shrub and groundcover cover no less than 50% of their respective benchmark levels provided in Table 10.85% survival rate of plantings, replacement plantings where required.</p>	<p>No greater than 30% cover by priority weeds.</p> <p>No greater than 40% cover by other weeds.</p> <p>Shrub and groundcover cover no less than 60% of benchmark levels provided in Table 10.</p> <p>85% survival rate of plantings, replacement plantings where required.</p>	<p>No greater than 15-20% cover by priority weeds.</p> <p>No greater than 20-30% cover by other weeds.</p> <p>Shrub and groundcover cover no less than 70% of benchmark levels provided in Table 10.</p> <p>Overall decrease in exotic diversity and increase in native diversity. Benchmark diversity levels provided in Table 10 can be used as a guide.</p>

**Table 10: General benchmark conditions for each PCT within the VMP area**

PCT	PCT Name (BioNet 2021)	Species richness*						Cover* (%)					
		Canopy	Shrub	Grass and Grass Like	Forb	Fern	Other	Canopy	Shrub	Grass and Grass Like	Forb	Fern	Other
3021	Northern Lowland Subtropical Rainforest	19	10	2	3	9	14	144.0	30.0	1.0	2.0	31.0	41.0

\* Based on monthly average following average rainfall year in NSW North Coast IBRA.

## 6. Approximate Hours

The hours needed for implementation for five-year period are approximately 3,025 hours. It is anticipated that approximately 95 bushland regeneration team days (team of four) will be needed to carry out all VMP works. An indicative timeline for labour hours is provided in Table 11.

### 6.1. Vegetation management works

#### 6.1.1. Weed control techniques

A total of 2,400 hours bush regenerator contractor works are required for the VMP areas at Bellingen WMTS. Bush regeneration contractors will implement the weed control treatments identified in this VMP. It is anticipated that 75 bushland regeneration team days (team of four) will be needed to carry out the primary and secondary weed control works over the five years.

#### 6.1.2. Revegetation treatments

Bush regeneration contractors will implement the revegetation works identified in this VMP.

According to Section 4.3 and Table 6 the recommended canopy and shrub planting densities total approximately **7,658** plantings. Canopy and shrub plantings are recommended to achieve reasonable/practical ecological resilience for this vegetation community into the future (if natural revegetation does not occur). Groundcover plantings can be undertaken at the discretion of the bush regenerator contractor, however hours for these are not included in Table 11. Tubestock installation labour hours include mulch, tree guards, planting, water crystals, fertiliser and initial watering, with a 10% replacement rate as separate task. It is anticipated a total of 493 hours (15 days with 4 ppl) are required for site preparation and revegetation works. This is based on 20 plants/ hour / person. Number of plants will vary significantly depending on topography, site access, mulch transportation, jute matting, hard ground and plant density.

It has been assumed that mulch will need to be brought from a sustainable source and be installed and spread, this has been estimated as 920 m<sup>3</sup>.

Hours for the collection of seed has been included as a separate task. If further seed collection works are required, this may require additional hours.

#### 6.1.3. Monitoring and reporting

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

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

A total of 60 hours of monitoring and reporting have been allocated.

Table 11: Implementation hours

Treatment	Establishment – Year 1	Year 2	Year 3	Year 4	Year 5	Total
<b>Revegetation Works</b>						
Seed collection, cleaning, storage	24 hours	24 hours	24 hours-	-	-	72 hours
Site preparation		24 hours	24 hours	24 hours	-	72 hours
Jute matting / Mulch	920m <sup>3</sup>	-	-	-	-	920m <sup>3</sup>
Install tubestock: mulch, tree guards, planting, water crystals, fertiliser and initial watering (canopy and shrub only). Approx. 12 days (8 hrs/day) with 4 people.	-	Canopy (3063 plants) 153 hours	Shrub (2298 plants) 115 hours	Shrub (2298 plants) 115 hours	-	383 hours
Replacement tubestock: mulch, tree guards, planting, water crystals, fertiliser and initial watering (Approx. 1.5 days (8 hrs/day) with 4 people)			Canopy and Shrub (766 plants) 38 hours		-	38 hours
Irrigation		6 hours / event	6 hours / event	6 hours / event	-	TBC
<b>Weed Control</b>						
Primary (40 days with 4 people)	640 hours	640 hours	-	-	-	1,280 hours
Secondary (20 days with 4 people)	-	320 hours	320 hours	-	-	640 hours
Maintenance (15 days with 4 people)			160 hours	160 hours	160 hours	480 hours
Monitoring and reporting	16 hours	8 hours	8 hours	8 hours	20 hours	60 hours
<b>Total hours (95 days with 4 people)</b>	680 hours	1,169 hours (not including all irrigation event/s)	689 hours (not including all irrigation event/s)	307 hours (not including all irrigation event/s)	180 hours	3,025 hours

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## Appendix A Flora list

Family	Scientific Name	Common Name	Exotic	TEC*
Fabaceae	<i>Acacia melanoxylon</i>	Black Wattle		
Pteridaceae	<i>Adiantum hispidulum</i>	Rough Maidenhair Fern		Yes
Asteraceae	<i>Ageratina adenophora</i>	Crofton Weed	Yes	Yes
Asteraceae	<i>Ageratum houstonianum</i>	Billy Goat Weed	Yes	Yes
Araceae	<i>Alocasia brisbanensis</i>	Cunjevoi		Yes
Araceae	<i>Alocasia macrorrhiza</i>	Giant Taro	Yes	
Rhamnaceae	<i>Alphitonia excelsa</i>	Red Ash		
Asteraceae	<i>Ambrosia artemisiifolia</i>	Annual Ragweed	Yes	
Poaceae	<i>Andropogon virginicus</i>	Whisky Grass	Yes	
Basellaceae	<i>Anredera cordifolia</i>	Madeira Vine	Yes	
Myrtaceae	<i>Archirhodomyrtus beckleri</i>	Rose Myrtle		
Arecaceae	<i>Archontophoenix cunninghamiana</i>	Bangalow Palm		Yes
Asteraceae	<i>Bidens pilosa</i>	Cobblers Pegs	Yes	
Blechnaceae	<i>Blechnum cartilagineum</i>	Gristle Fern		
Arecaceae	<i>Calamus muelleri</i>	Wait-a-while		
Dicksoniaceae	<i>Calochlaena dubia</i>	False Bracken		
Sapindaceae	<i>Cardiospermum grandiflorum</i>	Balloon Vine	Yes	
Poaceae	<i>Chloris gayana</i>	Rhodes Grass	Yes	
Lauraceae	<i>Cinnamomum camphora</i>	Camphor Laurel	Yes	
Myrtaceae	<i>Corymbia intermedia</i>	Pink Bloodwood		
Lauraceae	<i>Cryptocarya rigida</i>	Rose Maple		
Cyatheaceae	<i>Cyathea australis</i>	Rough Tree-fern		Yes
Giant Stinging Tree	<i>Dendrocnide excelsa</i>	Giant Stinging Tree		Yes
Fabaceae	<i>Desmodium uncinatum</i>	Silver-leaved Desmodium	Yes	
Dioscoreaceae	<i>Dioscorea transversa</i>	Native Yam		
Sapindaceae	<i>Diploglottis australis</i>	Native Tamarind		Yes
Elaeocarpaceae	<i>Elaeocarpus reticulatus</i>	Blueberry Ash		
Fabaceae	<i>Erythrina sykesii</i>	Coral Tree	Yes	Yes
Myrtaceae	<i>Eucalyptus microcorys</i>	Tallowwood		
Myrtaceae	<i>Eucalyptus pilularis</i>	Blackbutt		
Myrtaceae	<i>Eucalyptus saligna</i>	Sydney Blue Gum		

Family	Scientific Name	Common Name	Exotic	TEC*
Strangling Fig	<i>Ficus watkinsiana</i>	Giant Strangler-fig		Yes
Flagellariaceae	<i>Flagellaria indica</i>	Whip Vine		Yes
Poaceae	<i>Imperata cylindrica</i>	Blady Grass		
Convolvulaceae	<i>Ipomoea indica</i>	Morning Glory	Yes	Yes
Convolvulaceae	<i>Ipomoea cairica</i>	Coastal Morning Glory	Yes	
Verbenaceae	<i>Lantana camara</i>	Lantana	Yes	Yes
Dryopteridaceae	<i>Lastreopsis decomposita</i>	Trim Shield-fern		Yes
Oleaceae	<i>Ligustrum sinense</i>	Small-leaved Privet	Yes	Yes
Arecaceae	<i>Linospadix monostachyos</i>	Walking-stick Palm		Yes
Campanulaceae	<i>Lobelia purpurascens</i>	Whiteroot		
Asparagaceae	<i>Lomandra longifolia</i>	Spiny-headed Mat-rush		Yes
Asparagaceae	<i>Lomandra spicata</i>			Yes
Myrtaceae	<i>Lophostemon confertus</i>	Brush Box		Yes
Monstera deliciosa	<i>Monstera deliciosa</i>	Fruit Salad Plant	Yes	
Lauraceae	<i>Neolitsea dealbata</i>	Hairy-leaved Bolly Gum		Yes
Poaceae	<i>Oplismenus aemulus</i>	Basket Grass		
Poaceae	<i>Paspalum mandiocanum</i>	Broadleaf Paspalum	Yes	Yes
Poaceae	<i>Paspalum urvillei</i>	Vasey Grass	Yes	
Passifloraceae	<i>Passiflora edulis</i>	Common Passionfruit	Yes	
Staghorn	<i>Platycerium superbum</i>	Staghorn		Yes
Lamiaceae	<i>Plectranthus ciliatus</i>		Yes	Yes
Lamiaceae	<i>Plectranthus sp.</i>		Yes	
Araliaceae	<i>Polyscias murrayi</i>	Pencil Cedar		Yes
Araliaceae	<i>Polyscias sambucifolia</i>	Elderberry Panax		
Araceae	<i>Pothos longipes</i>	Pothos		Yes
Dennstaedtiaceae	<i>Pteridium esculentum</i>	Bracken		
Myrtaceae	<i>Rhodamnia rubescens</i>	Scrub Turpentine		
Euphorbiaceae	<i>Ricinus communis</i>	Castor Oil Plant	Yes	Yes
Fabaceae	<i>Senna pendula var. glabrata</i>	Cassia	Yes	Yes
Poaceae	<i>Setaria palmifolia</i>	Palm Grass	Yes	Yes
Poaceae	<i>Setaria sphacelata</i>	South African Pigeon Grass	Yes	
Elaeocarpaceae	<i>Sloanea australis</i>	Maiden's Blush		Yes
Elaeocarpaceae	<i>Sloanea woollsii</i>	Yellow Carrabeen		Yes
Solanaceae	<i>Solanum mauritianum</i>	Tobacco Bush	Yes	Yes



Family	Scientific Name	Common Name	Exotic	TEC*
Asteraceae	<i>Sphagneticola trilobata</i>	Singapore Daisy	Yes	
Poaceae	<i>Sporobolus africanus</i>	Parramatta Grass	Yes	
Acanthaceae	<i>Strobilanthes</i> sp.		Yes	
Arecaceae	<i>Syagrus romanzoffiana</i>	Cocos Palm	Yes	
Myrtaceae	<i>Syncarpia glomulifera</i>	Turpentine		
Meliaceae	<i>Synoum glandulosum</i>	Scentless Rosewood		
Winteraceae	<i>Tasmania insipida</i>	Dorrigo Pepper		Yes
Commelinaceae	<i>Tradescantia fluminensis</i>	Trad	Yes	Yes
Ericaceae	<i>Trochocarpa laurina</i>	Tree Heath		
Tropaeolaceae	<i>Tropaeolum majus</i>	Nasturtium	Yes	
Verbenaceae	<i>Verbena</i> sp.		Yes	
	<i>Cucumis</i> sp.	Cucumber	Yes	Yes

\*Threatened Ecological Community (TEC) indicates species which occur within mapped *Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions/Lowland Rainforest of Subtropical Australia*

## Appendix B Riparian buffer guidelines

# Controlled activities – Guidelines for riparian corridors on waterfront land

Controlled activities carried out in, on or under waterfront land are regulated by the *Water Management Act 2000* (WM Act). The Department of Planning and Environment administers the WM Act and is required to assess the impact of any proposed controlled activity to ensure that no more than minimal harm will be done to waterfront land as a consequence of carrying out the controlled activity.

Waterfront land includes the bed and bank of any river, lake or estuary and all land within 40 metres of the highest bank of the river, lake or estuary.

This means that a controlled activity approval must be obtained from the department before commencing the controlled activity.

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## What is a riparian corridor?

A riparian corridor (RC) forms a transition zone between the land, also known as the terrestrial environment, and the river or watercourse (aquatic environment). Riparian corridors perform a range of important environmental functions such as:

- providing bed and bank stability and reducing bank and channel erosion
- protecting water quality by trapping sediment, nutrients and other contaminants
- providing a diversity of habitats for terrestrial, riparian and aquatic plants (flora) and animals (fauna)
- providing connectivity between wildlife habitats
- conveying flood flows and controlling the direction of flood flows
- providing an interface or buffer between developments and waterways
- providing passive recreational uses.

The protection, restoration or rehabilitation of vegetated riparian corridors is important for maintaining or improving the shape, stability (or geomorphic form) and ecological functions of a watercourse.

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## Changes to controlled activities within riparian corridors

On 1 July 2012 rules commenced regarding controlled activities within riparian corridors. The rules amend the riparian corridor widths that apply to watercourses, providing more flexibility in how riparian corridors can be used and making it easier for applicants to determine the department's controlled activity approval requirements.

Key aspects of the changes include:

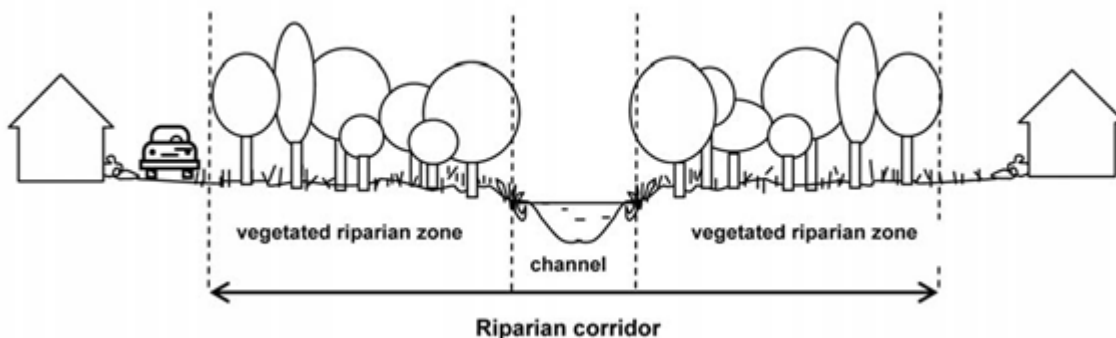
- provision of greater flexibility in the allowable uses and works permitted within riparian corridors
- the core riparian zone and vegetated buffer have been combined into a single vegetated riparian zone (VRZ)
- the width of the VRZ within the riparian corridor has been pre-determined and standardised for first, second, third and fourth order and greater watercourses
- where suitable, applicants may undertake non-riparian corridor works or development within the outer 50% of a VRZ, as long as they offset this activity by connecting an equivalent area to the RC within the development site
- a ‘riparian corridors matrix’ enables applicants to determine what activities can be considered in riparian corridors.

These changes will simplify the controlled activities application and assessment process, provide greater flexibility, help make more land available for housing, support floodplain, stormwater and bushfire management, and allow riparian corridors to be used for public amenity whilst continuing to deliver environmental outcomes required under the WM Act.

The riparian corridor (figure 1) consists of the:

- channel which comprises the bed and banks of the watercourse (to the highest bank)
- VRZ adjoining the channel.

Figure 1. The riparian corridor



## Riparian corridor widths

The department recommends a VRZ width based on watercourse order as classified under the Strahler System of ordering watercourses and using current 1:25 000 topographic maps (see Figure 1 and Table 1). The width of the VRZ should be measured from the top of the highest bank on both sides of the watercourse.

Figure 2. The Strahler system

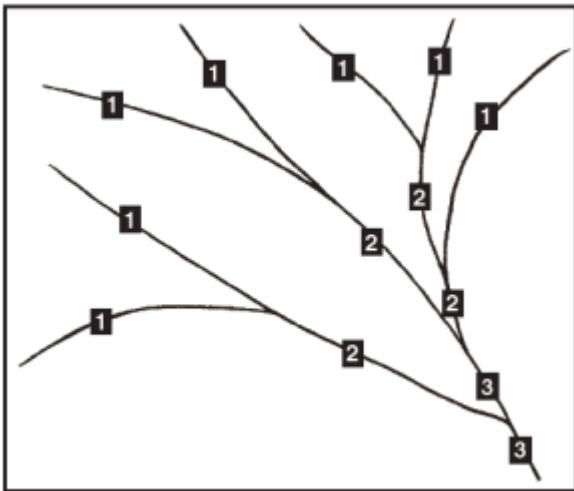


Table 1. Recommended riparian corridor widths

Watercourse type	VRZ width (each side of watercourse)	Total RD width
1 <sup>st</sup> order	10 metres	20 m + channel width
2 <sup>nd</sup> order	20 metres	40 m + channel width
3 <sup>rd</sup> order	30 metres	60 m + channel width
4 <sup>th</sup> order and greater (includes estuaries, wetlands and any parts of rivers influenced by tidal waters)	40 metres	80 m + channel width

Note: where a watercourse does not exhibit the features of a defined channel with bed and banks, the department may determine that the watercourse is not waterfront land for the purposes of the WM Act.

## Objectives for riparian corridor management

The overarching objective of the controlled activities provisions of the WM Act is to establish and preserve the integrity of riparian corridors.

Ideally, the environmental functions of riparian corridors should be maintained or rehabilitated by applying the following principles:

- identify whether or not there is a watercourse present and determine its order in accordance with the Strahler System
- define the RC/VRZ on a map in accordance with Table 1 if a watercourse is present
- maintain or rehabilitate a RC/VRZ with fully structured native vegetation in accordance with Table 1

- minimise disturbance and harm to the recommended RC/VRZ
- minimise the number of creek crossings and provide perimeter road separating development from the RC/VRZ
- locate services and infrastructure outside of the RC/VRZ. Within the RC/VRZ provide multiple service easements and/or utilise road crossings where possible
- treat stormwater run-off before discharging into the RC/VRZ.

The department, however, does allow for a range of works and activities on waterfront land and in riparian corridors to better meet the needs of the community, so long as they cause minimal harm as outlined in the riparian corridor matrix below.

## Riparian corridor matrix

The riparian corridor matrix enables applicants to identify certain works and activities that can occur on waterfront land and in riparian corridors. Applicants should note that the matrix relates to controlled activity approvals under the WM Act only. They are still required to comply with other relevant government legislation, such as threatened species, flood planning levels and fisheries guidelines.

Table 2: Riparian corridor matrix

Stream order	VRZ	RC offsetting for non-RC uses	Cycleways and paths	Detention Basins		Stormwater outlet structures and essential services	Stream realignment	Road crossings		
				Only within 50% outer VRZ	Online			Any	Culvert	Bridge
1 <sup>st</sup>	10m	•	•	•	•	•	•			
2 <sup>nd</sup>	20m	•	•	•	•	•		•		
3 <sup>rd</sup>	30m	•	•	•		•			•	•
4 <sup>th</sup> +	40m	•	•	•		•			•	•

### Key

**Stream order:** the watercourse order as classified under the Strahler System based on 1:25,000, 1:50,000 or 1:100,000 topographic maps whichever is the smallest scale available. A full list is provided in Part 2, Schedule 2 of the Water Management (General) Regulation 2011.

**Vegetated riparian zone (VRZ):** the required width of the VRZ measured from the top of the high bank on each side of the watercourse.

**Riparian corridor (RC) off-setting for non-RC uses:** non-riparian uses, such as Asset Protection Zones are allowed within the outer 50% of the VRZ, so long as offsets are provided in accordance with the averaging rule as seen in Figure 3.

**Cycleways and paths:** cycleways or paths no wider than four metres total disturbance footprint can be built in the outer 50% of the VRZ.

**Detention basins:** detention basins can be built in the outer 50% of the VRZ or online where indicated. Refer to the department's [Guidelines for outlet structures](#) and [Guidelines for in-stream works](#). Online basins must:

- be dry and vegetated
- be for temporary flood detention only with no permanent water holding
- have an equivalent VRZ for the corresponding watercourse order
- not be used for water quality treatment purposes.

**Stormwater outlet structures and essential services:** stormwater outlets or essential services are allowed in the RC. Works for essential services on a fourth order or greater stream are to be undertaken by directional drilling or tied to existing crossings. Refer to the department's [Guidelines for outlet structures](#) and [Guidelines for in-stream works](#).

**Stream realignment:** indicates that a watercourse may be realigned. Refer to the department's [Guidelines for in-stream works](#).

**Road crossings:** indicates permitted road crossing methods. Refer to the department's [Guidelines for watercourse crossings](#) and NSW Department of Primary Industries [Policy and Guidelines for Fish Friendly Waterway Crossings](#).

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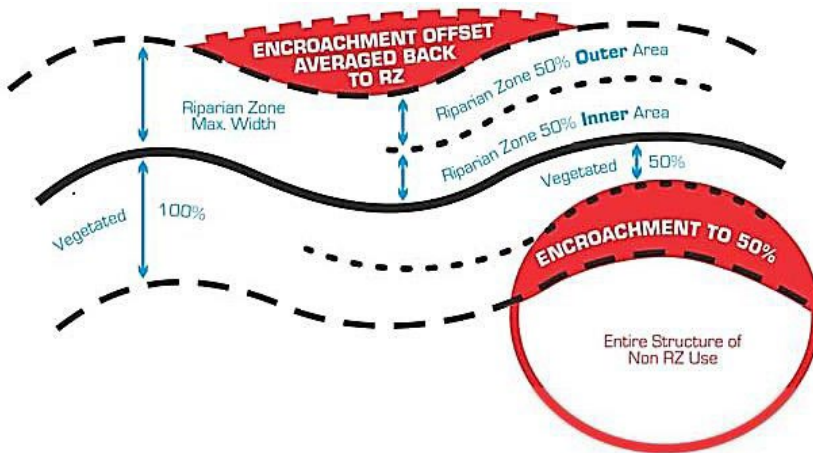
## The averaging rule

Non-riparian corridor works and activities can be authorised within the outer riparian corridor, so long as the average width of the vegetated riparian zone can be achieved over the length of the watercourse within the development site. That is, where appropriate 50% of the outer vegetated riparian zone width may be used for non-riparian uses including asset protection zones, recreational areas, roads, development lots and infrastructure. However, an equivalent area connected to the riparian corridor must be offset on the site (see Figure 3) and the inner 50% of the vegetated riparian zone must be fully protected and vegetated with native endemic riparian plant species.

Bridges, cycleways, paths, stormwater outlets and other essential services do not need to be offset but must comply with the requirements set out in the riparian corridor matrix (Table 2) and other relevant departmental controlled activities guidelines. Offline detention basins do not need to be offset so long as there is an equivalent VRZ for the corresponding watercourse and they are built in compliance with the department's [Guidelines for watercourse crossings](#) and [Guidelines for in-stream works](#). If a proposed basin will not have an equivalent VRZ for the corresponding watercourse, it may still be built in the outer 50% of the VRZ but must be offset.

The averaging rule should generally be applied to cleared waterfront land. Development proposals involving waterfront lands that contain existing native vegetation should seek to preserve that riparian vegetation according to the minimum riparian corridor requirements outlined in Table 1.

Figure 3: Averaging rule



## Applications for controlled activity approvals

Applications for controlled activities approvals should be informed by the riparian corridor matrix shown in Table 2 and prepared by visiting the [NSW Planning Portal](#). For assistance, refer to the [departments website](#). Other controlled activity guidelines are available on the [department's website](#) and outline relevant considerations for applicants when proposing activities and works on waterfront lands.

### Streamlined assessment

Where applications are presented in accordance with the riparian corridor matrix (Table 2) and other departmental controlled activity guidelines, they will be assessed under a streamlined process. This may decrease the amount of time it takes the department to make a determination, saving applicants time and money.

Applications that do not conform to the matrix and/or relevant departmental controlled activity guidelines will continue to be subject to merit assessment to ensure that the proposals meet the requirements of the WM Act. All applications will still need to demonstrate that minimal harm will occur to waterfront land before a controlled activity approval will be issued.

### More information

- For more information about controlled activities on waterfront land, visit the department's website at [water.dpie.nsw.gov.au/licensing-and-trade/approvals](http://water.dpie.nsw.gov.au/licensing-and-trade/approvals).
- Copies of the Acts and associated regulations are available on the NSW Government legislation site at [www.legislation.nsw.gov.au](http://www.legislation.nsw.gov.au).

If you think you need to make a controlled activity application, our easy-to-use online support tool Water Assist can help you. Visit [www.dpie.nsw.gov.au/water/water-assist](http://www.dpie.nsw.gov.au/water/water-assist).



## Appendix C Recommended Planting List

**Table 12: Recommended planting list for PCT 3021**

Form	Scientific Name	Common Name
Canopy	<i>Anetholea anistata</i>	Ringwood
	<i>Atractocarpus benthamianus</i>	Native Gardenia
	<i>Cryptocarya glaucescens</i>	Jackwood
	<i>Diploglottis australis</i>	Native Tamarind
	<i>Elaeocarpus grandis</i>	Blue Fig
	<i>Endiandra muelleri</i>	Green Leaved Rose Walnut
	<i>Endiandra discolor</i>	Domatia Tree
	<i>Ficus watkinsiana</i>	Giant Strangler-fig
	<i>Geissois benthamiana</i>	Red Carabeen
	<i>Heritiera trifoliolata</i>	White Booyong
	<i>Lophostemon confertus</i>	Brush Box
	<i>Mischocarpus pyriformis</i>	Yellow Pear-fruit
	<i>Sloanea australis</i>	Maiden's Blush
	<i>Sloanea woollsii</i>	Yellow Carabeen
<i>Syzygium corynanthum</i>	Sour Cherry	
Midstorey	<i>Acacia melanoxylon</i>	Blackwood
	<i>Archontophoenix cunninghamiana</i>	Bangalow Palm
	<i>Cordyline stricta</i>	Narrow-leaved Palm Lily
	<i>Cyathea leichhardtiana</i>	Prickly Tree Fern
	<i>Cyathea australis</i>	Rough Tree-fern
	<i>Diospyros pentamera</i>	Myrtle Ebony
	<i>Ficus coronata</i>	Sandpaper Fig
	<i>Linospadix monostachya</i>	Walking Stick Palm
	<i>Neolitsea dealbata</i>	Hairy-leaved Bolly Gum
	<i>Polyosma cunninghamii</i>	Featherwood
	<i>Polyscias murrayi</i>	Pencil Cedar
	<i>Sarcopteryx stipata</i>	Steelwood
	<i>Synoum glandulosum</i>	Scentsless Rosewood
	<i>Tasmania insipida</i>	Dorrigo Pepper
Grasses or Grass Like	<i>Lomandra longifolia</i>	Spiny-headed Mat-rush

Form	Scientific Name	Common Name
	<i>Lomandra spicata</i>	
Ferns	<i>Adiantum formosum</i>	Giant Maidenhair Fern
	<i>Adiantum silvaticum</i>	Silver Maidenhair Fern
	<i>Lastreopsis acuminata</i>	Shield Fern

## Appendix D Weed Control, Techniques and Specifications

### **Weed control**

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

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

### General

- The contractor shall take all care not to poison existing desirable vegetation when undertaking herbicide control methods;
- The correct herbicide shall be selected and used appropriately to ensure effective results on all Biosecurity weeds;
- Herbicide control is not to be used within or near water courses. The contractor shall obtain all required permits prior to use of herbicides near any water course and submit details of proposed spraying and chemicals to be used for approval prior to commencement;
- Biosecurity weed removal shall be carried out as described utilising weed removal techniques outlined in this specification. Should the contractor feel that techniques selected in the report will prove un-effective or inefficient; the contractor shall notify the ecologist nominating alternative procedures for review;
- All herbicide spraying is to be undertaken using apparatus deemed as appropriate, generally this will be Knap-Sack or vehicle mounted spray boom in large areas. All other methods of herbicide application are not to be used onsite unless discussed and approved in writing by the Ecologist; and
- The contractor shall ensure any spray drift is kept to an absolute minimum.

Note this list is not exhaustive, however intended to provide a guide to assist in VMP implementation.

### Herbicide Spraying

- Herbicides should not be applied prior to rain occurring. This reduces the herbicides effectiveness as well as being transported in runoff to creek lines and waterways. The use of herbicides should be considered when;
- There are small areas of dense Biosecurity weeds with few or no native plants to protect;
- There are large areas of Biosecurity weeds;
- The Biosecurity weeds are growing too rapidly for physical removal; and
- The spraying of weeds must only be undertaken by experienced persons with Chemcert or equivalent qualifications. The success of each treatment must be evaluated by the operator after a set period of time and re-applied (if Necessary) according to the labelled effectiveness

for each herbicide. Care must be taken when applying herbicides near drainage lines to avoid excess use due to the sensitivity of the alter bodies into which runoff will eventually flow.

### Mechanical Removal

- Mechanised removal using plant in a manner that does not impact the watercourse bed and bank.
- Once initial treatment has occurred follow up cut and paint will be required to ensure any remaining plants are treated. Should any plants be found that are small enough to pull out successfully by hand this is preferred. Ensure that all roots are removed. Hand pulling techniques are outlined below; and
- Hand removal will be required most probably after initial treatment and will be used in the event of new seedling emergence which will have recolonised after initial removal. Hand removal shall be employed ensuring that all roots are removed as described below.

### Hand Removal

- Best undertaken when the soil profile is moist to ensure full and ease of removal and disposal off site;
- Apparent seeds and fruit are to be removed and placed in a bag for removal and disposal off site;
- Firmly take hold of the seedling at ground level, pull and manipulate backwards and forwards until it releases cleanly. If the plant is held too high it may break resulting in root material left behind in the soil. Remaining plant material may re-establish in this instance;
- All roots remaining within the soil shall be removed;
- Should the seedling have a spreading root system, roots will require individual removal; and
- All seedlings and hand pulled weeds are to be placed in a bag, removed from site and disposed of sensibly.

### Woody Weed Removal Techniques

- Cut and Paint woody weeds to 10cm basal diameters;
- Stem injection;
- Frilling or Chipping - Plants should be actively growing and in good health;
- Deciduous plants should be treated in spring and autumn when leaves are fully formed;
- For multi-stemmed plants, inject or chip below the lowest branch to treat each stem individually; and
- Herbicides must be injected immediately before plant cells close (within 30 seconds) and translocation of herbicide ceases

### ***Revegetation works***

Revegetation has the twin aims of both re-establishing the original native vegetation community at the site and reducing erosion along the length of the riparian corridor, which will carry greatly increased peak flows due the increased run-off from the hard surfaces created by the associated development.

Any plantings should consist of local provenance stock.

Planting of Hiko for trees is the preferred method. Planting should be done via a low impact method such as hand digging or hand auger. The holes dug for each plant should be at least 1.5x the width and 2x the depth of the rootball. Fertiliser should be added to each hole dug as per the label specifications. Water crystals or wetting agents should be added to each plant hole. This will increase the water holding capacity of the soil and reduce watering schedules. Initial irrigation of the plantings is essential to ensure that the soil forms around the rootball and no air pockets are left. This will be required unless sufficient rainfall (approximately 10 mm) occurs on the day of planting.

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

Mulch should be used where identified. The use of mulch is very important because it provides organic matter to the top soil, improves soil structure and aeration, water infiltration, nutrient availability, and is also useful in the suppression of weed growth (Buchanan 2009). Mulch should be sourced from within the local area. Mulch must be free of weed propagules and invasive woody species. Mulching should not be undertaken within areas of high potential erosion. It is recommended jute matting is used in these areas prior to revegetation.

A temporary irrigation system should be installed to assist in the establishment of vegetation. Timing of the planting of these areas will need to take into consideration surrounding civil works and erosion/sediment control requirements, these areas will not be planted until earthworks have been completed. A maximum rate of attrition of 10% is to be tolerated, with any plant loss above this rate to be replaced at the expense of the contractor.

### ***Seed collection***

For the growth of the plants used in the revegetation works, seed must be collected from local provenance species within the Coffs Harbour region (flats, drainage lines and river terraces of coastal floodplains). Riparian/wetland species are typically widely dispersed and may be collected from the Coffs Harbour region. However, seed must be sourced from within a 20km radius where available.

Where species identified in this VMP cannot be sourced, they may be substituted for other Swamp Sclerophyll Forest species as identified by the NSW Scientific Committee. Species must be substituted with species of a similar form (e.g. tree for tree etc.). Only wild native species are to be used. Plants are not to be substituted with horticultural varieties under any circumstances.

Record keeping of seed collection and planting locations are to follow the Florabank guidelines (Mortlock 1999). A Section 132C licence under the NSW National Parks and Wildlife Act 1974 will be required to undertake seed collection works. The bush regeneration contractor is responsible for recording this information and providing it to MCC.

Only wild native species are to be used. Plants are not to be substituted with horticultural varieties under any circumstances.

***Bush regeneration contractors***

All vegetation management works in the establishment phase will be undertaken by suitably qualified and experienced bush regeneration contractors and/or similar person with bush regeneration experience and ChemCert. The contractor will need to carry out best practice bush regeneration techniques as described by Buchanan (2009). A flexible approach to this site is recommended since techniques may need to be changed or modified to suit site conditions. This approach is consistent with adaptive management and allows the contractor to develop and build on site knowledge whilst implementing this VMP. Monitoring will assist in the development of the VMP actions in subsequent years.

## Appendix E Photo Monitoring Points

**PMP 1 - 3021: NORTHERN LOWLAND SUBTROPICAL RAINFOREST (POOR – CORAL TREE INFESTATION)**



**Photo 10 PMP1 Photo 1 – 10.05.2023 North**





Photo 11 PMP1 Photo 2 – 10.05.2023 East



Photo 12 PMP1 Photo 3 – 10.05.2023 South



Photo 13 PMP1 Photo 4 – 10.05.2023 West

**PMP 2 - 3021: NORTHERN LOWLAND SUBTROPICAL RAINFOREST (MODERATE)**



**Photo 14 PMP2 Photo 1 – 10.05.2023 North**



Photo 15 PMP2 Photo 2 –10.05.2023 East



Photo 16 PMP2 Photo 3 – 10.05.2023 South



Photo 17 PMP2 Photo 4 – 10.05.2023 West

**PMP3 - 3021: NORTHERN LOWLAND SUBTROPICAL RAINFOREST (POOR – GENERAL WEED INFESTATION) RECOMMENDED PHOTO OPTIONS**



**Photo 18 PMP3 Option A – 10.05.2023**





Photo 19 PMP 3 Option B– 10.05.2023



Photo 20 PMP 3 Option C – 10.05.2023

## Appendix F Progress Report Templates



Comments

Ground Layer (visible)	Veg.	Bare Soil	Litter	Rock	Log
Cover (%) (total add to 100%)					
Litter	Average (cm)	>10cm	10->2cm	2-0cm	0cm
Litter Depth		deep	mod.	shallow	absent
Humus Depth		deep	mod.	shallow	absent

## Photo monitoring point and Data monitoring

<b>Site Attributes &amp; Sampling Details</b>			Pr. Code:	Site Name	
Date				Observer 1	
Start Time		Finish Time		Observer 2	
Land Tenure				Area of Site	
Nearest Town				Catchment	

Map Code					Map Name					
Min. MGA (from 1:25,000 topo. map)	E				N					Datum & Zone:
Max. MGA (from GPS reading)	E				N					

### Photo Point (PP) Details

Plot / Area Name / Description										
Photo Point Description										
Image File Name(s) (IFN) / #								Canopy Cover Reference Shot	Y / N	
Indicative Area within PP (sq m)								IFN		
Camera Location Marked in Field	Yes		No		Comments:					
Camera Type	Digital		Standard							
Camera View	Normal		Wide Angle		Zoom					
	Comments									
Camera View Aspect										
Height above Ground	(m)									
Points of Reference ( <i>please circle</i> )	none marked	1 stake	2 stakes	3 stakes	4 stakes	marked vegetation	other			
GPS Coordinate of Photo Point	E					N				

**Vegetation Type & Condition**

Vegetation Condition	Excellent		Very Good		Good		Moderate		Poor		Very Poor		No	
Restoration Approach	Maintenance		Natural or Assisted Regeneration		Assisted Regeneration					Reconstruction		Fabrication		
Vegetation Formation								Vegetation Class						
Growth Stage					Original Vegetation (describe if known)									

**General Vegetation Structure & Composition using Estimated Plant Cover (PC) %**

Projective Foliage Cover (PFC) Foliage Cover (FC) Crown Cover (CC) <i>Circle method used →</i>	All Strata	Emergent	Canopy	Mid-Storey	Under-Storey	Ground Cover
	PFC / FC / CC	PFC / FC / CC	PFC / FC / CC	PFC / FC / CC	PFC / FC / CC	PFC / FC
Height Range (m)						
Total PC %						
Native PC %						
Exotic PC %						

<b>3 Largest Trees</b>	1	2	3
Species / Common Name			
DBH / Circumference			

<b>Floristic Dominance</b>	Record dominant native species (assess within photo point / area) and life stage / Stratum (DP = Dead Plant, S = Seedling, J = Juvenile, A = Adult)								
Stratum	Sp. 1	No.	Cover	Sp. 2	No.	Cover	Sp. 3	No.	Cover
Emergent									
Canopy									
Mid-Storey									
Under-Storey									
Ground Cover									
	Record dominant exotic species (assess within photo point / area) and life stage / stratum (see above for codes)								
Stratum	Sp. 1	No.	Cover	Sp. 2	No.	Cover	Sp. 3	No.	Cover
Emergent									
Canopy									
Mid-Storey									
Under-Storey									
Ground Cover									

<b>Significant Flora Species</b>	Stratum	Count	Maturity	Height	Notes

<b>Fauna Species</b>	Obs. Type	Reliability	Count	Breeding	Sex	Notes

<b>Physical Details</b>	Elevation(m):	Slope%:	Aspect%:								
Topographic Position	(circle which best describes morphological element)										
	plateau	crest	ridge	upper slope	mid-slope	lower slope	gully	stream bank	flat	other.....	
Landscape Context	Proximity to Nearest Remnant Vegetation (m)			Adjacent Land Use (describe)							
	Remnant Type	rainforest	sclerophyll-wet-dry-swamp	heathland	sedge / fernland	grassland	mangrove				
	Type(s) of Waterways Nearby (circle relevant term)						Distance to Waterway (m)				
	creek	river	estuary	swamp	dam	lake	ocean				
Soil	Type	krasnozems	black earths	chocolate soils	podzols	clays (brown, grey)					
		solonchaks (salty soils)	soloths (acid soils)	sands	sandy loam	clay loam	other				
	Depth	deep > 10cm			shallow 2-10cm			skeletal < 2cm			
Geology	Mapped:				Observed:						

**Disturbance History**

Disturbance Type (DT)	DT No.	Intensity 1=light 2=moderate 3=severe	% of Site Affected	Time Since Last Event (est.)	Observation / Accuracy i.e. + / - 2 years + 1=visual est. / 2=written record / 3=information	1. Photo point 2. Site 3. Both
1.Wild fire 2.Hazard reduction burn 3.Flooding 4.Frost 5.Wind storm 6.Hail storm 7.Electrical storm 8.Weeds 9.Soil removal 10.Dumping 11.Recreational vehicles 12.Insect damage 13.Logging / timber harvesting 14.Clearing 15.Herbicide 16.Erosion 17.Subsidence 18.Grazing 19.Native fauna 20.Feral animals 21.Runoff 22.Nutrication 23. Other						

Notes:

**Habitat Attributes / Resource (HAR) Assessment**      Score by counting / estimating % of trees / shrubs with HAR characteristic or the number of habitat attributes or individuals, whatever is most appropriate under the corresponding column

HAR Characteristic & No.	HAR No.	100-75%	75-50%	50-25%	25-5%	<5%, many on each individual	<5%, few on each individual	None	# hab / attr or individuals	1. Photo point 2. Site 3. Both
1.Large tree hollows (trunk, >300mm) 2.Large tree hollows (branch, 100-300mm) 3.Small tree hollows (branch, <100mm) 4.Decortivating bark 5.Fleshy fruit 6.Nectar producing plants / flowers 7. Mistletoe 8.Epiphytes (stag-elk ferns) 9.Soaks 10.Small stags (<100mm dbh) 11.Large stags (>100mm dbh) 12.Large rocks / rocky outcrops 13.Large logs 14.Small logs 15. Other										
If other, please describe										

Notes:

Ground Layer (visible)	Veg.	Bare Soil	Litter	Rock	Log
Cover (%) (total add to 100%)					
Litter	Average (cm)	>10cm	10->2cm	2-0cm	0cm
Litter Depth		deep	mod.	shallow	absent
Humus Depth		deep	mod.	shallow	absent



## RESTORATION WORK REGENERATION DAILY RECORD DATA SHEET

Remnant / Site / Name:			Supervisor Name & Contact:			Site Owner & Contact:			APVMA Permit	Date			
Zone:			Justine Elder 0448519923			Bellingen Shire Council Manager			PER9907	Code			
Team Members & Hours Worked: <i>e.g. J Bloggs - 7.36</i>						Herbicide Use Checklist Completed ( <input type="checkbox"/> )		Total Hours:	Total Days:	Days Complete	Days Remaining:		
Area / Zone / Description		LGA	Spraying Time Start	Spraying Time Finish	Dune	R / F	Riparian	Other	Primary m <sup>2</sup>	Follow Up m <sup>2</sup>	No. Trees Planted	Area Planted m <sup>2</sup>	Length Planted Riparian
Area / Zone / Description	Target		Chemical Used	Herbicide Brand	Rate Used	Volume Used (ml)	Additives	Total Volume Used	Equipment Used	Wind Speed	Wind Direction	Other Weather Details	
			Glyphosate Metsulfuron methyl Other:	Roundup bioactive® Weedmaster duo® Brushkiller 600® Associate®	1:100 1:50 1:1.5 1:50+1.5g/10L Neat 1.5g/10L		Li700 Protec plus® Pulse Tru Blue Vege dye		Backpack Stem injector Poison pot	5 km/h	N	Cloudy	
<b>Comments:</b> Site / work details, manual weeding notes, growing conditions, vegetation type, priorities, significant flora / fauna, weather condition changes etc													
<b>Mark on a map location of work each day.</b>													