Vegetation Management Plan

Lennox Head South

Report prepared for Ballina Shire Council

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June 2022

DOCUMENT CONTROL

Revision	Date	Description	Prepared	Reviewed
DRAFT	3 Feb 2021	Draft HRP Lennox remnants (BSC)	R.James / A. McKinley	S.Pimm
REVISED DRAFT	15 March 2021	Lennox Head South Vegetation Management Plan	S.Pimm	R.James
REVISED DRAFT V2	3 May 2021	Lennox Head South Vegetation Management Plan	RJames	S.Pimm
Final V1	4 May 2021	V1_Lennox Head South Vegetation Management Plan	R.James	J.Brideson
Revised V2	29 April 2022	V2_Lennox Head South Vegetation Management Plan	S.Pimm	J.Brideson
Revised V3	6 June 2022	V3_Lennox Head South Vegetation Management Plan	S.Pimm	K.Johnson
Revised V4	20 June 2022	V4_Lennox Head South Vegetation Management Plan	S.Pimm	R.James

DISCLAIMER

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EXECUTIVE SUMMARY

Ballina Shire Council contracted Bushland Restoration Services to prepare a Vegetation Management Plan (VMP) for vegetated public reserves at Lennox Head. The overall site is approximately bounded by The Coast Road in the east, Skennars Head Road in the south, North Creek Road in the west and Palisade Way in the north.

This VMP discusses a variety of previous restoration and offset plans which relate to distinct parts of the overall site. Appropriate actions and recommendations from these previous plans have been incorporated into this current plan. This VMP is intended to be used to guide the restoration of the various bushland reserves, proposed to be implemented using a combination of Landcare volunteers, industry professionals, Council staff and local residents.

The overall site is of high environmental value and includes:

- Endangered Ecological Communities listed under the NSW *Biodiversity Conservation Act 2016* and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.
- Threatened flora species listed under both Acts listed above, including Coastal Fontainea *Fontania oraria,* a species with a distribution limited to the Lennox Head area.
- Mapped 'Coastal Wetlands' and 'Proximity to Coastal Wetlands' under *State Environmental Planning Policy (Resilience and Hazards) 2021.*
- Mapped 'Littoral Rainforest' and 'Proximity to Littoral Rainforest' areas under the above SEPP.
- Mapped High Biodiversity Value (in part) on the Biodiversity Values Map, authorised by the *Biodiversity Conservation Act 2016*.
- Part of a regional coastal wildlife corridor.
- A wide variety of contiguous and fragmented vegetation and habitat types, ranging from floodplain to coastal hillslope communities.

This plan addresses these values and provides details as to restoration actions that could be carried out to improve habitat for flora and fauna. It will also add to conservation and restoration information available to local residents.

The subject site is divided into sixteen reserves owned and managed by Ballina Shire Council (primarily as Community Land), with a total area of 32.5 hectares. The remnants range in size from 0.073 hectares on North Creek Road reserve to 14.49 hectares at Tara Downs.

This plan divides the overall site into management zones and provides detailed vegetation restoration actions, including identifying and providing control measures for the invasive weed species throughout the subject site. Littoral Rainforest is the most prevalent and important vegetation community within the VMP area and a rehabilitation planting species list is provided for revegetation of suitable cleared areas.

1. INTRODUCTION

Ballina Shire Council contracted Bushland Restoration Services to prepare a Vegetation Management Plan (VMP) for numerous vegetated reserves at Lennox Head South.

The area subject to this Vegetation Management Plan is divided into sixteen reserves with a total area of 32.5 hectares. The reserves range in size from 0.073 hectares on North Creek Road (unformed road reserve) to 14.49 hectares at Tara Downs (land dedicated to Council following residential subdivision).

1.1 Location

The subject site is in Ballina Shire, west of The Coast Road between Lennox Head and Skennars Head. The project area is bounded by Skennars Head Road in the south, The Coast Road in the east and North Creek Road in the west, with an elevated vegetated ridgeline running along the northern boundary.

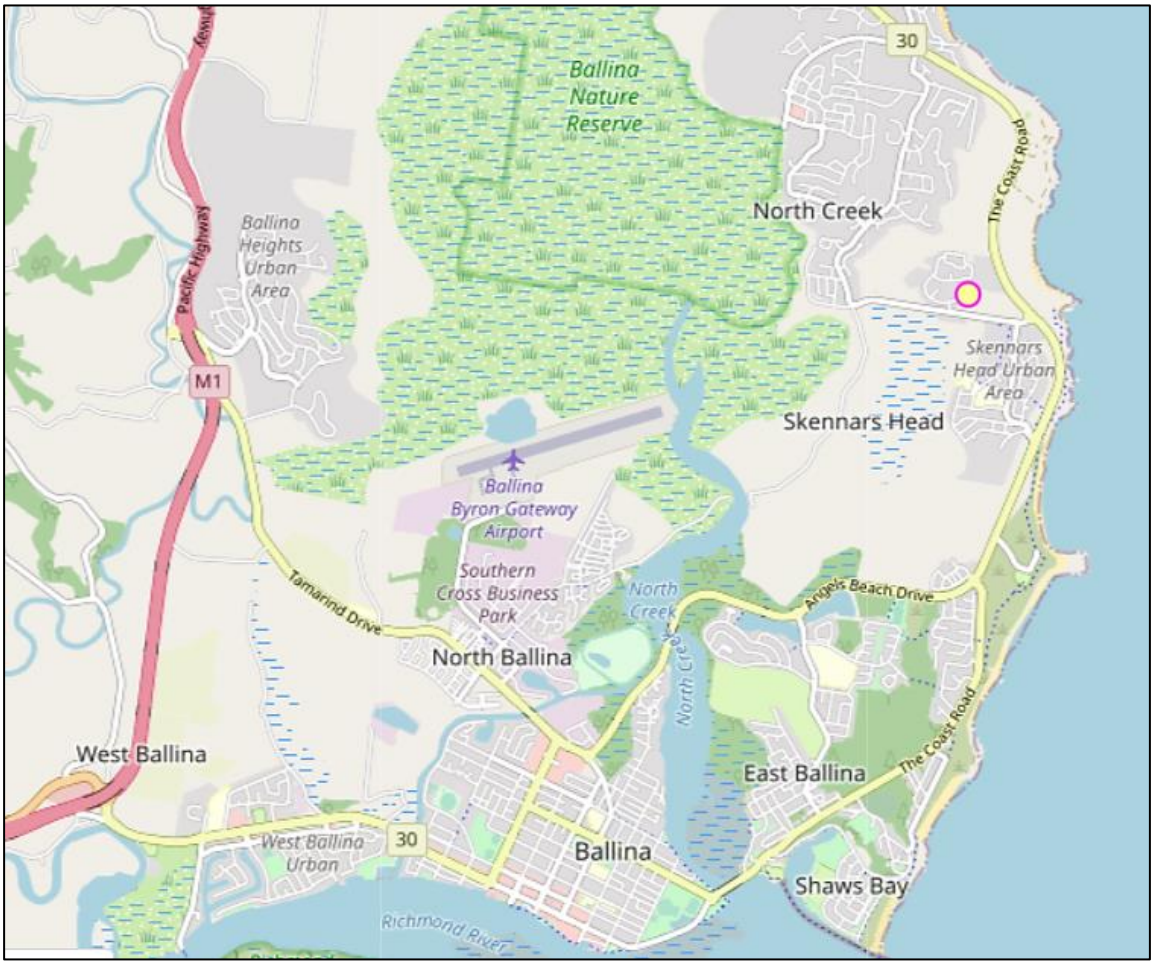


Figure 1: The approximate location of the reserves in shown by the yellow dot above.

1.2 Aims and Objectives

The aims of this Vegetation Management Plan are to improve the condition of retained vegetation and fauna habitat, and to inform and educate local residents as to the reserve values.

The primary objectives as detailed in the brief are:

- *VMP zonings and restoration actions to guide both contractors and volunteers.*
- *Address fauna habitat improvement considerations for ongoing restoration efforts.*
- *Address all weed species identification, issues and control measures.*
- *Recommend rehabilitation planting species where required and suitable.*
- *Address vegetation management and related issues.*
- *Address Coastal Fontainea protections and management including avoiding further plantings within 30m of infrastructure including underground services.*

The VMP will be used to guide the restoration of the various bushland reserves with a combination of Landcare volunteers, industry professionals, Council staff and residents implementing the plan.

Plate 1: Remnant and planted vegetation occurs amongst residential development

2. PROJECT AREA DESCRIPTION

2.1 Property Details

The sixteen reserves which make up the subject Zone have each been given a number and name for easy identification (see **Table 1** and **Figure 2** below). All reserves are Ballina Shire Council-owned Community Land, apart from the soccer fields (Operational Land) and linear areas along unformed road reserves.

Table 1: Work Zone Property Descriptions

Zone	Approximate size (hectares)	Reserve Name	Real Property Description
Zone 1	2.79	Soccer Field Wetland East	Lot 13 DP 1245669
Zone 2	0.29	Soccer Field Wetland West	Lot 13 DP 1245669
Zone 3	1.77	Kellie-Ann Crescent east Rainforest	Lot 47 DP 833002
Zone 4	1.25	Henderson Drive SEPP Rainforest	Lot 62 DP 864764
Zone 5	0.34	Kellie-Ann Crescent south Rainforest	Lot 47 DP 833002
Zone 6	0.21	Henderson Drive Fig 1	Lot 46 DP 833002
Zone 7	0.21	Henderson Drive Fig 2	Lot 46 DP 833002
Zone 8	14.49	Tara Downs	Lot 30 DP 833002
Zone 9	0.11	North Creek South	Lot 31 DP 715304
Zone 10	0.43	North Creek Central	Lot 31 DP 715304
Zone 11	6.34	Palisade Way	Lot 17 DP 261887 & Lot 28 DP 708120
Zone 12	0.07	North Creek North	Lot 16 DP 261887
Zone 13	0.31	North Creek Far North	Lot 15 DP 261887
Zone 14	0.47	The Pines	Lot 11 DP 627149
Zone 15	0.13	Fieldcrest Fig	Lot 232 DP 1076122
Zone 16	3.55	Rainforest Way	Lot 126 DP 828137
Total area	**32.75 ha**		

2.2 Landuse zoning

The reserves are primarily zoned DM 'Deferred Matter' under Ballina LEP 2012, intended to be rezoned to 'Conservation'. The Skennars Head sportsfield area and smaller urban parks and parcels adjacent subdivisions are zoned RE1 Public Recreation. Surrounding housing land is generally zoned R2 Medium Density Residential.

Under Ballina LEP 1987, the DM parcels were variously zoned 1(b) Rural (Secondary Agricultural Land) at Palisade Way south; 6(a) Open Space at Tara Downs north and Palisade Way north; 7(a) Environmental Protection (Wetlands) at the soccer fields wetlands east and Tara Downs wetlands and 7(l) Environmental Protection (Habitat) at the soccer fields wetlands west.

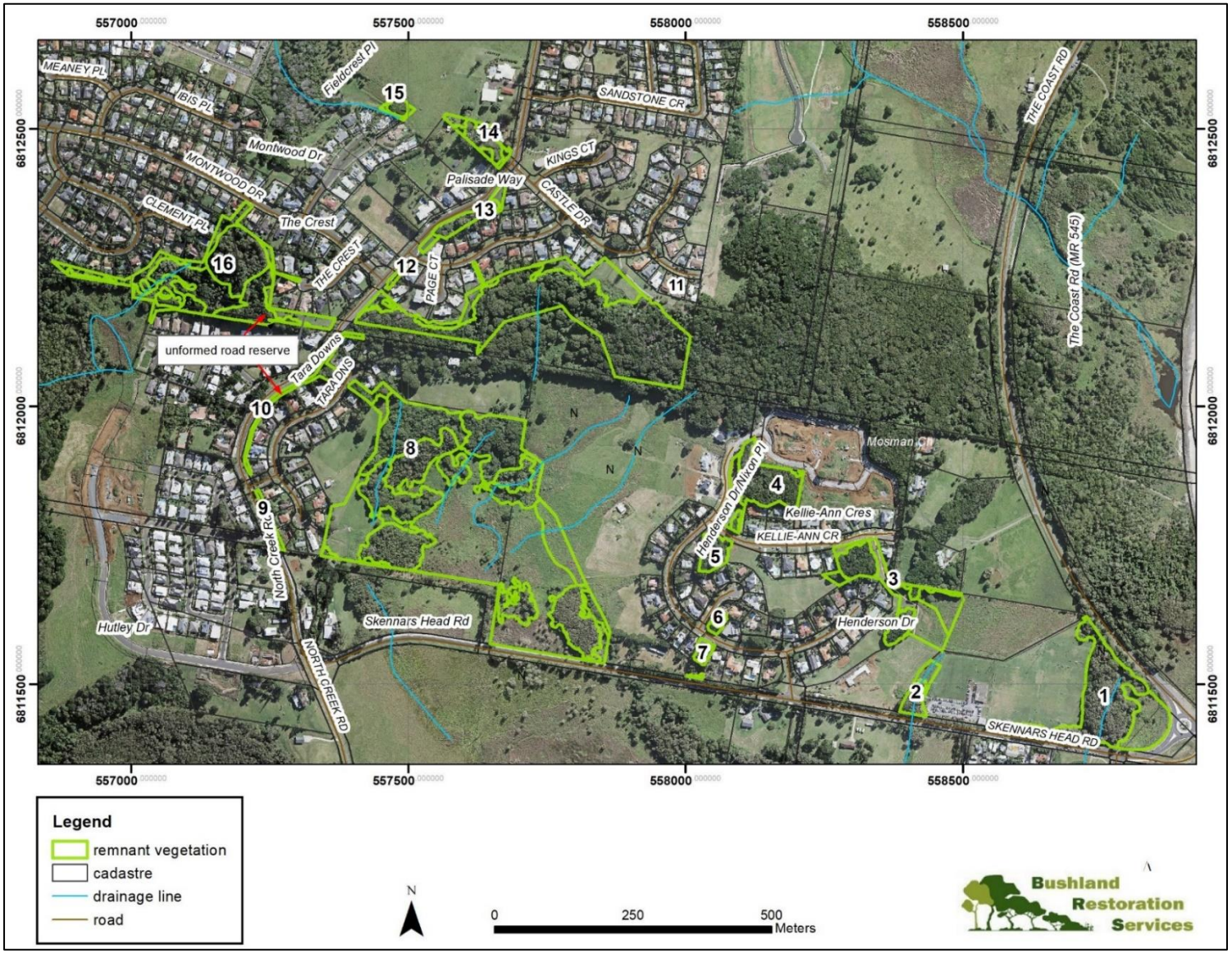


Figure 2: The sixteen reserves are indicated by the green outlines above.

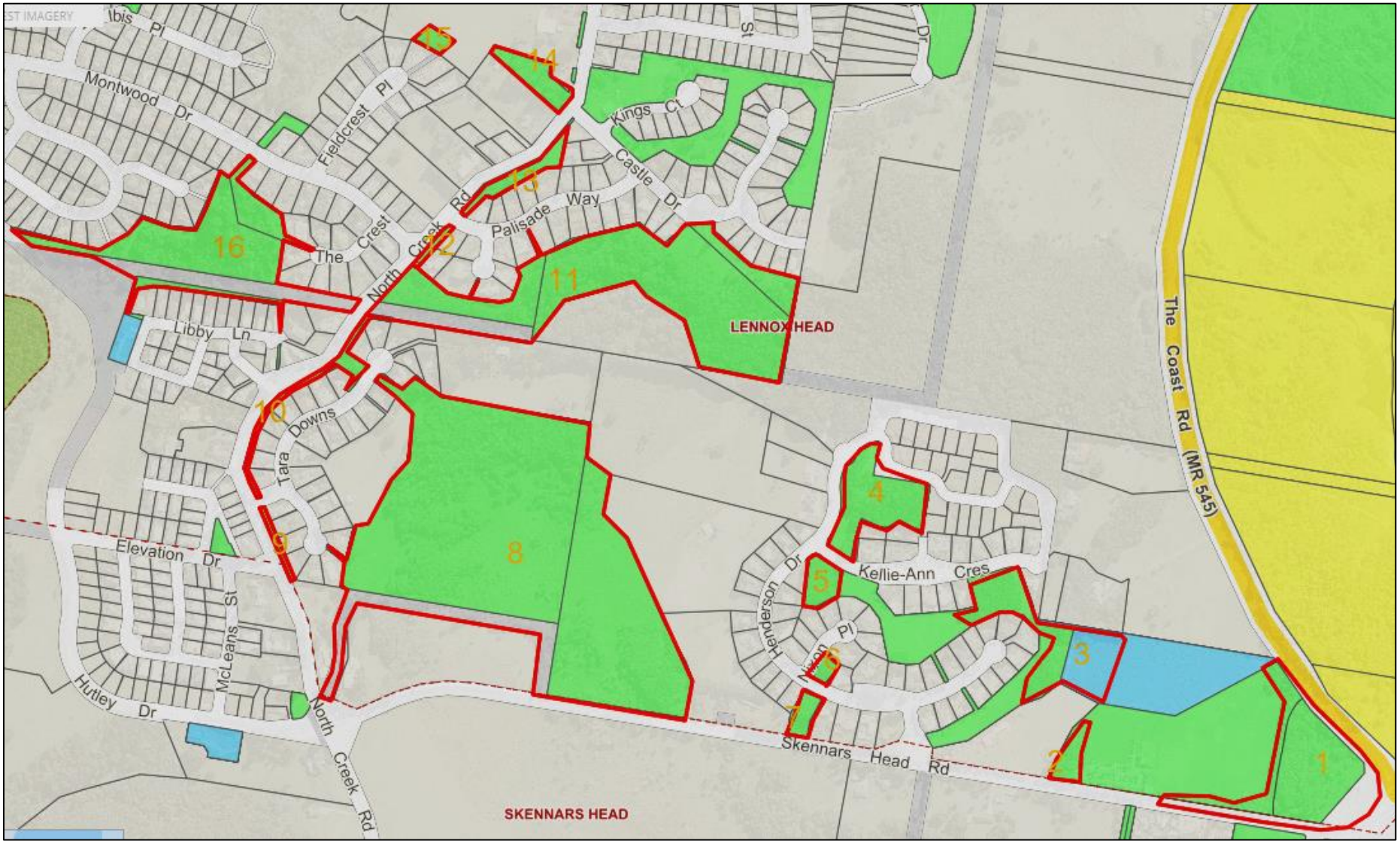


Figure 3: Community land is indicated in green, operational land in blue and road reserve in grey.

2.3 Site Access

Access is easily obtained by a two-wheel drive vehicle to each of the reserves from the adjacent sealed roads.

2.4 Topography, Geology and Soils

The central area of the site between Tara Downs and Henderson Drive is low-lying and contains first-order drainage lines running down from the escarpment, as well as coastal floodplains. The rainforest areas have a southerly aspect.

Lennox Head is one of the few places in the region where lava flows from the Wollumbin (Mount Warning) volcano reached the coast. The underlying geology is basaltic. Most of the site is mapped under Morand (1996) soil landscapes as *Bangalow*, within a landscape of low rolling hills on basalt. Relief is 40–100 m, elevation 100–150m AHD and slopes are 15–25%. Soils are moderately deep to deep well-drained ferrosols and brownish red ferrosols, deep, poorly drained alluvial ferrosols in drainage lines.

The eastern area of the sports field zone is mapped as *Tyagarah* soils, with a greater aeolian influence resulting in a sediment basin of mixed estuarine and aeolian origin forming level to gently undulating plains.

2.5 Vegetation Overview

The Zone contains eight primary vegetation types:

A total of seven (8) vegetation community (VC) types were recorded during field survey within the subject Zone. The eight primary vegetation types are listed below as they occur from east to west on the Zone.

1. Freshwater Wetland
2. Swamp Sclerophyll Forest to Woodland
3. Dry sclerophyll forest to shrubland.
4. Littoral Rainforest
5. Subtropical Rainforest, with some areas of established rainforest plantings
7. Established Sclerophyll plantings
7. Isolated Moreton Bay Fig trees and associated vegetation
8. Planted Norfolk Island Pines.

Detailed vegetation descriptions are contained in **Section 6** and illustrated on **Figure 9.**

Additional planted species and garden beds occur around the reserve boundaries with residential dwellings.

2.6 Landscape Context and Connectivity

The Zone is within an important regional fauna corridor running north-south along the coastal zone.

Ballina Nature Reserve occurs along North Creek to the west of the project area.

3. RELATED ENVIRONMENTAL LEGISLATION

3.1 Federal Legislation - Environmental Protection & Biodiversity Conservation Act 1999

The site contains Endangered Ecological Communities and threatened species listed under the *Environmental Protection & Biodiversity Conservation Act 1999 (EPBC Act)* as follows*:*

One EEC listed under the federal EPBC Act occurs on site, being:

1. *-Littoral Rainforest and Coastal Vine Thickets of Eastern Australia*. The large remnant of Littoral Rainforest south of Palisade Way (Zone 11) is likely to meet the guidelines for the Commonwealth EPBC Act listing for *Littoral rainforest and coastal vine thickets of eastern Australia.*

EPBC-listed Threatened Flora known from subject site:

- The Critically Endangered Coastal Fontainea *Fontainea oraria*.
- The Vulnerable species Coolamon *Syzygium moorei.*
- The Vulnerable species Rough-shelled Bush Nut *Macadamia tetraphylla.*
- The Vulnerable Hairy Joint Grass *Arthraxon hispidus* has previously been recorded in Tara Downs (Zone 8) and is assumed to be present. The species was not located in the current survey, undertaken when the species dies down over winter.

EPBC threatened flora species known from the 10km x 10km local area and with suitable habitat on site include:

- Scented Acronychia *Acronychia littoralis* - EPBC: Endangered
- Red Lilly Pilly *Syzygium hodgkinsoniae* -EPBC: Vulnerable.
- Stinking Cryptocarya *Cryptocarya foetida* – EPBC: Vulnerable.

3.2 NSW Biodiversity Conservation Act 2016 (BC Act)

Most of vegetation on site is mapped as **High Biodiversity Value** (purple) on the Biodiversity Values Map. No clearing of native vegetation is proposed within the mapped BV area. The site is not within an Area of Outstanding Biodiversity Value.

Endangered Ecological Communities

Four Endangered Ecological Communities (EEC's) listed under the BC Act are present on site:

- *Littoral Rainforest of the NSW North Coast, Sydney Basin and South East Corner bioregions* **-** applies to Zone 3, 4, 5, 8, 11 and 13.
- *Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions* **-** applies to Zone 8 and 16.
- *Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast***,** *Sydney Basin and South East Corner Bioregions* **–** applies to Zones 1a, 1b, 2, and 8c.
- *Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* – Zones 1 and 8 are likely to meet the EEC definition.

Threatened Flora

Four threatened flora species were recorded during current survey of the project area – White Lace Flower *Archidendron hendersonii* (Zone 3), Rough-shelled Bush Nut *Macadamia tetraphylla* (Zone 4 and Zone 8) Coolamon *Syzygium moorei* and Arrow-head Vine *Tinospora tinosporoides* within rainforest communities on the site.

The critically endangered Coastal Fontainea *Fontainea oraria* is known from Zone 11 and is one of a small population on the ridge to the north-east.

Coastal Fontainea is a rainforest tree only known from the Lennox Head area. The extremely low population numbers, and results from a genetic study indicating inbreeding, prompted a recovery program which includes habitat restoration and planting of additional Coastal Fontainea in appropriate habitat in the Lennox Head area. This program has been underway since 2010 and has resulted in planting out of 24 conservation translocation sites consisting of ten plants per site, including three sites within the remnant vegetation mapped as Zone 11, south of Palisade Way and east of North Creek Road. No additional Coastal Fontainea are to be included in rainforest within the project area unless authorised by DPE NPWS. Should further translocation plots be established they are to be placed in locations at least 30m away from pipeline infrastructure (see **Section 6**).

The Endangered Square-stemmed Spike Rush *Eleocharis tetraquetra* and the Vulnerable Hairy Joint Grass *Arthraxon hispidus* have previously been recorded in in Zone 8b at Tara Downs. In 2014 a Compensatory Management Plan was produced to offset potential losses arising to these species from the Tara Downs subdivision development. While not targeted during current survey, they are assumed to be present and are addressed in the Restoration Strategy and Monitoring sections of this report.

Hairy Joint Grass (HJG) is a moisture and shade-loving grass, found in moist sites on the margins of seepages and waterways, often near creeks or swamps or on the edges of rainforest and in wet eucalypt forest. Previous surveys for the species established that HJG would migrate upslope during wetter years and contract towards moist depressions during drier years. The main potential threat to Hairy Joint Grass is weed invasion. Competition from introduced grasses such as Setaria *Setaria sphacelata,* Paspalum *Paspalum mandiocanum* and Kikuyu *Pennisetum clandestinum* is likely to be the biggest threat at this site, while Mist Flower *Ageratina riparia*, Crofton Weed *Ageratina adenophora* and Lantana *Lantana camara* pose threats along creeks in forested habitats. Fire should be excluded from sites where this species occurs. Minor disturbance appears to improve the species persistence, most often due to light grazing but also occasional fire or slashing (no more than annually). This species is susceptible to Tordon® and this chemical should not be used in the compensatory area.

Squared-stemmed Spike Rush is found on the edges of freshwater wetlands. The species occupies habitat at or below the normal (non-flood) wet season level of the water table, characterised by vegetation successions arising from the disturbance associated with erosion and/or deposition. Some disturbance appears necessary for a population to flourish, as is higher light availability outside the edges of dense or tall vegetation. The species is susceptible to Glyphosate® and this herbicide should not be used on wetland edges.

Other threatened flora species previously recorded in the local area and with potential habitat on site include Stinking Cryptocarya *Cryptocarya foetida,* and Slender Cucumber *Neoachmandra cunninghamii.*

Threatened Fauna:

The VMP project area provides a contrast of vegetation community types that together support a range of habitat types for native fauna, including threatened species. Movement opportunities for fauna through the study area are limited by fragmentation of native vegetation, cleared lands, development and roads. Nectivores and frugivores such as Rose-crowned Fruit Dove *Ptilinopus regina* and Superb Fruit Dove *Ptilinopus superbus* and Grey-headed Flying-fox *Pteropus poliocephalus* are likely to use Littoral and Subtropical Rainforest, while wetland specialists such as Black Bittern *Ixobrychus flavicollis*, Wallum Froglet *Crinia tinnula* and Olongburra Frog *Litoria olongburensis* may be present in the coastal wetlands.

In low-lying and wet areas of potential Olongburra Frog and Wallum Froglet habitat such as Melaleuca swamp and sedgeland, a hygiene protocol should be implemented in accordance with 'Threatened Species Management

Information Circular No. 6 - Hygiene protocol for the control of disease in frogs' (NSW National Parks & Wildlife Service 2008 – see link) https://frogwatchsa.com.au/files/618_hyprfrog.pdf?v=982

The project area is not mapped as any of the following categories under the *Ballina Shire Council Koala Management Strategy 2016* – important population, core Koala Habitat or Preferred Koala habitat. One preferred Koala food tree species Swamp Mahogany is present on the Zone due to planting in Zone 1 Soccer Fields east, Zone 10 North Creek Central and Zone 13 North Creek Far North. Occasional Koala records occur to the north (2019) and south-east (2012). The paperbark area could be used as a movement corridor during dispersal but does not provide preferred Koala habitat. Some Swamp Mahogany have been planted on the wetland edge in Zone 1 Soccer Fields east.

State Environmental Planning Policy (Resilience and Hazards) 2021

The site includes vegetation mapped as 'Coastal Wetland', 'Littoral Rainforest' and 'proximity areas' (or buffers) to the two vegetation types. The Paperbark swamp and Freshwater wetland parts of the project area are mapped as *Coastal Wetlands* under Chapter 2 Coastal Management of *State Environmental Planning Policy (Resilience and Hazards) 2021*. Much of the northern reserves area is mapped as *Littoral Rainforest* under the SEPP. Zone 1 is also mapped as 'Coastal Environment Area'. See **Figure 4 below**.

Restoration works will not trigger any impact that would require assessment under Clause 2.7, 2.8 or 2.10 of the SEPP.

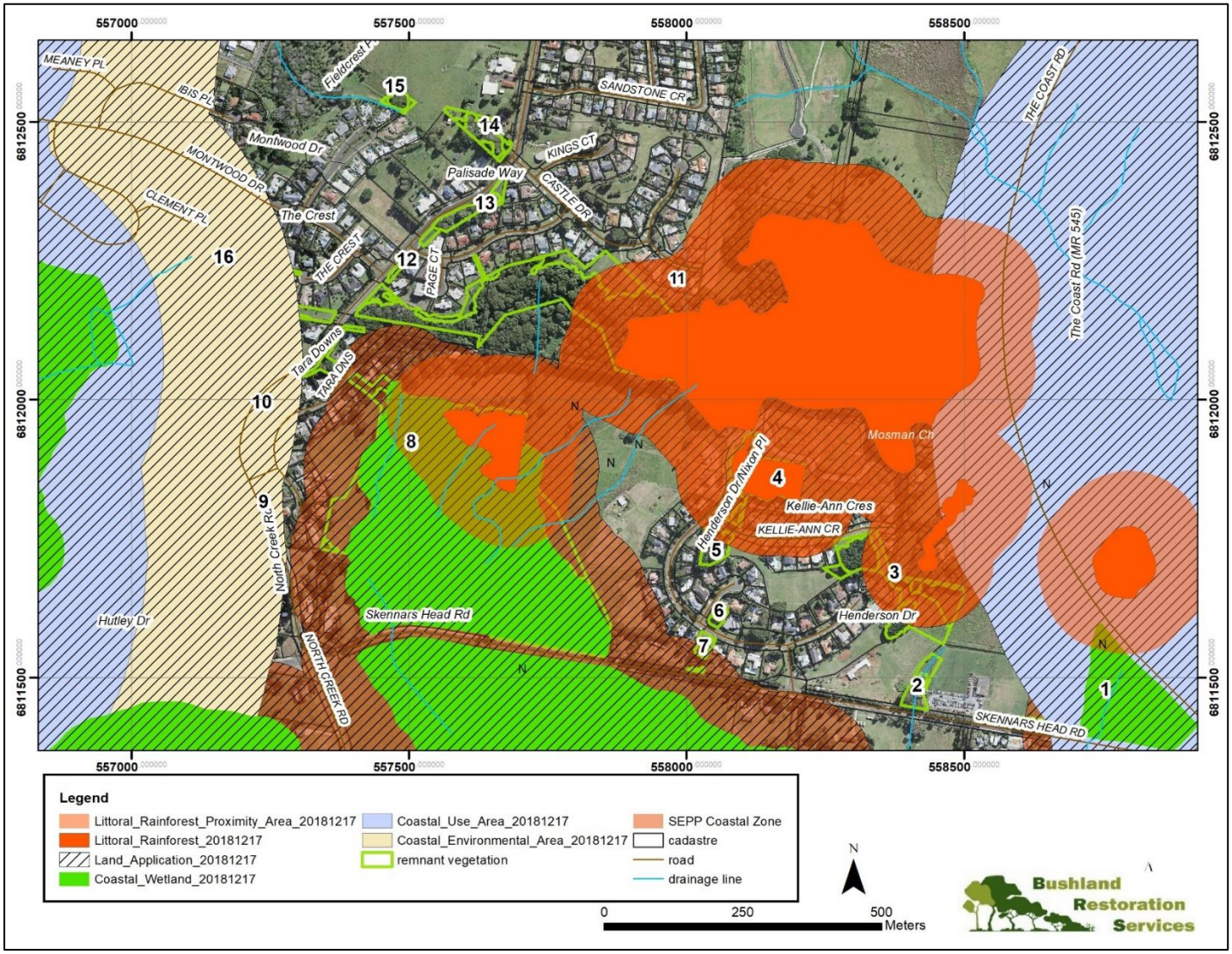
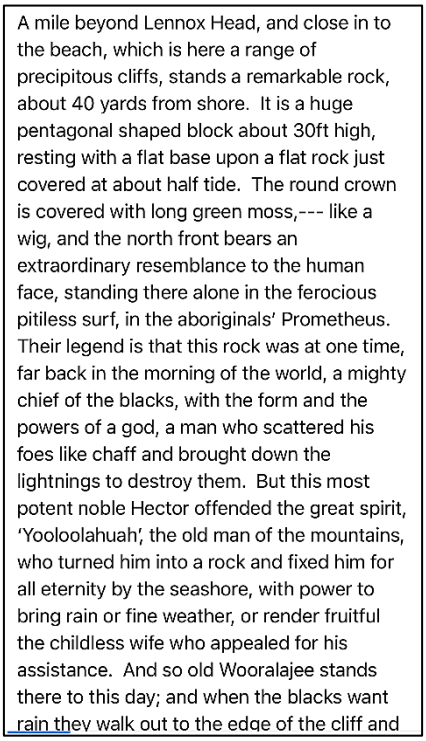


Figure 4: SEPP (Resilience and Hazards) mapping. Orange shading indicates Littoral Rainforest and its 'proximity area'. Green shading indicates Coastal Wetlands.

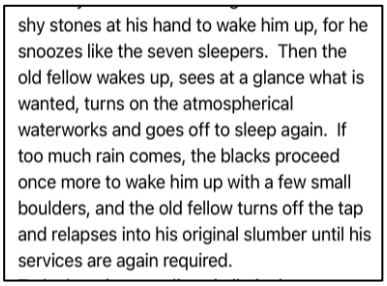
4. ABORIGINAL CULTURAL HERITAGE

An extensive Aboriginal Heritage Information Management System (AHIMS) search was undertaken and returned 34 sites of importance within the local area. They include open campsites, middens, a stone quarry, potential archaeological sites, and Aboriginal Culture and Dreaming sites.

Much of the local Aboriginal history is anecdotal, as in this example reported in *The Queenslander* newspaper of 22 May 1880 concerning 'Shag Rock' on the coastline north of Boulder Beach, which collapsed during a heavy ocean storm in June 2012:



A mile beyond Lennox Head, and close in to the beach, which is here a range of precipitous cliffs, stands a remarkable rock, about 40 yards from shore. It is a huge pentagonal shaped block about 30ft high, resting with a flat base upon a flat rock just covered at about half tide. The round crown is covered with long green moss,--- like a wig, and the north front bears an extraordinary resemblance to the human face, standing there alone in the ferocious pitiless surf, in the aboriginals' Prometheus. Their legend is that this rock was at one time, far back in the morning of the world, a mighty chief of the blacks, with the form and the powers of a god, a man who scattered his foes like chaff and brought down the lightnings to destroy them. But this most potent noble Hector offended the great spirit, 'Yooloolahuah', the old man of the mountains, who turned him into a rock and fixed him for all eternity by the seashore, with power to bring rain or fine weather, or render fruitful the childless wife who appealed for his assistance. And so old Wooralajee stands there to this day; and when the blacks want rain they walk out to the edge of the cliff and



shy stones at his hand to wake him up, for he snoozes like the seven sleepers. Then the old fellow wakes up, sees at a glance what is wanted, turns on the atmospherical waterworks and goes off to sleep again. If too much rain comes, the blacks proceed once more to wake him up with a few small boulders, and the old fellow turns off the tap and relapses into his original slumber until his services are again required.

The following information was obtained from previous Vegetation Management Plans prepared by EnviTE, as stated within the *Lennox Head Coastal Vegetation Management Plan* (Blackwood 2018). It relates to the local Lennox Head area.

A well-preserved Bora Ring is located in Gibbon Street in Lennox Head. This ceremonial Zone for the Nyangbul people (a sub-group of the Bundjalung) and the adjacent well established workshop areas, campsites and middens bear witness to long occupation and was declared an Aboriginal Place under the management of the National Parks and Wildlife Service (NPWS) in 1973. Jolander Nayutah from the Gungil Jindabah Centre at Southern Cross University (Lismore) has advised that Lake Ainsworth to the north of town is the subject of a dreaming story. This refers to three Bundjalung brothers, which has been documented by NPWS officers (AWACS, 1996). The lake was also known to contain large eels and turtles in the past that would have supplemented other food resources such as the Pipi (Plebidonax deltoides) and seasonal mass gatherings of spawning mullet, tailor and salmon.

Midden sites have also been recorded to the north and south of Seven Mile Beach on old remnant dunes behind the beach and small deposits of Turbinidae sp. shells have been uncovered near the old four-wheel-drive beach access track by Dunecare workers. Quartz was reportedly mined at Iron Peg for cutting tools.

Clearly the local area is of high significance to local Aboriginal people. Works proposed in this plan will improve the condition of local remnant vegetation, improve habitat value for local native fauna species and preserve the integrity of the area.
Jali Local Aboriginal Land Council (LALC) is the consultative body for indigenous related matters within Ballina Shire. Consultation with the Jali LALC should occur prior to undertaking any works that involve disturbance of the ground surface (with the exception of planting works) to ensure protection of cultural objects or sites.

Cultural Heritage Act 2018
A basic Aboriginal Cultural Heritage Information Management Services (AHIMS) search was undertaken for the area and returned 21 Aboriginal Sites recorded in or near the location, with no Aboriginal places declared in or near the location. A further extensive AHIMS search was carried out and found 34 local sites in the surrounding coastal area, including open campsites, middens, a stone quarry, potential archaeological sites and Aboriginal Culture and Dreaming Sites.

While the proposed works will create minimal disturbance, artefacts or shell middens could be encountered during restoration works. In the event that any Aboriginal artefacts, skeletal remains or shell midden materials are encountered, works are to stop, and the Sites Officer with Jali Aboriginal Land Council is to be notified immediately. Works are not to commence until the Sites Officer gives his or her approval. An Aboriginal Heritage Impact permit may be required before works can continue.

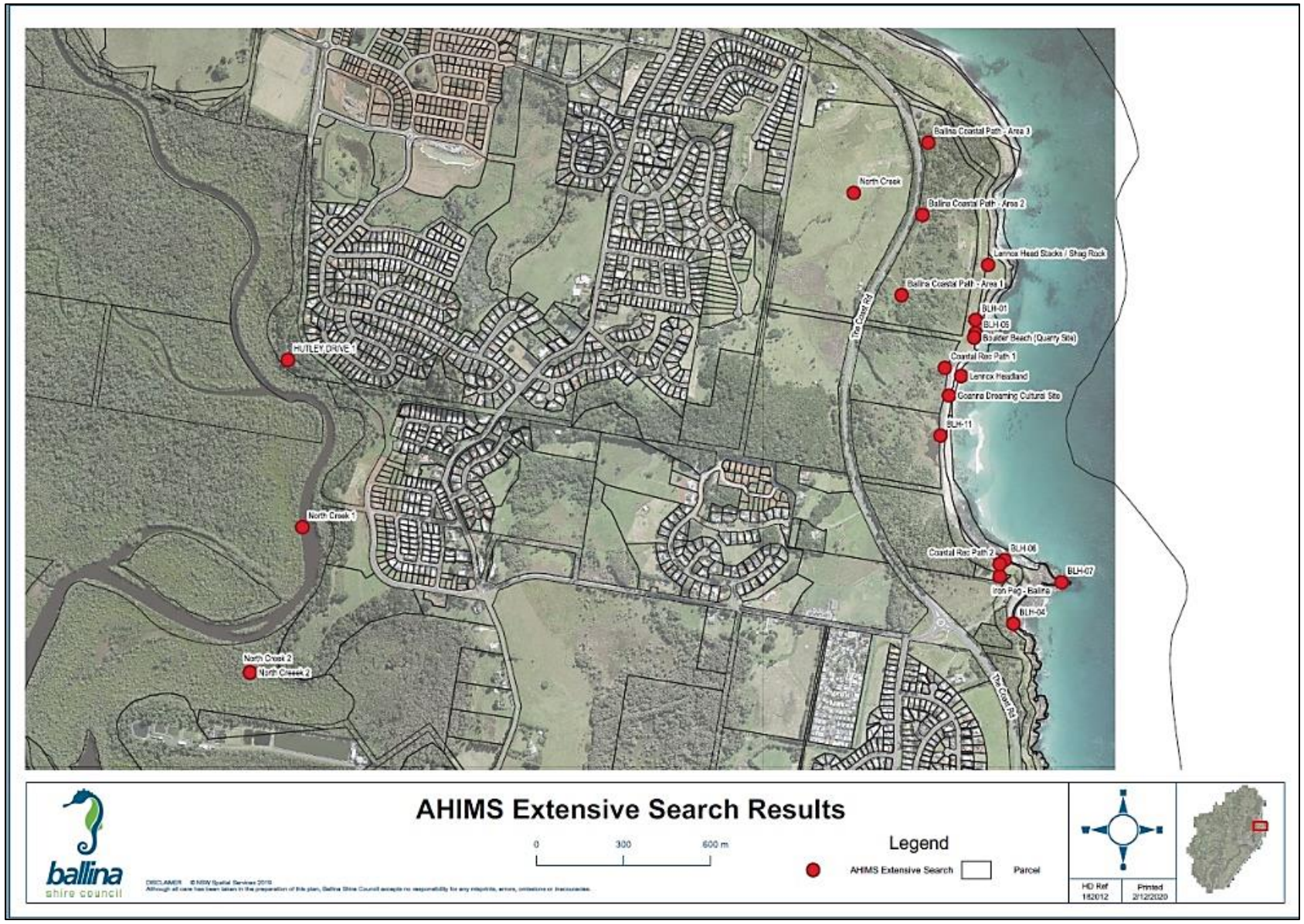


Figure 5: Results of Aboriginal Heritage Information Management Services search. Red dots indicate sites of cultural heritage significance.

5. EXISTING RESTORATION PLANS and WORKS

The following plans have been previously prepared for Zones included within this Plan.

5.1 Zone 3c Littoral Rainforest (Melaleuca Group)

- *Vegetation Management Plan as offset for proposed extension to Skennars Head soccer fields at Lot 12 DP 1181479, 54 Skennars Head Road, Lennox Head* – unpublished report to Newton Denny Chapelle by Melaleuca Group Pty Ltd (undated).

The above plan aimed to "reinstate high conservation and/or high-quality vegetation as an offset to vegetation removed" for the purpose of construction of additional sportsfields and adjacent roadworks. Compensatory zones A, B, C, and D of the abovenamed plan apply to this current Vegetation Management Plan (VMP), described herein as the eastern section of Zone 3.

Zone A and Zone B of this plan were revegetated in 2019 and are currently maintained by bush regeneration contractors. Work to date includes weed removal undertaken through spraying exotic grasses, annual weeds, Ground Asparagus, Lantana and Bitou Bush. Zone C was planted in 2020 and is under active management. Zone D is currently mown by Council and has potential for future planting to Littoral Rainforest as funds become available. Further information for this Zone is available in **Section 8.2**.

5.2 Zone 4 Henderson SEPP (Bushland Restoration Services 2017)

- *Vision Estate Rehabilitation Plan - Lot 62 DP864764.Condition of Consent 48 DA 2016/166, Henderson Drive Lennox Head (2017).* Report prepared for Newton Denny Chapelle P/L by Bushland Restoration Services.

This plan proposed restoration works in Zone 4 of this VMP. Primary and follow-up weed control work has been completed by bush regeneration contractors, and maintenance is ongoing.

- *Vision Estate Weed Eradication and Buffer Enhancement Plan - Lot 27 (Lot 7 DP 1216761, Lot 12 DP 814039, Lot 52 DP 864764 & Crown Public Road), Henderson Drive and Kellie Anne Crescent, Skennars Head. DA 2016/166.* Report prepared for Newton Denny Chapelle P/L by Bushland Restoration Services.

The abovenamed plan provided actions for weed eradication works and buffer planting along the eastern edge of the Zone 4 remnant Littoral Rainforest. Revegetation is complete in this area and is currently under maintenance. The Littoral Rainforest was included in the restoration undertaken by BSC contractors. Further areas along Henderson Drive are mown and maintained by BSC, where additional planting potential exists.

5.3 Zone 8 Tara Downs (Tara Downs Landcare)

- *Planning Proposal – Lot 12 DP 8813210 (BSCPP 14/004 – 16 Tara Downs, Lennox Head).* Report to Ballina Council by staff.

The Planning Proposal relates to the allotment listed above, which was vacant at the time. In 2004, the owners sought a Local Environment Plan rezoning from rural to residential land to enable subdivision. Ecological assessment undertaken as part of this process found a patch of grassland some 505m^2 in area contained the threatened species Hairy Joint Grass *Arthraxon hispidus*. The conclusion reached in the assessment was that this patch of Hairy Joint Grass (HJG) was unlikely to be viable in the longer term due to its small size, the relatively low proportion of HJG within the patch and the uncertainty regarding ongoing land use, particularly the absence of cattle grazing and a proposed ongoing mowing/slashing regime.

To compensate for the loss of HJG, the proponent proposed compensatory habitat offset works. An agreement was reached as a condition of rezoning that the proponent fund the preparation of a Vegetation Management Plan and the associated establishment, maintenance and monitoring of a compensatory habitat planting area of 0.35ha.

Zone 8 of this VMP comprises the offset area that was set aside for Hairy Joint Grass. Works in this Zone were initiated by the Tara Downs Landcare Group but ceased more than ten years ago. The following plan was written to specify compensatory habitat areas for protection and restoration.

- *Compensatory Habitat Management Plan "Tara Downs"*. Report to Ballina Shire Council by SMEC (2014).

The report aimed to offset loss of Hairy Joint Grass *Arthraxon hispidus* found on part of the Tara Downs proposed residential subdivision allotments. Site assessment indicates that none of these targets are likely to have been met as of 2022, due to the invasion of environmental weeds and in the absence of additional planting and maintenance. This plan includes restoration actions over the Zone that will improve each of the habitat values sought as compensation. Additional compensatory allocations proposed by the plan are indicated in the **Figure 14.**

- *Management Plan and Proposal for Regeneration of Tara Downs Rainforest, Palm Forest and Wetlands*. Unpublished report to Ballina Shire Council by Craig Copeland and Tara Downs Landcare Group (undated). https://ballina.nsw.gov.au/files/Regeneration_Tara_Downs_Rainforest_New.pdf

This compensatory plan is to be superseded and will provide further restoration opportunities for implementation of this VMP.

5.4 Zone 11 Palisade Way (NSW DEC 2005)

- *Draft Recovery Plan for* Fontainea oraria *Coastal Fontainea*. NSW Department of Environment and Conservation (2005). https://www.environment.nsw.gov.au/resources/nature/recoveryplanDraftFontaineaOraria.pdf

Translocations of Coastal Fontainea were undertaken as part of Recovery Plan Actions. These plots are subject to monitoring and the species protected. Zone 11 and the adjacent eastern Littoral Rainforest is under active management by bush regeneration contractors, which commenced in 2016. The work includes three translocation plots. A small section along the northern boundary of Zone 11 at the western extent is maintained by bush regenerators under contract to BSC.

5.5 Zone 16 Rainforest Way (EnviTE 2007)

- *Rainforest Way Vegetation Management Plan* (Envite 2007). https://ballina.nsw.gov.au/files/RainforestWayVegetationPlan.pdf

The detailed plan produced is still relevant to guide restoration works as little work has been undertaken in the Zone to date. Zone 3 of the above-listed VMP was planted by the developer of the Pacific Pines estate prior to handing the reserve over to the community. A range of Eucalyptus species (not generally suited to the coastal zone) provide the only sclerophyll community within the subject Zone. Additional plantings include Coast Banksia *Banksia integrifolia*, Brush Box *Lophostemon confertus* and White Bottlebrush *Callistemon salignus*. While these species do occur on the North Coast they would not usually be found on this soil type.

6. EXISTING INFRASTRUCTURE and CONSTRAINTS

Existing assets and potential constraints to restoration actions are listed below.

6.1 Sportsfields

Zone 1 surrounds Ballina Council managed sports fields on the corner of The Coast Road and Skennars Head Road. Additional pressure may arise from human visitation; however, the fields and carparks are well -defined and remnant vegetation is not likely to be subject to damage or removal as a result.

6.2 Walkways

Walkways between residential dwellings provide pedestrian access to Zone 8, Zone 11 and Zone 16. Parks are public use areas and various pathways and facilities occur within the recreational zones.

Parts of the site are unformed crown road reserves managed by Ballina Shire Council.

6.3 Residential housing

Several of the Zones are adjacent to residential housing and some plantings have been undertaken on Council land, with weed encroachments occurring from garden escapees. Restoration work will focus on removal of exotics. The main threat to the reserves is environmental weed encroachment. Residential encroachment, exotic planting, garden dumping and stormwater discharge are also issues.

It is recommended to erect signage at strategic locations to indicate 'bush regeneration works in progress – please keep out/ no garden dumping' and to hold workshops to educate local residents.

6.4 Pipelines

Water, sewer and recycled water supply pipelines run near or through a number of the reserves subject to this VMP. On **Figure 6** below aqua coloured lines represent drinking water pipelines, blue lines represent wastewater pipelines and yellow lines indicate recycled water pipelines. Future plantings or translocations should avoid planting within 6m of pipeline locations due to the need for maintenance access.

A water pipeline runs close to translocated Coastal Fontainea *Fontainea oraria*. Future Coastal Fontainea plantings require a 30m buffer from any pipelines.

6.5 Bushfire Management

The Palisade Way Fire Trail is located south of Palisade Way Zone 11 (see **Figure 7**), providing emergency access for bushfire-fighting purposes. The trail is maintained by BSC. The trail is to be maintained as a cleared area and no planting undertaken in this area.

The Pacific Pines Asset Protection Zone has been established south of Pacific Pines estate adjacent Zone 16, (see **Figure 8**) and is maintained by Ballina Shire Council (BSC). It is important to keep this area open and prevent planting within the protection zone.

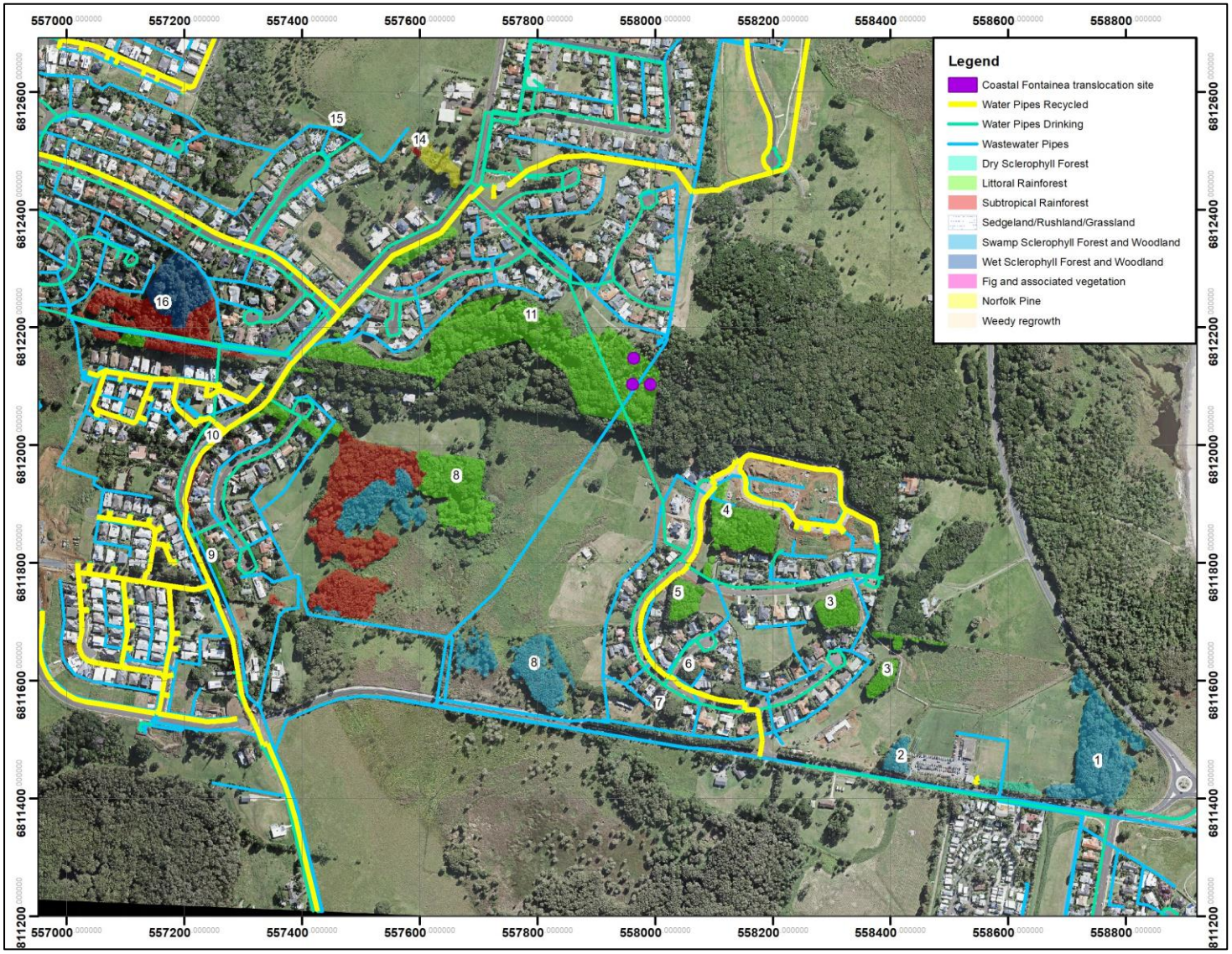


Figure 6: Pipeline infrastructure in the vicinity of the reserves

Figure 7: Palisade Fire Trail behind Palisade Way.

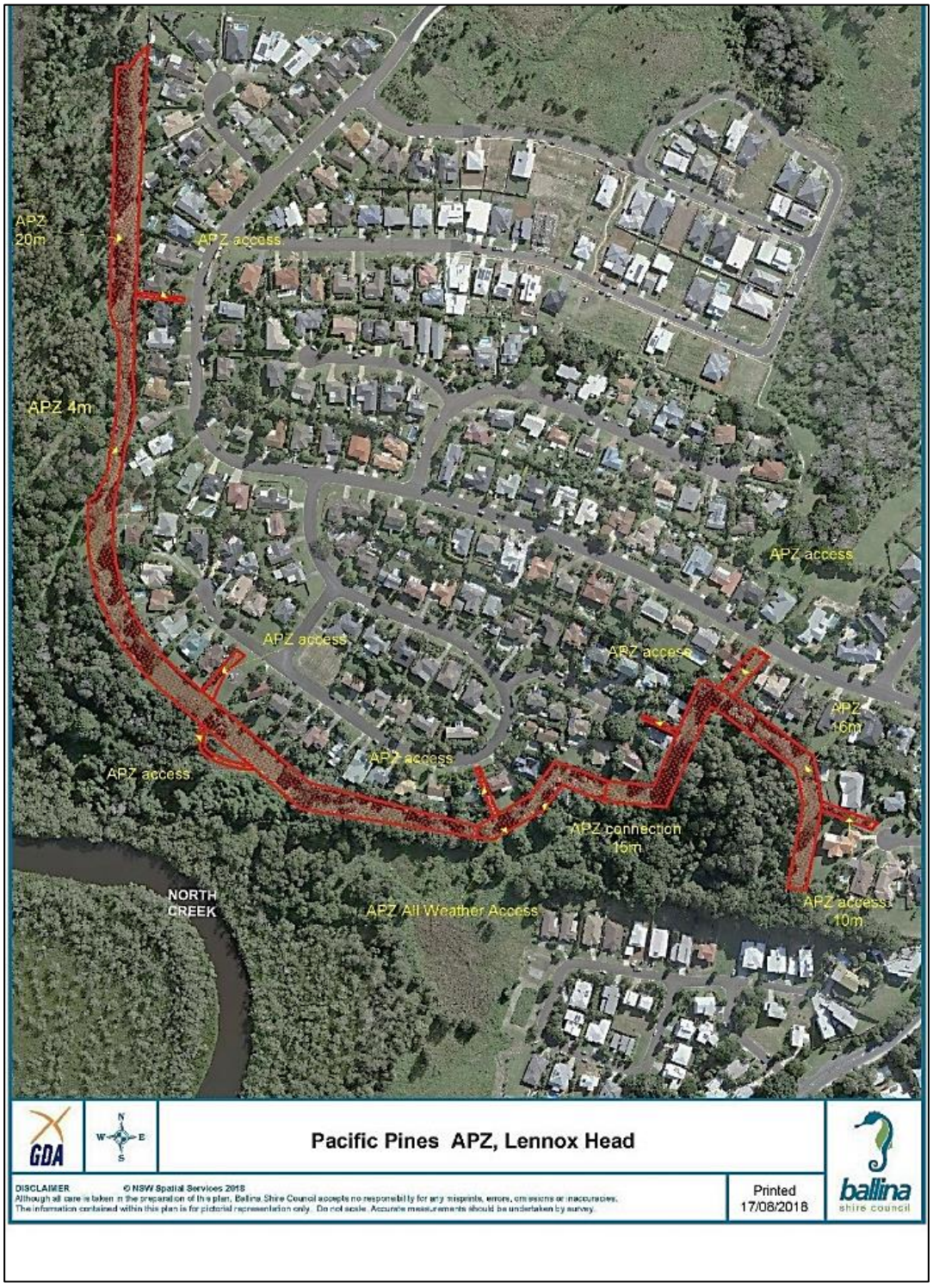


Figure 8: Pacific Pines asset protection zone marked in red.

7. FLORA SURVEY

Ballina Shire Council's vegetation mapping for the site was ground-truthed to ascertain vegetation community types, condition, dominant weed species, and habitat values in August 2020. Surveyed flora was classified into vegetation communities by dominant species, vegetation height, percentage vegetation cover (%) and structural formation.

The Ballina Shire Council (BSC) vegetation community mapping was found to be generally accurate. A description of all surveyed vegetation communities is provided in Section 3.1 and a comprehensive list of all flora species recorded during field survey has been compiled (Appendix 1).

7.1 Vegetation Communities

A total of seven (7) vegetation community (VC) types were recorded during field survey within the subject Zone. The eight primary vegetation types are listed as they occur from west to east on the Zone (See **Figure 9** below):

1. Freshwater Wetland, variously dominated by Leafy Flat Sedge *Cyperus lucidus* or Broadleaf Cumbungi *Typha orientalis* and Common Reed *Phragmites australis*. Part of this community in Tara Downs (Zone 8b) includes previous records of Hairy Joint Grass *Arthraxon hispidus* and Square-stemmed Spike Rush *Elaeocharis tetrequentra,* which require particular management (see **Section 8**).

2. Swamp Sclerophyll Forest to Woodland dominated by Broad-leaved Paperbark *Melaleuca quinquenervia* and Swamp Oak *Casuarina glauca*, with varying degrees of Camphor Laurel *Cinnamomum camphora*, Queensland Umbrella Tree *Schefflera actinophylla* and Coastal Morning Glory *Ipomoea cairica.*

3. Dry sclerophyll forest to shrubland, dominated by Coast Banksia *Banksia integrifolia.*

4. Littoral Rainforest dominated by Tuckeroo *Cupaniopsis anacardioides*, Guioa *Guioa seimglauca* and Camphor Laurel, some with varying degrees of Coast Banksia and Red Bean *Dysoxylum mollisimum*. The understorey is often open, and the ground layer is dominated by exotic grasses, Coastal Morning Glory and Corky Passionflower *Passiflora suberosa*.

5. Subtropical Rainforest including Bangalow Palms *Archontophoenix cunninghamiana*, Riberry *Syzygium leuhmannii*, Umbrella Cheese Tree *Glochidion sumatranum*, Small-leaved Fig *Ficus obliqua*, Harsh Ground Fern *Hypolepis muelleri*, Crofton weed *Ageratina adenophora*, Lantana *Lantana camara*, and Camphor Laurel.
    - As a sub-category of Subtropical Rainforest vegetation, Type 3 of this community consists of established Rainforest plantings including Blue Fig *Elaeocarpus grandis*, Hoop Pine *Araucaria cunninghamii* and White Booyong *Argyrodendron trifoliolatum*.

6. Established Sclerophyll plantings including Blackbutt *Eucalyptus pilularis*, Grey Ironbark *Eucalyptus siderophloia,* Swamp Mahogany *Eucalyptus robusta,* Flooded Gum *Eucalyptus grandis* and *Eucalyptus saligna* Sydney Blue Gum.

7. Isolated Moreton Bay Fig trees *Ficus macrophylla* and associated regrowth vegetation.

8. Planted Norfolk Pines *Araucaria heterophylla* and associated regrowth vegetation.

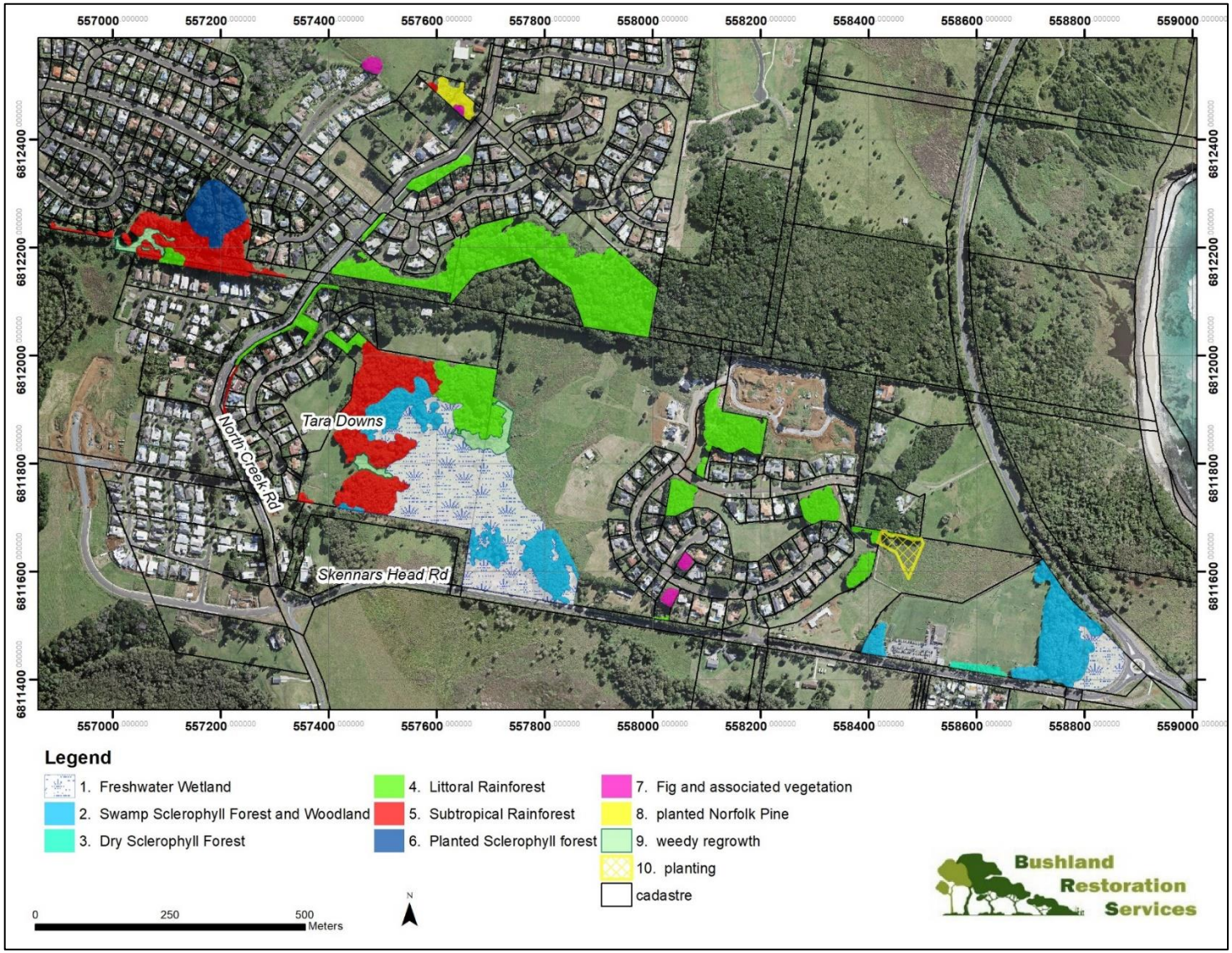


Figure 9: Vegetation Communities

Vegetation Community 1: Freshwater Wetland

This community occurs in Zone 1 Soccer Fields Wetland east; the most eastern remnant on the south-eastern corner of the project site at the intersection of The Coast Road and Skennars Head Road, and also within two sections of Zone 8 Tara Downs. It occurs in low-lying areas and intergrades with Swamp Sclerophyll Forest and rainforest communities at edges where elevation increases. At Tara Downs, this community comprises a mosaic of grassland dominated by the weed species Para Grass *Urochloa mutica*, Broad-leaved Cumbungi *Typha orientalis* and Swamp Water Fern *Blechnum indicum*. With a rise in elevation the weeds Cherry Guava *Psidium cattleyanum* and Ochna *Ochna serrulata* were recorded.

Area:	2.83ha
Upper stratum:	Absent.
Middle stratum:	Largely absent - Shrubs and small trees were scattered throughout – Umbrella Cheese Tree *Glochidion sumatranum*, Coast Banksia *Banksia integrifolia*, Yellow Kamala *Mallotus discolor*, Tuckeroo *Cupaniopsis anacardioides*, Coast Wattle *Acacia sophora* and the weed species Camphor Laurel *Cinnamomum camphora*, Queensland Umbrella Tree *Schefflera actinophylla* and Lantana *Lantana camara*.
Ground stratum:	Leafy Flat Sedge *Cyperus lucidus* is dominant. Fernland is dominated by Swamp Water Fern *Blechnum indicum* and Harsh Ground Fern *Hypolepis muelleri*. Grassland is dominated by exotic species including Para Grass, Setaria and Molasses Grass. In Tara Downs Broadleaf Cumbungi, Common Reed *Phragmites australis* and Swamp Water Fern dominate amongst grassland weeds.
Condition summary:	Poor to good.
Focus weed areas:	Control grass weeds Para grass, Broad-leaved Paspalum, Setaria and Molasses Grass. Control other weed species including Coastal Morning Glory, Wild Tobacco *Solanum mauritanium,* Camphor Laurel and Queensland Umbrella Tree. Control annual weeds Ragweed, Crofton Weed and Blue Billygoat weed *Ageratum houstonianum.*

Plate 2: Freshwater wetlands at Zone 1 Soccer Fields wetland east

Plate 3: Rushland at Zone 8 Tara Downs

Vegetation Community 2: Swamp Sclerophyll forest and woodland

This community occurs in Zone 1 Soccer Field Wetland east, Zone 2 Soccer Field Wetland west and parts of Zone 8 Tara Downs. All Zones are dominated by Broad-leaved Paperbark, with part of Tara Downs also containing Swamp Oak in the canopy.

Area:	3.86 ha
Upper stratum:	Broad-leaved Paperbark *Melaleuca quinquenervia,* minor *Casuarina glauca* Swamp Oak. *Erythrina x sykesii* Coral Tree dominates the canopy on the edge of the Zone 8 wetland and lower slope, and Alexander Palms *Archontophoenix alexandrae* are present in the canopy in Zone 1.
Middle stratum:	Shrubs and small trees were scattered throughout, including Umbrella Cheese Tree, Cabbage Palm *Livistona australis*, Pink-flowered Doughwood *Melicope elleryana*, Blueberry Ash *Elaeocarpus reticulatus,* Brown Kurrajong *Commersonia bartramia,* Coast Banksia, Yellow Kamala, Tuckeroo, Coast Wattle. Winter Senna, Alexander Palm, Camphor Laurel, Queensland Umbrella Tree and Lantana weed species present.
Ground stratum:	Tall Saw Sedge *Gahnia clarkei*, Swamp Water Fern, Harsh Ground Fern and Leafy Flat-sedge. Weed species Ragweed *Ambrosia artemisiifolia*, Coastal Morning Glory, Wild Tobacco, Mock Orange *Murraya paniculata*, Broadleaf Paspalum, Crofton Weed and Blue Billygoat weed.
Condition summary:	Poor. Evidence of previous disturbance. Regeneration is limited by weeds in the ground stratum.
Focus weed areas:	Exotic grass species and Crofton Weed were common in the ground layer. Control current areas of Broadleaf Paspalum and Johnson Grass *Sorghum johnsonii*. Systematically control other weed species including Queensland Umbrella Tree, Camphor Laurel and Coastal Morning Glory.

Plate 4: Coastal Swamp Forest in Zone 1 Soccer Fields wetland west

Plate 5: Swamp Sclerophyll Forest in Zone 1.

Vegetation Community 3: Dry Sclerophyll Forest

This type forms as an open forest to shrubland on deep sand soils within close proximity of the ocean. This community occurs only in Zone 1 as a strip extending west along Skennars Head Road from the Soccer Fields east. Banksia Dry Sclerophyll Forest to Shrubland

Area:	0.14ha
Upper stratum:	Coast Banksia, Tuckeroo and Coastal Acronychia *Acronychia imperforata*. Swamp Box *Lophostemon suaveolens* and Broad-leaved Paperbark occur where the community intergrades with wetter communities.
Middle stratum:	Lantana, Coastal Wattle, Cheese Tree *Glochidion ferdinandi*, Umbrella Cheese Tree, Tuckeroo, Coastal Acronychia, Red Ash *Alphitonia excelsa* and Native Guava *Rhodomyrtus psidioides*.
Ground stratum:	Coastal Morning Glory, Climbing Asparagus Fern *Asparagus plumosis*, Soft Bracken *Calochlaena dubia*, Spiny-headed Mat Rush *Lomandra longifolia*, Broadleaf Paspalum *Paspalum mandiocanum* and Mistflower *Ageratina riparia*.
Condition summary:	Poor. Evidence of previous disturbance and planting. Generally has good canopy coverage, though regeneration is limited by weeds in the ground stratum. Some infiltration of ground cover weeds associated with edge effects occurring adjacent to Skennars Head Rd.
Focus weed areas:	Control current areas of Brazilian Cherry *Eugenia uniflora*, Coastal Morning Glory, Cocos Palm *Syagrus romanzoffianum*, Lantana, Climbing Asparagus Fern and Queensland Umbrella Tree. Plantings of Lilly Pilly *Syzygium* spp. and an unidentified garden weed occur.

Plate 6: Banksia shrubland in Zone 1.

Vegetation Community 4: Littoral Rainforest

This community is the most common vegetation community occurring within the restoration project area. It includes Zone 3 (1.77ha), Zone 4 (1.25ha), Zone 5 (0.34ha), part of Zone 8, Zone 9 (0.11ha) Zone 11 (6.34ha), Zone 12 (0.07ha) and Zone 13 (0.31ha). The canopy of each patch is dominated by Tuckeroo and Guioa, with varying degrees of other natives, and the weed Camphor Laurel. The threatened species White Laceflower *Archidendron hendersonii* was recorded in the canopy in Zone 3.

Area:	8.45ha
Upper stratum:	Tuckeroo and Guioa are dominant in all areas. Brushbox *Lophostemon confertus* Coast Banksia and Pink-flowered Doughwood are also common. Occasional Red Bean *Dysoxylum mollisimum* and Moreton Bay Fig occur *Ficus macrophylla*. Camphor Laurel is common in the canopy in all areas and Cocos Palm and Queensland Umbrella Tree is present in the canopy in some sections.
Middle stratum:	Beach Acronychia, Three- veined Laurel *Cryptocarya triplinervis*, Plum Myrtle *Pilidiostigma glabrum*, Sweet Pittosporum *Pittosporum undulatum*, Scentless Rosewood *Synoum glandulosum* subsp. *glandulosum*, Umbrella Cheese Tree and Rough-leaved Elm *Aphananthe philippinensis*.
Ground stratum:	Some native grasses present including *Oplismenus* sp. (Basket Grass) and *Ottochloa gracillima,* but generally the ground layer was dominated by weed species as listed below.
Condition summary:	Condition is variable. Weed species density was generally high to moderate in all strata included Camphor Laurel, Cocos Palm, *Koelreuteria paniculata* Golden Rain Tree, Queensland Umbrella, Alexander Palm, Mock Orange, Ochna, Johnson Grass and Singapore Daisy *Sphagneticola trilobata*. There was a large patch of Lantana, Coastal Morning Glory and White Passionflower *Passiflora subpeltata* interspersed with Native Ginger *Alpinia caerulea* and Whip Vine *Flagellaria indica*.
Focus weed areas:	Inject mature canopy weed species including Camphor Laurel, Cocos Palm, Golden Rain Tree, Queensland Umbrella and Alexander Palm. Cut and paint mid-storey weeds including Mock Orange, Bitou Bush *Chrysanthemoides monilifera*, Lantana and Torch Ginger *Etlingera elatior*. Spray weed seedlings and exotic grasses including Broadleaf Paspalum. Cut, scrape and paint vine weeds including Corky Passionfruit *Passiflora suberosa*, White Passionflower, Ground Asparagus *Asparagus aethiopicus* and Climbing Nightshade *Solanum seaforthianum*.

Plate 7: Littoral Rainforest in Zone 3 Soccer Field Rainforest.

Plate 8: Littoral Rainforest in Zone 11 Palisade Way.

Plate 9: Littoral Rainforest in Zone 16 Rainforest Way.

Vegetation Community 5: Subtropical Rainforest

Three variations of subtropical rainforest (Type 1 and Type 2 below) were identified from the subject Zone in parts of Zone 8 and Zone 16. On the mid to lower slope in the east of Zone 8, Bangalow Palm dominates the canopy and understorey. In other parts of Zone 8, the subtropical rainforest community canopy is dominated by Figs and other rainforest species. A third type (Type 3 below) consists of native subtropical rainforest vegetation that has been planted and is now established.

Subtropical Rainforest Type 1 - Bangalow Palm - Pink-flowered Doughwood - Umbrella Cheese Tree.	
Area:	4.35ha
Upper stratum:	Gallery rainforest dominated by Bangalow Palm *Archontophoenix cunninghamiana.* Pink-flowered Doughwood *Melicope elleryana,* Umbrella Cheese Tree *Glochidion sumatranum* and Camphor Laurel.
Middle stratum:	Blue Lilly Pilly *Syzygium oleosum*, Riberry *Syzygium luehmannii*, Creek Sandpaper Fig *Ficus coronata*, Bangalow Palm, Small-leaved Fig *Ficus obliqua,* and the weed species Cherry Guava *Psidium cattleyanum* var. *cattleyanum*, Ochna *Ochna serrulata* and Camphor Laurel.
Ground stratum:	Broadleaf Paspalum *Paspalum mandiocanum,* Coral Tree *Erythrina x sykesii*, Mistflower *Ageratina riparia*, Ardisia *Ardisia crenata*, Corky Passionfruit and Alexander Palm.
Condition summary:	Poor to moderate.
Focus weed areas:	Control current areas of Broadleaf Paspalum infiltration and other weeds. Monitor and control as required.

Plate 10: Subtropical Rainforest Type 1 dominated by Bangalow Palms

Subtropical Rainforest Type 2 – Small-leaved Fig – Riberry - Tuckeroo subtropical rainforest.

Area:	1.18 ha
Upper stratum:	Small-leaved Fig *Ficus obliqua*, Moreton Bay Fig *Ficus macrophylla*, Red Ash *Aphananthe philipinnensis,* Native Celtis *Celtis paniculata,* Tuckeroo*,* Hard Quandong *Elaeocarpus obovatus,* Native Tamarind *Diploglottis australis* and Rosewood *Dysoxylum fraserianum.* Canopy weeds include Queensland Umbrella Tree and Camphor Laurel, with Coral Tree present on edges.
Middle stratum:	Red Kamala *Mallotus philippensis*, Peanut Tree *Sterculia quadrifida*, Red-barked Sassafras *Cinnamomum virens* and Red-fruited Laurel *Cryptocarya laevigata.* Weeds include Ochna, Brazillian Cherry *Eugenia uniflora*, Queensland Umbrella Tree, Cocos Palm, Lantana, Icecream Bean *Inga edulis,* Mock Orange *Murraya paniculata,* Lantana and Winter Senna *Senna pendula var. glabrata* on edges.
Ground stratum:	Basket Grass *Oplismenus imbecillis*; Harsh Ground Fern*,* Soft Bracken, Crofton Weed and Trad *Tradescantia fluminensis.*
Condition summary:	Poor. Regenerating community with good canopy coverage across most of the community and some regeneration evident in lower stratums. Significant weed infiltration in all layers, particularly in canopy gaps.
Focus weed areas:	Control woody weeds. Control current areas of Mistflower and Crofton Weed infiltration near Camphor Laurel stand and forest edges, monitor and control as required.

Plate 11: Subtropical Rainforest Type 2.

Vegetation Community 6: Planted Sclerophyll Forest

This community has been planted and occurs in parts of Zone 10, Zone 13 and Zone 16.

Swamp Mahogany –Blackbutt-- Sydney Blue Gum.

Area:	0.9ha
Zone 10	The plantings include Cadaghi *Eucalyptus torreliana*, Swamp Mahogany *Eucalyptus robusta*, Silky Oak *Grevillea robusta*, Traveller's Palm *Ravenala madagascariensis*, and NZ Pohutakawa *Metrosideros sp*. There is a planting of Brush Cherry *Syzygium australe* at the southern end of the roadside strip. Weed species Ochna and Bamboo Bambusa sp. were also present.
Zone 12:	The canopy included Broad-leaved Paperbark, Lemon-scented Gum *Corymbia citriodora*, Slash Pine *Pinus elliottii* and Weeping Bottlebrush *Callistemon viminalis*. The open understorey included ornamental Hibiscus *Hibiscus* sp., Tuckeroo and Common Lilly Pilly *Acmena smithii*.

Zone 13

The canopy is dominated by Swamp Mahogany and Blackbutt *Eucalyptus pilularis* with Silky Oak, Slash Pine and Cocos Palm. The midstorey includes Broad-leaved Paperbark, Foambark *Jagera pseudorhus*, Flame Tree *Brachychiton acerifolius*, Cape Chestnut *Calodendrum capense* and Golden Penda *Xanthostemon chrysanthus*. Weed species recorded were Golden Rain Tree, Cocos Palm, Camphor Laurel, Alexander Palms, Mock Orange, Kahili Ginger *Hedychium gardnerianum*, Golden Bells *Tecoma stans* and Slash Pine. There was a large Poinciana *Delonix regia* at the southern end of the strip.

Zone 16:

Planted sclerophyll species include include Cadaghi, Swamp Mahogany, Forest Red Gum *Eucalyptus tereticornis* and Blackbutt.

Plate 12: Edge of planted sclerophyll forest in Zone 16

Vegetation Community 7: Isolated Fig Trees and associated vegetation

Isolated Figs occur in several zones, as shown below. Some natural regeneration is occurring, but most species surrounding the figs are exotics and environmental weeds.

Moreton Bay Fig and associated vegetation	
Area:	0.9ha
Zone 6 Henderson Fig 1	The vegetation consists of a large Moreton Bay Fig *Ficus macrophylla*. The understorey was dominated by native rainforest species including Coogera *Arytera divaricata* and Guioa, but also included the weed species Alexander Palm and garden plantings.
Zone 7 Henderson Fig 2	The vegetation consists of a large Moreton Bay Fig. The understorey included native rainforest species such as Guioa and Tuckeroo and weed species Alexander Palm, Syngonium and Winter Senna. Downslope from the fig tree there were plantings of rainforest species, Mango and treated Camphor Laurel. The weed species Murraya had been planted on the eastern edge.
Zone 15 Fieldcrest Fig	The vegetation consists of a large Moreton Bay Fig with Tuckeroo also present in the canopy. The understorey included a diversity of native species such as Guioa and Coogera. Weed species include exotic grasses, Senna and Ground Asparagus Fern.

Plate 13: Isolated Fig Tree at Zone 6 Henderson Drive.

Plate 14: Isolated Fig Tree at Zone 7

Plate 15: Fig tree and associated vegetation at Zone 15 Fieldcrest.

Vegetation Community 8: Planted Norfolk Pine

Zone 14 The Pines includes a substantial planting of Norfolk Pine *Araucaria heterophylla*. Some natural regeneration is occurring, but most species surrounding the Pines are exotics and environmental weeds.

The vegetation consists of planted *Araucaria heterophylla* Norfolk Pines and two large Moreton Bay Figs. The understorey was dominated by weed species but there was a diversity of native rainforest species present including Three- veined Laurel, Bolly Gum *Neolitsea australiensis*, Red Bean, Coogera and Guioa. Weed species included Pereskia *Pereskia aculeata*, Winter Senna, Ground Asparagus Fern, Traveller's Palm, Cocos Palm, Phoenix Palm *Phoenix canariensis*, Climbing Umbrella Tree *Schefflera arboricola*, Ochna, Queensland Umbrella Tree, Duranta *Duranta erecta* and Cape Ivy *Delairea odorata*.

Plate 16: Planted Norfolk Pine and associated vegetation

7.2. Weeds /Introduced Plants

A wide range of exotic and non-endemic weed species of all growth forms, tree, shrub, vine, groundcover and grass, were recorded during the vegetation survey (**Appendix 1**).

A total of eighty-two (82) weeds species were recorded during the survey and included all growth forms (i.e. tree, shrub, vine, groundcover / grass) (**Appendix 2**). The dominant weed species in each vegetation type are included in **Section 8.1.**

Biosecurity Act (NSW) 2015

The *Biosecurity Act 2015* and Regulations streamline the way weeds are managed in NSW, with specific legal requirements for State level priority weeds and Regional high risk priority weeds. In keeping with its premise that biosecurity is a shared community responsibility, the 2015 Act introduces the legally enforceable concept of a General Biosecurity Duty.

For weeds *'the General Biosecurity Duty means that any person dealing with plant matter must take measures to prevent, eradicate or minimise / contain the biosecurity risk as far as reasonably practicable*'.

Plant matter includes plants, parts of plants and seeds. Dealing has a broad definition in the Act and includes (but is not limited to) activities such as grazing, cropping, fodder production, horticulture, weed control, seed and other plant production, as well as carrying, sale and distribution of these products as part of a commercial, professional, volunteer or recreational activity or lifestyle.

North Coast Regional Strategic Weed Management Plan 2017-2022

The *North Coast Regional Strategic Weed Management Plan 2017-2022*, while not a regulatory document, plays an important role in articulating the shared responsibility principle of the *Biosecurity Act 2015* (the Act) to regulators, stakeholders, public agencies and the wider community. It provides necessary information to enable people to effectively meet the requirements of the General Biosecurity Duty and discharge their obligations under the Act.

The State level priority and Regional high risk priority weeds identified on the Zone within each Vegetation Management Zones during field survey are listed in **Table 2** alongside the applicable management category stipulated in the *North Coast Regional Strategic Weed Management Plan 2017-2022*. The weed control strategy and methods for the removal of these priority weeds are detailed in **Section 8** of this plan.

Table 2– State level priority (annotated "S") and Regional high risk priority (annotated "R") weeds.

Common Name	Scientific Name	Management Category				
		PREVENT	ERADICATE	CONTAIN	ASSET PROTECTION	WATCH
Bitou Bush	*Chrysanthemoides monilifera* subsp. *rotundata*			**S**		
Camphor Laurel	*Cinnamomum camphora*				**R**	
Cape ivy	*Delaria odorata*				**R**	
Cecropia	*Cecropia peltata*					
Cocos Palm	*Syagrus romanzoffianum*					
Coral Berry	*Rivina humilis*				**R**	
Crofton Weed	*Ageratina adenophora*				**R**	
Giant Devils Fig	*Solanum chrysotrichum*			**R**		
Ground Asparagus	*Asparagus aethiopicus*				**R**	
Groundsel Bush	*Baccharis halimifolia*			**R**		
Indian Coral Tree	*Erythrina sykesii*				**R**	
Lady of the Night	*Cestrum nocturnum*				**R**	
Lantana	*Lantana camara*				**S**	
Mickey Mouse Plant	*Ochna serrulata*				**R**	
Mock Orange	*Murraya paniculata*				**R**	
Passionfruit	*Passiflora spp.*				**R**	
Leaf cactus	*Pereskia aculeata*					
Slash Pine	*Pinus elliottii*				**R**	
Small-leaved privet	*Ligustrum sinense*				**R**	
Umbrella Tree	*Schefflera actinophylla*				**R**	
Yellow Bells	*Tecoma stans*					

Source: *North Coast Regional Strategic Weed Management Plan 2017-2022*

Plate 17: Weedy edge of Coastal Swamp Forest in Zone 8 Tara Downs

Plate 18: Dense Lantana on northern edge of Palisade Way Zone 11

8. RESTORATION STRATEGY

8.1 Restoration Approach

The rehabilitation strategy in this plan is derived from the common approaches described in **Table 3**. The selection of a suitable approach depends on the degree of resilience that is present in the existing native vegetation and/or seed bank, as well as the nature and extent of disturbance including weed infestation. A flow chart has been used to guide the selection of a suitable ecological restoration approach for each management zone. See Figure 10.

Table 3 – Common ecological restoration approaches.

Restoration Approach	Application
Natural Regeneration	Where resilience is intact, and recovery is automatic with the removal of the cause of damage.
Assisted Natural Regeneration	Where degrees of resilience exist and "triggered" interventions (either disturbance or resource provision) can affect recovery by natural regeneration.
Reconstruction (Revegetation)	Where resilience is depleted, and abiotic or biotic elements need wholesale importation or major amendment before recovery can commence.
Fabrication (Type Conversion)	Where conditions are permanently changed and better-adapted local systems can be regenerated or constructed to restore integrity to the landscape.

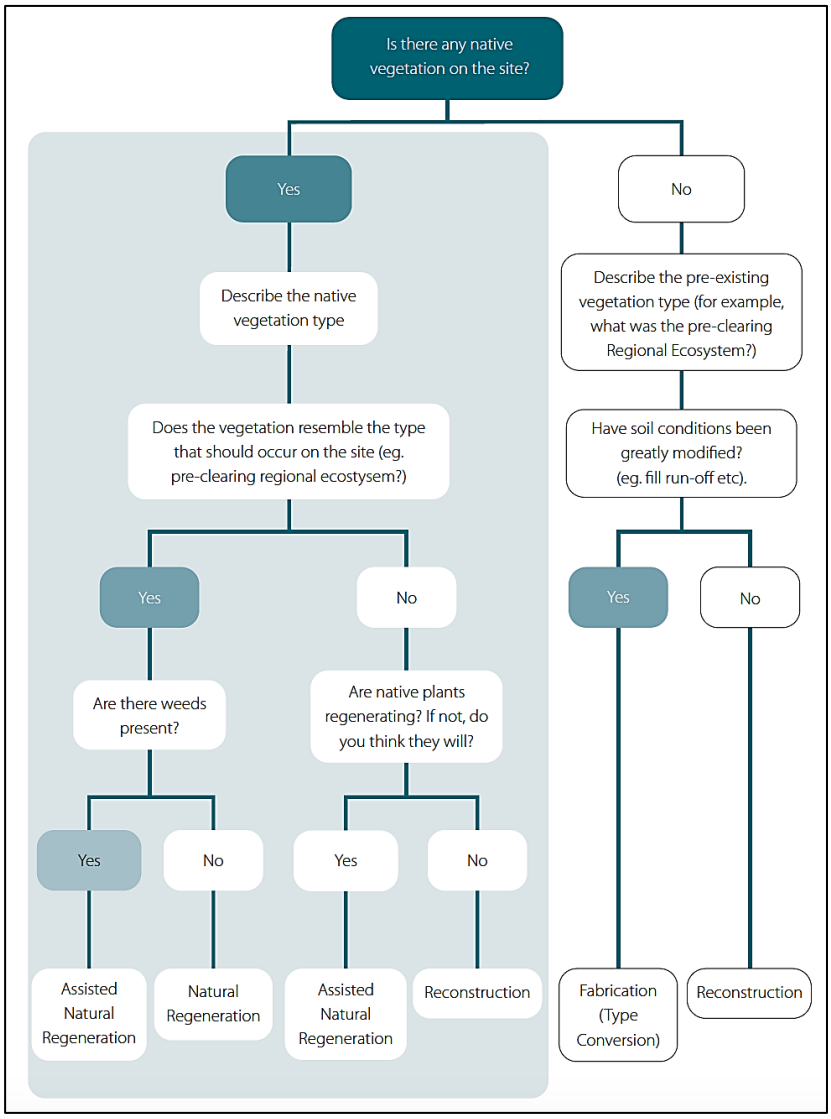


Figure 10: Selection of restoration approach. Source: Chenoweth EPLA & BRS 2012

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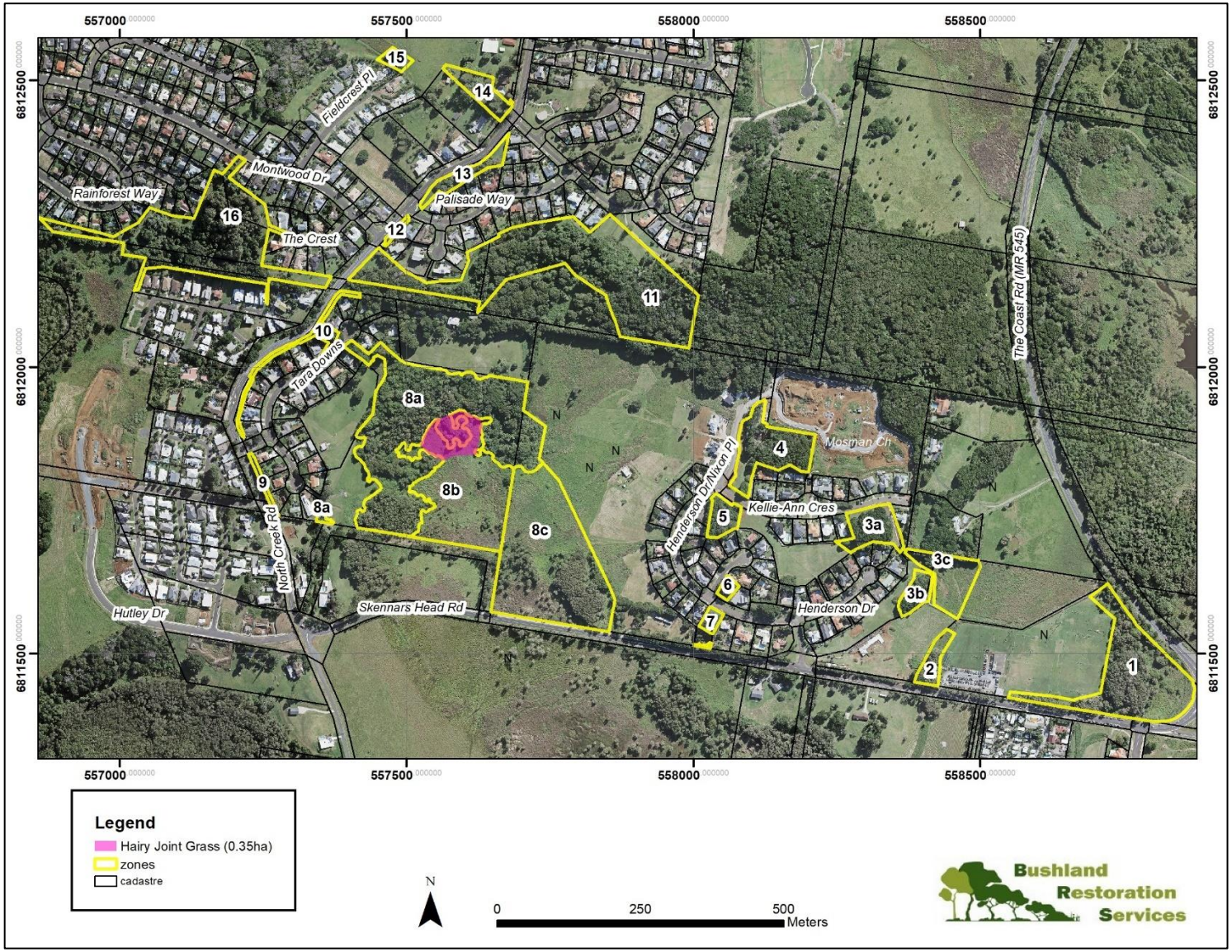

Figure 11: Restoration Work Zones

8.2 Restoration Works

The subject site has been divided into work zones for restoration and management, as described below and illustrated on **Figure 11** above.

Work Zone 1: Soccer Field Wetland East - 2.79ha

Zone 1 is the most eastern remnant on the north-eastern corner of the intersection of The Coast Road and Skennars Head Road, with a strip extending west along Skennars Head Road. Access is from the roadside. The zone has an area of 2.79ha. Zone 1 includes three vegetation types, to be treated as one work zone.

The linear western edge of Zone 1 along Skennars Head Road is Coast Banksia dry sclerophyll shrubland. In this area, there are plantings of Lilly Pilly *Syzygium* spp. and an unidentifiable garden weed. Other weed species recorded here were Brazilian Cherry *Eugenia uniflora*, Five Leaf Morning Glory *Ipomoea cairica*, Cocos Palm *Syagrus romanzoffianum*, Lantana *Lantana camara*, Asparagus Fern *Protasparagus* sp. and Queensland Umbrella *Schefflera actinophylla.*

The eastern side of Zone 1 contains Freshwater wetland consisting of Sedgeland /Fernland /Grassland. The central area of Zone 1 contains Paperbark Swamp Forest where the primary Koala feed tree Swamp Mahogany has been previously planted on edges.

Zones 1 has minor to moderate weed infestation and therefore Assisted Natural Regeneration is the recommended ecological restoration approach. Additional Swamp Mahogany are not recommended for planting near the busy Coast Road.

Commence work in Zone 1 on the west along the roadside strip, then along the drier edge of the sedgeland, working into the central section where possible, then work through the forest adjacent to The Coast Road. Then move into the paperbark forest and work from the northern edge to the southern end.

Table 4 – Summary of restoration actions for Zone 1

Work Sequence	Dominant Weed Species	Actions	Work Area
Primary Work Zone 1 (Year 1)	Brazilian Cherry Cocos Palm Lantana Umbrella Tree Winter Senna Camphor Laurel Alexander Palm	▪ Work systematically and comprehensively through the zone commencing from the west and. continue work following this line eastwards then northwards to complete the zone. Work into the sedgeland areas and visually determine if weed control is required – treat as necessary. ▪ Cut, scrape and paint (CSP) woody weeds such as Lantana, Winter Senna, Camphor Laurel, Umbrella Tree and other woody weeds encountered along weedy slopes adjoining sedgeland. ▪ Lop cut stems to reduce trip hazard or allow access for bush regen team if necessary.	2.79ha

Work Sequence	Dominant Weed Species	Actions	Work Area
		▪ Leave treated Lantana frames and other woody weeds in place to break down gradually. ▪ Smaller plants can be hand pulled. ▪ Drill inject larger exotic trees such as Camphor Laurel, Umbrella Tree and Winter Senna.	
	Coastal Morning Glory Asparagus fern	▪ Cut Coastal Morning Glory and other exotic vines at shoulder height, cut, scrape and paint the base of the plant with herbicide. Dense leafy stems can be pulled down or cleared from native shrubs intact and bundled to spray. Small or shallow rooted specimens can be hand pulled. Asparagus fern to be spot sprayed.	
	Exotic Grasses Para Grass Setaria Molasses Grass Johnson Grass Ragweed Crofton Weed Blue Billygoat Weed	▪ Clear exotic grasses and groundcovers around small native plants prior to spray to prevent off-target damage. ▪ Spot spray all exotic grasses, herbs and groundcover weeds (overspray dense areas in the north of Paperbark forest) throughout the zone, working thoroughly and systematically as described in primary work above. Follow up the spot spray every 2 months depending on season and prevailing weather conditions.	
Follow Up (Years 2 & 3)	Regrowth of woody weeds, exotic vines, grasses and groundcovers	▪ Follow up spot spray (approx. 4-6 visits / year) depending on season and prevailing weather conditions. Encourage recruitment of native species by well-timed control of weeds.	2.79ha
Maintenance (Years 4 & 5)	Regrowth of woody weeds, exotic vines, grasses and groundcovers	▪ Follow up spot spray (approx. 2-3 visits / year) depending on season and prevailing weather conditions. ▪ Encourage recruitment of native species by well-timed control of weeds.	2.79ha

Work Zone 2: Soccer Fields Wetland West - 0.29ha

Zone 2 is small remnant located to the west of Zone 1 containing Swamp Sclerophyll Forest dominated by Broad-leaved Paperbark *Melaleuca quinquenervia* and Swamp Oak *Casuarina glauca*. Weeds include Camphor Laurel, Queensland Umbrella Tree and Coastal Morning Glory in the canopy. The northern section will require planting should natural regeneration not establish after the first year of primary work.

Table 5 – Summary of restoration actions for Zone 2

Work Sequence	Dominant Weed Species	Actions	Work Area
Primary Work Zone 2 (Year 1)	Brazilian Cherry Cocos Palm Lantana Umbrella Tree Winter Senna Camphor Laurel Alexander Palm	▪ Work systematically and comprehensively through the zone commencing from the north and continue work following this line southwards to complete the zone. ▪ Cut, scrape and paint (CSP) woody weeds such as Lantana, Winter Senna, Camphor Laurel, Umbrella Tree and other woody weeds encountered along weedy slopes adjoining sedgeland. ▪ Lop cut stems to reduce trip hazard or allow access for bush regen team if necessary. ▪ Leave treated Lantana frames and other woody weeds in place to break down gradually. ▪ Smaller plants can be hand pulled. ▪ Drill inject larger exotic trees such as Camphor Laurel, Umbrella Tree and Winter Senna.	0.29ha
	Coastal Morning Glory Asparagus fern	▪ Cut Coastal Morning Glory and other exotic vines at shoulder height, cut, scrape and paint the base of the plant with herbicide. Dense leafy stems can be pulled down or cleared from native shrubs intact and bundled to spray. Small or shallow rooted specimens can be hand pulled. Asparagus fern to be spot sprayed.	
	Exotic Grasses Para Grass Setaria Molasses Grass Johnson Grass Ragweed Crofton Weed Blue Billygoat Weed	▪ Clear exotic grasses and groundcovers around small native plants prior to spray to prevent off-target damage. ▪ Spot spray all exotic grasses, herbs and groundcover weeds (overspray dense areas in the north of Zone 2) throughout the zone, working thoroughly and systematically as described in primary work above. Follow up the spot spray	

Work Sequence	Dominant Weed Species	Actions	Work Area
		every 2 months depending on season and prevailing weather conditions.	
Follow Up (Years 2 & 3)	Regrowth of woody weeds, exotic vines, grasses and groundcovers	▪ Follow up spot spray (approx. 4-6 visits / year) depending on season and prevailing weather conditions. If natural regeneration of wetland groundcovers in the north of Zone 2 does not occur, then consider plantings. ▪ Encourage recruitment of native species by well-timed control of weeds.	0.29ha
Maintenance (Years 4 & 5)	Regrowth of woody weeds, exotic vines, grasses and groundcovers	▪ Follow up spot spray (approx. 2-3 visits / year) depending on season and prevailing weather conditions. ▪ Encourage recruitment of native species by well-timed control of weeds.	0.29ha

Work Zone 3: Kellie-Ann Crescent East Rainforest – 1.77ha

Zone 3 is located north west of the Soccer Fields and has an area of 1.77ha. The Zone can be accessed on the east through the soccer fields or from Kellie Ann Crescent on the west.

The vegetation consists of three separate patches of Littoral Rainforest, north-west, south and central. The central section includes cleared land which was planted in 2020. The threatened White Laceflower was recorded in the Littoral Rainforest.

The central area is subject to a Vegetation Rehabilitation Plan (VHP) (Melaleuca Group P/L) and has had restoration and planting undertaken in June 2020. The mown grassland to the south of the 2020 plantings is also proposed to be planted as per the VHP, Area D (see **Figure 13**).

Zone 3 has minor to dense weed infestation and Assisted Natural Regeneration is the recommended ecological restoration approach in the Littoral Rainforest areas. Reconstruction (planting) is recommended in the cleared eastern section as provided in the Vegetation Rehabilitation Plan (Melaleuca Group P/L).

Commence work in the northwest adjacent to Kellie Ann Crescent, working south into the central forested strip and then south into the southern section of Littoral Rainforest. The eastern section works are detailed in the Vegetation Rehabilitation Plan (Melaleuca Group P/L).

Table 6– Summary of restoration actions for Zone 3.

Work Sequence	Dominant Weed Species	Actions	Work Area
Primary Work Zone 3 (Year 1)	Umbrella Tree Cocos Palm Indian Hawthorn Murraya Winter Senna Torch Ginger Alexander Palms Camphor Laurel Indian Hawthorn Bitou Bush	▪ Work systematically and comprehensively through the zone commencing from the west and continue work following this line eastwards then northwards to complete the zone. ▪ Cut, scrape and paint (CSP) woody weeds such as Lantana, Winter Senna, Camphor Laurel, Umbrella Tree and other woody weeds encountered along weedy slopes adjoining sedgeland. ▪ Lop cut stems to reduce trip hazard or allow access for bush regen team if necessary. Prior to injecting larger trees ensure that smaller woody weeds and groundcovers have had primary work. ▪ Leave treated Lantana frames and other woody weeds in place to break down gradually. ▪ Smaller plants can be hand pulled. ▪ Drill inject larger exotic trees such as Camphor Laurel, Umbrella Tree and Winter Senna.	1.77ha

Work Sequence	Dominant Weed Species	Actions	Work Area
	Corky Passionfruit White Passionfruit Asparagus Fern Climbing Nightshade Coastal Morning Glory Syngonium	▪ Cut Coastal Morning Glory and other exotic vines at shoulder height, cut, scrape and paint the base of the plant with herbicide. Dense leafy stems can be pulled down or cleared from native shrubs intact and bundled to spray. Small or shallow rooted specimens can be hand pulled. Asparagus fern to be spot sprayed.	
	Exotic Grasses Ground Asparagus *Callisia repens*	▪ Clear exotic grasses and groundcovers around small native plants prior to spray to prevent off-target damage. ▪ Spot spray all exotic grasses, herbs and groundcover weeds (overspray dense areas) throughout the zone, working thoroughly and systematically as described in primary work above. Follow up the spot spray every 2 months depending on season and prevailing weather conditions.	
Follow Up (Years 2 & 3)	Regrowth of woody weeds, exotic vines, grasses and groundcovers	▪ Follow up spot spray (approx. 4-6 visits / year) depending on season and prevailing weather conditions. ▪ Encourage recruitment of native species by well-timed control of weeds.	1.77ha
Maintenance (Years 4 & 5)	Regrowth of woody weeds, exotic vines, grasses and groundcovers	▪ Follow up spot spray (approx. 2-3 visits / year) depending on season and prevailing weather conditions. ▪ Encourage recruitment of native species by well-timed control of weeds.	1.77ha

Figure 12: Zone 3 work zone breakdown in the existing Vegetation Rehabilitation Plan (Melaleuca Group P/L)

Work Zone 4: Henderson Drive SEPP Rainforest -1.25ha

Work Zone 4 is located to the east of Henderson Drive on the corner of Mossman Chase in the Visions Estate. The remnant has an area of 1.25ha. The remnant is subject to two plans, being *Vision Estate Weed Eradication and Buffer Enhancement Plan* and *Vision Estate Rehabilitation Plan* prepared in June 2017 by Bushland Restoration Services P/L. Restoration is detailed in these Plans. The remnant is in good condition as has had primary and follow up restoration over the past two years.

The vegetation consists of Littoral Rainforest dominated by Tuckeroo *Cupaniopsis anacardioides* and Guioa *Guioa semiglauca*. The threatened Rough-shelled Bush Nut was recorded in the Littoral Rainforest.There is a section of cleared land within road reserve on the west and north adjacent to Henderson Drive that is currently mown and suitable for clump planting of Littoral Rainforest species. See **Section 8.3** Proposed Plantings Littoral Rainforest. Native grasses are establishing although Broad-leaved Paspalum *Paspalum mandiocanum* and annual weeds were recorded.

Table 7 – Summary of restoration actions for Zone 4

Work Sequence	Dominant Weed Species	Actions	Work Area
Planting	Mown grass	▪ In consultation with Ballina Shire Council undertake clump planting of Littoral Rainforest trees and shrubs as listed in Section 8.3	0.15ha
Maintenance Annual basis	Regrowth of woody weeds, exotic vines, grasses and groundcovers	▪ Follow up spot spray (approx. 2-3 visits / year) depending on season and prevailing weather conditions. ▪ Encourage recruitment of native species by well-timed control of weeds.	1.25ha

Figure 13: Zone 4 Henderson Drive SEPP is pictured left as the vegetated area. Proposed buffer Plantings are shown as offset areas 1 and 2.

Work Zone 5: Kellie-Ann Crescent south Rainforest – 0.338ha

Work zone 5 is located on the corner of Henderson Drive and Kellie Anne Crescent. It is a small rainforest remnant with an area of 0.338ha. There are encroachments from adjoining houses which include a caravan, boat and tubs. Care to be taken when using chemical adjacent to the houses.

The vegetation consists of one vegetation class - Littoral Rainforest with a canopy dominated by Tuckeroo and Guioa. Camphor Laurel was common in the canopy and understorey. The understorey included a diversity of native rainforest species such as Bolly Gum *Neolitsea australiensis* and Three-veined Laurel *Cryptocarya triplinervis* but weed species such as Alexander Palm, Cocos Palm and Small-leaved Privet *Ligustrum sinense* were also prevalent. Ground Asparagus Fern *Asparagus aethiopicus* and Queensland Umbrella were present in the ground strata.

Zone 5 has minor to dense weed infestation and Assisted Natural Regeneration is the recommended ecological restoration approach as there is a good representation of Littoral Rainforest species to colonise following weed control.

Table 8 – Summary of restoration actions for Zone 5.

Work Sequence	Dominant Weed Species	Actions	Work Area
Primary Work Zone 5 (Year 1)	Cocos Palm Alexander Palms Camphor Laurel Umbrella Tree Camphor Laurel Lantana Small-leaved Privet Winter Senna	▪ Work systematically and comprehensively through the zone commencing from the northwest corner and. continue work following this line eastwards then southwards to complete the zone. ▪ Cut, scrape and paint (CSP) smaller woody weeds such as Lantana, Privet, Winter Senna, Camphor Laurel, Umbrella Tree. ▪ Drill and inject larger exotic trees such as Camphor Laurel and Cocos and Alexander Palms. Prior to injecting larger trees ensure that smaller woody weeds and groundcovers have had primary work. ▪ Lop cut stems to reduce trip hazard or allow access for bush regen team if necessary. ▪ Leave treated Lantana frames and other woody weeds in place to break down gradually. ▪ Smaller plants can be hand pulled.	0.338ha
	Corky Passionflower	▪ Cut Corky Passionflower and other exotic vines at shoulder height, cut, scrape and paint the base of the plant with herbicide. Dense leafy stems can be pulled down or cleared from native shrubs intact and bundled to spray. Small or shallow rooted specimens can be hand pulled.	
	Exotic Grasses Ragweed Ground Asparagus Umbrella Tree seedlings	▪ Clear exotic grasses and groundcovers around small native plants prior to spray to prevent off-target damage. ▪ Spot spray all exotic grasses, Ground Asparagus and groundcover weeds (overspray dense areas) throughout the zone, working thoroughly and systematically as described in primary work above.	

Work Sequence	Dominant Weed Species	Actions	Work Area
		Follow up the spot spray every 2 months depending on season and prevailing weather conditions.	
Follow Up (Years 2 & 3)	Regrowth of woody weeds, exotic vines, grasses and groundcovers	▪ Follow up spot spray (approx. 4-6 visits / year) depending on season and prevailing weather conditions. ▪ Encourage recruitment of native species by well-timed control of weeds.	0.338ha
Maintenance (Years 4 & 5)	Regrowth of woody weeds, exotic vines, grasses and groundcovers	▪ Follow up spot spray (approx. 2-3 visits / year) depending on season and prevailing weather conditions. ▪ Encourage recruitment of native species by well-timed control of weeds.	0.338ha

Work Zone 6: Henderson Fig 1 – 0.21ha

Work Zone 6 is located on the corner of Henderson Drive and Nixon Place and has an area of 0.21ha. It consists of a large Moreton Bay Fig and surrounding vegetation on a small area of land. The mown grass area south of the zone is maintained by Council. As this zone is within the residential area there is incidence of dumping of garden waste and other items.

The vegetation consists of a large Moreton Bay Fig *Ficus macrophylla.* The understorey was dominated by native rainforest species I including Coogera *Arytera divaricata* and Guioa but also includes planted Alexander Palms and garden plantings. There is minimal weed and evidence of weed control along the edges.

Houses are in close proximity to this zone so it is necessary to ensure that treated woody stems do not remain near houses if they could pose a safety risk, and that chemical use is restricted adjacent to the houses. Council is to consult with neighbours in relation to use of chemical and inappropriate plantings.

Table 9 – Summary of restoration actions for Zone 6

Work Sequence	Dominant Weed Species	Actions	Work Area
Primary Work Zones 6 (Year 1)	Alexander Palms Camphor Laurel Umbrella Tree Lantana Winter Senna Garden species	▪ Work systematically and comprehensively adjacent to the large fig commencing from the road frontage and continue work following this line across the remnant to complete the zone. ▪ Cut, scrape and paint (CSP) smaller woody weeds such as Lantana, Winter Senna, Camphor Laurel, Umbrella Tree. ▪ Drill and inject larger exotic trees such as Camphor Laurel and Alexander Palms. Take into consideration proximity to houses, do not treat if overhanging mown area or nearby house. Consult with Council.	0.21ha

Work Sequence	Dominant Weed Species	Actions	Work Area
		▪ Lop cut stems to reduce trip hazard or allow access for bush regen team if necessary. ▪ Leave cut woody weeds in place to break down gradually. ▪ Smaller plants can be hand pulled.	
	Syngonium	▪ Scrape and paint Syngonium along the stems. Other exotic vines cut at shoulder height, cut, scrape and paint the base of the plant with herbicide. Dense leafy stems can be pulled down or cleared from native shrubs intact and bundled to spray. Small or shallow rooted specimens can be hand pulled.	
	Exotic Grasses	▪ Clear exotic grasses and groundcovers around small native plants prior to spray to prevent off-target damage. ▪ Spot spray all exotic grasses and groundcover weeds throughout the zone, working thoroughly and systematically as described in primary work above. Follow up the spot spray every 2 months depending on season and prevailing weather conditions.	
Follow Up (Years 2 & 3)	Regrowth of woody weeds, exotic vines, grasses and groundcovers	▪ Follow up spot spray (approx. 4-6 visits / year) depending on season and prevailing weather conditions. ▪ Encourage recruitment of native species by well-timed control of weeds.	
Maintenance (Years 4 & 5)	Regrowth of woody weeds, exotic vines, grasses and groundcovers	▪ Follow up spot spray (approx. 2-3 visits / year) depending on season and prevailing weather conditions. ▪ Encourage recruitment of native species by well-timed control of weeds.	

Work Zone 7 Henderson Fig 2 – 0.21ha

Work Zone 7 is located south of Henderson Drive opposite Zone 6. It has an area of 0.21ha.

The vegetation consists of a large Moreton Bay Fig. The understorey includes native rainforest species such as Guioa and Tuckeroo and weed species Alexander Palm, Syngonium and Winter Senna. Downslope from the fig tree there are plantings of rainforest species and Mango and treated Camphor Laurel. The weed species Murraya has been planted on the eastern edge. It appears that the neighbours on both sides undertake weed control on the edges. There is minimal weed in the northern section becoming weedier in the south.

Table 10 – Summary of restoration actions for Zone 7

Work Sequence	Dominant Weed Species	Actions	Work Area
Primary Work Zone 7 (Year 1)	Alexander Palms Camphor Laurel Umbrella Tree Lantana Winter Senna Garden species	▪ Work systematically and comprehensively adjacent to the large fig commencing from the road frontage and continue work following this line across the remnant to complete the zone. ▪ Cut, scrape and paint (CSP) smaller woody weeds such as Lantana, Winter Senna, Camphor Laurel, Umbrella Tree. ▪ Drill and inject larger exotic trees such as Camphor Laurel and Alexander Palms. Take into consideration proximity to houses, do not treat if overhanging mown area or nearby house. Consult with Council. ▪ Lop cut stems to reduce trip hazard or allow access for bush regen team if necessary. ▪ Leave cut woody weeds in place to break down gradually. ▪ Smaller plants can be hand pulled.	0.21ha
	Syngonium	▪ Scrape and paint Syngonium along the stems. Other exotic vines cut at shoulder height, cut, scrape and paint the base of the plant with herbicide. Dense leafy stems can be pulled down or cleared from native shrubs intact and bundled to spray. Small or shallow rooted specimens can be hand pulled.	
	Exotic Grasses	▪ Clear exotic grasses and groundcovers around small native plants prior to spray to prevent off-target damage. ▪ Spot spray all exotic grasses and groundcover weeds throughout the zone, working thoroughly and systematically as described in primary work above. Follow up the spot spray every 2 months depending on season and prevailing weather conditions.	
Follow Up (Years 2 & 3)	Regrowth of woody weeds, exotic vines, grasses and groundcovers	▪ Follow up spot spray (approx. 4-6 visits / year) depending on season and prevailing weather conditions. ▪ Encourage recruitment of native species by well-timed control of weeds.	
Maintenance (Years 4 & 5)	Regrowth of woody weeds, exotic vines, grasses and groundcovers	▪ Follow up spot spray (approx. 2-3 visits / year) depending on season and prevailing weather conditions. ▪ Encourage recruitment of native species by well-timed control of weeds.	

Work Zone 8: Tara Downs – 14.49ha

Work Zone 8 is located to the east of North Creek Road and accessed from Tara Downs Road on the west via a pedestrian pathway, and from Skennars Head Road to the south-east. The southern and eastern sections can be accessed through the palm forest. The Zone has areas of dense grasses and inundation making access difficult. The northern section of the zone is accessed through the rainforest and along the northern boundary to the eastern edge. The zone has an area of 14.49ha.

Previous plans prepared for Tara Downs are *Management Plan & Proposal for Regeneration of Tara Downs Rainforest, Palm Forest and Wetlands* (Tara Downs Landcare Group, undated) and *Compensatory Habitat Management Plan "Tara Downs"* (SMEC 2014). These plans are summarised and actions brought into this VMP.

The vegetation consists of five vegetation classes –
Subtropical Rainforest, Littoral Rainforest, Swamp Sclerophyll Forest, Planted Rainforest and Freshwater Wetland.

Vegetation condition and weed density is highly variable ranging from dense exotic grasses and shrubs through to good condition Palm Forest and rainforest. Threatened species recorded in Zone 8 include Rough-shelled Bush Nut in the Littoral Rainforest. Hairy Joint Grass and Square-stemmed Spike Rush have been previously recorded in the central wetter area of the zone.

Tara Downs is divided into three sub-zones for implementation (**Figure 14**). The drier northern section of sub-zone 8a has previously been planted by Tara Downs Landcare which was active in the zone in the past. Zone 8a is easier to access through the Littoral Rainforest. Zones 8b and 8c are regularly inundated and will require systematic control of weedy grasses and groundcovers within the freshwater wetland and swamp forest.

There are areas of cleared grassland on the east and west. The western area is maintained by Ballina Shire Council. The eastern section is paddock and not maintained. Future plantings could be included in these areas. See **Section 8.3** Proposed Plantings Littoral Rainforest.

Zone 8a includes Subtropical and Littoral Rainforest, regenerating subtropical rainforest and planted rainforest, Swamp Sclerophyll Forest and Woodland and an area on the east dominated by Coral Tree. This zone includes a former cattle dip site known as Meaneys Dip. The lease to use the dip expired in 2001 and the site has since been decommissioned and capped. Planning constraints and special requirements apply to this area. Guidance from Ballina Shire Council must be sought prior to any excavation or planting work here.

Zone 8b is Freshwater Wetland **–** Sedgeland/Grassland/Fernland comprising a mosaic of grassland (dominated by the weed species Para Grass, sedgeland (Cumbungi *Typha orientalis*) and fernland (Swamp Water Fern). This zone contains an area of 0.35ha set aside as an offset for loss of Hairy Joint Grass *Arthraxon hispidus* (**Figure 14**). It also includes an offset for Square-stemmed Spike Rush *Eleocharis tetraquetra* within the Freshwater Wetland in Zone 8b. These areas and species require particular care and management as indicated in **Table 11** and are a priority for future funding.

Zone 8c is Swamp Sclerophyll Forest – Broad-leaved Paperbark and Swamp Oak with exotic grass species and Crofton Weed common in the ground layer, and Freshwater Wetland – Sedgeland/Grassland/Fernland comprised a mosaic of grassland (dominated by the weed species Para Grass, sedgeland (Cumbungi) and fernland (Swamp Water Fern).

Table 11 – Summary of restoration actions for Zone 8

Work Sequence	Dominant Weed Species	Actions	Work Area
Prior to work	Zone 8b Hairy Joint Grass offset area (Figure 14).	▪ Define the boundaries of the 0.35ha area of Hairy Joint Grass (HJG) offset (Figure 14) and survey areas of potential habitat nearby. Target the species and map extent of the population if found. ▪ If present establish two monitoring transects with quadrats using technique as listed in the Monitoring section of this VMP.	0.35ha
Prior to work	Zone 8b Square-stemmed Spike Rush Offset area (Figure 14).	▪ Review the freshwater wetland area for Square-stemmed Spike Rush (SSSR) within Zones 8b and 8c (Figure 15). Conduct targeted survey across the site, focusing on freshwater swamp margins. If found survey swamp edges for presence and map are of occupancy.	0.4ha
Primary Work Work Zone 8a Work Zone 8b Work Zone 8c (Year 1)	**Work Zone 8a** Coral Tree Camphor Laurel Cocos Palm Umbrella Tree Lantana Ochna Cherry Guava **Work Zone 8b** Isolated woody weeds **Work Zone 8c** Camphor Laurel Winter senna Umbrella Tree	▪ If Hairy Joint Grass is found in Zone 8b, slash the area once annually in late June/July when the species has died down to reduce competition from exotic grasses. ▪ If Square-stemmed Spike Rush is located in Zone 8b or 8c, use mechanical techniques to remove infestations of weeds (particularly groundsel) from areas where it is impacting on survival and reproduction. Note - the species is particularly sensitive to glyphosate, so do not use on wetland edges. ▪ Work systematically and comprehensively through the Zone commencing in Zone 8a from the west following the northern boundary eastwards then southwards to complete the zone. ▪ Then work Zone 8c from the southern boundary working east to west in lines moving northward and through the Freshwater Wetland. Zone 8c is Freshwater Wetland and will require gradual control of weeds throughout. Work into the wetlands in Zones 8b and 8c and visually determine if weed control is required – treat as necessary. Zone 8c includes a strip of grassland which in the future could be planted. ▪ Cut, scrape and paint (CSP) woody weeds such as Lantana, Winter Senna, Camphor Laurel, Umbrella Tree and other woody weeds. ▪ Lop cut stems to reduce trip hazard or allow access for bush regen team if necessary. ▪ Leave treated Lantana frames and other woody weeds in place to break down gradually. ▪ Smaller plants can be hand pulled.	Zone 8a Zone 8b Zone 8c

Work Sequence	Dominant Weed Species	Actions	Work Area
		▪ Drill inject larger exotic trees such as Camphor Laurel, Coral Tree, Umbrella Tree and Winter Senna. Prior to injecting larger trees ensure that smaller woody weeds and groundcovers have had primary work.	
	Work Zones 8a, 8b, 8c Corky Passionflower Coastal Morning Glory	▪ Cut Coastal Morning Glory and other exotic vines at shoulder height, cut, scrape and paint the base of the plant with herbicide. Dense leafy stems can be pulled down or cleared from native shrubs intact and bundled to spray. Small or shallow rooted specimens can be hand pulled. ▪ Where native vines are impacting native trees and shrubs, they are to be cut at head height to reduce their impact.	
	Work Zone 8a Crofton Weed Exotic grasses **Work Zone 8b** Para Grass Setaria Broad-leaved Paspalum Molasses Grass Tradescantia **Work Zone 8c** Para Grass Exotic grasses	▪ Clear exotic grasses and groundcovers within the rainforest vegetation around small native plants prior to spray to prevent off-target damage. ▪ Spot spray all exotic grasses, herbs and groundcover weeds (overspray dense areas) throughout Work Zone 8a and forested area of Work Zone 8c working thoroughly and systematically as described in primary work above. ▪ Sub-zone 8b and the northern section of sub-zone 8c will require long term systematic weed control to reduce the Para Grass and other weeds so that they can be replaced by wetland species of sedges, rushes, grasses and ferns. ▪ Follow up the spot spray every 2 months depending on season and prevailing weather conditions.	
Annually in winter	**Zone 8b** HJG area	▪ Slash areas containing Hairy Joint Grass once in July after the species has died down to reduce competition from exotic grasses.	
Annually following rain in February	**Zone 8b** SSSR	▪ Survey wetland edges for the presence of Square-stemmed Spike Rush and map area of occupancy using hand-held GPS or application with GPS capability.	
Follow Up (Years 2 & 3)	Regrowth of woody weeds, exotic vines, grasses and groundcovers	▪ Follow up spot spray (approx. 4-6 visits / year) depending on season and prevailing weather conditions. ▪ Encourage recruitment of native species by well-timed control of weeds.	
Maintenance (Years 4 & 5)	Regrowth of woody weeds, exotic vines, grasses and groundcovers	▪ Follow up spot spray (approx. 2-3 visits / year) depending on season and prevailing weather conditions. ▪ Encourage recruitment of native species by well-timed control of weeds.	

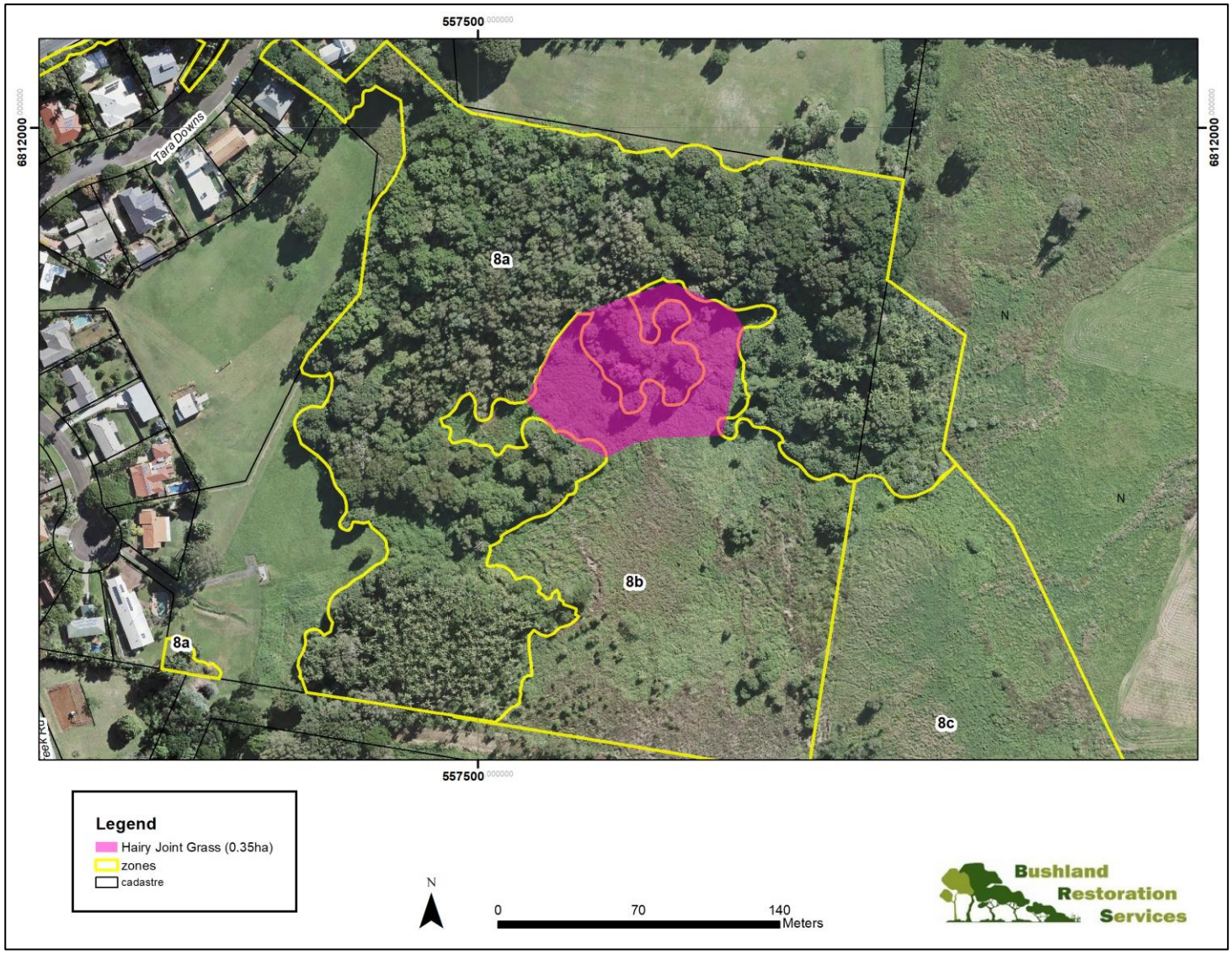

Figure 14: Tara Downs sub-zones showing Hairy Joint Grass offset area in pink.

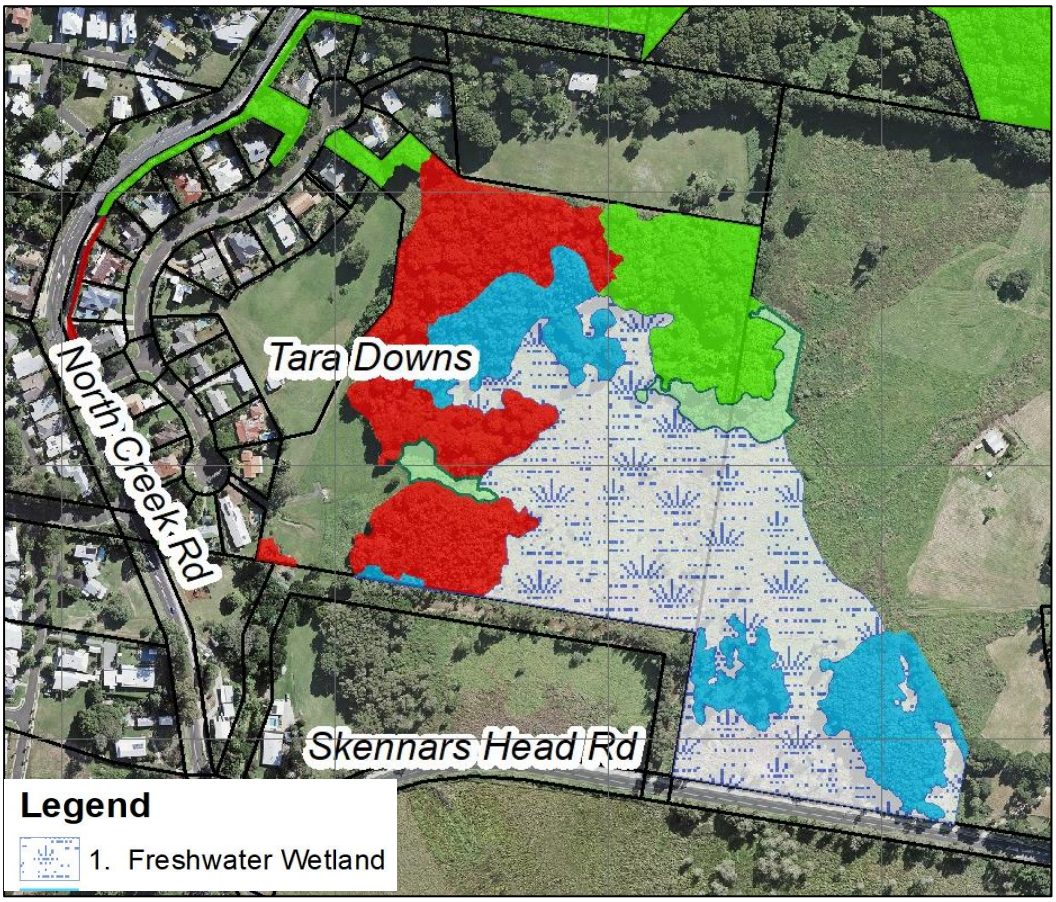

Figure 15: Survey edges of freshwater wetland for Square-stemmed Spike Rush.

Plate 19: Western edge of sub-zone 8a – weedy edge with Palm Forest in background

Plate 20: Freshwater wetland in sub-zone 8b with Palm Forest in background

Work Zone 9: North Creek South – 0.11ha

Work Zones 9, 10, 12 and 13 are strips of vegetation within road reserve along the eastern side of North Creek Road between the footpaths and the back of houses. The width is variable, as is the density of weeds. The majority of the vegetation is planted and contains a mix of native and exotic species. There are sections of naturally occurring native trees and shrubs and areas of mown grass maintained by Council within these zones.

Additional planting could be undertaken after weed control in areas which were previously dominated by weeds or are currently mown grass maintained by Council. See **Section 8.3** Proposed Plantings Littoral Rainforest.

As these zones are adjacent to the residential area there is incidence of dumping of garden waste and other items. Houses are in close proximity so ensure that treated woody stems are not in close proximity to backyards. Restrict the use of chemical adjacent to the houses. Council to consult with neighbours in relation to use of chemical and inappropriate plantings.

The vegetation in Work Zone 9 consists of a narrow strip of Littoral Rainforest dominated by Tuckeroo and Guioa. There is an old stone wall along the northern side. The rainforest is in good condition with most weed species and plantings below the wall. Weeds include Asparagus Fern, Brazilian Cherry, Night Cestrum, Golden Rain Tree and Queensland Umbrella tree. Planting may be appropriate along the wall e.g. Brush Cherry *Syzygium australe*.

Table 12 – Summary of restoration actions for Zone 9

Work Sequence	Dominant Weed Species	Actions	Work Area
Primary Work Zone 9 (Year 1)	Brazilian Cherry Night Cestrum Golden Rain Tree Cocos Palm Ochna Umbrella Tree Lantana Winter Senna Garden species	▪ Work systematically and comprehensively through the zone commencing in the south at the road frontage and continue work across the remnant and moving north to complete the zone. ▪ Cut, scrape and paint (CSP) smaller woody weeds such as Lantana, Winter Senna, Ochna, Umbrella Tree. ▪ Drill inject larger exotic trees such as Cocos Palm and garden species. Take into consideration proximity to houses, do not treat if overhanging backyards or footpath. Consult with Council. ▪ Lop cut stems to reduce trip hazard or allow access for bush regen team if necessary. ▪ Leave cut woody weeds in place to break down gradually. ▪ Smaller plants can be hand pulled.	0.11ha
	Syngonium sp. Exotic vines and creepers	▪ Scrape and paint Syngonium along the stems. Other exotic vines cut at shoulder height, cut, scrape and paint the base of the plant with herbicide. Dense leafy stems can be pulled down or cleared from native shrubs intact and bundled to spray. Small or shallow rooted specimens can be hand pulled.	

Work Sequence	Dominant Weed Species	Actions	Work Area
	Exotic Grasses Ground Asparagus	▪ Clear exotic grasses and groundcovers around small native plants prior to spray to prevent off-target damage. ▪ Spot spray all exotic grasses and groundcover weeds throughout the zone, working thoroughly and systematically as described in primary work above. Follow up the spot spray every 2 months depending on season and prevailing weather conditions.	
Follow Up (Years 2 & 3)	Regrowth of woody weeds, exotic vines, grasses and groundcovers	▪ Follow up spot spray (approx. 4-6 visits / year) depending on season and prevailing weather conditions. ▪ Encourage recruitment of native species by well-timed control of weeds.	
Maintenance (Years 4 & 5)	Regrowth of woody weeds, exotic vines, grasses and groundcovers	▪ Follow up spot spray (approx. 2-3 visits / year) depending on season and prevailing weather conditions. ▪ Encourage recruitment of native species by well-timed control of weeds.	

Work Zone 10: North Creek Central – 0.43ha

The vegetation consists of two vegetation classes - Littoral Rainforest and plantings along the roadside. The canopy of the littoral rainforest is dominated by Camphor Laurel and Guioa, with Moreton Bay Fig and Ribbonwood *Euroschinus falcatus*. Sweet Pittosporum *Pittosporum undulatum* and Rough-leaved Elm *Aphananthe philippinensis* were recorded in the mid stratum. There was a diversity of weed species in the littoral rainforest including Golden Rain Tree, Queensland Umbrella, Cocos Palm, Cestrum and Asparagus Fern. There is a vegetated extension adjacent to houses leading to Tara Downs.

The plantings include Cadaghi *Eucalyptus torreliana*, Swamp Mahogany *Eucalyptus robusta*, Silky Oak *Grevillea robusta*, Traveller's Palm and NZ Pohutakawa *Metrosideros* sp. There is a planting of Brush Cherry at the southern end of the roadside strip. Ochna and Bamboo are also present.

Table 13 – Summary of restoration actions for Zone 10

Work Sequence	Dominant Weed Species	Actions	Work Area
Primary Work Zones 10 (Year 1)	Brazilian Cherry Night Cestrum Golden Rain Tree Cocos Palm Ochna Umbrella Tree Lantana Winter Senna Garden species	▪ Work systematically and comprehensively through the zone commencing in the south at the road frontage continue work across the remnant and moving north to complete the zone. ▪ Cut, scrape and paint (CSP) smaller woody weeds such as Lantana, Winter Senna, Ochna, Umbrella Tree. ▪ Drill inject larger exotic trees such as Cocos Palm and garden species. Take into consideration proximity to	0.43ha

Work Sequence	Dominant Weed Species	Actions	Work Area
		houses, do not treat if overhanging backyards or footpath. Consult with Council. ▪ Lop cut stems to reduce trip hazard or allow access for bush regen team if necessary. ▪ Leave cut woody weeds in place to break down gradually. ▪ Smaller plants can be hand pulled.	
	Syngonium sp. Exotic vines and creepers	▪ Scrape and paint Syngonium along the stems. Other exotic vines cut at shoulder height, cut, scrape and paint the base of the plant with herbicide. Dense leafy stems can be pulled down or cleared from native shrubs intact and bundled to spray. Small or shallow rooted specimens can be hand pulled.	
	Exotic Grasses Ground Asparagus	▪ Clear exotic grasses and groundcovers around small native plants prior to spray to prevent off-target damage. ▪ Spot spray all exotic grasses and groundcover weeds throughout the zone, working thoroughly and systematically as described in primary work above. Follow up the spot spray every 2 months depending on season and prevailing weather conditions.	
Follow Up (Years 2 & 3)	Regrowth of woody weeds, exotic vines, grasses and groundcovers	▪ Follow up spot spray (approx. 4-6 visits / year) depending on season and prevailing weather conditions. ▪ Encourage recruitment of native species by well-timed control of weeds.	
Maintenance (Years 4 & 5)	Regrowth of woody weeds, exotic vines, grasses and groundcovers	▪ Follow up spot spray (approx. 2-3 visits / year) depending on season and prevailing weather conditions. ▪ Encourage recruitment of native species by well-timed control of weeds.	

Work Zone 11: Palisade Way – 6.34ha

Zone 11 is one of the largest remnants and of the highest conservation significance. The zone has an area of 6.34ha. The zone extends from North Creek Road along the rear of houses fronting Palisade Way and Castle Drive east to adjoining Littoral Rainforest on private land. There is a track along the back of the houses suitable for a four-wheel drive vehicle which is maintained as the Palisade Fire Trail.

The eastern section has had continual weed control for the past five years through Saving Our Species funding for Coastal Fontainea. The work includes three translocation plots of the Coastal Fontainea. Liaise with Ballina Shire Council and any bush regeneration team prior to commencement to link up with current bush restoration works. Council is to liaise with NPWS representative if future translocation plots are planned for Coastal Fontainea to ensure plots are located at a minimum distance of 30m from all pipelines.

There is continuing weed control along the southern edge of the track behind the first two houses at the western section from North Creek Road. Condition is variable with dense weed along edges of the track to areas of minimal weed within the forest. There is a mown area on Castle Drive that could be included as a buffer planting. See **Section 8.3** Proposed Plantings Littoral Rainforest.

The vegetation consists of one vegetation class - Littoral Rainforest. The canopy is dominated by Tuckeroo and Guioa. Cocos Palm, Camphor Laurel and Queensland Umbrella were present in the canopy. The understorey included Tuckeroo, Guioa and Coogera. Weed species include Camphor Laurel, Cocos Palm, Golden Rain Tree, Queensland Umbrella, Alexander Palm, Murraya, Johnson Grass and Singapore Daisy. There is a large patch of Lantana, Coastal Morning Glory and White Passionflower interspersed with Native Ginger and Whip Vine adjacent to the track.

The eastern section has had continual weed control for the past five years through *Saving Our Species* funding for Coastal Fontainea. The work includes three translocation plots of the Coastal Fontainea. Liaise with Ballina Shire Council and any bush regeneration team prior to commencement to link up with current bush restoration works. Council is to liaise with NPWS representative if future translocation plots are planned for Coastal Fontainea to ensure plots are located at a minimum distance of 30m from all pipelines.

There is continuing weed control along the southern edge of the track behind the first two houses at the western section from North Creek Road. Condition is variable with dense weed along edges of the track to areas of minimal weed within the forest. There is a mown area on Castle Drive that could be included as a buffer planting. See **Section 8.3** Proposed Plantings Littoral Rainforest.

Table 14 – Summary of restoration actions for Zone 11.

Work Sequence	Dominant Weed Species	Actions	Work Area
Primary Work Zone 11 (Year 1)	Camphor Laurel Cocos Palm Alexander Palm Golden Rain Tree Umbrella Tree Lantana Murraya	▪ Work systematically and comprehensively through the zone commencing from the east, south of the grassed area fronting Castle Drive. Current work is east of this point. Work south from Castle Drive then move westward following this line to complete the zone. ▪ Cut, scrape and paint (CSP) woody weeds such as Lantana, Winter Senna, Camphor Laurel, Umbrella Tree and other woody weeds encountered along weedy slopes adjoining sedgeland. ▪ Lop cut stems to reduce trip hazard or allow access for bush regen team if necessary. ▪ Leave treated Lantana frames and other woody weeds in place to break down gradually. ▪ Smaller plants can be hand pulled. ▪ Drill and inject larger exotic trees such as Camphor Laurel, Umbrella Tree and Cocos Palms. Prior to injecting larger trees ensure that smaller woody weeds and groundcovers have had primary work.	6.34ha
	Corky Passionfruit White Passionflower Coastal Morning Glory	▪ Cut Coastal Morning Glory and other exotic vines at shoulder height, cut, scrape and paint the base of the plant with herbicide. Dense leafy stems can be pulled down or cleared from native shrubs intact and bundled	

Work Sequence	Dominant Weed Species	Actions	Work Area
		to spray. Small or shallow rooted specimens can be hand pulled. Asparagus Fern to be spot sprayed. ▪ Cut back native Whip Vine where it is impacting on native trees.	
	Exotic Grasses Johnson Grass Singapore Daisy	▪ Clear exotic grasses and groundcovers around small native plants prior to spray to prevent off-target damage. ▪ Spot spray all exotic grasses, herbs and groundcover weeds (overspray dense areas such as Singapore Daisy) throughout the zone, working thoroughly and systematically as described in primary work above. Follow up the spot spray every 2 months depending on season and prevailing weather conditions.	
Follow Up (Years 2 & 3)	Regrowth of woody weeds, exotic vines, grasses and groundcovers	▪ Follow up spot spray (approx. 4-6 visits/year) depending on season and prevailing weather conditions. ▪ Encourage recruitment of native species by well-timed control of weeds.	6.34ha
Maintenance (Years 4 & 5)	Regrowth of woody weeds, exotic vines, grasses and groundcovers	▪ Follow up spot spray (approx. 2-3 visits/year) depending on season and prevailing weather conditions. ▪ Encourage recruitment of native species by well-timed control of weeds.	6.34ha

Plate 21: Zone 11 Dense planting of Brush Cherry

Plate 22: Zone 11 Weedy edge

Work Zone 12: North Creek North – 0.07ha

The vegetation consists of a mixed planting – native and exotic species with an open understorey. The ground layer is mown. The canopy includes Broad-leaved Paperbark, a flowering gum (*Corymbia sp.*), Slash Pine and Weeping Bottlebrush *Melaleuca viminalis*. The open understorey included ornamental Hibiscus, Tuckeroo and Common Lilly Pilly.

Table 15 – Summary of restoration actions for Zone 12.

Work Sequence	Dominant Weed Species	Actions	Work Area
Primary Work Zone 12 (Year 1)	Brazilian Cherry Night Cestrum Golden Rain Tree Cocos Palm Ochna Umbrella Tree Lantana Winter Senna Garden species	▪ Work systematically and comprehensively through the zone commencing in the south at the road frontage and continue across the zone, moving north to complete. ▪ Cut, scrape and paint (CSP) smaller woody weeds such as Lantana, Winter Senna, Ochna, Umbrella Tree. ▪ Drill and inject larger exotic trees such as Cocos Palm and garden species. Take into consideration proximity to houses, do not treat if overhanging backyards or footpath. Consult with Council. ▪ Lop cut stems to reduce trip hazard or allow access for bush regen team if necessary. ▪ Leave cut woody weeds in place to break down gradually. ▪ Smaller plants can be hand pulled.	0.07ha
	Syngonium sp. Exotic vines and creepers	▪ Scrape and paint Syngonium along the stems. Other exotic vines cut at shoulder height, cut, scrape and paint the base of the plant with herbicide. Dense leafy stems can be pulled down or cleared from native shrubs intact and bundled to spray. Small or shallow rooted specimens can be hand pulled.	
	Exotic Grasses Ground Asparagus	▪ Clear exotic grasses and groundcovers around small native plants prior to spray to prevent off-target damage. ▪ Spot spray all exotic grasses and groundcover weeds throughout the zone, working thoroughly and systematically as described in primary work above. Follow up the spot spray every 2 months depending on season and prevailing weather conditions.	
Follow Up (Years 2 & 3)	Regrowth of woody weeds, exotic vines, grasses and groundcovers	▪ Follow up spot spray (approx. 4-6 visits/year) depending on season and prevailing weather conditions. ▪ Encourage recruitment of native species by well-timed control of weeds.	
Maintenance (Years 4 & 5)	Regrowth of woody weeds, exotic vines, grasses and groundcovers	▪ Follow up spot spray (approx. 2-3 visits/year) depending on season and prevailing weather conditions. Encourage recruitment of native species by well-timed control of weeds.	

Work Zone 13: North Creek Far North – 0.31ha

The vegetation consists of planted native and exotic species with an open understorey. The ground layer is mown. The canopy is dominated by Swamp Mahogany and Blackbutt *Eucalyptus pilularis* with Silky Oak, Slash Pine and Cocos Palm. The midstorey includes Paperbark, Foambark, Flame Tree, Cape Chestnut and Golden Penda. Weed species recorded are Golden Rain Tree, Cocos Palm, Camphor laurel, Alexander Palms, Murraya, Kahili Ginger *Hedychium gardnerianum*, Golden Bells *Tecoma stans* and Slash Pine. There is a large Poinciana *Delonix regia* at the southern end of the strip.

Table 16 – Summary of restoration actions for Zone 13.

Work Sequence	Dominant Weed Species	Actions	Work Area
Primary Work Zone 13 (Year 1)	Brazilian Cherry Night Cestrum Golden Rain Tree Cocos Palm Ochna Umbrella Tree Lantana Winter Senna Garden species	▪ Work systematically and comprehensively through the zone commencing in the south at the road frontage and continue work across and moving north to complete the zone. ▪ Cut, scrape and paint (CSP) smaller woody weeds such as Lantana, Winter Senna, Ochna, Umbrella Tree. ▪ Drill and inject larger exotic trees such as Cocos Palm and garden species. Take into consideration proximity to houses, do not treat if overhanging backyards or footpath. Consult with Council. ▪ Lop cut stems to reduce trip hazard or allow access for bush regen team if necessary. ▪ Leave cut woody weeds in place to break down gradually. ▪ Smaller plants can be hand pulled.	0.31ha
	Syngonium sp. Exotic vines and creepers	▪ Scrape and paint Syngonium along the stems. Other exotic vines cut at shoulder height, cut, scrape and paint the base of the plant with herbicide. Dense leafy stems can be pulled down or cleared from native shrubs intact and bundled to spray. Small or shallow rooted specimens can be hand pulled.	
	Exotic Grasses Ground Asparagus	▪ Clear exotic grasses and groundcovers around small native plants prior to spray to prevent off-target damage. ▪ Spot spray all exotic grasses and groundcover weeds throughout the zone, working thoroughly and systematically as described in primary work above. Follow up the spot spray every 2 months depending on season and prevailing weather conditions.	
Follow Up (Years 2 & 3)	Regrowth of woody weeds, exotic vines, grasses and groundcovers	▪ Follow up spot spray (approx. 4-6 visits/year) depending on season and prevailing weather conditions. ▪ Encourage recruitment of native species by well-timed control of weeds.	

Work Sequence	Dominant Weed Species	Actions	Work Area
Maintenance (Years 4 & 5)	Regrowth of woody weeds, exotic vines, grasses and groundcovers	▪ Follow up spot spray (approx. 2-3 visits/year) depending on season and prevailing weather conditions. ▪ Encourage recruitment of native species by well-timed control of weeds.	

Plate 23: Zone 13 Mown grass area

Work Zone 14: The Pines – 0.47ha

Zone 14 is located on the western side of North Creek Road and has an area of 0.47ha. Access is through a pedestrian pathway from North Creek Road. The stand of Norfolk Island Pines is not included in the project works.

The vegetation consists of planted Norfolk Pines and two large Moreton Bay Figs. The understorey was dominated by dense weed species but there was a diversity of native rainforest species including Three- veined Laurel *Cryptocarya triplinervis*, Bolly Gum *Neolitsea australiensis*, Red Bean, Coogera and Guioa. Weed species include Pereskia *Pereskia aculeata*, Winter Senna, Asparagus Fern, Travellers Palm *Ravenala madagascariensis*, Cocos Palm, Phoenix Palm *Phoenix* sp., Climbing Umbrella Tree *Schefflera arboricola*, Ochna, Queensland Umbrella, Duranta, Cape Ivy *Delairea odorata*.

Table 17 – Summary of restoration actions for Zone 14.

Work Sequence	Dominant Weed Species	Actions	Work Area
Primary Work Zone 14 (Year 1)	Cocos Palm Travellers Palm Umbrella Tree Ochna Duranta Winter Senna Garden species	▪ Work systematically and comprehensively adjacent to the large figs commencing from the eastern boundary and continue work following this line across the remnant to complete the zone. Weeds are dense and will require cutting back to provide access. Pereskia has large thorns. ▪ Cut, scrape and paint (CSP) smaller woody weeds such as Duranta, Winter Senna, Umbrella Tree. ▪ Drill and inject larger exotic trees such as Alexander Palm. ▪ Lop cut stems to reduce trip hazard or allow access for bush regen team if necessary. ▪ Leave cut woody weeds in place to break down gradually. ▪ Smaller plants can be hand pulled.	0.47ha
	Climbing Asparagus Pereskia Climbing Umbrella Tree Cape ivy	▪ Scrape, gouge and paint Climbing Asparagus. Lop back Pereskia and treat base. Care not to be spiked or tread on thorns. Scrape and paint stems of Cape Ivy or can be sprayed. Small or shallow rooted weeds can be hand pulled.	
	Exotic Grasses Ground Asparagus	▪ Clear exotic grasses and groundcovers around small native plants prior to spray to prevent off-target damage. ▪ Spot spray all exotic grasses and groundcover weeds throughout the zone, working thoroughly and systematically as described in primary work above. Follow up the spot spray every 2 months depending on season and prevailing weather conditions.	
Follow Up (Years 2 & 3)	Regrowth of woody weeds, exotic vines, grasses and groundcovers	▪ Follow up spot spray (approx. 4-6 visits / year) depending on season and prevailing weather conditions. ▪ Encourage recruitment of native species by well-timed control of weeds.	0.47ha
Maintenance (Years 4 & 5)	Regrowth of woody weeds, exotic vines, grasses and groundcovers	▪ Follow up spot spray (approx. 2-3 visits / year) depending on season and prevailing weather conditions. ▪ Encourage recruitment of native species by well-timed control of weeds.	).47ha

Work Zone 15: Fieldcrest Fig – 0.13ha

Zone 15 is located north of Fieldcrest Drive and accessed through a walkway from the cul-de-sac. The Zone has an area of 0.13ha.

The vegetation consists of a large Moreton Bay Fig with Tuckeroo also present in the canopy. The understorey includes a diversity of native species such as Guioa and Coogera. Weed species include exotic grasses, Lantana, Winter Senna and Ochna. A buffer planting could be included in consultation with Council. See **Section 8.3** Proposed Plantings Littoral Rainforest.

Table 18 – Summary of restoration actions for Zone 15.

Work Sequence	Dominant Weed Species	Actions	Work Area
Primary Work Zone 15 (Year 1)	Alexander Palms Camphor Laurel Umbrella Tree Lantana Winter Senna Garden species	▪ Work systematically and comprehensively adjacent to the large figs commencing from the road or access frontage continue work following this line across the remnant to complete the zone. ▪ Cut, scrape and paint (CSP) smaller woody weeds such as Lantana, Winter Senna, Camphor Laurel, Umbrella Tree. ▪ Drill inject larger exotic trees such as Camphor Laurel and Alexander Palms. Take into consideration proximity to houses, do not treat if overhanging mown area or nearby house. Consult with Council. ▪ Lop cut stems to reduce trip hazard or allow access for bush regen team if necessary. ▪ Leave cut woody weeds in place to break down gradually. ▪ Smaller plants can be hand pulled.	0.13ha
	Syngonium	▪ Scrape and paint Syngonium along the stems. Other exotic vines cut at shoulder height, cut, scrape and paint the base of the plant with herbicide. Dense leafy stems can be pulled down or cleared from native shrubs intact and bundled to spray. Small or shallow rooted specimens can be hand pulled.	
	Exotic Grasses	▪ Clear exotic grasses and groundcovers around small native plants prior to spray to prevent off-target damage. ▪ Spot spray all exotic grasses and groundcover weeds throughout the zone, working thoroughly and systematically as described in primary work above. Follow up the spot spray every 2 months depending on season and prevailing weather conditions.	

Work Sequence	Dominant Weed Species	Actions	Work Area
Follow Up (Years 2 & 3)	Regrowth of woody weeds, exotic vines, grasses and groundcovers	▪ Follow up spot spray (approx. 4-6 visits/year) depending on season and prevailing weather conditions. ▪ Encourage recruitment of native species by well-timed control of weeds.	
Maintenance (Years 4 & 5)	Regrowth of woody weeds, exotic vines, grasses and groundcovers	▪ Follow up spot spray (approx. 2-3 visits / year) depending on season and prevailing weather conditions. ▪ Encourage recruitment of native species by well-timed control of weeds.	

Work Zone 16: Rainforest Way – 3.55ha

Zone 16 is located west of North Creek Road, west of The Crest and south of Rainforest Way. The zone has an area of 3.55ha. The zone is accessed through pathways from North Creek Road, The Crest and Montwood Drive. Pacific Pines Asset Protection Zone, along the northern boundary of the zone, is maintained by Council.

A vegetation management plan prepared for Rainforest Way (EnviTE 2004) was funded by a Natural Heritage Trust grant and prepared as a requirement of Ballina Shire Council to enable the Rainforest Way Landcare group to undertake restoration works on the south-western slopes of the Pacific Pines Estate. The plan found that original vegetation had undergone major disturbance with the pre-existing Littoral Rainforest cleared, regrowth occurring in the road reserve and a few isolated copses of trees existing within the study site. It provided a methodology for carrying out systematic weed control and vegetation restoration of the endemic vegetation type of Littoral Rainforest. Initial works were undertaken in the zone by the Landcare group but have now ceased. This VMP supercedes this previous plan.

The vegetation includes a patch of Littoral Rainforest dominated by Tuckeroo and Guioa, rainforest regrowth and planted eucalypt forest. Weed density is variable and generally mid-dense on edges and extending into the forested areas. Rough-shelled Bush Nut was recorded in the Zone.The planted eucalypt forest is located south of the Montwood access, the Littoral rainforest and rainforest regrowth is located west of The Crest and North Creek Road access tracks extending west to weedy regrowth and the strip of rainforest on the west.

Table 19 – Summary of restoration actions for Zone 16.

Work Sequence	Dominant Weed Species	Actions	Work Area
Primary Work Zone 16 (Year 1)	Alexander Palms Golden Rain Tree Camphor Laurel Cadaghi Murraya Winter Senna Umbrella Tree Cestrum Lantana Ochna	▪ Work systematically and comprehensively through the zone commencing from the southern edge and working from the fire trail in a north south direction, gradually moving to the west. Continue work following this line westwards to complete the zone. ▪ Cut, scrape and paint (CSP) woody weeds such as Lantana, Winter Senna, Camphor Laurel, Umbrella Tree and other woody weeds encountered in the zone. ▪ Lop cut stems to reduce trip hazard or allow access for bush regen team if necessary.	3.55ha

Work Sequence	Dominant Weed Species	Actions	Work Area
		▪ Leave treated Lantana frames and other woody weeds in place to break down gradually. ▪ Smaller plants can be hand pulled. ▪ Drill inject larger exotic trees such as Camphor Laurel, Umbrella Tree and Winter Senna. Prior to injecting larger trees ensure that smaller woody weeds and groundcovers have had primary work.	
	White Passionflower Glycine	▪ Cut White Passionflower, Glycine and other exotic vines at shoulder height, cut, scrape and paint the base of the plant with herbicide. Dense leafy stems can be pulled down or cleared from native shrubs intact and bundled to spray. Small or shallow rooted specimens can be hand pulled. Asparagus fern to be spot sprayed. Cut back native Water Vine where impacting on native trees.	
	Exotic Grasses Broad-leaved Paspalum Singapore Daisy	▪ Clear exotic grasses and groundcovers around small native plants prior to spray to prevent off-target damage. ▪ Spot spray all exotic grasses, herbs and groundcover weeds (overspray dense areas) throughout the zone, working thoroughly and systematically as described in primary work above. Follow up the spot spray every 2 months depending on season and prevailing weather conditions.	
Follow Up (Years 2 & 3)	Regrowth of woody weeds, exotic vines, grasses and groundcovers	▪ Follow up spot spray (approx. 4-6 visits/year) depending on season and prevailing weather conditions. ▪ Encourage recruitment of native species by well-timed control of weeds.	3.55ha
Maintenance (Years 4 & 5)	Regrowth of woody weeds, exotic vines, grasses and groundcovers	▪ Follow up spot spray (approx. 2-3 visits / year) depending on season and prevailing weather conditions. ▪ Encourage recruitment of native species by well-timed control of weeds.	3.55ha

Figure 16: Zone 16 includes a section of unformed road reserve

Plate 24: View to Work Zone 16 July 2021

8.3 Proposed Planting List – Littoral Rainforest

Plant selection is to be guided by the occurrence of species in the adjacent remnants or those that are included in Littoral Rainforest and have successfully established in the roadside plantings. The density of planting is to range from 1.5 to 3m or in clumps, depending on the location.

Prior to planting, ensure that the Work Zone has been prepared by controlling weeds so that they do not inhibit the establishing plants once planted. Preparation can be the control of all weeds, generally mown grass, or sprayed circles of approximately 1m diameter.

Holes to be dug using a motorised auger, ensuring that hole is deeper and wider than the plant container. Holes to be dug on the day of planting so that the soil has not dried out. Prior to planting soak the plants in water with added seaweed fertiliser. Slow-release fertiliser suitable for native plants to be added and mixed with the soil to assist in plant establishment. Water is to be added to the hole before and after planting. The amount of water will depend on the soil moisture. Mulch to be placed around the plant if soil is bare.

Fencing or guards may be required if planting is likely to be impacted by browsing by wallabies or rabbits. Water and maintenance frequency will depend on weather conditions. The proposed planting list is contained in **Table 20** below.

Table 20: Littoral Rainforest species suitable for planting if required.

Scientific Name	Common Name
Acmena smithii	Common Lilly-pilly
Alphitonia excelsa	Red Ash
Apananthe phillipensis	Rough-leaved Elm
Archonotophoenix cunninghamiana	Bangalow Palm
Arytera divaricata	Coogera
Beilschmedia obtusifolia	Blush Walnut
Breynia oblongifolia	Breynia
Bridelia exaltata	Brush Ironbark
Canthium coprosmoides	Coast Canthium
Cassine australis	Red Olive-berry
Commersonia bartramia	Brown Kurrajong
Cryptocarya triplenervis	Three-veined Laurel
Cupaniopsis anarcardiodes	Tuckeroo
Diploglottis australis	Native Tamarind
Duboisia myoporoides	Corkwood
Dysoxylum mollissima	Red Bean
Eleocarpus obovatus	Hard Quandong
Ervatamia augustifolia	Banana Bush
Glochidion sumatranum	Umbrella Cheese Tree
Guioa semiglauca	Guioa
Mallotus discolor	Yellow Kamala
Mallotus phillippinnensis	Red Kamala
Neolitsea australiensis	Green Bolly gum
Notolea longifolia	Mock Olive
Olea paniculata	Native Olive
Rapanea howittiana	Brush Muttonwood
Sarctopteryx stipata	Steelwood

Scientific Name	Common Name
Sterculia quadrifida	Peanut Tree
Synoum glandulosum	Scentless Rosewood
Syzygium oleosum	Blue Lilly-pilly

8.4 Schedule of Works

This plan specifies a five (5) year duration for the weed control program (**Table 21**) comprising primary weed control and planting if required (Year 1), then follow-up weed control (Year 2 & 3) followed by Work Zone maintenance (Year 4 & 5).

Table 21– Five (5) year implementation schedule for restoration works.

Year	Activity
1	▪ Two (2) monitoring photo-points to be set up within each vegetation management zone and baseline monitoring data recorded prior to commencement of any habitat restoration works. ▪ Primary weed control in all vegetation management zones. ▪ Follow up weed control in all vegetation management zones every 2 months or as required. ▪ Repeat photo point monitoring at the end of Year 1. ▪ Submit annual progress report with monitoring results to Ballina Shire Council.
2 & 3	▪ Maintenance weed control in all zones (approx. 6 visits/year). ▪ Repeat photo point monitoring at the end of Year 2 & 3. ▪ Submit annual progress report with monitoring results to Ballina Shire Council.
4 & 5	▪ Maintenance weed control in all zones (approx. 3 visits/year). ▪ Repeat photo point monitoring at the end of Year 4 & 5. ▪ Submit final evaluation report with all monitoring results to Ballina Shire Council.

8.5 Weed Control Methods

Weeds must be controlled in such a way that they are replaced by native species. Weed control in this context consists of several stages including (a) primary weed control, (b) follow up weed control, and (c) maintenance of the Work Zone. The sequence of proposed works is based upon the need to arrest the degradation factors while maximising the regeneration potential in the vegetation management zone. Seasonal weather conditions and the need to systematically follow up weed control are also important considerations. Weed control methods are provided in **Appendix 3.**

9. GENERAL RESTORATION GUIDELINES

9.1 Bush Regenerators

On ground weed control works and maintenance may be undertaken by qualified bush regeneration contractors or Landcare Volunteers. Contractors working on site should holding TAFE Conservation & Land Management Certificate 3 and supervisor holding CLM Certificate 4 or equivalent, and with minimum 3 years' experience working in local rainforest, sclerophyll and swamp forest vegetation communities. A qualified bush regenerator will be capable of advising on the extent and timing of works, record keeping, selected locations and appropriate species for planting, and Work Zone maintenance program.

The bush regeneration team must hold an appropriate licence (issued under the *Biodiversity Conservation Act 2016*) to work in the habitat of threatened species and endangered ecological communities prior to commencing on ground weed control works. Ballina Shire Council holds Scientific licence SL 100560, which authorises approved bush regeneration contractors and Landcare volunteers to undertake such work - see **Appendix 4**.

Hygiene protocol activities are required for working with specific threatened species within restoration zones, moving from identified infected Work Zones to a sensitive Work Zone and for off-road trail and track movement, in accordance NSW Government *Hygiene Guidelines for Wildlife*, accessed on the link below:

https://www.environment.nsw.gov.au/research-and-publications/publications-search/hygiene-guidelines

9.2 Pesticide Application

Use of chemicals such as herbicides and their additives must only be carried out by personnel who hold current chemical users' certificates. These chemicals must be used in accordance with label directions unless an off-label use permit is procured from the Australian Pesticides and Veterinary Medicines Authority (APVMA).

Chemical use records must also be kept and include weather conditions, areas treated, amounts used and application rates in accordance with the NSW Pesticides Act 1999.

Bush regenerators working in any Work Zones on public land must comply with Ballina Shire Council Pesticide Use Notification Plan (2016) requirements. See link below:

https://ballina.nsw.gov.au/files/19-69482--Policy---P04A-Pesticide-Use-Adopted-281119%283%29.pdf

9.3 Workplace Health and Safety

All works are to adhere to the relevant industry standards, permits, certificates and regulations. In accordance with the Work Health and Safety Act 2011 and Work Health and Safety Regulations 2017 workers will comply to ensure safety in the workplace. Contractors are also required to provide WorkCover for employees or ensure sub-contractors hold individual personal insurance for bush regeneration work.

Contractors and Landcare volunteers approved by Ballina Shire Council need to ensure they have submitted and adhere to an approved current Work Health and Safety System as per Council requirements.

10 MONITORING AND RECORD KEEPING.

10.1 Monitoring Requirements

The monitoring program measures Key Performance Indicators (KPIs) designed to gauge, progressively, the success of the program and allow for the early detection of risk factors to achieving the aims and objectives of the restoration project. This provides an opportunity for adaptive management and improves the chances for success of the project.

10.2 Monitoring Methodology

General Monitoring

The habitat restoration program will be monitored annually using photo points. Two (2) photo points are to be set up within each restoration zone prior to commencement of work. The photo point location should be determined using a GPS, with point coordinates recorded in the work diary or Daily Record Sheet and marked on a map of the Zone. The compass orientation of each photo should also be noted. The photo points are to be set up as follows:

- Photo point location marked using a star picket with protective cap on the top.
- The marker to be located in the centre of the photo to provide a reference point.
- Photos to be taken in the same direction and time of the day each time.
- The camera lens, angle and height to be the same for each photo.

For each photopoint describe the vegetation as follows:

- Species richness for each forest layer (no. of species weeds and native).
- Height and Foliage cover for each forest layer (%).
- Exotic vegetation cover in each layer (%).
- For the planting areas record survival rate and growth rate of plants (5 plants in each planting to be flagged and measured on annual basis)

The photo points are to be repeated on an annual basis for five (5) years and photos included within annual progress reports to Ballina Shire Council.

Hairy Joint Grass Monitoring

If this species is located during survey in Zone 8b prior to commencement of work, monitoring is to be undertaken annually in late April to May. Use 1 m x 1 m quadrats to estimate the density of hairy joint grass along transects set 10m apart across the HJG location area. A quadrat sample to be undertaken at the beginning of the transect, then 2 to 5 meters measured along the transect and another quadrat sample taken. Only HJG presence is to be measured. Density criteria are as follows:

- High density = greater than 31% cover;
- Medium density = 11-30% cover;
- Low density = less than 10% cover
- Strands = up to 10 stems over 30 cm in length

Square-stemmed Spike Rush monitoring

If this species is found during survey prior to commencement of work in Zone 8b, survey swamp edges for presence and map extent of occurrence to determine trends in habitat condition and population size. Assess size and distribution of the population annually using the crown cover assessment technique (sensu Bell 2001). Also assess density of weeds and native vegetation potentially competing for space and resources. Conduct monitoring following rain in February (when plants are fertile).

10.3 Key Performance Indicators

- Primary treatment of all weeds in the to achieve environmental weed cover of less than 10% ground cover and less than 1% shrub and tree layer species at completion of year one (establishment period).
- During years 2-5 (maintenance period) environmental weeds are to be progressively treated to ensure no weeds are present at completion of year five.
- Planting stock to achieve a survival rate of 90 %.
- During the establishment and maintenance period increased recruitment of native species and percentage cover of native species to be achieved.

Two photopoints are to be set up within each restoration zone, staked and marked with pink flagging tape. The photopoint location is to be recorded using a handheld GPS.

Monitoring of KPIs and repeat photographs to be undertaken on an annual basis. Adaptive management may be required as a recommendation after monitoring. This adaptive management approach is especially important in relation to the control of weeds and the species selection and survival rates for planting programs. Regular monitoring is to be used to assess the effectiveness of management strategies and provide the basis for adaptation of the implementation schedule.

10.4 Reporting

The bush regeneration contractor undertaking the weed control works must provide an annual progress report to Ballina Shire Council for the duration of the five (5) year habitat restoration program. The annual report is to include:

- A brief discussion of works completed to date, including an update on the progress of plantings, weed control and assisted natural regeneration works.
- A discussion on the results of surveys and subsequent monitoring for Hairy Joint Grass and Square-stemmed Spike Rush if located on site.
- A description of project issues and potential resolution (i.e. adaptive management).
- A self-assessment against the Performance Indicators provided in this plan.
- Repeat photo point monitoring.
- Recommendations for future vegetation management works.
- Copies of Daily Record Sheets.

In addition to progress reports, a final evaluation report is to be prepared at the end of the five-year program. The evaluation report will summarise the monitoring data over the five-year period, discuss findings and provide recommendations for future management of the Work Zone.

Reporting on the Hairy Joint Grass monitoring results is to include an overview of climatic conditions since the previous spring. Specifically, rainfall patterns in relation to long term monthly averages are to be plotted and any correlations between HJG and rainfall noted.

10.5 Adaptive Management

A key factor for project success will be the ability of those implementing the plan to respond to changing Work Zone conditions. The purpose of regular monitoring, recording and reporting is not only to document the progress of the project, but also to respond to unanticipated circumstances, provide feedback on the success or failure of the plan, and allow adaptation of the management actions and implementation measures to achieve maximum effectiveness in vegetation and fauna management.

Where necessary, an adaptive management statement should be prepared and detail the nature of any issues that may threaten the achievement of project objectives as well as appropriate corrective actions, for review and endorsement by Ballina Shire Council.

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APPENDIX 1: Native Flora Species List

Scientific Name	**Common Name**
Acacia melanoxylon	Sally Wattle
Acacia smithii	Common Lilly Pilly
Acacia sophorae	Coast Wattle
Acronychia imperforata	Beach Acronychia
Adiantum hispidulum	Rough Maidenhair
Ailanthus triphysa	White Bean
Alectryon tomentosus	Hairy Alectryon
Alocasia brisbanensis	Cunjevoi
Alphitonia excelsa	Red Ash
Alpinia caerulea	Native Ginger
Aphananthe philippinensis	Rough-leaved Elm
Araucaria cunninghamii	Hoop Pine
Archidendron hendersonii	**White Laceflower**
Archontophoenix cunninghamiana	Bangalow Palm
Argydendron trifoliolatum	White Booyong
Arytera divaricata	Coogera
Asplenium australasicum	Crows Nest Fern
Backhousia myrtifolia	Grey Myrtle
Banksia integrifolia	Coast Banksia
Breynia oblongifolia	Coffee Bush
Carex appressa	Tall Sedge
Castanospermum australe	Black Bean
Casuarina glauca	Swamp Oak
Celtis paniculata	Native Celtis
Cinnamomum virens	Red-barked Sassafras
Cissus antarctica	Water Vine
Commelina cyanea	Blue Commelina
Commersonia bartramia	Brown Kurrajong
Cordyline petiolaris	Broad-leaved Palm Lily
Cryptocarya glaucescens	Jackwood
Cryptocarya laevigata	Glossy Laurel
Cryptocarya triplinervis	Three-veined Laurel
Cupaniopsis anacardioides	Tuckeroo
Cyathea leichhardtiana	Prickly Tree Fern
Cyperus lucidus	Leafy Flat Sedge
Derris involuta	Native Derris
Dianella caerulea	Blue Flax-lily
Diploglottis australis	Native Tamarind
Dysoxylum fraserianum	Rosewood
Dysoxylum mollissimum	Red Bean

Scientific Name	**Common Name**
Elaeocarpus grandis	Blue Fig
Elaeocarpus obovatus	Hard Quandong
Elaeocarpus reticulatus	Blueberry Ash
Embelia australiana	Embelia
Eucalyptus grandis	Flooded Gum
Eucalyptus robusta	Swamp Mahogany
Eucalyptus saligna	Blue Gum
Eucalyptus siderophloia	Grey Ironbark
Euroschinus falcatus	Ribbonwood
Ficus coronata	Creek Sandpaper Fig
Ficus macrophylla	Moreton Bay Fig
Ficus obliqua	Small-leaved Fig
Ficus virens	White Fig
Ficus watkinsiana	Strangling Fig
Flagellaria indica	Whip Vine
Flindersia schottiana	Cudgerie
Fontainea oraria	**Coastal Fontanea**
Gahnia aspera	Rough Saw Sedge
Gahnia clarkei	Tall Saw Sedge
Geitonoplesium cymosum	Scrambling Lily
Glochidion ferdinandi	Cheese Tree
Glochidion sumatranum	Umbrella Cheese Tree
Gomphocarpus fruticosus	Balloon Cotton Bush
Grevillea robusta	Silky Oak
Guioa semiglauca	Guioa
Hibbertia scandens	Climbing Guinea Flower
Hibiscus tiliaceous	Cottonwood Hibiscus
Homalanthus populifolius	Bleeding Heart
Hypolepis muelleri	Harsh Ground Fern
Ipomoea cairica	Coast Morning Glory
Jagera pseudorhus	Foambark
Livistona australis	a cabbage palm
Lophostemon confertus	Brush Box
Lygodium microphyllum	Climbing Snake Fern
Macadamia tetraphylla	**Rough-shelled Bush Nut**
Macaranga tanarius	Macaranga
Maclura cochinchinesis	Cockspur Vine
Mallotus discolor	Yellow Kamala
Mallotus philippensis	Red Kamala
Marsdenia rostrata	Milk Vine
Melaleuca quinquenervia	Paperbark
Melia azedarach	White Cedar
Melicope elleryana	Pink-flowered Doughwood

Scientific Name	**Common Name**
Myrsine howittiana	Brush Muttonwood
Neolitsea australiensis	Green Bolly Gum
Neolitsea dealbata	White Bolly Gum
Olea paniculata	Native Olive
Oplismenus aemulus	Basket Grass
Oplismenus spp.	a basket grass
Oplismenus undulatifolius	a rainforest grass
Pandorea pandorana	Wonga Wonga Vine
Pararchidendron pruinosum	Snowwood
Parsonsia straminea	Common Silkpod
Persicaria sp.	a smart weed
Phragmites australis	Common Reed
Pittosporum undulatum	Native Daphne
Podocarpus elatus	Brown Pine
Polyscias murrayi	Pencil Cedar
Pouteria australis	Black Apple
Psychotria loniceroides	Psychotria
Sarcopteryx stipata	Steelwood
Smilax australis	Sarsparilla
Stenocarpus sinuatus	Firewheel Tree
Stephania japonica	Snake Vine
Sterculia quadfrida	Peanut Tree
Syncarpia glomulifera	Turpentine
Syzygium luehmannii	Riberry
Syzygium moorei	**Durobby**
Syzygium oleosum	Blue Lilly Pilly
Telmatoblechnum indicum	Swamp Water Fern
Tinospora tinosporoides	**Arrowhead Vine**
Toona australis	Red Cedar
Typha sp.	Bull Rush

***Species in Bold** are listed threatened species under the Biodiversity Conservation Act 2016

APPENDIX 2: Weed Species List

Scientific Name	Common Name
Ageratina adenophora	Crofton Weed
Ageratina riparia	Mist Flower
Ageratum houstonianum	Blue Billygoat weed
Ambrosia artemisiifolia	Ragweed
Archontophoenix alexandrae	Alexander Palm
Ardisia crenata	Coralberry
Bambusa sp.	Bamboo
Bidens pilosa	Farmers Friend
Brachiaria mutica	Para Grass
Callisia repens	Turtle Vine
Cecropia peltata	Cecropia
Cenchrus purpureus	Elephant Grass
Cestrum nocturnum	Night Jessamine
Cinnamomum camphora	Camphor Laurel
Citharexylum spinosum	Fiddlewood
Cocrosmia x cocrosmiiflora	Monbrettia
Corymbia torelliana	Cadaghi
Chrysanthemoides monilera var *rotundata*	Bitou Bush
Cuphea carthagenesis	Cuphea
Delairea odorata	Cape Ivy
Dracaena sp.	Dracaena
Erythrina sykesii	Coral Tree
Eugenia uniflora	Brazilian Cherry
exotic grasses	
exotic palm	
Ficus benjamina	Weeping Fig
Gomphocarpus fruticosus	Balloon Cotton Bush
Hedychium gardnerianum	
Inga sp.	Ice Cream Bean
Ipomoea cairica	Coast Morning Glory
Koelreuteria paniculata	Golden Rain Tree
Lantana camara	Lantana
Ligustrum sinense	Small-leaved Privet
Macroptilium atropurpureum	Siratro
Megathyrsus maximum	Guinea Grass
Melinis repens	Molasses Grass
Murraya paniculata	Murraya
Neonotonia wightii	Glycine
Nephrolepis cordifolia	Fishbone Fern
Ochna serrulata	Mickey Mouse Plant
Paspalum mandiocanum	Broad-leaved Paspalum

Scientific Name	Common Name
Passiflora edulis	Edible Passionfruit
Passiflora suberosa	Corky Passionflower
Passiflora subpeltata	White Passionflower
Pellaea viridis	Green Cliff Brake
Pinus eliottii	Slash Pine
Protasparagus aethiopicus	Ground Asparagus
Protasparagus plumosus	Climbing Asparagus
Protasparagus sp	Asparagus Fern
Psidium cattleyanum	Cherry Guava
Psidium guajava	Yellow Guava
Pyrostegia venusta	Flame Vine
Ravenala madagascariensis	Travellers Palm
Rivina humilis	Coral Berry
Sanseveiria trifasciata	Sanseveira
Schefflera actinophylla	Queensland Umbrella Tree
Schefflera arboricola	Dwarf Umbrella Tree
Senna pendula	Winter Senna
Setaria sphacelata	Setaria
Sida rhombifolia	Paddy's Lucerne
Solanum mauritianum	Wild Tobacco
Sorghum halapense	Johnson Grass
Spathodea campanulata	African Tulip Tree
Sphagneticola trilobata	Singapore Daisy
Syagrus romanzoffianum	Cocos Palm
Syngonium podophyllum	Arrowhead Plant
Solanum seaforthianum	Brazlian Nightshade
Tecoma stans	Yellow Bells
Tradescantia albiflora	Trad
unidentified ground cover orange flower1	
Verbena rigida	Veined Verbena
Hoya pubicalyx	a Hoya
Citharexylum spinosum	Fiddlewood
Corymbia henryi	Spotted Gum
Diospsyros kaki	Persimon
Eucalyptus sp.	a Eucalypt
Grevillea robusta	Silky Oak
Mangifera indica	Mango
Metrosideros	NZ Christmas Tree
Musa sp.	Banana

APPENDIX 3 – Weed Control Methods

"**Cut-scrape-paint" method**: This method applies to all woody shrubs, trees and some vines e.g. Camphor laurel, Senna, Lantana.

(a) Cut plant low to the ground at an angle.
(b) Apply herbicide immediately at the rate of 1 part glyphosate to 1 part water with a paintbrush approximately 1.5 cms. wide.
(c) Scrape sides lightly to reveal green tissues and apply the herbicide to the scraped area.
(d) Take care that the brush is not contaminated with soil.

This method is modified to Scrape and Paint for fleshy vines such as Madeira Vine and Syngonium. The thick stems are scraped (lengths approximately 15cm) from base to head height and painted taking care not to break the vine.

Stem Injection: This method applies to all woody trees and shrubs with a stem diameter >6 cms, e.g Camphor Laurel, Privet and Coral Tree.

(a) With a drill (10mm bit), drill a hole at a downwards and transverse angle into the stem.
(b) Apply herbicide immediately into the cut using a tree injecting device (using glyphosate, apply at the rate of 1: 0.5).
(c) Repeat at spaces of 10cm around the circumference of the tree, as close to the ground as possible. Where the presence of a crotch angle makes this difficult, make a hole above it. (**Note**: One row is sufficient. larger trunk diameters will need correspondingly more).
(d) Treat all visible lateral roots as per (a).

Spot Spraying: This is carried out using a 15 litre back-pack spray unit with a modified spray nozzle that gives a solid spray pattern. Glyphosate is the main herbicide used, with the addition of the red markerdye. For plants which show some resistance to herbicides e.g. Ground Asparagus, or when growing conditions are not optimal, a penetrant is also added. A mixture of glyphosate and Metsulphuron methyl is approved for plants that are difficult to control with glyphosate alone (Note: an appropriate permit is required for this 'off-label' herbicide usage).

Overspray: This method is applicable to large, dense infestations of such plants as Lantana and exotic grasses where it is desirable to leave the dead plants intact to prevent erosion and over-exposure of large areas, to protect native seedlings from predators such as wallabies and to avoid trampling by humans.

(a) Spray over the top of the infestation, using a solution of glyphosate (Note: any native plants that may be under the weed will be protected by the foliage cover of the weed).
(b) Leave the sprayed plants intact so that native seedlings can establish under the shelter provided.
Note: For Lantana, the usual dilution rate is glyphosate 1**:**75 water**;** for exotic grasses glyphosate 1**:**100 water.

Alternatively, weeds can be cut and flattened with brush-hooks or loppers and the subsequent regrowth sprayed with glyphosate.

Crowning: This method is applicable to weeds which have their growing points below the surface of the ground (corms, bulbs, rhizomes, clumped or fibrous root systems etc. e.g. Asparagus spp. and exotic grasses).

(a) Grasp the leaves or stems and hold them tightly so that the base of the plant is visible. Plants with sharp leaves or stems should be cut back first.
(b) Insert the knife close to the base of the plant at a slight angle, with the tip well under the root system.
(c) Cut through the roots close to the base. Depending on the size of the plant, two or more cuts may be needed to sever all the roots.
(d) Remove the plant. Make sure that the base of the plant where the roots begin is completely removed.

Hand Pull: Gently pull seedling out by the roots, wriggling the plant to fully free them.