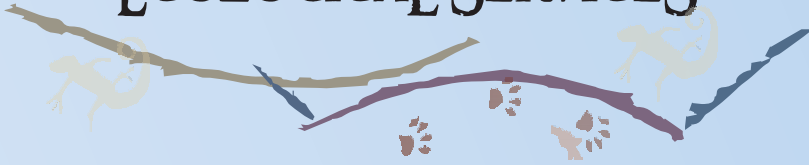


BLACKWOOD ECOLOGICAL SERVICES



Vegetation Management Plan East Ballina Reserves

Prepared for Ballina Shire Council
July 2014

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1	INTRODUCTION	5
1.1	Background	5
1.2	The Subject site	5
1.3	Aims and objectives	5
1.4	Consultation	6
1.5	Structure of this report	6
2	SITE BACKGROUND	7
2.1	Introduction	7
2.2	Climate	7
2.3	Land tenure and management requirements	7
2.4	Geomorphology	12
2.5	Historical land uses	12
2.6	Previous management plans	12
2.6.1	Angels Beach Vegetation Management Plan (Envite 2004)	12
2.6.2	Shelly Beach to Lighthouse Beach Vegetation Management Plan (Envite 2005)	13
2.6.3	West Shelly Beach Vegetation Management Plan (Envite 2007)	13
2.6.4	Shaws Bay Escarpment Site Action Plan (Greening Australia 2004)	13
2.6.5	Bitou Bush TAP site plans	13
2.7	Volunteer landcare groups	13
2.8	Current bush regeneration contracts	13
2.9	Current and proposed developments of relevance to this VMP	14
2.9.1	Compton Drive Realignment	14
2.9.2	Coastal Recreational Path	14
2.9.3	Shared Path East and West	14
3	ABORIGINAL CULTURAL HERITAGE MANAGEMENT	15
3.1	Introduction	15
3.2	East Ballina Aboriginal Place (EBAP)	15
3.3	Vegetation Management Protocols for works within the EBAP	15
3.3.1	Induction requirements	15
3.3.2	Consultation requirements	15
4	RELEVANT WEED LEGISLATION & LISTS	17
4.1	Introduction	17
4.2	Definition	17
4.3	Weed Species Categories	17
4.3.1	Noxious weeds	17
4.3.2	Environmental Weeds	18
4.3.3	Weeds of National Significance (WoNS)	18
4.3.4	National Environmental Alert List Weeds	18
5	SITE DESCRIPTION, ECOLOGICAL VALUES AND CONSTRAINTS	20
5.1	Introduction	20
5.2	Vegetation communities	20
5.2.1	Rainforest types	20
5.2.2	Coastal forest and woodland types	21
5.2.3	Other native vegetation types	25
5.2.4	Exotic vegetation	26
5.3	Endangered ecological communities	27

5.3.1	State listed EECs.....	27
5.3.2	Commonwealth listed TECs	28
5.4	Threatened flora species.....	29
5.4.1	Species known to occur within the VMP project area	29
5.4.2	Species which may occur in the VMP Project area.....	31
5.5	Threatened fauna and habitats	31
5.5.1	Threatened fauna	31
5.5.2	Discussion of threatened fauna habitat within the VMP project area	33
6	INFRASTRUCTURE MANAGEMENT AND VISITOR FACILITIES	36
6.1	Introduction	36
6.2	Walkways and cycleways including beach access tracks	36
6.3	Emergency services including 4WD accesses to beaches	36
6.4	Public toilets.....	37
6.5	Picnic and BBQ areas	37
6.6	Car parks.....	37
6.7	Seating and viewing platforms.....	37
6.8	Dog exercise areas.....	38
7	VEGETATION MANAGEMENT ISSUES & GUIDELINES.....	39
7.1	Introduction	39
7.2	Tree vandalism.....	39
7.3	Vegetation/Rubbish dumping.....	39
7.4	Informal tracks	39
7.5	Erosion	40
7.5.1	Beach recession and sea-level rise	41
7.6	Adjacent residential properties and encroachment	41
7.7	Guidelines for working around threatened species.....	41
7.8	Guidelines for chemical usage around terrestrial orchids	42
7.9	Pandanus Plant Hopper	42
7.10	Best practice guidelines and other requirements	42
8	MANAGEMENT ZONES.....	44
8.1	Zone 1 – Lighthouse Beach.....	46
8.2	Zone 2 – Parkland along Compton Drive and around Shaws Bay.....	50
8.3	Zone 3 – Shaws Bay Escarpment	55
8.4	Zone 4 – Ballina Head to Shelly Beach south.....	62
8.5	Zone 5 – Coastal Cypress between Short and Suvla Streets.....	65
8.6	Zone 6 – Vegetation around East Ballina Cemetery.....	68
8.7	Zone 7 – Shelly Beach and Black Head	74
8.8	Zone 8 – Angels Beach and Flat Rock.....	78
9	MONITORING AND RECORD KEEPING	83
9.1	Introduction	83
9.2	Monitoring.....	83
9.3	Record keeping	83
10	REFERENCES	85

1 INTRODUCTION

1.1 Background

Ballina Shire Council (BSC) and the Ballina Coastcare Inc. have engaged Blackwood Ecological Services to prepare a Vegetation Management Plan (VMP) for Public Reserves located in East Ballina. The VMP is required to upgrade and consolidate several older plans, add several additional areas and incorporate requirements of the East Ballina Aboriginal Place (EBAP). Significant restoration works have been undertaken across much of the project area since the preparation of these plans and the revised VMP is to account for these site changes.

1.2 The Subject site

The Subject site includes a number of Public Reserves as well as Community and Operational Land located in East Ballina. The location and extent of the site is illustrated in **FIGURE A.1** and an aerial view is provided in **FIGURE A.2** in **APPENDIX A**. It includes coastal vegetation from Sharpes Creek in the north to Richmond River North Wall in the south as well as vegetated areas around Shaws Bay Escarpment and west of Shelly Beach.

1.3 Aims and objectives

The aim of this VMP is to provide strategies, actions and a works schedule to assist in the restoration of the structure, function, integrity and dynamics of the native vegetation communities across the Subject site as well as reconstruct severely degraded zones, and continue to manage all areas with respect to their ecological and cultural values.

The objectives of the VMP and its recommended works are to:

- assess the current condition of site vegetation and determine the regeneration potential;
- provide updated information on weed species, distribution, weed control and restoration techniques;
- provide information on threatened species and endangered communities known to occur within the Subject site;
- identify and assess threats that are contributing to the degradation of vegetation communities;
- make recommendations for the restoration, and where necessary reconstruction, of the vegetation communities;
- make recommendations for the enhancement of threatened fauna habitat;
- suggest best practice methods to undertake vegetation restoration with the aim of maintaining dune stability and improving resistance to erosion;
- suggest appropriate generic weed control methods, adapting these as required to be suitable for works in culturally sensitive areas such as the EBAP;
- recommend strategies to consolidate the existing vegetation through the planting of local native species in areas where natural regeneration is least likely to occur (i.e. sites that are highly disturbed and/or physically compacted);
- increase public awareness of the importance of coastal vegetation and encourage local stewardship for the area;
- act as a supporting document for further funding;
- offer guidelines for regulatory action by BSC where needed to adequately protect vegetation communities; and
- assist fauna/flora corridor development and improve habitat connectivity north to south along the coastline as well as westwards to the Ballina Nature Reserve.

1.4 Consultation

As part of the preparation of this VMP consultation has been undertaken with the following groups/stakeholders:

- Ballina Shire Council (BSC)
- Ballina Coastcare Inc.
- The Ballina Shire Council Aboriginal Community Committee (BSCACC)

The groups listed above were also invited to provide comment on the draft report.

1.5 Structure of this report

This report provides information on the following aspects of the VMP project area:

Chapter 2

- Background information on the VMP project area including zoning, previous VMPs, active landcare groups and bush regeneration contracts. Also includes a discussion of relevant approved and proposed developments within the VMP project area.

Chapter 3

- Background information on the East Ballina Aboriginal Place and protocols for undertaking vegetation management works within this area.

Chapter 4

- Relevant weed legislation including known Noxious and Weeds of National Significance (WoNS) which occur in the VMP project area.

Chapter 5

- Details on vegetation communities which occur in the VMP Project area as well as threatened species/communities known to occur in the VMP project area. Brief discussion on threatened fauna habitat and threatened fauna species previously recorded within the Ballina LGA.

Chapter 6

- Brief overview of relevant infrastructure and visitor services located within the VMP project area and discussion on the management and maintenance of such facilities.

Chapter 7

- Discussion of various vegetation management issues often encountered when undertaking bush regeneration works as well as recommended guidelines for best practice.

Chapter 8

- Delineation of works zones and recommendations on various work activities to be undertaken and relevant responsibilities.

Chapter 9

- Monitoring and record keeping requirements.

Chapter 10

- References.

2 SITE BACKGROUND

2.1 Introduction

This section provides background information about the VMP project area including climate, zoning, geomorphology, previous management plans, active volunteer landcare groups, current bush regeneration contracts and approved and proposed developments.

2.2 Climate

The region has a warm temperate climate with a pronounced summer/autumn “wet” season and “dry” mild winters. Rainfall is strongly seasonal with approximately 60% of the annual average rainfall (of 1791mm) falling in the months of January to May. March is traditionally the wettest month with 215mm and September the driest with 64mm. The warmest month is January with an average maximum temperature of 28.2°C and July the coldest with average maximum temperatures around 20°C (Bureau of Meteorology 2014). Frosts are generally absent in the immediate coastal strip. The prevailing wind is from the south-east, however there are strong northerly winds throughout the summer months (BSC 2003).

2.3 Land tenure and management requirements

The Subject site is located within the Ballina Local Government Area (LGA) and is subject to the Ballina Local Environment Plan 1987 (BLEP 1987) and the BLEP 2012. The majority of land within the Subject site is identified as a deferred matter under the BLEP 2012 and is therefore still subject to the BLEP 1987. The more recent BLEP only applies to some smaller areas of land around Shaws Bay and near the Ballina cemetery. **FIGURE A.3** in **APPENDIX A** illustrates the zonings applicable across the Subject site. **TABLE 1** below provides a summary of each applicable zoning including the objectives and development restrictions. **TABLE 2** details the land tenures applicable to the VMP project area and include Council owned land classified for community or operational purposes as well as Crown land managed by Council. Land tenures are illustrated in **FIGURE A.4** of **APPENDIX A**.



**TABLE 1
BLEP ZONES APPLICABLE TO THE SUBJECT SITE**

Zone	Primary objectives	Notes
BLEP 1987		
2(a) Living area	<p>The primary objectives are:</p> <p>(a) to regulate the subdivision and use of land to permit housing and ancillary development where the scale, type and traffic generating characteristics of the ancillary development are compatible with the character and amenity of the surrounding residential area,</p> <p>(b) to permit development which is considered by the council to be an essential land use within the urban living area, but not including a shop (other than a general store), and</p> <p>(c) to allow detailed provision to be made, by means of a development control plan, to set aside specific areas within the zone for varying housing densities as well as other associated urban and tourist facilities.</p>	No development is permitted without development consent.
6(a) Open Space	<p>The primary objectives are:</p> <p>(a) to identify land that is used or capable of being used for active or passive recreation purposes,</p> <p>(b) to encourage the development of open spaces in a manner which maximises the satisfaction of the community's diverse recreation needs, and</p> <p>(c) to enable development associated with, ancillary to or supportive of recreation use, and</p> <p>(d) to enable development that assists in meeting the social and cultural needs of the community.</p>	Drainage; roads; works for the purposes of gardening, landscaping or bush fire hazard reduction is permitted without development consent.
7(d) Environmental Protection – Scenic escarpment	<p>The primary objectives are:</p> <p>(a) to protect and enhance those areas of particular scenic value to the Shire of Ballina, and</p> <p>(b) to minimise soil erosion from escarpment areas and prevent development in geologically hazardous areas.</p>	Agriculture (other than feed lots, piggeries, poultry farms, stock homes and other intensive keeping of animals and not including the erection of buildings) is permitted without development consent.
7(f) Environmental Protection – Coastal lands	<p>The primary objectives are:</p> <p>(a) to protect environmentally sensitive coastal lands, and</p> <p>(b) to prevent development which would adversely affect or be adversely affected, in both the short and long term, by the coastal processes.</p>	No development is permitted without development consent.
BLEP 2012		
RE1 Recreation	<p>Public</p> <ul style="list-style-type: none"> • To enable land to be used for public open space or recreational purposes. • To provide a range of recreational settings and activities and compatible land uses. • To protect and enhance the natural environment for recreational purposes. • To provide for a diversity of development that meets the social and cultural needs of the community. 	Environmental protection works; Flood mitigation works; Roads are permitted without development consent.

Zone	Primary objectives	Notes
	<ul style="list-style-type: none"> • To provide for public access to open space and natural recreation areas. • To protect and conserve landscapes in environmentally sensitive areas, particularly in foreshore and visually prominent locations. • To provide for development that is consistent with any applicable plan of management. • To encourage development that achieves the efficient use of resources such as energy and water. 	

TABLE 2
LAND TENURES APPLICABLE TO THE VMP PROJECT AREA

Council ID	Lot	Sec	DP	Owner	Classification Status	Crown Reserve
2300101	1		632176	Council	Community	
2301201	59		827785	Council	Operational	
2301501	1		1127820	Council	Community	
2301502	2		1127820	Council	Community	
2301503	3		1127820	Council	Community	
2301504	4		1127820	Council	Community	
2301505	5		1127820	Council	Community	
2301506	6		1127820	Council	Community	
2301601	1		781542	Council	Community	
2301701	1		781540	Council	Community	
2301702	2		781540	Council	Community	
2301703	3		781540	Council	Community	
2301704	4		781540	Council	Community	
2301705	5		781540	Council	Community	
2301801	11		539824	Council	Community	
2304701	533		729679	Crown	Managed by Council	R1010068 Ballina Coastal Reserve
2304702	539		729687	Crown	Managed by Council	R1010068 Ballina Coastal Reserve
2304801	7016		1068899	Crown	Managed by Council	R88004 Ballina Shaws Bay Reserve Trust
2304802	439		43825	Crown	Managed by Council	R88004 Ballina Shaws Bay Reserve Trust



Council ID	Lot	Sec	DP	Owner	Classification Status	Crown Reserve
2304803	497		729703	Crown	Managed by Council	R88004 Ballina Shaws Bay Reserve Trust
2305101	529		729679	Crown	Managed by Council	R1010068 Ballina Coastal Reserve
2305202	379		755684	Crown	Managed by Council	R1010068 Ballina Coastal Reserve
2305203	4	78	758047	Crown	Managed by Council	R1010068 Ballina Coastal Reserve
2305204	7028		1064315	Crown	Managed by Council	R1010068 Ballina Coastal Reserve
2305205	530		729679	Crown	Managed by Council	R1010068 Ballina Coastal Reserve
2305206	531		729679	Crown	Managed by Council	R1010068 Ballina Coastal Reserve
2305207	532		729679	Crown	Managed by Council	R1010068 Ballina Coastal Reserve
2305208	1	78	758047	Crown	Managed by Council	R1010068 Ballina Coastal Reserve
2305209	3	78	758047	Crown	Managed by Council	R1010068 Ballina Coastal Reserve
2305210	540		729687	Crown	Managed by Council	R1010068 Ballina Coastal Reserve
2305301	394		755684	Crown	Managed by Council	R1010068 Ballina Coastal Reserve
2305302	516		729900	Crown	Managed by Council	R1010068 Ballina Coastal Reserve
2305304	402		755684	Crown	Managed by Council	R1010068 Ballina Coastal Reserve
2305306	7014		1068898	Crown	Managed by Council	R1010068 Ballina Coastal Reserve
2305501	519		729428	Crown	Managed by Council	R1010068 Ballina Coastal Reserve
2306101	526		729676	Crown	Managed by Council	R1010068 Ballina Coastal Reserve
2306301	520		729428	Crown	Managed by Council	R1010068 Ballina Coastal Reserve
2306601	523		729429	Crown	Managed by Council	R1010068 Ballina Coastal Reserve
2306602	522		729429	Crown	Managed by Council	R1010068 Ballina Coastal Reserve
2308101	467		729067	Crown	Managed by Council	D1000687 East Ballina Cemetery
2308102	468		729067	Crown	Managed by Council	D1000687 East Ballina Cemetery
2308301	4		821993	Council	Operational	
2308902	6	78	758047	Crown	Managed by Council	R1010068 Ballina Coastal Reserve
2308903	2	78	75804	Crown	Managed by Council	R1010068 Ballina Coastal Reserve
2309001	7017		1064314	Crown	Managed by Council	R1010068 Ballina Coastal Reserve
2309002	528		729679	Crown	Managed by Council	R1010068 Ballina Coastal Reserve
2309309	7030		1063893	Crown	Managed by Council	R1010068 Ballina Coastal Reserve



Council ID	Lot	Sec	DP	Owner	Classification Status	Crown Reserve
2309310	7032		1063896	Crown	Managed by Council	R1010068 Ballina Coastal Reserve
2309311	7024		1063860	Crown	Managed by Council	R1010068 Ballina Coastal Reserve
2309312	7023		1064275	Crown	Managed by Council	R1010068 Ballina Coastal Reserve
2309313	7034		1063872	Crown	Managed by Council	R1010068 Ballina Coastal Reserve
2309314	7041		1071329	Crown	Managed by Council	R1010068 Ballina Coastal Reserve
2309601	1		1152892	Council	Community	
2309801	7025		1064241	Crown	Managed by Council	R1010068 Ballina Coastal Reserve
2310201	406		755684	Crown	Managed by Council	R1010068 Ballina Coastal Reserve
2310202	525		729429	Crown	Managed by Council	R1010068 Ballina Coastal Reserve
2310203	524		729429	Crown	Managed by Council	R1010068 Ballina Coastal Reserve
2310204	1		823591	Crown	Managed by Council	R1010068 Ballina Coastal Reserve
2310205	7013		1113173	Crown	Managed by Council	R1010068 Ballina Coastal Reserve

2.4 Geomorphology

There are four main landscape types along the Ballina Coastline - beaches, headlands, alluvial & estuarine deposits, and the sand sheets or sandplains. The western sections of the VMP Project area are composed of the East Ballina Aeolian Landscape which includes elevated Quaternary (Pleistocene) dunes forming very low undulating rises blanketing Lismore Basalts and comprise very deep (300cm), rapidly drained Podzols (Morand 1994). The headlands within the Subject site are outcrops of the Lismore Basalts (Tertiary) resulting from lava flows from the Mount Warning Shield Volcano. Beaches within the Subject site are predominantly Quaternary (Holocene) beach and dune sand. The beach, foredunes and most of the hindunes are deep siliceous and calcareous sands, with some disturbed hindunes also consisting of very disturbed Podzols (Morand, 1994). Mapping produced by Morand (1994) shows the western parts of Shaws Bay and inland areas of Sharpes Beach comprise the Ewingsdale Residual Landscape which is made up of deep, well-drained Krasnozem soils on very low to low undulating hills and rises on Lismore Basalts. Degraded Krasnozem soils can also be found at shallow depth below alluvial sand at places along Angels Beach north of Pontoon Rocks (Lee Andresen pers. comm.).

Lighthouse Beach is a recently accreted landform, occupying the original Richmond River mouth. Prior to the construction of the northern training wall, the river mouth was very mobile and transient, part of a broad meandering marine tidal delta forming the mouth of the Richmond River (BSC 2003).

2.5 Historical land uses

Various past land management practices, operations and developments have had a lasting impact on site vegetation and landform. These include:

- Black sand extraction operations from Flat Rock to Pontoon Rocks on Angels Beach;
- Basalt quarrying and topsoil removal on Black Head;
- Dairy cattle grazing along Angels Beach; and
- Hydrological alterations associated with stormwater impacts from adjacent residential estate developments.

2.6 Previous management plans

A number of management plans have been prepared previously for the majority of the Subject site. Significant restoration works have been undertaken based upon the recommendations made in these plans and they provide a good background on site condition and history. Two small areas within the Subject site have not been covered by a management plan in the past. These sections consist of:

- Vegetation along the south-eastern facing escarpment of Shaws Bay above and below Compton Drive; and
- A small section of vegetation on the southern side of Pine Avenue between Short Street and Suvla Street.

2.6.1 Angels Beach Vegetation Management Plan (Envite 2004)

This plan covers vegetated areas on the eastern side of The Coast Road from Sharpes Creek (north of Flat Rock) south to Black Head. The site covers an area of approximately 70 hectares, split into 23 main work zones with some additional sub zones. A variety of site specific recommendations are outlined for each zone with respective priorities and responsibilities. The plan provides good detail on site vegetation and work activities as well as a thorough history of the area.

2.6.2 Shelly Beach to Lighthouse Beach Vegetation Management Plan (Envite 2005)

This plan covers a 3.5km length of foreshore vegetation from the north wall of the Richmond River mouth in the south to Black Head in the north. The site was broken up into three main work zones and 12 sub zones. A variety of site specific recommendations are outlined for each zone with respective priorities and responsibilities.

2.6.3 West Shelly Beach Vegetation Management Plan (Envite 2007)

This plan covers vegetated areas west of Shelly Beach, roughly bound by Suvla Street to the south, Shelly Beach Road to the east, Pine Avenue to the west and Hindmarsh Street and Pacific Terrace to the north. The study area is divided into seven zones to guide management actions.

2.6.4 Shaws Bay Escarpment Site Action Plan (Greening Australia 2004)

This plan covers the vegetated escarpment areas above Compton Drive and is bound by Bayview Street, Suvla Street, Seaview Street and Beach Road. It also includes open grassy areas adjacent to Compton Drive which is currently utilised as a dog exercise area. The site was divided into nine zones as part of the plan.

2.6.5 Bitou Bush TAP site plans

Extensive work has been undertaken to control Bitou Bush along the study area coastline as part of the Bitou Bush Threat Abatement Plan (TAP) funding. Aerial spraying and follow-up efforts by landcare and contractors has significantly reduced the extent of Bitou bush infestation within the study area. Funding as part of this project has now ceased although additional Bitou bush control is currently being undertaken around the front quarried face of Black Head as part of an Environmental Trust grant (refer to Section 2.8). Follow-up work throughout the treated areas is required to ensure the long-term control of this Weed of National Significance (WONS) within the study area.

There are still dense persisting patches of Bitou Bush in some areas of the VMP Project area including Ballina Head, Sharpes Creek and the swale of the east face of Black Head. These areas are discussed in more detail in the relevant subzone tables in Section 8.

2.7 Volunteer landcare groups

Three volunteer groups are currently active within the Subject site. Angels Beach Dunecare Group meets three times a week (Tuesday, Wednesday and Saturday) between 8 and 11am. This group is active from the northern part of the Subject site to the southern end of Black Head and North Shelly Beach, covering an area of over 70 hectares. East Ballina Landcare Group meets once a month (second Sunday) between 8 and 11am. This group is active around the Shaws Bay and associated escarpment, East Ballina Cemetery as well as other areas west of Shelly Beach. Lighthouse Beach Dunecare Group meets weekly (Monday) between 8 and 11am and is active through dune areas of Lighthouse Beach at the southern end of the Subject site. These three groups are amalgamated into Ballina Coastcare Inc. for the purposes of coordination, support and resource sharing.

2.8 Current bush regeneration contracts

Four areas within the Subject site have active bush regeneration contracts in place which are being funded through Environmental Trust grants. These are detailed below:

- Two year grant (mid-2012 to mid-2014) targeting Ground asparagus fern around the Beachfront Parade Car park in the middle of Angels Beach. These works are currently being undertaken by Ecoplus Regen.



- A six-year Environmental Trust Large Project Stream Grant is currently funding contractors within three areas of the Subject site. Target species include Ground asparagus fern and other Weeds of National Significance (WONS). These projects are currently in the second year of three-year contracts, renewable in 2015 and include:
 - Flat Rock, south of the Flat Rock Tent Park, work is currently being undertaken by BushBoss;
 - Black Head, work is currently being undertaken by Envite and Austspray (abseiling) and is focused on Ground asparagus and Bitou bush; and
 - Shaws Bay, work is being undertaken by Bailey Environmental.

2.9 Current and proposed developments of relevance to this VMP

2.9.1 Compton Drive Realignment

The alignment of Compton Drive has recently been changed as part of the redevelopment of the Lighthouse Beach Surf Club. The road now extends through the southern section of Zone I as outlined in the Greening Australia (2004) plan. A number of trees, mostly Coast banksia, were removed as part of these works. A Revegetation, Rehabilitation and Weed Control Plan was completed by Blackwood Ecological Services (2013a) outlining the compensatory works required for the road realignment project. The plan outlines a specific compensation area and specifies the planting of 213 trees to compensate for tree removal at a ratio of 3:1. Further details are provided in the relevant management zone outlined in this report.

2.9.2 Coastal Recreational Path

The construction of a coastal walking path which extends along the coastal escarpment and hind dunes from Pat Morton lookout at Lennox Head to south Angels Beach is currently in the development application process. The majority of the path would extend along existing informal tracks with some widening to occur in places. New sections of path would be required between Flat Rock and Sharpes Beach car park and behind Boulder Beach wetland as well as a short section along the eastern side of The Coast Road, south of the Angels Beach underpass tunnel. Blackwood Ecological Services have completed a detailed ecological assessment for the proposed path (2013b). Should the project be approved, compensation works would be required to offset native vegetation loss resulting from the works. At this stage opportunities for compensation works for this project have been identified along the coastal dune zone north of Sharpes Beach and behind Boulders Beach. Planning of any compensation works within the VMP project area should take into consideration the management recommendations outlined in this plan.

2.9.3 Shared Path East and West

A shared path to be utilised by cyclists and pedestrians is also in the final stages of the development application with some sections currently approved and under construction. The Shared Path (West) would link existing paths at Silver Gull Drive in East Ballina with North Creek Road/Amber Drive in Lennox Head via the Skennars Head development. The Shared Path (East) would extend south from Pat Morton Lookout at Lennox Head to Skennars Head Road. Blackwood Ecological Services have completed detailed ecological assessments for both these proposed shared paths (2013c, 2013d & 2012). Should the remaining sections of shared path be approved, compensation works would be required to offset native vegetation loss resulting from the works. Planning of any compensation works within the VMP Project area should take into consideration the management recommendations outlined in this plan.

3 ABORIGINAL CULTURAL HERITAGE MANAGEMENT

3.1 Introduction

This section discusses the indigenous heritage values associated with the study area and outlines specific management measures relevant to ensuring the long-term protection of these values and places. All vegetation management works undertaken within the East Ballina Aboriginal Place are to be undertaken in a manner consistent with the recognised cultural significance of the land and the existing fauna and flora.

3.2 East Ballina Aboriginal Place (EBAP)

The East Ballina Aboriginal Place (EBAP) was gazetted in July 2012 and recognises the special significance of the place to Aboriginal culture and people. It acknowledges and commemorates early colonial conflicts and the 1853-54 massacre of Bundjalung people associated with the area. The place is approximately 183 hectares in size and includes a range of cultural sites, including burials and shell middens, as well as other occupation or camping places. These cultural sites demonstrate how previous generations of Aboriginal people lived on Bundjalung Country and provide a continuing teaching resource for current and future generations. The gazettal including the extent of the Aboriginal Place is provided in **APPENDIX B**. The EBAP includes wetlands, coastal bushland, rocky shores and beaches which continue to provide sources of traditional foods and medicines for Aboriginal people.

The Ballina Shire Council Aboriginal Community Committee (BSCACC) has recently been established as the consultative body for indigenous related matters within the Ballina Shire.

3.3 Vegetation Management Protocols for works within the EBAP

3.3.1 Induction requirements

Ballina Shire Council, in association with the Jali Aboriginal Land Council, sites officer and BSCACC, provides an induction course for personnel working within the EBAP, including volunteer landcarers, BSC field staff and contract bush regenerators. These induction courses are run periodically. All personnel undertaking works within the EBAP are required to complete this induction program.

Site personnel may be given an onsite induction by Landcare members, contractors or other site personnel who have completed the formal induction process until such time as they can complete the induction course.

3.3.2 Consultation requirements

Provided that work is completed by (or under the supervision of) personnel who have completed an induction for working within the EBAP, no further consultation is required for works that do not involve significant ground disturbance, including:

- basic weed control and bush regeneration including tree planting;
- minor or temporary fencing works or repairs;
- viewing platform maintenance and
- minor track maintenance.

The Site officer is to be consulted prior to the commencement of any low impact works requiring ground disturbance, such as:

- track reconstruction;
- viewing platform construction;



- minor machinery works;
- installation of poles for lighting, fencing or signage;
- non-minor fencing works and
- erosion control and storm damage remediation works.

High impact works including machinery works for construction of new tracks, viewing platforms and stormwater culverts require Sites Officer consultation as well as the possible notification of OEH.

Any interpretive educational material, sign, pamphlets etc. produced for areas within the EBAP or to be installed within the EBAP are to be approved by the BSCACC prior to publication/installation.

In the event that any Aboriginal artefacts, skeletal remains or shell midden materials are encountered, works are to stop and the Sites Officer is to be notified immediately. Works are not to commence until the Sites Officer gives his or her approval. This includes emergency beach track erosion works.

4 RELEVANT WEED LEGISLATION & LISTS

4.1 Introduction

This section provides details on licencing and training required for working around threatened species, EECs and/or indigenous heritage items/places. In addition, information on noxious weed legislation relevant to this VMP and provides background information on different weed categories.

4.2 Definition

The use of the term ‘exotic species’ or ‘weed’ in this VMP applies to any species which is considered invasive and does not belong in a specific area. This includes both non-local native species and exotic species.

4.3 Weed Species Categories

Weeds are often classed in broad groups depending on their characteristics and types of threats they pose. Several different categories of weeds (noxious weeds, environmental weeds, WONS, National Environmental Alert List Weeds) are recognised at a national, state, regional (catchment) and local level as described below.

4.3.1 Noxious weeds

Declared noxious weeds in NSW are plants that have been proclaimed under the Noxious Weeds Act 1993 (NW Act). The NW Act is the primary legislative framework governing the classification and control of noxious weeds in NSW. The Act is implemented and enforced by the Local Control Authority (LCA) for the area, in this case being the Far North Coast Weeds. Under the NW Act certain plants are declared as noxious weeds based upon their ability or potential to cause environmental and/or economic harm. Individual land holders and managers are required under the NW Act to control noxious weeds declared for their area according to their classification. Relevant control classes of noxious weeds as defined under the NW Act are explained in **TABLE 3**.

TABLE 3
CONTROL CLASSES OF NOXIOUS WEEDS (SOURCE: DPI WEBSITE)

Control class	Weed type	Example control requirements
Class 1	Plants that pose a potentially serious threat to primary production or the environment and are not present in the State or are present only to a limited extent.	The plant must be eradicated from the land and the land must be kept free of the plant. The weeds are also "notifiable" and a range of restrictions on their sale and movement exist.
Class 2	Plants that pose a potentially serious threat to primary production or the environment of a region to which the order applies and are not present in the region or are present only to a limited extent.	The plant must be eradicated from the land and the land must be kept free of the plant. The weeds are also "notifiable" and a range of restrictions on their sale and movement exist.
Class 3	Plants that pose a potentially serious threat to primary production or the environment of a region to which the order applies, are not widely distributed in the area and are likely to spread in the area or to another area.	The plant must be fully and continuously suppressed and destroyed.
Class 4	Plants that pose a potentially serious threat to primary production, the environment or human health, are	The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local

Control class	Weed type	Example control requirements
	widely distributed in an area to which the order applies and are likely to spread in the area or to another area.	control authority.
Class 5	Plants that are likely, by their sale or the sale of their seeds or movement within the State or an area of the State, to spread in the State or outside the State.	There are no requirements to control existing plants of Class 5 weeds. However, the weeds are "notifiable" and a range of restrictions on their sale and movement exists.

Noxious weeds declared for the Ballina Shire Council area which occur within the VMP project area include:

- Camphor laurel [*Cinnamomum camphora*] (Class 4)
- Crofton weed [*Ageratina adenophora*] (Class 4)
- Mistflower [*Ageratina riparia*] (Class 4)
- Prickly pear [*Opuntia* sp.] (Class 4)
- Bitou bush [*Chrysanthemoides monilifera* ssp. *rotundata*] (Class 4)
- Annual ragweed [*Ambrosia artemisiifolia*] (Class 5)
- Broad-leaf pepper tree [*Schinus terebinthifolius*] (Class 3)
- Lantana [*Lantana* sp.] (Class 4)
- Yellow bells [*Tecoma stans*] (Class 3)

4.3.2 Environmental Weeds

Environmental weeds are defined as non-indigenous plant species that have invaded (or have the potential to invade) natural ecosystems and threaten (or have potential to threaten) environmental and/or conservation assets. Invasions of environmental weeds often reduce plant diversity and result in a loss of habitat for native animals (Muyt, 2001). Environmental weeds can be declared noxious weeds however a number of serious environmental weeds are not included in the classifications of the NW Act. Environmental weeds can also be Australian native species that are not local (indigenous) to an area but have the potential to damage the local plant community.

4.3.3 Weeds of National Significance (WoNS)

Thirty two WoNS have been identified by the Commonwealth Government based on their invasiveness, potential for spread and environmental, social and economic impacts. A list of 20 WoNS was endorsed in 1999 and a further 12 were added in 2012. WoNS known to occur within the VMP area include:

- Madeira vine
- Ground asparagus fern
- Climbing asparagus
- Bitou bush
- Lantana
- African boxthorn (possible occurrence)
- Prickly pear
- Fireweed

4.3.4 National Environmental Alert List Weeds

Under the National Weeds Strategy, 28 environmental weeds were identified National Environmental Alert Weeds. Alert Weeds are non-native plant species that are in the early stages of establishment and have the potential to become a significant threat to biodiversity if they are



not managed. One of the listed weeds, Golden rain tree (*Koelreuteria elegans* subsp. *formosana*), was recorded within the VMP Project site near the East Ballina Cemetery.

5 SITE DESCRIPTION, ECOLOGICAL VALUES AND CONSTRAINTS

5.1 Introduction

This section provides details on the ecological attributes and values of the Subject site including vegetation communities, EECs, threatened species, threatened fauna habitats and noxious weeds. Information in this section was obtained during the site surveys undertaken between December 2013 and February 2014. Additional information has been collated from a variety of sources including but not limited to:

- Previous VMPs applicable to the Subject site;
- Previous ecological assessments undertaken by Blackwood Ecological Services within the Subject site including detailed flora and fauna surveys undertaken for the proposed Coastal Recreational Path (Angels Beach to Lennox Head);
- Vegetation mapping provided by BSC; and
- Ballina Coastcare Inc. including detailed flora and fauna database, known threatened flora locations as well as weed problem areas.

5.2 Vegetation communities

Twelve main vegetation communities were identified across the Subject site and are outlined in **TABLE 4**. Mapping of the vegetation communities across the project area has been divided into relevant management zones. These are discussed further in Section 8.

**TABLE 4
VEGETATION COMMUNITIES LOCATED WITHIN THE VMP PROJECT AREA**

No.	Community description
1	Littoral Rainforest
2	Coast banksia open forest/ woodland/shrubland
3	Mixed coastal woodland/shrubland
4	Heathland
5	Coastal Cypress Pine forest & woodland
6	Swamp sclerophyll forest
7	Brush box forest and woodland
8	Coastal wattle shrubland
9	Foredune vegetation
10	Mangroves
11	Wetland
12	Exotic vegetation

5.2.1 Rainforest types

Littoral rainforest

Littoral rainforest communities occur along coastal dunes as well as in more protected areas behind foredunes where there is still some influence from salt laden winds. Along Shelly Beach and Angels Beach Coastal banksia dominates the canopy, or is co-dominant with Tuckeroo, with a developing Littoral rainforest component in the understory. Littoral rainforest around the Shaws Bay escarpment includes Brush box in the canopy and in some parts has a high proportion of weed species throughout. Behind Flat Rock Littoral rainforest grades into Swamp sclerophyll forest in poorly drained dune swales and into drier heathy mixed forest upslope.

Littoral rainforest areas comprise a variety of rainforest species including Tuckeroo (*Cupaniopsis*

anacardioides), Beach alectryon (*Alectryon coriaceus*), Beach acronychia (*Acronychia imperforata*), Three-veined cryptocarya (*Cryptocarya triplinervis*), Umbrella cheese tree (*Glochidion sumatranum*), Guioa (*Guioa semiglauca*), Duboisia (*Duboisia myoporoides*), Lilly pilly (*Acmena smithii*), Blue lilly pilly (*Syzygium oleosum*), Yellow pear fruit (*Mischocarpus pyriformis*), Brown kurrajong (*Commersonia bartramia*), Coogera (*Arytera divaricata*) and Coast canthium (*Cyclophyllum coprosmoides*). The native vines Austral sarsparilla (*Smilax australis*), Water vine (*Cissus antarctica*) and Five-fingered water vine (*C. hypoglauca*) are common throughout, particularly around disturbed edges. The groundcover includes a diversity of species and is dependent upon the extent of weed and vine infestation. Species commonly recorded include Blue flax lily (*Dianella caerulea*), Spiny-headed matrush (*Lomandra longifolia*), Bracken (*Pteridium esculentum*), Pastel flower (*Pseuderanthemum variabile*), Commelina (*Commelina cyanea*), Palm lilies (*Cordyline* spp.) and Basket grass (*Oplismenus aemulus*).

Littoral rainforest communities provide habitat for threatened flora species including White laceflower (*Archidendron bendersonii*), Scented acronychia (*Acronychia littoralis*), Durobby (*Syzygium moorei*) and Stinking cryptocarya (*Cryptocarya foetida*).



PLATE 1

Littoral
rainforest along
the northern end
of Shelly Beach.

5.2.2 Coastal forest and woodland types

Coast banksia open forest/woodland/shrubland

This community is common throughout the Study area and is characteristic of well-drained beach ridges and dunes often occurring behind more exposed Spinifex communities on the foredune. The community is characterised by a canopy dominated by Coast banksia (*Banksia integrifolia*) which may form a windsheared shrubland on more exposed beaches or a taller open forest in less exposed sites. Coast banksia communities typically include a developing Littoral rainforest component to varying extents, with Tuckeroo often present in the canopy layer.

Associated tree and shrub species vary greatly across the Subject site depending upon disturbance history, exposure, soil depth and landform location. Disturbed areas may comprise dense thickets

of Coastal wattle, Lantana and Bitou bush with scattered Coast banksia.



PLATE 2

Coast banksia open woodland behind Lighthouse Beach. Note regenerating littoral rainforest species in the understorey.

Mixed coastal woodland/shrubland

The community type describes areas of mixed native vegetation along dune systems and the shores of Shaws Bay where Coast banksia is co-dominant with other native species including Pandanus (*Pandanus tectorius* var. *australiannus*), Horsetail oak (*Casuarina equisetifolia*), Black she-oak (*Allocasuarina littoralis*), Coastal cypress pine, Swamp oak (*C. glauca*), Tuckeroo and Coastal wattle (*Acacia longifolia* subsp. *sophorae*). This community typically has a patchy distribution within the Study area. Associated groundcover species vary between sites but typically include Beach spinifex (*Spinifex sericeus*) and Pigface (*Carpobrotus glaucescens*) on exposed dunes and soft herbs and grasses such as Commelina (*Commelina cyanea*) and Basket grass (*Oplismenus aemulus*) at less exposed sites. Exotic grasses are also common in this community.



PLATE 3

Regenerating mixed coastal shrubland/woodland around Black Head

Heathland

Drier heathy forest occurs on the north and east facing slopes below the East Ballina cemetery. These areas support a mixed forest to about 5m tall with common species consisting of Black she-oak (*Allocasuarina littoralis*), Coast banksia (*Banksia integrifolia*), Wallum banksia (*B. aemula*), Phebalium, Brush box (*Lophostemon confertus*), Teatrees (*Leptospermum* spp.), Duboisia (*Duboisia myoporoides*), Cheese tree (*Glochidion fernandi*) and Coastal cypress pine (*Callitris columellaris*). This community was typically found to have limited weed presence.



PLATE 4

Low heathland located around Ballina Cemetery.

Coastal Cypress Pine forest

Coastal cypress pine (*Callitris columellaris*) occurs in extensive stands above the Shaws Bay escarpment as well as in patches within coastal dune systems where it grades into Littoral rainforest and Coast banksia forest. Coastal cypress pine dominates the canopy almost exclusively in some stands although may be co-dominant with Coast banksia (*Banksia integrifolia*) as well as Tuckeroo (*Cupaniopsis anacardioides*) to a lesser extent. The floristic character of the understorey varies greatly with species in backdune locations including Yellow pear fruit (*Mischocarpus pyriformis*), Tuckeroo (*Cupaniopsis anacardioides*), Beach alectryon (*Alectryon coriaceus*), Sandfly zieria (*Zieria smithii*) and Large mock olive (*Notelaea longifolia*). The ground layer comprises the native species Blue flax lily (*Dianella* sp.) and Spiny-headed matrush (*Lomandra longifolia*). Core areas of this community type typically have an open to sparse understorey. The exotic Ground asparagus fern is common as a very dense ground layer where no previous weed control works have been undertaken.



PLATE 5

Coastal cypress pine forest around Compton Drive showing dense Ground asparagus fern in the ground layer.

Swamp sclerophyll forest

Areas of swamp sclerophyll forest occur in low-lying dune swales and are dominated by Broad-leaved paperbark (*Melaleuca quinquinervia*) with minor occurrences of Swamp mahogany (*Eucalyptus robusta*) and Swamp turpentine (*Lophostemon suaveolens*) present in some areas. There is typically a dense ferny understorey (to 1-2m tall) of Rainbow fern, Bracken (*Pteridium esculentum*) and Bat's wing fern (*Histiopteris incisa*) with patches of climbing Native sarsparilla (*Smilax australis*). South of Flat Rock areas of Swamp sclerophyll forest support pools of standing water during periods of rainfall with patches of Giant sedge (*Lepironia articulata*) occurring in low lying areas subject to intermittent inundation.



PLATE 6

Broad-leaved paperbark dominant forest north of Flat Rock Road.

Brush box forest and woodland

Brush box occurs as a component of many of the Littoral rainforest patches in the Study area as well as within Coastal cypress forest. In some areas it dominates the canopy in small patches in the ecotone between these two community types or on the fringes of drier heathland forest.

An extensive area west of the Flat Rock Tent Park contains Brush box throughout the canopy with Old man banksia co-dominant in some areas and associated patches of Pink bloodwood and Black she-oak. This area has minimal weed presence with the exception of Ground asparagus, which is common throughout the groundlayer, particularly along Flat Rock Road.



PLATE 7

Brush box dominant forest located on the upper Shaws Bay escarpment at the end of Seaview Street.

5.2.3 Other native vegetation types

Coastal wattle shrubland

Areas of Coastal wattle shrubland occur on foredunes on exposed beaches, often forming a patchy band of vegetation between foredune Spinifex grassland and Coast banksia forest or Littoral rainforest on the landward side. In some areas Coastal wattle shrubland has developed where Bitou bush infestations have been controlled. The species has also been extensively replanted over recent years and is now widely re-established and vigorous in most dune areas. This community typically has a low dense wind-sheared canopy with Tuckeroo, Coast banksia and Duboisia present. The native woody vine Twining guinea flower (*Hibbertia scandens*) is common where restoration works have been undertaken along the dunes and can dominate the groundlayer in open areas.



PLATE 8

Coastal wattle shrubland along Shelly Beach. Note dead patches of Bitou bush.

Foredune vegetation

This community type describes foredune vegetation occurring along the beaches within the Study area including Lighthouse Beach, Shelly Beach and Angels Beach. Vegetation is characterised by a low open grassland/herbland/low shrubland dominated by Coastal spinifex (*Spinifex sericeus*) with Pigface (*Carpobrotus glaucescens*), Goats foot convolvulus (*Ipomoea brasiliensis*), Dune bean (*Vigna marina*), Blady grass (*Imperata cylindrica*), Prickly couch (*Zoysia macrantha*) and *Melanthera biflora*. Vegetation cover is sparse where erosional forces dominate. The extent of the exotic species Bitou bush has been reduced in recent years as a result of ongoing weed control works but it is still prevalent in areas.



PLATE 9

Foredune vegetation along Lighthouse Beach

Mangroves

A narrow fringing band of Grey mangrove occurs along sections of Shaws Bay. River mangrove is also present with some juvenile Black mangroves recorded in the intertidal channel west of Shaws Bay. Small patches of saltmarsh vegetation occur within or on the seaward edge of mangrove communities.



PLATE 10

Mangroves
fringing Shaws
Bay.

5.2.4 Exotic vegetation

Exotic species occur within the majority of vegetation types within the Study area but are generally present as invasive species within an intact or developing native vegetation community type. In some discrete areas patches of vegetation are dominated by exotic species forming Lantana shrubland, Bitou bush shrubland, exotic grassland and Slash pine forest. These communities typically have some native vegetation component, with Tuckeroo and Coast banksia saplings growing amongst headland and foredune Lantana/Bitou bush communities and Coast cypress pine occurring within Slash pine forest around the Shaws Bay escarpment.



PLATE 11

Bitou bush
dominant
shrubland north
of Black Head.
Bitou bush
control around
Black Head is
currently being
funded through
an Environment
Trust grant until
2015.



PLATE 12
Slash pine
dominant forest
around
Compton Drive.

5.3 Endangered ecological communities

5.3.1 State listed EECs

A total of four EECs listed under the Threatened Species Conservation Act 1995 occur within the VMP project area in various states of intactness and condition. These are discussed in more detail below. Areas of EEC were mapped within the VMP project area and are illustrated in **FIGURE A.5** in **APPENDIX A**.

5.3.1.1 Littoral rainforest EEC

Littoral Rainforest is generally a closed forest (at least 70% canopy cover), the structure and composition of which is strongly influenced by its proximity to the ocean with exposed patches having a wind-sheared effect and sheltered sites (e.g. behind Flat Rock) being characterised by a taller canopy. The plant species of this community are predominantly rainforest species however scattered emergent individuals of sclerophyll species, such as Coast banksia, occur in many stands. Of the sub-alliances described in the EEC identification guidelines, vegetation within the VMP project area is best described by Sub-alliance 17: Tuckeroo (*Cupaniopsis anacardioides*). This sub-alliance is typically well developed and occurs on deep sand that is more exposed to salt-spray, north from Port Stephens. Common weeds found to occur in this EEC within the VMP project area include Bitou bush, Ground asparagus fern, Coastal Morning glory, Fleabane, Winter senna and Lantana.

5.3.1.2 Swamp sclerophyll forest on coastal floodplains EEC

This EEC is generally found close to standing water on soils that are either waterlogged or subject to periodic flooding or inundation. It is usually an open to closed forest with a shrubby or reedy/ferny understorey. Characteristic tree species within the north coast area include Swamp Mahogany (*Eucalyptus robusta*) and Broadleaved paperbark (*Melaleuca quinquenervia*). The Scientific Committee's final determination of the Swamp Sclerophyll Forest does not delineate between higher and lower quality remnants of this community.

Within the VMP project area this EEC consists almost exclusively of Broad-leaved paperbark with little to no Swamp mahogany present. This EEC occurs in several locations including north of Flat Rock Road, south of Flat Rock Tent Park and west of Shelly Beach. These areas are generally in good condition with limited weed species present, although some weed incursion around the edges is evident. Common weeds found to occur in this EEC within the VMP project area include Umbrella tree, Coastal morning glory and Lantana.

5.3.1.3 Coastal cypress pine forest EEC

Coastal cypress pine forest is typically found on coastal sand plains north from Angourie within the far north coast of NSW. The community characteristically has a closed to open canopy of Coastal cypress pine (*Callitris columellaris*), which may sometimes be mixed with eucalypts, wattles, Coast banksia (*Banksia integrifolia*) and/or rainforest trees. The understorey of shrubs, sedges and herbs is typically open to sparse.

This EEC occurs in various degrees of condition dependent upon past weed control works. It occurs around the Shaws Bay escarpment and behind Angels Beach north. Degraded patches are typically heavily infested with Ground asparagus fern and a variety of other weeds in the understorey. The canopy comprises a dominance of Coastal cypress pine with some exotics in disturbed patches including Umbrella tree and Slash pine. Regeneration of Coastal cypress pine in degraded patches is restricted due to dense patches of Ground asparagus fern. Weed control works have been undertaken in some areas of this EEC with good results.

5.3.1.4 Coastal saltmarsh EEC

Small patches of saltmarsh species occur around the fringe of Shaws Bay on the shoreward side of mangroves. Exotic grasses and Ground asparagus fern are common in some parts of this community. These areas were not mapped due to their small size and scale of mapping used in this study.

5.3.2 Commonwealth listed TECs

One Commonwealth listed Threatened Ecological Community (TEC) listed under the Environment Protection and Biodiversity Conservation Act 1999 occurs within the VMP project area.

5.3.2.1 Littoral Rainforest and Coastal Vine Thickets of Eastern Australia TEC

Littoral Rainforest and Coastal Vine Thickets of Eastern Australia TEC is listed as critically endangered under the EPBC Act and comprises areas of littoral rainforest/vine thicket within 2km of the coast that have a closed canopy. It is naturally distributed as a series of disjunct and localised stands occurring on a range of landforms derived from coastal processes. In order to meet the definition of the TEC a number of condition criteria must be met including:

- Minimum patch size of 0.1ha,
- Cover of transformer weeds is 70% or less
- The patch must have:
 - At least 25% native plant species diversity characteristic of the TEC in that bioregion
 - OR
 - At least 30% canopy cover of one rainforest canopy (either tree or shrub) species (excluding Banksia and Eucalyptus species that may be part of the ecological community).

The areas of Littoral rainforest within the VMP Project area which are likely to meet the

condition criteria include larger patches of Littoral rainforest around Shaws Bay escarpment, Flat Rock and Angels Beach.

5.4 Threatened flora species

5.4.1 Species known to occur within the VMP project area

TABLE 5 lists the threatened flora species known to occur within the VMP project area. This list of threatened species was compiled from a number of sources including NSW Wildlife Atlas, Ballina Coastcare Inc., site surveys, previous VMPs and ecological assessments. Protocols for working around Threatened flora species are detailed in Section 7. Any new sightings of listed Threatened flora species or identification of a new Threatened flora species is to be reported to the BSC Natural Resource Officer and Ballina Coastcare Inc. A sample may need to be sent to the NSW Herbarium for identification.

TABLE 5

THREATENED FLORA SPECIES KNOWN FROM THE VMP PROJECT AREA

Species	Distribution and Habitat	Occurrence in VMP project area ³
Stinking cryptocarya <i>Cryptocarya foetida</i> TSC: V EPBC: V	This species is found in coastal south-east Queensland and north-east NSW south to Iluka. It occurs in littoral rainforest, usually on sandy soils.	Ballina Coastcare Inc. reports that there is a large mature Stinking cryptocarya to the south-west of the Flat Rock Tent Park which flowers every 3 to 4 years with the last flowering occurring approximately 3 years ago. As a result there are a number of Stinking cryptocarya seedlings within the surrounding area (Black Head to Sharpes Creek) approximately 15-40cm tall.
White lace flower <i>Archidendron bendersonii</i> TSC: V	This species occurs in north-east NSW on a variety of soils including coastal sands and those derived from basalt and metasediments. It occurs in riverine and lowland subtropical rainforest and littoral rainforest.	This species occurs in a number of locations within the VMP project area north of Black Head. The presumed parent tree is located near the Flat Rock Tent Park but there are others in the vicinity of The Coast Road, near Angels Beach North.
Durobby <i>Syzygium moorei</i> TSC: V EPBC: V	This species occurs in the Richmond, Tweed and Brunswick River valleys in north-east NSW. It is found in subtropical and riverine rainforest at low altitude and can often occur as isolated remnant paddock trees.	This species is known to occur in three locations north of Black Head. An older mature individual occurs outside the Shaws Bay café and may be the source tree of the other known occurrences.
Scented acronychia <i>Acronychia littoralis</i> TSC: E EPBC: E	Scented Acronychia is found between Fraser Island in Queensland and Port Macquarie on the north coast of NSW. It occurs in littoral rainforest on sand.	There is one verified record of this species between Black Head and Flat Rock within littoral rainforest habitats and one verified record at Fred Stoker Park, East Ballina, just west of the VMP Project area. Several additional unverified records are also listed by the NSW Wildlife Atlas as occurring around the Shaws Bay escarpment area.
Necklace pod <i>Sophora tomentosa</i> TSC: E	Necklace pod occurs on coastal dunes in coastal areas in Queensland and northern NSW.	Two known locations within the VMP project area, one at Lighthouse Beach and one between Black Head and Flat Rock (source: Ballina Coastcare Inc.).
Rusty plum <i>Niemeyera whitei</i> TSC: V	Rusty Plum occurs in the coast and adjacent ranges of northern NSW from the Macleay River into southern Queensland. It occurs in rainforest and the adjacent understorey of moist eucalypt forest.	One medium height self-sown individual occurs near Black Head (source: Ballina Coastcare Inc.).

³ All Ballina Coastcare Inc. records of threatened species have been verified through specimens, by either the NSW or Queensland Herbariums, or else through competent local professional botanists/ecologists.

5.4.2 Species which may occur in the VMP Project area

Based upon the literature review there are number of additional threatened species known to occur within the immediate Study area which were not recorded within the Subject site during the survey. These include:

- **Coast fontainea** (*Fontainea oraria*) – This species is listed as critically endangered under the TSC Act and is known to only occur in four locations near Lennox Head. These sites occur within a 600 m radius and the total population comprises ten adults and 45 seedlings and juveniles. The known population is not within the VMP project area but the species may occur within Littoral rainforest patches within the site.
- **Hairy joint grass** (*Arthraxon hispidus*) – This species is regularly recorded in the locality however all existing records are located west of the Coast Road. The closest record of this species to the Subject site was recorded by Blackwood Ecological Services on the western side of the underpass north of Sharpes Beach car park in April 2011. Despite this species not being recorded within the VMP project area it may potentially occur within areas of suitable habitat (low-lying, wet grassland) on a seasonal basis.
- **Red Lilly pilly** (*Syzygium hodgkinsoniae*) – This species was recorded in 2004 by Envite at the southern edge of the patch of SEPP 26 Littoral Rainforest at the southern end of Boulder Beach. This location is not within the VMP project area but the species may occur within Littoral rainforest patches within the site.

5.5 Threatened fauna and habitats

5.5.1 Threatened fauna

A large number of Threatened fauna species have been previously recorded within the Ballina Shire Local Government Area (LGA) according to the NSW Wildlife Atlas database. A list of those species is provided in **TABLE 6** below. Species restricted to marine environments have been excluded from this list.

TABLE 6
NSW WILDLIFE ATLAS DATABASE RECORDS OF THREATENED FAUNA
RECORDED WITHIN THE BALLINA LGA

Common Name	Scientific Name	NSW Status	Commonwealth Status	No. of records
Amphibians				
Pouched Frog	<i>Assa darlingtoni</i>	V,P		1
Wallum Froglet	<i>Crinia tinnula</i>	V,P		70
Green and Golden Bell Frog	<i>Litoria aurea</i>	E1,P	V	2
Olongburra Frog	<i>Litoria olongburensis</i>	V,P	V	12
Reptiles				
Three-toed Snake-tooth Skink	<i>Coeranoscincus reticulatus</i>	V,P	V	1
White-crowned Snake	<i>Cacophis harriettae</i>	V,P		1
Aves				
Magpie Goose	<i>Anseranas semipalmata</i>	V,P		5
Freckled Duck	<i>Stictonetta naevosa</i>	V,P		2
Wompoo Fruit-Dove	<i>Ptilinopus magnificus</i>	V,P		49
Rose-crowned Fruit-Dove	<i>Ptilinopus regina</i>	V,P		103
Superb Fruit-Dove	<i>Ptilinopus superbus</i>	V,P		4
Marbled Frogmouth	<i>Podargus ocellatus</i>	V,P		1

Common Name	Scientific Name	NSW Status	Commonwealth Status	No. of records
Black-necked Stork	<i>Ephippiorhynchus asiaticus</i>	E1,P		99
Australasian Bittern	<i>Botaurus poiciloptilus</i>	E1,P	E	6
Black Bittern	<i>Ixobrychus flavicollis</i>	V,P		6
Spotted Harrier	<i>Circus assimilis</i>	V,P		19
Red Goshawk	<i>Erythrotriorchis radiatus</i>	E4A,P	V	6
Little Eagle	<i>Hieraaetus morphnoides</i>	V,P		24
Eastern Osprey	<i>Pandion cristatus</i>	V,P		197
Black Falcon	<i>Falco subniger</i>	V,P		1
Brolga	<i>Grus rubicunda</i>	V,P		9
Pale-vented Bush-hen	<i>Amaurornis moluccana</i>	V,P		15
Bush Stone-curlew	<i>Burbinus grallarius</i>	E1,P		8
Beach Stone-curlew	<i>Esacus magnirostris</i>	E4A,P		16
Sooty Oystercatcher	<i>Haematopus fuliginosus</i>	V,P		26
Pied Oystercatcher	<i>Haematopus longirostris</i>	E1,P		164
Greater Sand-plover	<i>Charadrius leschenaultii</i>	V,P	MBA	38
Lesser Sand-plover	<i>Charadrius mongolus</i>	V,P	MBA	62
Comb-crested Jacana	<i>Irediparra gallinacea</i>	V,P		8
Australian Painted Snipe	<i>Rostratula australis</i>	E1,P	E	1
Sanderling	<i>Calidris alba</i>	V,P	MBA	31
Curlew Sandpiper	<i>Calidris ferruginea</i>	E1,P	MBA	115
Great Knot	<i>Calidris tenuirostris</i>	V,P	MBA	72
Broad-billed Sandpiper	<i>Limicola falcinellus</i>	V,P	MBA	9
Black-tailed Godwit	<i>Limosa limosa</i>	V,P	MBA	18
Terek Sandpiper	<i>Xenus cinereus</i>	V,P	MBA	90
Red-backed Button-quail	<i>Turnix maculosus</i>	V,P		2
White Tern	<i>Gygis alba</i>	V,P		2
Sooty Tern	<i>Onychoprion fuscata</i>	V,P		8
Grey Ternlet	<i>Procelsterna cerulea</i>	V,P		1
Little Tern	<i>Sternula albifrons</i>	E1,P	MBA	121
Glossy Black-Cockatoo	<i>Calyptorhynchus lathami</i>	V,P		8
Little Lorikeet	<i>Glossopsitta pusilla</i>	V,P		2
Eastern Ground Parrot	<i>Pezoporus wallicus wallicus</i>	V,P		4
Powerful Owl	<i>Ninox strenua</i>	V,P		1
Eastern Grass Owl	<i>Tyto longimembris</i>	V,P		52
Masked Owl	<i>Tyto novaehollandiae</i>	V,P		4
Sooty Owl	<i>Tyto tenebricosa</i>	V,P		2
Collared Kingfisher	<i>Todiramphus chloris</i>	V,P		2
Albert's Lyrebird	<i>Menura alberti</i>	V,P		29
Mangrove Honeyeater	<i>Lichenostomus fasciolaris</i>	V,P		15
Grey-crowned Babbler (eastern subspecies)	<i>Pomatostomus temporalis</i> <i>temporalis</i>	V,P		25
Varied Sittella	<i>Daphoenositta chrysoptera</i>	V,P		33

Common Name	Scientific Name	NSW Status	Commonwealth Status	No. of records
Barred Cuckoo-shrike	<i>Coracina lineata</i>	V,P		7
White-eared Monarch	<i>Carterornis leucotis</i>	V,P		13
Mammals				
Spotted-tailed Quoll	<i>Dasyurus maculatus</i>	V,P	E	11
Brush-tailed Phascogale	<i>Phascogale tapoatafa</i>	V,P		1
Common Planigale	<i>Planigale maculata</i>	V,P		20
Koala	<i>Phascolarctos cinereus</i>	V,P	V	297
Squirrel Glider	<i>Petaurus norfolcensis</i>	V,P		2
Long-nosed Potoroo	<i>Potorous tridactylus</i>	V,P	V	14
Red-legged Pademelon	<i>Thylogale stigmatica</i>	V,P		7
Grey-headed Flying-fox	<i>Pteropus poliocephalus</i>	V,P	V	76
Common Blossom-bat	<i>Syconycteris australis</i>	V,P		7
Yellow-bellied Sheath-tail-bat	<i>Saccolaimus flaviventris</i>	V,P		1
Eastern Freetail-bat	<i>Mormopterus norfolkensis</i>	V,P		1
Eastern False Pipistrelle	<i>Falsistrellus tasmaniensis</i>	V,P		1
Little Bentwing-bat	<i>Miniopterus australis</i>	V,P		34
Eastern Bentwing-bat	<i>Miniopterus schreibersii oceanensis</i>	V,P		6
Southern Myotis	<i>Myotis macropus</i>	V,P		4
Eastern Long-eared Bat	<i>Nyctophilus bifax</i>	V,P		18
Greater Broad-nosed Bat	<i>Scoteanax rueppellii</i>	V,P		6
New Holland Mouse	<i>Pseudomys novaehollandiae</i>	P	V	1
Hastings River Mouse	<i>Pseudomys oralis</i>	E1,P	E	1
Insects				
Atlas Rainforest Ground-beetle	<i>Nurus atlas</i>	E1		1
Gastropods				
Mitchell's Rainforest Snail	<i>Thersites mitchellae</i>	E1	CE	2

KEY

NSW Status: V-Vulnerable, E1-Endangered, E4A-Critically Endangered, P-Protected

Commonwealth status: V-Vulnerable, E-Endangered, CE-Critically endangered, MBA-Migratory Bird Agreement

5.5.2 Discussion of threatened fauna habitat within the VMP project area

5.5.2.1 Introduction

The VMP project area provides a contrast of vegetation community types that together support a range of habitat types for native fauna, including threatened (NSW TSC Act 1995 & Commonwealth EPBC Act 1999) species. Movement opportunities for fauna through the Study area are limited by clearing, development and roads, although there is a discontinuous corridor of vegetation along the coastal strip. The forested corridor along the hind dunes is largely intact from Angels Beach in the south to Sharpes Beach.

5.5.2.2 Amphibians

Habitat for amphibians within the Study area is generally confined to low-lying areas of Paperbark forest, small patches of wetland and adjoining areas of littoral rainforest, with roadside drains and localised depressions also providing habitat. Grassy headlands, foredunes and areas of

drier coastal scrub are generally too exposed to provide amphibian habitat.

The Wallum froglet (*Crinia tinnula*) is the only threatened amphibian species likely to occur, with low lying Paperbark areas north and south of Flat Rock Tent Park providing the best areas of potential habitat.

5.5.2.3 Reptiles

The Study area provides a contrast of habitat types that represent good quality habitat for reptiles, although fragmentation, past clearing and disturbance and roadkill are likely to be factors in limiting reptile diversity, with species relying on larger tracts of habitat or highly sensitive to disturbance unlikely to occur.

Threatened reptile species are unlikely to occur, with likely common species including the Eastern water dragon, Eastern blue-tongued lizard, Land mullet, Robust ctenotus, Yellow-faced whip snake, Carpet python, Green tree snake, Red-bellied black snake, Brown snake, Small-eyed snake, Burton's legless lizard, Lace monitor, Bandy bandy, *Ramphotyphlops nigrescens* (blind snake) and various smaller skinks.

5.5.2.4 Birds

The juxtaposition of habitat types within a relatively small area can be expected to contribute toward a high diversity of bird species over the course of the seasons. Birds known from the area include coastal and oceanic birds (e.g. Oystercatchers, cormorants, shorebirds, terns and gulls), raptors (Osprey, Brahminy kite, Whistling kite), grassbirds (e.g. wrens, finches, Golden-headed cisticola) wetland birds (ducks, grebes, Purple swamphen) and birds typical of rainforest habitats (e.g. Noisy pitta, Eastern yellow robin, Varied triller, shrike-thrushes) as well as habitat generalists and open country birds (e.g. honeyeaters, lorikeets and rosellas, butcherbirds) and migratory species (e.g. Dollarbird, Rufous fantail, cuckoos and Spangled drongo).

Birds requiring large tree hollows for nesting are unlikely to be common in the Study area. Additional nomadic and migratory species would be expected to occur at certain times of the year, including shorebird species at Flat Rock such as the terns, Red-necked stint, Ruddy turnstones, Wandering tattler, Whimbrel and Red-capped plovers.

Threatened species that may occur within the project area include rainforest birds such as the Barred cuckoo-shrike, White-eared monarch and Rose-crowned fruit-dove. Ongoing vegetation rehabilitation works will continue to improve habitat values for these species. The Osprey is a common sighting along this section of coast. Beach habitats provide habitat for the Pied oystercatcher and Little tern, with dune rehabilitation and protection works improving habitat values for these species. A diversity of threatened shorebird species have been recorded at Flat Rock and the surrounding beach including the Sooty oystercatcher, Lesser and Great sandplover, Sanderling, Little tern, Godwits and the Terek sandpiper (Hans Lutter of Birdlife Australia pers comm., June 2014).

5.5.2.5 Mammals

Habitat fragmentation and disturbance history is likely to limit mammal diversity as well, with mammals found in larger tracts of coastal vegetation, such as the Sugar glider and Eastern chestnut mouse, unlikely to occur. Mammals relying on larger tree hollows are unlikely to breed in the area. The Common planigale has been recorded within a small patch of planted rainforest at Pat Morton Lookout and is also known from forest behind Boulder Beach (Ian Gaskell, pers comm., October 2011). Other mammal species occurring in the area include the Bush rat, Swamp



rat, Black rat and Brushtail possum.

Additional mammal species considered likely to occur include the Short-beaked echidna, Mountain brushtail possum, Brown antechinus and Ringtail possum. Roadkill along The Coast Road is also likely to be a factor limiting mammal populations in the study area.

Ongoing vegetation rehabilitation works will continue to improve habitat values for threatened fauna including the Common blossom bat, Common planigale, Little bent-wing bat, Greater broad-nosed bat and Southern myotis.

6 INFRASTRUCTURE MANAGEMENT AND VISITOR FACILITIES

6.1 Introduction

This section discusses and recommends the management and maintenance of council infrastructure within the VMP project area as well as existing visitor/community facilities and services.

6.2 Walkways and cycleways including beach access tracks

The VMP project area contains a vast network of walkways and beach access tracks. Formal pedestrian access to beaches is provided at a number of points at Lighthouse Beach, Shelly Beach and Angels Beach. Beach and bushland access tracks managed by BSC and volunteer groups have been assigned an identity number and are shown in **FIGURE A.6** of **APPENDIX A**.

In general, formal beach and bushland tracks were found to be in good order during the surveys with limited erosion issues noted. However, it may be worth consolidating the vast network of formal paths to reduce maintenance costs in the long-term and reduce opportunities for weed species incursion along edges. Any consolidation plans should be undertaken in consultation with Ballina Coastcare Inc. as coastcarers have recognised maintenance and access trails for managing dunal forests. Wiring/fencing along beach access tracks as well as handrails should be maintained to ensure longevity and safety. The lower section of the handrail located on the stairs leading from Hill Street/Pine Avenue down to Shaws Bay was found to be unsecure during the site survey.

BSC's open space and reserves bushland and beach access track maintenance guidelines are included in **APPENDIX C**. These guidelines stipulate specific maintenance requirements for the aerial corridor and ground along managed tracks as well as the frequency of maintenance requirements.

The recently approved Shared Path West is located within the vicinity of the VMP project area. The southern section of this walkway/cycleway will extend along the western side of The Coast Road from North Angels Beach roundabout to Headlands Drive at the Skennars Head residential development. It will provide a linkage between East Ballina, Skennars Head and Lennox Head. A Coastal Recreational Path is also proposed and is currently within the development application process. It will extend along the coastal escarpment north from the existing walkway at the Angels Beach underpass through to the Pat Morton Lookout at Lennox Head via the Flat Rock Tent Park, Sharpes Beach and Boulder Beach. The location of the Shared Path West and Coastal Recreational Path are shown in **FIGURE A.7** of **APPENDIX A**.

6.3 Emergency services including 4WD accesses to beaches

Only authorised 4WD vehicles by BSC (includes licensed commercial fishermen) as the reserve trust manager and emergency vehicles are permitted on beaches within the VMP Project area. BSC website provides details on four-wheel drive vehicle access along Seven Mile Beach, north of the Lake Ainsworth Sport and Recreational Facility and a permit is required. Beach access ramps for four-wheel drive emergency vehicles are provided at all beaches within the VMP project area, although some access ramps may sometimes be closed as required for maintenance, beach safety and regulatory purposes.

Trail gates and barriers should be maintained regularly to ensure they are intact and functional in order to deter illegal access.

6.4 Public toilets

Public toilets are provided at Compton Drive (western edge of Shaws Bay), North Wall (near the Coastguard Tower), Lighthouse Beach surfclub, Shelly Beach surfclub and Flat Rock car park. These toilet facilities should be maintained as required. Existing toilet facilities are located within Richmond Park at Bayview Street. These facilities are currently closed, at this stage Council is considering whether to demolish or reopen these facilities.

6.5 Picnic and BBQ areas

A number of picnic and BBQ facilities are provided at several scenic locations across the VMP project area. These should be maintained as part of Council's regular maintenance program. Of particular mention are the old, degraded BBQ facilities at the eastern end of Compton Drive (**PLATE 13**). This area is unlikely to be utilised given its close proximity to Compton Drive after the recent realignment and removal of seating. BBQ facilities and concrete slabs should be removed from this area.



PLATE 13

Degraded BBQ facilities at the eastern end of Compton Drive should be removed.

6.6 Car parks

Car park facilities are provided throughout the VMP project area at the various beaches. New car park facilities have recently been completed at Lighthouse Beach and at the dog exercise area on Compton Drive as part of the road realignment works and new surfclub development. The formalisation of Sharpes Beach car park is also in the planning approval stage. Also worth noting is the proposed closure of the existing car park/vehicle tracks at Angels Beach as part of the Coastal Recreational Path project. It is proposed that a 20m by 20m car park would be constructed at the existing entrance and the existing car park would be rehabilitated. Rehabilitation of the car park would be undertaken as part of the Coastal Recreational Path project following construction of the path through this area.

Timber bollards have recently been installed along Compton Drive as part of the realignment project to prevent vehicle access to grassed areas on the northern side. This will greatly assist with eliminating informal access, erosion and illegal dumping within this area.

6.7 Seating and viewing platforms

Seating and viewing platforms are provided throughout the VMP project area at various scenic locations, beach fronts and parklands. Maintain and replace as required all viewing platform structures to be safe and functional and maintain existing ocean views east of the viewing structures by carefully pruning below the railing height to ensure continued views. Any

revegetation works to be undertaken within the coastal views of existing viewing platforms needs to be undertaken so as not to impede the views in the future through the planting of low growing species on the eastward side of viewing platforms.

The usability of some lookout platforms may be somewhat obsolete given extensive vegetation growth, for example the viewing platform on track No. 67 at Lighthouse Beach. Alternative uses, removal or relocation of any such viewing platforms may be considered warranted and should be decided by BSC in consultation with landcare groups.

An additional viewing platform is proposed at the northern end of the VMP project area (just south of Sharpes Creek) as part of the Coastal Recreational Path project. A finger path would also lead from this viewing platform down onto Sharpes Beach.

6.8 Dog exercise areas

A designated off-leash dog exercise area is provided in the open grassland area along Compton Drive at Shaws Bay. No rehabilitation works are proposed for the 'Shaws Bay off lead dog area' which is to be maintained as a mown grass exercise area. Dogs are prohibited from Lighthouse Beach, Shelly Beach, Shaws Bay, Flat Rock Reef and the northern end of Sharpes Beach (during summer when the beach is patrolled). Dogs are permitted on Angels Beach and Sharpes Beach but must be on a leash at all times. Refer to BSC's website for all updated dog exercise areas and mapping.

Dog litter facilities should be provided where appropriate and maintained/emptied on a regular basis as required. Appropriate signage should also be installed/maintained to inform dog owners of regulated areas. Specific effort to enforce dog restrictions along prohibited beaches, especially Flat Rock reef, should be undertaken to prevent impacts on shorebird populations, particularly during pre-migratory and breeding periods.

7 VEGETATION MANAGEMENT ISSUES & GUIDELINES

7.1 Introduction

This section provides details on specific management issues which may be encountered in the field and which are of relevance to on-ground works and the success of such works.

7.2 Tree vandalism

Recent evidence of tree vandalism is present along the Shelly Beach embankment within the VMP project area. If any tree vandalism is suspected, letters should be sent to all properties along the relevant street notifying them of the rules and regulations surrounding tree removal/vandalism and the associated penalties. While tree vandalism is unlikely to be a major problem in the area it should be treated seriously. Where obvious view enhancement is probable as a reason for evident tree loss, specific management protocols should be implemented to prevent further incident. Management responses employed by some councils have included the use of large banners where trees have mysteriously died to prevent views or obvious signage indicating the trees were poisoned.

7.3 Vegetation/Rubbish dumping

A number of vegetation rubbish dumps were noted within bushland areas of the VMP project area during the surveys. These are highlighted and addressed in the relevant management zones discussed in Section 8. The majority of the dumps occur at the rear of residential properties where their boundary adjoins a bushland area. Local residents adjoining bushland areas should be notified by letter/pamphlet regarding Council's weekly green waste collection as well as the penalties associated with dumping rubbish/vegetation. Specific effort should be made where new bush regeneration works are proposed to educate adjacent residents on the merits of weed control and how they can assist conservation efforts.

One major dumping site worth noting is located at the reservoir car park on Lookout Road. The previous VMP for this area (Greening Australia 2004) recommended either a gate to close off vehicle access to the car park or a fence along the edge of bushland to prevent dumping in this area which was a major source of weed infestation in the area. Significant weed control works have been undertaken in this area since the VMP was prepared. As a result of the dumping, native regeneration in this area is absent and weeds continue to be a problem, especially Climbing philodendron. Specific measures should be implemented to prevent further rubbish dumping in this area and assist with the long-term eradication of weeds from this area.

Appropriate signage should be installed where required to assist in addressing this issue.

7.4 Informal tracks

A number of additional tracks (to those shown in **FIGURE A.6**) including several informal tracks and/or overgrown disused tracks were identified during the site surveys. Those considered to be of relevance to this VMP are discussed further below in **TABLE 7**.

TABLE 7
INFORMAL TRACKS REQUIRING ATTENTION

Track location	Notes
Compton Drive up to Beach Parade (eastern end)	An old track extends from the disused BBQ facilities on Compton Drive (eastern end) up the vegetated slope to Beach Road. The track is somewhat overgrown although a series of concrete steps are still visible and useable. During the survey a number of local residents highlighted the dangers of trying to cross into Beach Road from the Ballina Head car park given the

Track location	Notes
	<p>inability to see oncoming traffic. The upgrade of this track to improve access could be one option of providing safer access for local residents around Grandview Street to Lighthouse Beach, although crossing of Compton Drive would still be required.</p> <p>In general there are limited opportunities for residents around Grandview Street to cross Suvla Street, Compton Drive or Shelly Beach Road and access local beaches and coastal walking tracks.</p>
Shaws Bay Escarpment	<p>An informal track runs from the Coastal cypress pine parkland on Bayview Street down the steep slope to the dog exercise area on Compton Drive. This track is very steep and is causing erosion of the hillside despite the installation of erosion control matting which was noted along the path. The previous VMP for this area noted that the track should be closed by installing barrier fencing and signage or Council could formalise and stabilise the path with appropriate structures.</p>
Underpass Angels Beach (south)	<p>An informal short cut extends from track 50 at the southern end of Angels Beach through a semi-vegetated drainage line to the underpass near Bayview Drive. Despite signage near the underpass that the track is closed, the short cut is obviously still being utilised to gain faster access to the beach track. Its location through a drainage line which is obviously inundated during wet weather is prohibitive to formalisation unless a boardwalk is constructed which is considered uneconomical. Additional plantings of spiky plants such as Mat rush (<i>Lomandra longifolia</i>) and installation of signage at both ends may further deter people from utilising this short cut.</p> <p>It has been noted by Ballina Coastcare Inc. that during heavy rainfall, runoff from The Coast Road pours along this informal track/drainage line causing erosion and impacting on site vegetation. BSC should investigate options to redirect this runoff from the road and install appropriate drainage where required.</p>

7.5 Erosion

Coastlines within the VMP project area are subject to ongoing change and erosion. These include:

- Beach erosion and associated access tracks and viewing platforms resulting from storms including extreme wave and wind energies as well as high tides and currents
- Dune erosion as a result of people movements, wind and water runoff
- Track erosion as a result of people movements and water runoff.

These processes continually shape the beach and dunal profiles and can cause erosion where vegetation cover is lacking and sand is exposed. Landcare groups are assisting with the recovery and planting of native vegetation on dune areas where exposed areas occur as a result of Bitou bush control. All works planned within the fragile dunal environment should take into consideration the likelihood of erosion to occur following weed control and undertake works in a staged manner followed by supplementary planting where natural regeneration is slow or lacking.

Adjustment of beach track gradients by hand or machine may be required at times to maintain beach accesses without further damage to the dune environment. Additionally formed and structural pathway surface materials such as asphalt, concrete and board and chain may need lengthening or removing of sections as beach sand heights alter and dunes accrete and recede. Lifting of board and chains and removing excess sand and forest vegetation litter off tracks may occasionally be required. In addition, storm events that cause dangerous and impassable forest

and track conditions may require pruning and felling of dangerous trees and chopping to ground to discourage trellis's for weeds and speed up decomposition. Unsafe viewing platforms resulting from severe beach erosion following major storm events may also require removal, relocation or rebuilding within the fragile dune environment.

7.5.1 Beach recession and sea-level rise

Projected sea-level rise will impact upon areas discussed within this VMP over time. A long term shoreline retreat assessment was undertaken as part of the Ballina Shire Coastline Hazard Definition Study Final Report (WBM 2003). The report states that the beaches within the VMP project area are likely to experience relative stability into the future although medium term shifts of sand from one end of each beach to the other can be expected in response to variation in the prevailing wave climate (beach rotation). A nominal allowance of 10m recession is recommended for planning purposes to account for such processes on top of other short term erosion and sea level rise influences. At the north end of Angels Beach there is a risk of substantial erosion and realignment of the shoreline should the tombolo become detached from Flat Rock due to other influences. However, it was not possible to accurately quantify such erosion without detailed modelling beyond the scope of the study (WBM 2003).

In general, an increase in native vegetation cover particularly on the dunes will assist in mitigating the impacts of sea-level rise. Vegetation management activities may need to adapt to any foreshore recession, impacts from storm events etc. As part of BSC ongoing coastline management studies and plans, specific protection measures may be required in the event of severe erosion hazards.

7.6 Adjacent residential properties and encroachment

The majority of the bushland areas subject to this VMP are located adjacent to or in close proximity to residential properties. Encroachment and invasive weeds in gardens significantly contribute to weed incursion and bushland degradation. The highest weed densities were recorded around the interface between bushland and backyard. BSC should consider implementing a residential education program within the VMP project area which details the aims and objectives of this VMP, the benefits of conserving bushland areas within East Ballina and the importance of managing invasive weeds in backyard areas. Ballina Coastcare Inc. have mentioned that the landcare groups would be willing to go by invitation into residential backyards, where they adjoin bushland areas currently receiving weed control works, and treat invasive weeds such as Ground asparagus fern.

7.7 Guidelines for working around threatened species

A number of threatened species and endangered ecological communities are known to occur within the Subject site. These are discussed in further detail in Section 5. Those undertaking works in areas where threatened species occur or within an EEC require a Section 132C licence (application for a scientific licence for the purpose of bush regeneration) under the National Parks and Wildlife Act 1974 (NPW Act). A checklist for bush regeneration activities in the habitat of threatened species, endangered populations and EECs has been prepared by the NPWS Northern Directorate and is provided in **APPENDIX D**. This checklist outlines specific methodology to be employed around threatened species such as buffer distances and the gradual removal of weeds which provide habitat for threatened fauna. It also stipulates that all workers carrying out bush regeneration works will be supervised by a trained and experienced coordinator with recognised certification or a minimum 2 years' experience.

All volunteers are to be briefed on threatened flora species prior to undertaking any works across the Subject site. This is to be the responsibility of the landcare supervisor. Qualified bush

regenerators are to be adequately experienced, licensed and knowledgeable on such species.

The identification of any additional threatened species within the Subject site is to be reported to BSC's Natural Resource Officer. A sample may need to be sent to the NSW Herbarium for positive identification. Any new sightings are to be added to BSC's database as well as the flora database managed by Ballina Coastcare Inc.

7.8 Guidelines for chemical usage around terrestrial orchids

Terrestrial orchids have been identified at the Shelly Beach site in proximity to the Harriers Track, Black Head as well as Angels Beach to Flat Rock area. Species recorded in the Angels Beach to Flat Rock area in 2005 by the local orchid specialist, John Moye, include:

- *Petrostylis ophioglossa*
- *Cheirostylis ovata*
- *Acianthus exiguus*
- *Pterostylis* sp. (?*concinna*)
- *Zeuxine oblonga*
- *Acianthus amplexicaulis*
- *Pterostylis* sp. (?*curta*)

As these orchids are often inconspicuous they can be overlooked when regeneration works are being undertaken. Most terrestrial orchids appear above ground mid-April to October, although this may not always be the case. If spraying of herbicides is undertaken around known populations of orchids, consideration should be given to timing the treatment for when the orchids are dormant underground. Soil disturbance should be avoided year-round in these areas, so as not to displace tubers. Ballina Coastcare Inc. have information on the species and locations of known terrestrial orchid populations around Angels Beach to Flat Rock and should be consulted prior to any earthworks or spraying of herbicide through this area.

7.9 Pandanus Plant Hopper

Pandanus trees within the Ballina Shire area are currently at risk from dieback due to a sap-sucking insect known as the "planthopper" (*Jamella australiae*) which is native to North Queensland. Infestations have been located in both Lennox Head and East Ballina and Ballina Shire Council is actively controlling these infestations. It is recommended that sightings of planthopper be reported to Ballina Shire Council for treatment and monitoring.

7.10 Best practice guidelines and other requirements

The following requirements are to be adhered to in all management zones:

- All weed control and planting works are to be undertaken by suitably qualified and/or experienced Bush regenerators and/or under the supervision of trained and experienced landcare personnel.
- Bush regenerators are to follow best practice guidelines as detailed in **APPENDIX E**.
- Bush regenerators are to complete Daily record sheets. The BSC Bush Regeneration and Herbicide Record Sheet is included in **APPENDIX F**. Daily record sheets are to be submitted electronically for recording purposes to BSC quarterly or as a project area is completed.
- Any appointed nursery contractors for supply of plantings are to follow hygiene protocols in order to reduce the potential for pathogens, bacteria, pests and weeds being inadvertently introduced to the site. In particular, nursery's should ensure no plants showing signs of Myrtle rust are delivered to the site.



- All monitoring should be undertaken by a suitably qualified ecologist (refer to Section 9).
- Weed management is to be in accordance with the Weed Control Guidelines (**APPENDIX G**).
- Any planting is to be undertaken in accordance with the Guide to Planting (**APPENDIX H**).
- Any planting works to be undertaken within the VMP project area should utilise seedlings sourced from local provenance seed, cuttings or other propagation materials. Local provenance includes an area within 50km of the VMP Project area.

8 MANAGEMENT ZONES

The VMP project area has been divided into eight management zones based primarily upon location and existing defined boundaries such as roads and tracks. The location of zones is presented in **FIGURE A.8** of **APPENDIX A**. Consideration was also given to current landcare and contractor jurisdictions as well as long-term land use objectives and management actions. The eight management zones have then been split into a number of subzones based upon vegetation communities, condition and management requirements.

Each subzone has been given a condition rating as detailed below in **TABLE 8**. The same scale used in the EnviTE VMPs has been utilised to maintain consistency and allow an assessment of changes in weed dominance over time.

TABLE 8
CONDITION RATING OF SUBZONES

Rating	Condition
1	Weed dominated, native trees absent or dead.
2	Weed dominated with a few emergent native trees and shrubs.
3	Has structure of forest or original vegetation type with heavy weed infestation leading to rapid decline.
4	Has structure of forest or original vegetation type with heavy weed but some natural regeneration.
5	Has structure of original vegetation type with a number of stratum, healthy but threatened by encroaching weeds.
6	Vegetation in good order, sporadic weeds.
7	Forest or system self-sustaining, needs no assistance.

This chapter has been split into eight sections with each section dedicated towards one management zone. Each section provides detailed information on the relevant management zone including:

- Map of each zone and delineation of subzones
- Mapping and description of vegetation communities
- Discussion on ecological values including EECs, threatened flora and fauna
- Progress since previous VMP (where applicable)
- Current condition of vegetation and degree of weed infestation
- Vegetation management recommendations including priorities and designation of responsibilities
- General recommendations relating to infrastructure management and other non-vegetation related issues
- List of exotic species noted during the survey. A general cover abundance score was assigned to each species across the zone based upon the following system:

+	<5% one or a few individuals
1	<5% many individuals
2	6-25%
3	26-50%
4	51-75%
5	76-100%

A priority rating of low, medium or high is given to each vegetation management recommendation in the following tables. The intent of the priority ratings is to provide a relative



comparison of the importance of various actions described within each sub zone. Highest priority has been applied where highly invasive weeds are threatening previously worked areas or are at an early stage of infestation where control/eradication from the subzone could be achieved quickly and with minimal resources. Priority ratings have also been assigned based upon the consideration of priority areas across the entire VMP project area and where resources would best be utilised. All ongoing weed control works within previously worked areas should be afforded important priority to prevent re-establishment.



8.1 Zone 1 – Lighthouse Beach

Geographic location/extent of zone: Lighthouse Beach dune vegetation

Subzones identified in the EnviTE VMP (2005) have been modified to correspond with dune position and existing vegetation structure, and subsequently the type of management required. Extensive weed control works since 2005 meant the previous subzones were no longer applicable. (Refer to **FIGURE A.9** in **APPENDIX A**).

Main vegetation communities in zone (refer to **FIGURE A.9** in **APPENDIX A**)

Foredune areas are dominated by Coastal spinifex with patches of *Melanthera biflora* and dune vines. Beyond this coastal wattle is dominant as a low dense shrubland, although open areas occur where Bitou bush has been removed. Sheltered areas along the back dune are dominated by Coast banksia open forest with regenerating littoral rainforest in the understorey.

Ecological values

Hind dune comprises Coast banksia forest with regenerating littoral rainforest species. Given time this community will almost certainly develop into Littoral Rainforest EEC (TSC Act). It should be noted that this area is part of a reconstructed landform which was formed following the installation of the Richmond River North Wall. The TSC Act listed endangered species *Sophora tomentosa* (Silver bush) is known to occur in this area according to information provided by Ballina Coastcare Inc. Threatened fauna species recorded within the area include Eastern osprey, Beach Stone-curlew, Little tern and Sooty oystercatcher.

Progress since previous VMP (EnviTE 2005)

Extensive works have been undertaken in this zone since the previous VMP prepared in 2005 including aerial spraying of Bitou bush which has mostly controlled this weed across the site. Supplementary weed control and planting by the local dunecare group has assisted the regeneration of native shrubs and trees with the majority of this zone now comprising limited weed infestation. Treatment of Hairy commelina and Turkey rhubarb noted in the EnviTE VMP in 2005 appear to have been successful. Ongoing monitoring of these areas will be required to ensure their long-term eradication from the site.

General recommendations for zone

Maintain track posts and wiring as required. There is an old interpretive walk north of track 68 which links to an observation platform on track 67. Vegetative growth is now inhibiting views from this platform and a number of the interpretative signs are no longer visible. The Dunecare group and BSC should investigate opportunities to improve the functionality and use of the interpretative walk and platform. There is also an old paved path north of track 69 which is no longer utilised. Pavings should be removed where possible to allow natural regeneration in this area.

Sub-zone	Vegetation Description	Condition	Vegetation Management Recommendations	Priority	Work to be performed by:
1a	<p>Foredune and sections of the interdune which comprise a low grassland dominated by Spinifex and Native couch with <i>Melanthera biflora</i>, Pigface and Beach morning glory. Occasional Pandanus and Horse-tail she-oak and scattered patches of Coastal wattle occur.</p> <p>Limited weed presence throughout subzone.</p>	6-7	<p>Treat area of the exotic <i>Hydrocotyle bonariensis</i> spreading through foredune area around track No. 68 (refer to photo in Appendix I). Refer to the weed control table in Appendix G.</p> <p>Continue control of Coastal morning glory and other sporadic weeds in this area. Coral tree seedlings were noted at the southern end. Continue reducing exotic couch infestations and encouraging Prickly couch spread.</p> <p>Continue removal of Bitou seedlings and planting of Coastal wattle in interdune area as required.</p> <p>Specific measures may be required following any large storm events which cause erosion of the foredune.</p>	<p>Medium</p> <p>Low</p> <p>Low</p> <p>As required</p>	<p>BSC contractor</p> <p>Dunecare</p> <p>Dunecare</p> <p>BSC</p>
1b	<p>Shrubland areas of the interdune dominated by Coastal wattle.</p> <p>Aerial spraying has controlled majority of Bitou bush in area although some mature shrubs and seedlings still occur.</p> <p>Extensive regeneration of Tuckeroo and other littoral rainforest species occurring.</p> <p>Limited weed presence throughout subzone.</p>	6	<p>Continue control of weeds including Bitou bush, Coastal morning glory, Siratro, Fleabane, Lantana etc.</p> <p>Continue maintenance of existing plantings and undertake additional planting of Coastal wattle and littoral rainforest species where appropriate, consolidate open areas and where natural regeneration is lacking.</p> <p>The native Snake vine and Climbing guinea flower should be cut back and controlled where they are smothering native saplings and inhibiting germination.</p>	<p>Medium</p> <p>Medium</p> <p>Low</p>	<p>Dunecare</p> <p>Dunecare</p> <p>Dunecare</p>
1c	<p>Coast banksia dominant forest on hind dune with extensive regeneration of littoral rainforest species in this understory.</p> <p>Some plantings have been undertaken by Dunecare group in open areas.</p>	6	<p>Continue ongoing sporadic weed control as required. Exotic species noted include White passionfruit, Ground asparagus, Ochna (seedling), Climbing nightshade, exotic grasses, Siratro and Coastal morning glory. Panic veldt grass is common throughout the rear sections of the beach and should be sprayed as required. Spraying should focus</p>	Low	Dunecare

Sub-zone	Vegetation Description	Condition	Vegetation Management Recommendations	Priority	Work to be performed by:
	Minimal invasive weed presence throughout zone.		<p>on denser patches which may inhibit the germination of native species as well as spraying around native groundcovers to allow further spread of these species.</p> <p>Continue maintenance of existing plantings and undertake additional plantings of littoral rainforest species in open areas, specifically where natural regeneration is lacking and/or beneath senescing Coast banksia trees.</p> <p>Investigate possibility of treating mature Norfolk Island pines which occur along this zone in a linear strip.</p> <p>Ongoing monitoring of Hairy commelina and Turkey rhubarb areas to prevent re-occurrence.</p>	<p>Low</p> <p>Low</p> <p>High</p>	<p>Dunecare</p> <p>BSC</p> <p>Dunecare</p>

List of exotic species recorded in Zone 1 during surveys

Family	Botanical Name	Common Name	Cover/abundance across Zone 1
Apiaceae	<i>Hydrocotyle bonariensis</i>		1
Araucariaceae	<i>Araucaria heterophylla</i>	Norfolk pine	1
Asparagaceae	<i>Asparagus aethiopicus</i>	Ground asparagus fern	1
Asteraceae	<i>Bidens pilosa</i>	Cobblers pegs	1
Asteraceae	<i>Chrysanthemoides monilifera</i>	Bitou bush	1
Asteraceae	<i>Conyza</i> sp.	Fleabane	1
Convolvulaceae	<i>Ipomoea cairica</i>	Coastal morning glory	1
Fabaceae	<i>Macroptilium atropurpureum</i>	Siratro	1
Fabaceae	<i>Erythrina crista-galli</i>	Cockspur coral tree	+
Myrtaceae	<i>Leptospermum laevigatum</i>	Coastal teatree	+
Ochnaceae	<i>Ochna serrulata</i>	Ochna	+
Onagraceae	<i>Oenothera drummondii</i>	Beach primrose	1
Passifloraceae	<i>Passiflora suberosa</i>	Corky passionfruit	1
Passifloraceae	<i>Passiflora subpeltata</i>	White passionflower	1
Poaceae	<i>Ehrharta erecta</i>	Panic veldt grass	2-3

Family	Botanical Name	Common Name	Cover/abundance across Zone 1
Poaceae	<i>Digitaria didactyla</i>	Queensland blue couch	1-2
Poaceae	<i>Panicum repens</i>	Torpedo grass	1
Solanaceae	<i>Solanum dulcumara</i>	Climbing nightshade	1
Solanaceae	<i>Solanum nigrum</i>	Black-berry nightshade	+
Verbenaceae	<i>Lantana camara</i>	Lantana	+

8.2 Zone 2 – Parkland along Compton Drive and around Shaws Bay

Geographic location/extent of zone: Recreational areas around Shaws Bay and the northern side of Compton Drive (dog exercise area). Refer to **FIGURE A.10** in **APPENDIX A**.

Main vegetation communities in zone (refer to **FIGURE A.10** in **APPENDIX A**)

These areas are primarily used for recreation and generally comprise open grass/gravel areas with patches of vegetation. Management of these zones would primarily be oriented towards maintaining recreational usability. Weed management in this zone is generally not a high priority given the limited ecological values of vegetation in the area although it would improve aesthetics and reduce exotic seed sources to surrounding areas of vegetation.

EECs/threatened flora/threatened fauna habitat in zone

Small patches of Coastal cypress pine forest EEC occur within this zone including older remnant trees and regenerating areas of cypress pine. Small patches of Saltmarsh EEC occur amongst mangroves fringing Shaws Bay. The NSW Wildlife Atlas database shows previous records for Black-necked stork and Pied oystercatcher in the vicinity of Shaws Bay. No observed threatened flora species in zone.

General recommendations for zone

Dumping of garden waste noted at the western end of zone (photo in **APPENDIX I**). Discourage further dumping through the installation of suitable signage and/or the installation of bollards to prevent vehicle access off Compton Drive. BSC to install some form of barrier/fencing such as rocks/logs around patches of Coastal cypress pine and other native patches of vegetation to prevent encroachment of machine mowing. Trim fallen branches and prostrate branches of Coast wattle which are extending into mown areas in order to maintain a defined edge and allow ease of mowing and prevent herbaceous weed growth around edges.

There are numerous Golden wreath wattles and Coast teatrees throughout this zone, both of which are non-local native species and quite invasive. Consideration should be given to replacing these species with native species, particularly within patches of native vegetation. Mowing of parkland areas around Shaws Bay should be undertaken regularly to prevent the establishment of Coast teatree as numerous seedlings of this species were noted within grassland areas around the foreshore of Shaws Bay.

BSC is currently in the process of preparing a new management plan for Shaws Bay. Any vegetation management recommendations regarding mangroves/saltmarsh should be incorporated into this plan. **FIGURE A.10** outlines the NSW Fisheries permit mangrove exclusion zones around Shaws Bay. The NSW Fisheries permit allows for the removal of mangroves within this exclusion zone with the exception of existing mature and semi-mature individuals.

Sub-zone	Vegetation Description	Condition	Vegetation Management Recommendations	Priority	Work to be performed by:
2a	<p>Patches of Coastal cypress pine forest are located at the eastern and western end. Fringing mangroves around edge of Shaws Bay with smaller patches of saltmarsh species.</p> <p>Vegetation at the western end is heavily weed infested in the understorey.</p> <p>Several mature and suckering individuals of the exotic Golden wreath wattle occur throughout this zone.</p>	N/A	<p>Spray patches of Ground asparagus which occur around the base of trees. Infestation is denser at the western end of zone below Cypress pine.</p>	Medium	BSC contractor
			<p>Control exotic vines including Coastal morning glory and Siratro. Control invasive weeds within patch of vegetation at the western end including Ground asparagus, Ochna, Senna and a large Bitou bush.</p>	Medium	BSC contractor or EBL (East Ballina Landcare)
			<p>Spray Madeira outbreak around dumped vegetation, small infestation with limited climbers. Control small occurrence of prickly pear at eastern end of subzone.</p>	High	BSC contractor
			<p>Drill and inject Coral tree growing along retaining wall. Also investigate the option of treating the Golden wreath wattle in this zone, particularly where it is suckering or growing amongst native vegetation.</p>	Low	BSC contractor
			<p>Maintain grass areas through regular mowing.</p>	As required	BSC
2b	<p>Dog exercise area north of Compton Drive. Comprises open grassland with islands of exotic and native vegetation.</p> <p>A new car park area and timber bollards along Compton Drive have recently been installed to prevent vehicle access to grassed areas.</p>	N/A	<p>Consolidate islands of vegetation by removing islands comprising weeds and controlling weeds amongst islands of native vegetation. Dominant weeds include Ground asparagus fern, Slash pine, Bitou bush and herbaceous annuals.</p>	Medium	BSC contractor or EBL
			<p>Control weeds amongst the row of paperbarks planted along Compton Drive including Winter senna and Ground asparagus fern.</p>	Medium	BSC contractor or EBL
			<p>Continue mowing regime.</p>	As	BSC

Sub-zone	Vegetation Description	Condition	Vegetation Management Recommendations	Priority	Work to be performed by:
			Investigate opportunities to create defined edges around islands of native vegetation to assist with maintaining a mown edge and allowing regeneration of native seedlings within islands of vegetation. Fallen logs/timber could be a short-term option.	required Medium	BSC
2c	<p>Patches of vegetation within Denison Park and foreshore vegetation around the eastern edge of Shaws Bay up to the North Wall.</p> <p>Patches of vegetation amongst parkland comprise a mosaic of planted and regenerating native and non-local native species. Common species noted include Swamp oak, Swamp mahogany, Tuckeroo, Coast banksia, Coast wattle, Melaleuca spp., mixed Eucalyptus spp., Coastal cypress pine, Norfolk Island pine, Horse-tail she-oak, Golden wreath wattle and Coastal tea-tree.</p> <p>Scattered small patches of mangroves and saltmarsh occur around the foreshore of Shaws Bay. These areas are predominately weed free. Foreshore areas opposite the north wall comprise clumps of exotic vegetation between the bank and mown edge. Exotics include Siratro, exotic grasses, Treasure flower.</p>	N/A	<p>Control exotic and invasive non-local native species within patches of native vegetation. Dominant weeds noted in these areas include Umbrella tree, Ground asparagus, Coastal morning glory, Siratro, Corky passionfruit, Lantana, Bitou bush, Slash pine, Golden wreath wattle, Coast tea tree and herbaceous annuals.</p> <p>Consolidate clumps of vegetation by supplementary plantings in open areas and where Coast wattles have died.</p> <p>Consultation with Lakeside Holiday Park required regarding planted exotics within parkland areas such as Cocos palm, Slash pine, Umbrella tree, Coral tree, Oleander, Hibiscus, succulents etc. Negotiate to remove highly invasive species and replace with natives.</p> <p>Patch of Resurrection plant outbreak and sailor boy daisy along foreshore (between North Wall and caravan park) should be controlled through spraying to prevent spread (refer to photo in Appendix I).</p> <p>Sporadic Treasure flower occurs along the foreshore areas and should be sprayed to suppress the spread of this weed. A metsulfuron methyl only mix may be suitable in parkland areas to prevent grass dieback.</p> <p>Investigate options to prevent further erosion of the</p>	Medium Low Low High Low Medium	BSC contractor or EBL EBL BSC BSC contractor BSC contractor BSC

Sub-zone	Vegetation Description	Condition	Vegetation Management Recommendations	Priority	Work to be performed by:
			foreshore opposite the north wall (refer to photo in Appendix I).		
			There is a planted area of the parkland (directly adjacent to the VMP project area and opposite #52 Fenwick Drive) which has been planted by a local resident most likely and is irrigated. The comprises a diversity of exotic species such as Mother-in-laws tongue, bromeliads, daisies, Agapanthus, Umbrella tree, succulents etc. and is likely to be a ongoing source of weed propagules for surrounding areas. BSC to investigate option of consulting local resident and negotiating to remove the highly invasive weeds such as Mother-in-laws tongue and Umbrella tree.	Low	BSC
			Continue current mowing regime and control exotic species within the dripline of scattered parkland trees. Consider slashing/brush cutting denser clumps of exotic vegetation along the foreshore where access with a mower is restricted.	As required	BSC

List of exotic species recorded in Zone 2 during surveys

Family	Botanical Name	Common Name	Cover/abundance across Zone 2
Alliaceae	<i>Agapanthus praecox</i> *	Agapanthus	1
Araliaceae	<i>Schefflera actinophylla</i> *	Umbrella tree	1
Araliaceae	<i>Schefflera arboricola</i> *	Dwarf umbrella tree	+
Arecaceae	<i>Syagrus romanzoffiana</i> *	Cocos palm	+
Asparagaceae	<i>Asparagus aethiopicus</i> *	Ground asparagus fern	2-3
Asteraceae	<i>Ageratum houstonianum</i> *	Blue billygoat weed	1
Asteraceae	<i>Ambrosia artemisiifolia</i> *	Annual ragweed	1
Asteraceae	<i>Bidens pilosa</i> *	Cobblers peg	1

Family	Botanical Name	Common Name	Cover/abundance across Zone 2
Asteraceae	<i>Chrysanthemoides monilifera</i> *	Bitou bush	1-2
Asteraceae	<i>Comyza</i> sp.*	Fleabane	1
Asteraceae	<i>Gazania</i> sp.*	Treasure Flower	1
Basellaceae	<i>Anredera cordifolia</i> *	Madeira vine	+
Cactaceae	<i>Opuntia</i> sp.*	Prickly pear	+
Caesalpinioideae	<i>Senna pendula</i> var. <i>glabrata</i> *	Winter senna	+
Commelinaceae	<i>Commelina benghalensis</i> *	Hairy commelina	1
Convolvulaceae	<i>Ipomoea cairica</i> *	Coastal morning glory	1-2
Crassulaceae	<i>Brypphyllum pinnatum</i> *	Resurrection plant	1
Euphorbiaceae	<i>Euphorbia cyathophora</i> *	Painted spurge	1
Mimosaceae	<i>Acacia saligna</i> *	Golden wreath wattle	2
Myrtaceae	<i>Leptospermum laevigatum</i> *	Coast teatree	2
Ochnaceae	<i>Ochna serrulata</i> *	Ochna	1
Passifloraceae	<i>Passiflora suberosa</i> *	Corky passionfruit	1-2
Pinaceae	<i>Pinus elliottii</i> *	Slash pine	1
Poaceae	<i>Andropogon virginicus</i> *	Whisky grass	1
Poaceae	<i>Chloris gayana</i> *	Rhodes grass	1
Poaceae	<i>Melinis minutiflora</i> *	Molasses grass	1
Poaceae	<i>Melinis repens</i> *	Red natal grass	1
Poaceae	<i>Panicum repens</i> *	Torpedo grass	1
Poaceae	<i>Pennisetum clandestinum</i> *	Kikuyu grass	1-2
Poaceae	<i>Setaria pumila</i> *	Pigeon grass	1
Poaceae	<i>Setaria sphacelata</i> *	Setaria	1
Poaceae	<i>Sporobolus africanus</i> *	Parramatta grass	1
Rutaceae	<i>Murraya paniculata</i> *	Mock orange	1
Verbenaceae	<i>Lantana camara</i> *	Lantana	1-2

8.3 Zone 3 – Shaws Bay Escarpment

Geographic location/extent of zone: Shaws Bay Escarpment. This zone has been split into six subzones based upon vegetation communities, weed densities and previous work history (refer to **FIGURE A.11** in **APPENDIX A**).

Main vegetation communities in zone (refer to **FIGURE A.11** in **APPENDIX A**)

Zone 3 comprises a variety of vegetation communities, the dominant being littoral rainforest, although it is in varying stages of development and condition. More developed areas comprise a mature canopy dominated by littoral rainforest species as well as Brush box. Native vines dominate along disturbed edges and in open areas where the canopy is lacking. Littoral rainforest is less developed towards the eastern end where Coast banksia dominates the canopy and littoral rainforest species are prevalent in the regenerating understorey. Large areas of Coastal cypress pine forest along the upper and lower section of the escarpment, the lower section being co-dominant with the exotic Slash pine. Smaller areas of Broad-leaved paperbark and Bangalow palm dominate protected, low-lying areas below the escarpment.

Ecological values

Zone 3 comprises areas of Littoral rainforest EEC, Coastal cypress pine EEC, Swamp sclerophyll forest EEC as well as some larger areas of littoral rainforest which may meet the criteria of the TEC Littoral Rainforest and Coastal Vine Thickets of Eastern Australia (EPBC Act). The NSW Wildlife Atlas database search identifies several Scented acronychia (*Acronychia littoralis*) records around subzones 3a and 3b. Other littoral rainforest species which may be present include White laceflower (*Archidendron hendersonii*), Durobby (*Syzygium moorei*) and Stinking cryptocarya (*Cryptocarya foetida*). The NSW Wildlife Atlas database shows records for Threatened fauna within the vicinity include the Curlew sandpiper, Mangrove honeyeater, Black-necked stork and Pied oystercatcher. This area may provide habitat for Threatened bird species including Fruit-doves, White-eared monarch, Yellow-eyed cuckoo shrike as well as the Common blossom bat and several microchiropteran bat species.

Progress since previous VMP

Extensive works have been undertaken throughout some areas of this zone since the previous VMP prepared in 2004 by Greening Australia. Bitou bush and other woody weeds have largely been controlled through the eastern end of the zone and extensive regeneration of littoral rainforest species is occurring in this area. More recently, weed control has been funded around the reservoir along the top of the escarpment and accessible mid-slopes. These works have greatly reduced Ground asparagus fern amongst the Coastal cypress pine community and other weeds around the car park and adjoining property boundaries.

General recommendations for zone

Sections of the Shaws Bay escarpment areas comprise very steep slopes making it difficult to undertake weed control works. Significant funding and abseiling equipment is likely to be required if weed control is proposed in these areas. Garden escapees from adjoining properties along the top of the escarpment as well as the illegal dumping of vegetation are major sources of weed infestation in this zone. In the event that works are undertaken within these difficult areas, specific measures would need to be implemented to reduce this seed source in order to guarantee the effectiveness of weed

control efforts. Management measures may include the following:

- A letter from BSC notifying residents of proposed works and how they can help
- Cooperation from adjacent residents to agree to remove invasive weeds from their backyards and maintain their boundaries. The provision of native plants from BSCs Nursery to adjacent residents would help reduce weed densities in the long-term.

Sub-zone	Vegetation Description	Condition	Vegetation Management Recommendations	Priority	Work to be performed by:
3a	<p>No previous work has been undertaken in this subzone which comprises a high density of exotic species. Area is likely to have high resilience with good regeneration potential, however properties located above this subzone will continue to be an ongoing source of weed propagule input unless their cooperation is sought to control garden escapees and remove invasive species from their backyards.</p> <p>Good native canopy present along the lower sections. Upper slope is dominated by exotics in the canopy and understory.</p> <p>Large infestation of woody weeds and Madeira vine at top of stairs. Numerous garden escapees throughout subzone.</p> <p>Medium infestation of Glory lily along the western side of the track, approximately half way up (refer to photo in Appendix I).</p> <p>Dense infestation of the Class 3 Noxious Weed Yellow bells (<i>Tecoma stans</i>) at top of stairs.</p> <p>Dense Ground asparagus throughout subzone.</p>	3	<p>Works in this subzone are dependent upon funding and resource availability. Long-term funding would be required as well as cooperation from adjacent landholders located above the subzone.</p> <p>Carry out initial comprehensive weed control works. This would include targeting areas of Madeira vine, Glory lily and woody weeds. Given the difficulties associated with the site and density of weeds it is recommended that trained contractors undertake the primary works.</p> <p>Follow-up weed control will be needed for at least 3-5 years. Once primary and secondary works have been undertaken it may be possible for EBL to continue ongoing weed control in this subzone, although the steepness of the subzone may restrict volunteer opportunities.</p> <p>Handrail along stairway linking Compton Drive and Pine Avenue needs repair.</p>	High (dependent upon funding)	BSC BSC contractors BSC contractors and/or EBL BSC

Sub-zone	Vegetation Description	Condition	Vegetation Management Recommendations	Priority	Work to be performed by:
3b	<p>Steep escarpment comprising closed and open sections of Littoral rainforest canopy. High weed infestation throughout understorey. Common weeds observed include Cape ivy, Madeira vine, Winter senna, Ground asparagus, Coastal morning glory, Lantana, Umbrella tree and Air potato.</p> <p>Eastern section comprises dense vine thickets of both native and exotic species with limited canopy trees.</p> <p>Vegetation at the western end has better structure and canopy closure with a diversity of native species.</p>	2-3	<p>No previous work has been undertaken in this subzone which comprises a high density of exotic species. Area is likely to have high resilience with good regeneration potential, however long-term funding would be required as well as cooperation from adjacent landholders located above the subzone. Properties located above this subzone will continue to be an ongoing source of weed propagule input unless their cooperation is sought to control garden escapees and remove invasive species from their backyards. The position and irregularity of lot boundaries in this subzone provides further management issues with regard to weed control.</p> <p>Undertake primary works targeting woody weeds and invasive vines followed by spraying of Ground asparagus. Preferably work from the top of the escarpment downslope and from better areas of vegetation outwards. Continue expanding primary work and undertake ongoing maintenance through worked areas.</p>	High (dependent upon funding)	<p>BSC</p> <p>BSC contractors</p>
3c	<p>Steep south-west facing escarpment dominated by littoral rainforest species with well developed canopy through most of the subzone. Previous works have been undertaken through the central and eastern portions of the subzone, primarily controlling Ground asparagus and woody weeds.</p> <p>The western section is steeper with difficult access which has precluded previous works in some areas, especially along the top of the escarpment. This area contains dense native vines <i>Cissus</i> spp., and <i>Smilax australis</i> with limited canopy cover. Emergent Umbrella trees are</p>	2-3	<p>Continue ongoing maintenance works in previous worked areas, spraying Ground asparagus seedlings/regrowth as required.</p> <p>Unworked, steep areas may require abseiling equipment. Investigate funding opportunities to undertake this work. Would involve drilling of Umbrella trees, treatment of other woody weeds and spraying of Ground asparagus.</p> <p>Control Madeira vine at the end of Bayview Street and undertake letter box drop for nearby residents notifying them of works and penalties associated with dumping including information on BSC's urban waste management</p>	<p>High</p> <p>Medium (dependent upon funding)</p> <p>High</p>	<p>BSC contractor</p> <p>BSC and BSC contractor</p> <p>BSC contractor</p>

Sub-zone	Vegetation Description	Condition	Vegetation Management Recommendations	Priority	Work to be performed by:
	<p>present amongst the vine and the groundlayer is dominated by Ground asparagus in unworked areas.</p> <p>Vegetation dump at end of Bayview Street, large Madeira infestation present (photo in Appendix I).</p>		<p>3 bin system. Singapore daisy seems to have been controlled in this area since the previous VMP was prepared.</p> <p>Undertake monitoring and compliance of known dump sites and undertake any action as required.</p> <p>Close existing informal access track which extends down the steep slope and is causing erosion. Alternatively, formalise track subject to funding.</p>	<p>Medium</p> <p>Medium</p>	<p>BSC</p> <p>BSC</p>
3d	<p>Dense Slash pine forest (western end of zone) with scattered Coastal cypress pine. Dominant weeds include Umbrella tree, Winter senna, Ground asparagus fern, Fishbone fern, Ochna and Coastal morning glory.</p> <p>Moderate regeneration potential, may be somewhat limited by dense pine needle cover on ground. Tuckerroo seedlings present.</p> <p>Works in this area would assist with the restoration and recovery of the local occurrence of Coastal Cypress Pine EEC.</p>	2-3	<p>Treat slash pine⁴ and other woody weeds as well as climbing exotic vines. Need to consider safety issues associated with dead slash pine, particularly along the edge of the roadway and parkland/dog exercise area. Felling of any large exotic trees which pose a safety risk will need to be undertaken by qualified arborists.</p> <p>Spray out Ground asparagus fern and Fishbone fern as well as other sporadic weeds.</p> <p>Maintain works area for 3-5 year period.</p> <p>Undertake plantings of suitable species if native regeneration is lacking.</p>	High (dependent upon funding)	<p>BSC contractor</p> <p>BSC contractor</p> <p>BSC contractors and/or EBL</p> <p>BSC contractors and/or EBL</p>
3e	Parkland area comprises scattered Coast cypress pine, Brush box and Coast banksia with a mown grassy groundlayer. Low weed presence.	5-6	Continue mowing regime within parkland area. Spray sporadic weeds as required including Ground asparagus to prevent spreading to adjacent cypress forest.	As required	BSC

⁴ Previous option put forward by Crown Lands regarding the potential for Slash pines to be harvested by commercial contractors where possible could be investigated further.

Sub-zone	Vegetation Description	Condition	Vegetation Management Recommendations	Priority	Work to be performed by:
	Adjacent forest comprises Cypress pine forest with Brush box and limited weeds due to previous works. Sporadic Ground asparagus seedlings/regrowth.		Continue maintenance program to control Ground asparagus fern and other sporadic weeds.	Low	BSC contractor
3f	<p>Littoral rainforest species dominant in canopy with Coast banksia, Brush box, Coastal cypress pine also present.</p> <p>Extensive works have been undertaken throughout this subzone which has resulted in vigorous regeneration of native seedlings, especially towards the eastern end of this subzone where littoral rainforest species dominate the understorey.</p> <p>Weed control works around the reservoir car park and alongside the property boundary to the SE have greatly reduced weed densities in these areas (as per Greening Australia 2004). However, limited natural regeneration is occurring, particularly around the dumping site below the reservoir car park (refer to photo in Appendix I). Weeds present including Climbing philodendron, Lantana, Coral tree and Ground asparagus.</p> <p>Bushland/property boundaries along Seaview Street and Grandview Street comprise a mix of invasive weeds and garden escapees. Exotic species noted include Painted spurge, Winter senna, Wandering jew, Glory lily, Ground asparagus, Mother-in-laws tongue, Coastal morning glory, Resurrection plant, Ochna.</p>	2-6	<p>Continue weed control works and ongoing maintenance throughout subzone. A number of weeds including Umbrella tree, Lantana, Bitou bush and Ground asparagus require further treatment through previously worked areas at the eastern end of this subzone.</p> <p>Undertake weed control works in unworked areas targeting woody weeds and dense Ground asparagus fern which occurs throughout areas of cypress pine along the base of the escarpment.</p> <p>Implement management procedures to prevent further dumping below reservoir car park. This may include signage, cameras, fencing, restricted access etc. Consider installing a gate at the entrance which is closed dusk to dawn to prevent illegal dumping. Planting of the top edge with spiky plants, eg Lomandra's, may further deter dumping.</p> <p>Undertake planting of suitable local native seedlings (littoral rainforest species) where natural regeneration is insufficient. Consider planting around the edge between subzone 2b and 3f to augment canopy cover and create a more defined edge.</p> <p>Selectively control native vines which are smothering regenerating saplings and preventing growth. It is important to get the structure established.</p>	<p>High</p> <p>Medium</p> <p>High</p> <p>Medium</p> <p>Low</p>	<p>BSC contractor</p> <p>BSC contractor</p> <p>BSC EBL (planting)</p> <p>EBL</p> <p>BSC contractor and/or EBL</p>

Sub-zone	Vegetation Description	Condition	Vegetation Management Recommendations	Priority	Work to be performed by:
	Compensation works involving weed control and planting of 213 trees are to be undertaken in this subzone as part of the Compton Drive realignment. The compensation area is outlined on the subzone figure.		Undertake letterbox drop notifying residents of works and how they can help. Include contact details of local landcare group and working times. Control invasive weeds along edge and 'push back' garden escapees. Compensation works are to be undertaken in accordance with the Revegetation, Rehabilitation and Weed Control Plan prepared by Blackwood Ecological Services (2013a).	Low-Med As detailed in DA	BSC BSC contractor

List of exotic species recorded in Zone 3 during surveys

Family	Botanical Name	Common Name	Cover/abundance across Zone 3
Apocynaceae	<i>Thevetia peruviana</i> *	Yellow oleander	1-2
Araceae	<i>Philodendron sp.</i> *	Climbing philodendron	2
Araliaceae	<i>Schefflera actinophylla</i> *	Umbrella tree	2
Araliaceae	<i>Schefflera arboricola</i> *	Dwarf umbrella tree	1-3
Arecaceae	<i>Syagrus romanzoffiana</i> *	Cocos palm	+
Asparagaceae	<i>Asparagus aethiopicus</i> *	Ground asparagus fern	1-4
Asteraceae	<i>Ageratina adenophora</i> *	Crofton weed	1
Asteraceae	<i>Ambrosia artemisiifolia</i> *	Annual ragweed	1
Asteraceae	<i>Bidens pilosa</i> *	Cobblers pegs	1
Asteraceae	<i>Chrysanthemoides monilifera</i> *	Bitou bush	1
Asteraceae	<i>Conyza sp.</i> *	Fleabane	1
Asteraceae	<i>Senecio macroglossus</i> *	Cape ivy	0-3
Basellaceae	<i>Anredera cordifolia</i> *	Madeira vine	2
Bignoniaceae	<i>Tecoma stans</i> *	Yellow bells	1-3
Caesalpinioideae	<i>Senna pendula</i> var. <i>glabrata</i> *	Winter senna	2
Commelinaceae	<i>Callisia repens</i> *	Inch plant	1

Family	Botanical Name	Common Name	Cover/abundance across Zone 3
Commelinaceae	<i>Tradescantia fluminensis</i> *	Wandering jew	1
Convolvulaceae	<i>Ipomoea cairica</i> *	Coastal morning glory	2
Euphorbiaceae	<i>Euphorbia cyathophora</i> *	Painted spurge	1
Liliaceae	<i>Gloriosa superba</i> *	Glory lily	2 (zone 3a)
Malvaceae	<i>Hibiscus</i> sp.*	Hibiscus (exotic)	+
Malvaceae	<i>Sida rhombifolia</i> *	Paddy's lucerne	+
Moraceae	<i>Morus alba</i> *	Mulberry	1
Myrtaceae	<i>Corymbia torelliana</i>	Cadaghi tree	+
Myrtaceae	<i>Leptospermum laevigatum</i> *	Coastal teatree	0-1
Ochnaceae	<i>Ochna serrulata</i> *	Ochna	1
Passifloraceae	<i>Passiflora subpeltata</i> *	White passionflower	1
Pinaceae	<i>Pinus elliotii</i> *	Slash pine	0-4
Poaceae	<i>Paspalum dilatatum</i> *	Paspalum	1
Polygonaceae	<i>Acetosa sagittata</i> *	Turkey rhubarb	+
Solanaceae	<i>Solanum mauritianum</i> *	Wild tobacco tree	1
Verbenaceae	<i>Lantana camara</i> *	Lantana	2

8.4 Zone 4 – Ballina Head to Shelly Beach south

Geographic location/extent of zone: Ballina Head to Shelly Beach south. This zone has been split into three subzones based upon management requirements and weed densities (refer to **FIGURE A.12 in APPENDIX A**).

Main vegetation communities in zone (refer to **FIGURE A.12 in APPENDIX A**)

Open Coast banksia forest/shrubland dominates this zone with patches of Coastal wattle shrubland in the understorey. Exposed dune between Ballina Head and Shelly Beach car park is dominated by Bitou bush.

Ecological values

Small patch of degraded Littoral rainforest EEC located on the northern side of the lookout car park, adjacent to Suvla Street. Areas of Bitou bush are likely to have once comprised littoral rainforest vegetation prior to clearing and incursion by Bitou bush. Several wind-sheared Tuckeroos occur amongst the Bitou bush shrubland. Area provides limited value for Threatened flora and fauna species.

Works since previous VMP (EnviTE 2005)

Limited works have been undertaken throughout this zone since the VMP was prepared.

General recommendations for zone

BSC to regularly maintain open areas around the lookout and lighthouse through slashing and/or mowing. This will assist with reducing herbaceous annuals and their incursion into bushland areas. Any future plans for the old Shellys-on-the-Beach cafe building should incorporate a landscape plan with local native species, as recommended in the EnviTE VMP (2005).

Sub-zone	Vegetation Description	Condition	Vegetation Management Recommendations	Priority	Work to be performed by:
4a	Exposed coastal areas around Ballina Headland and Shelly Beach car park (south).	2	Treat infestation of Madeira vine (refer to photo in Appendix I) and Prickly pear.	High	BSC contractor
	Dense areas of Bitou bush and smaller patches of <i>Melanthera biflora</i> with scattered canopy trees including Tuckeroo, Horse-tail she-oak and Pandanus.		Treat areas of Bitou bush using the cut, scrape and paint method. Target initial works around native trees and larger patches of <i>Melanthera biflora</i> . Slowly expand Bitou control outwards from these areas, leaving woody material in situ to minimise erosion and exposure of native vegetation, especially Coast banksia trees. Undertake planting of suitable species where regeneration is limited including	Medium	BSC contractor
	Isolated patches of Madeira vine, Molasses grass and Prickly pear. Ground asparagus along cliff				

Sub-zone	Vegetation Description	Condition	Vegetation Management Recommendations	Priority	Work to be performed by:
	edge.		Tuckeroo, Three-veined laurel, Beach alectryon and Coastal wattle. Recommend some form of low sediment control fencing and low plantings around exposed point to reduce impacts associated with informal pedestrian access.	Low	BSC
4b	Coast banksia and Tuckeroo patch around small playground at Shelly Beach car park (south). Umbrella tree, Norfolk Island hibiscus and large <i>Agave americana</i> present. Other weeds include Ground asparagus and Painted spurge.	3-4	Treat Agave and Umbrella tree. Norfolk Island hibiscus is not known as an invasive exotic in the area and is to be left. Spray Ground asparagus and spurge as required.	Low	BSC or contractor
4c	Coast banksia shrubland/open forest above the Lighthouse Beach surfclub and around Beach Road and Suvla Street. Scattered Pandanus, Tuckeroo and Coastal wattle present. Minor infestations of Ground asparagus, Glory lily and Coastal morning glory.	5-6	Control Coastal morning glory and spot spray occurrences of Ground asparagus and Glory lily as well as other herbaceous annuals as required. Consider planting additional Coastal wattle, Tuckeroo, Coast banksia seedlings in open areas to augment canopy.	Medium Low	BSC contractor and/or EBL EBL

List of exotic species recorded in Zone 4 during surveys

Family	Botanical Name	Common Name	Cover/abundance across Zone 4
Agavaceae	<i>Agave</i> sp.		+
Agavaceae	<i>Dracaena fragrans</i> *	Happy plant	+
Araliaceae	<i>Schefflera actinophylla</i> *	Umbrella tree	1
Asparagaceae	<i>Asparagus aethiopicus</i> *	Ground asparagus fern	1
Asteraceae	<i>Chrysanthemoides monilifera</i> *	Bitou bush	1-4
Asteraceae	<i>Bidens pilosa</i> *	Cobblers pegs	1
Asteraceae	<i>Conyza</i> sp.*	Fleabane	1
Basellaceae	<i>Anredera cordifolia</i> *	Madeira vine	1
Cactaceae	<i>Opuntia</i> sp.*	Prickly pear	+
Convolvulaceae	<i>Ipomoea cairica</i> *	Coastal morning glory	1
Euphorbiaceae	<i>Euphorbia cyathophora</i> *	Painted spurge	1



Family	Botanical Name	Common Name	Cover/abundance across Zone 4
Fabaceae	<i>Macropodium atropurpureum*</i>	Siratro	1
Liliaceae	<i>Gloriosa superba*</i>	Glory lily	+
Malvaceae	<i>Lagunaria patersonia*</i>	Norfolk Island hibiscus	+
Poaceae	<i>Melinis minutiflora*</i>	Molasses grass	1-2
Poaceae	<i>Paspalum dilatatum*</i>	Paspalum	1
Verbenaceae	<i>Lantana camara*</i>	Lantana	1-2



8.5 Zone 5 – Coastal Cypress between Short and Suvla Streets

Geographic location/extent of zone: Triangular area of vegetation located between The Coast Road, Suvla Street and Short Street (refer to FIGURE A.12 in APPENDIX A).

Main vegetation communities in zone (refer to FIGURE A.12 in APPENDIX A)

The predominant vegetation community located in Zone 5 is Coastal cypress pine forest, although it is in a highly degraded state.

Ecological values

This area comprises Coastal cypress pine forest EEC (TSC Act). While the canopy is mostly intact, with the exception of a small Slash pine area, the understorey is dominated by exotic species.

General recommendations for zone:

While the isolated nature of this zone and small size somewhat reduces its ecological value, it benefits any future weed control works by creating a buffer and allowing an edge to be maintained. There are also some additional benefits associated with connectivity and fauna/flora corridor enhancement on a larger scale.

A powerline easement extends along the medium strip between Short Street and the adjacent right-of-way which has resulted in the lopping of several Coast cypress pine trees and other canopy vegetation along the easement. Subsequently, weed infestation along the easement is high and the location of the easement should be considered when undertaking weed control works in this area. Option to plant low-medium height natives which will create a dense canopy and shade out exotics in this area.

Sub-zone	Vegetation Description	Condition	Vegetation Management Recommendations	Priority	Work to be performed by:
5a	Coastal cypress pine forest with occasional Coast banksia and mostly intact canopy cover. No previous works have been undertaken through this zone and the mid-storey and understorey are dominated by exotic species including highly invasive species such as Madeira vine, Ground asparagus, Glory lily, Mother-of-millions, Duranta, Umbrella tree, Ochna and Giant fishbone fern.	3	<p>Carry out initial comprehensive weed control works. Ground asparagus (refer to photo in Appendix I) is dominant at the western end of the patch while Giant fishbone fern dominates the eastern section.</p> <p>Follow up weed control will be need for at least 3 years. Investigate whether local residents or landcare would be interested in maintaining the zone once initial works have been completed.</p>	Medium (dependent upon funding)	BSC contractor BSC contractor/volunteers

Sub-zone	Vegetation Description	Condition	Vegetation Management Recommendations	Priority	Work to be performed by:
			Large Madeira infestation will require treatment and ongoing follow-up for some time. Numerous aerial tubers present.		BSC contractor/volunteers

List of exotic species recorded in Zone 5 during surveys

Family	Botanical Name	Common Name	Cover/abundance across Zone 5
Anacardiaceae	<i>Schinus terebinthifolia</i> *	Broad-leaf pepper tree	1
Apocynaceae	<i>Thevetia peruviana</i>	Yellow oleander	1
Apocynaceae	<i>Plumeria acutifolia</i> *	Frangipani	+
Araceae	<i>Philodendron</i> sp.*	Climbing philodendron	2
Araliaceae	<i>Schefflera actinophylla</i> *	Umbrella tree	2-3
Araliaceae	<i>Hedera helix</i>	English ivy	2
Asparagaceae	<i>Asparagus aethiopicus</i> *	Ground asparagus fern	4
Asteraceae	<i>Bidens pilosa</i> *	Cobblers pegs	1
Asteraceae	<i>Conyza</i> sp.*	Fleabane	1
Asteraceae	<i>Sphagneticola trilobata</i> *	Singapore daisy	1
Basellaceae	<i>Anredera cordifolia</i> *	Madeira vine	2
Bignoniaceae	<i>Spathodea campanulata</i> *	African tulip tree	+
Caesalpinioideae	<i>Senna pendula</i> var. <i>glabrata</i> *	Winter senna	2
Commelinaceae	<i>Commelina benghalensis</i> *	Hairy commelina	1
Commelinaceae	<i>Tradescantia zebrina</i> *	Wandering jew	1
Convolvulaceae	<i>Ipomoea cairica</i> *	Coastal morning glory	1-2
Crassulaceae	<i>Bryophyllum delagoense</i> *	Mother-of-millions	1
Davalliaceae	<i>Nephrolepis</i> sp.*	Giant fishbone fern	3-4
Davalliaceae	<i>Nephrolepis cordifolia</i> *	Fishbone fern	2
Dracenaceae	<i>Sansevieria trifasciata</i> *	Mother-in-laws tongue	1
Euphorbiaceae	<i>Euphorbia cyathophora</i> *	Painted spurge	2
Lamiaceae	<i>Plectranthus verticillatus</i> *	Swedish ivy	1
Lauraceae	<i>Cinnamomum camphora</i> *	Camphor laurel	+
Liliaceae	<i>Gloriosa superba</i> *	Glory lily	1
Malvaceae	<i>Sida rhombifolia</i> *	Paddy's lucerne	1



Family	Botanical Name	Common Name	Cover/abundance across Zone 5
Malvaceae	<i>Lagunaria patersonia</i> *	Norfolk Island hibiscus	+
Malvaceae	<i>Eriobotrya japonica</i> *	Loquat	+
Mimosaceae	<i>Acacia saligna</i> *	Golden wreath wattle	+
Myrtaceae	<i>Lagerstroemia</i> sp.*	Crepe myrtle	+
Ochnaceae	<i>Ochna serrulata</i> *	Mickey mouse plant	2
Pinaceae	<i>Pinus elliotii</i> *	Slash pine	1
Poaceae	<i>Panicum repens</i> *	Torpedo grass	1-2
Poaceae	<i>Paspalum dilatatum</i> *	Paspalum	1
Verbenaceae	<i>Lantana camara</i> *	Lantana	2
Verbenaceae	<i>Duranta repens</i>	Duranta	1

8.6 Zone 6 – Vegetation around East Ballina Cemetery

Geographic location/extent of zone: Bounded by The Coast Road, Shelly Beach Road, Norfolk Avenue, Pacific Terrace and East Ballina Cemetery. This zone has been split into six subzones, primarily based upon geographical location (refer to **FIGURE A.13** in **APPENDIX A**).

Main vegetation communities in zone (refer to **FIGURE A.13** in **APPENDIX A**)

This zone comprises a diversity of vegetation communities including Swamp paperbark forest, heathy open forest, Littoral rainforest in various stages, Coast banksia woodland and fernland.

Ecological values

Zone 6 comprises areas of Littoral rainforest EEC, Swamp sclerophyll forest EEC and Coastal cypress pine EEC. Areas of Littoral Rainforest in this area are generally small and unlikely to meet the condition criteria for the TEC Littoral Rainforest and Coastal Vine Thickets of Eastern Australia (EPBC Act). The NSW Wildlife Atlas database search did not record any threatened flora or fauna species in this zone, although Stinking cryptocarya (*Cryptocarya foetida*) is believed to occur in this zone (Lee Andresen pers. comm.).

Works since previous VMP (EnviTE 2007)

Extensive works have been undertaken through some sections of this zone. These works have primarily focussed on subzone 6f which extends along the grass reserve off Shelly Beach Road. This area is now in good condition with only sporadic weeds.

General recommendations for zone:

This zone supports a relatively large area of native vegetation types with good connectivity to forested areas to the west. It is a particularly challenging area in several ways, including the variety of vegetation types present and the presence of residential areas along the eastern and south-western boundaries, with dumping of garden waste evident in several areas. Management of this residential/bushland interface is important to achieve the long term goals of restoration in this zone.

Sub-zone	Vegetation Description	Condition	Vegetation Management Recommendations	Priority	Work to be performed by:
6a	Northern corner between Pacific Tce and The Coast Rd, up to path at end of Hindmarsh Street. High weed density throughout all stratum, but mostly midstorey and groundlayer. Scattered mature canopy of Tuckeroo, Coast banksia and	3	Determine if resources are available for works in this subzone. If so, notify adjacent properties and educate/inform regarding weeds and dumping of garden refuse. Carry out initial comprehensive weed control works targeting Madeira vine, other exotic vines and woody	Medium (dependent upon funding)	BSC

Sub-zone	Vegetation Description	Condition	Vegetation Management Recommendations	Priority	Work to be performed by:
	<p>Swamp mahogany with patches of Paperbark.</p> <p>Moderate infestation of Madeira vine (refer to Figure A.13 in Appendix A).</p> <p>Main weeds include Ground asparagus, Madeira vine, Ochna, Senna, Air potato, Climbing philodendron.</p> <p>Open drainage area in southern part of zone dominated by ferns and exotic vines (<i>Ipomoea</i> spp.) and Hairy commelina.</p>		<p>weeds. Work from better areas outwards to edges. Initial weed control works should be undertaken by professional bush regenerators given the density of weeds present.</p> <p>Follow-up weed control will be needed for at least 3-5 years but natural regeneration potential is likely to be high (with the exception of edges).</p>		
6b	<p>Between The Coast Road and western Norfolk Avenue. Comprises Coast Banksia, Brush box and Tuckeroo. Understorey and groundlayer dominated by exotics.</p> <p>Prevalent exotics noted include Umbrella tree, Bitou bush, Ochna, Brazillian cherry, Ground asparagus, Camphor laurel, Tobacco, Climbing asparagus, Senna, Coastal morning glory, Lantana and Giant fishbone fern.</p>	3-4	<p>Determine if resources are available for works in this subzone. If so, notify adjacent properties regarding works. Seek potential volunteers.</p> <p>Carry out initial comprehensive weed control works targeting Madeira vine, other exotic vines and woody weeds. Work from better areas outwards to edges. Initial weed control works should be undertaken by professional bush regenerators given the density of weeds present.</p> <p>Follow-up weed control will be needed for at least 3-5 years but natural regeneration potential is likely to be high (with the exception of edges).</p>	Medium (dependent upon funding)	BSC
6c	<p>Heathy vegetation around northern end of cemetery.</p> <p>Majority of vegetation comprises good native vegetation with intact native canopy and high diversity. Patches of weeds in the understorey including Ground asparagus, Corky passionfruit, Senna and Ochna.</p>	5-6	<p>Continue follow up weed control works throughout subzone.</p> <p>There is a small area of Mother-of millions located just west of the VMP project area, adjacent to Zone 6c (refer to Figure A.13 in Appendix A). This weed should be controlled through hand removal or spraying to prevent its spread.</p>	Low High	BSC contractor or EBL BSC contractor or EBL

Sub-zone	Vegetation Description	Condition	Vegetation Management Recommendations	Priority	Work to be performed by:
6d	<p>Vegetation along Norfolk Avenue.</p> <p>Canopy in core areas is relatively intact with Paperbark dominant in low lying areas and early stage Littoral rainforest present around the periphery. Edges along Norfolk Avenue are highly disturbed and dominated by exotics.</p> <p>Dominant weeds noted include Umbrella tree, Senna, Climbing asparagus, Lantana, Bitou bush, Coastal morning glory and Madeira vine. Large Madeira vine infestation along Norfolk Avenue (refer to Figure A.13 in Appendix A and photo in Appendix I).</p>	4	<p>Determine if resources are available for works in this subzone. If so, notify adjacent properties regarding works and educate on weeds/dumping of garden refuse. Seek potential volunteers.</p> <p>Carry out initial comprehensive weed control works targeting Madeira vine, Umbrella trees, other exotic vines and woody weeds. Work from better areas outwards to edges. Initial weed control works should be undertaken by professional bush regenerators given the density of weeds present.</p> <p>Follow-up weed control will be needed for at least 3-5 years but natural regeneration potential is likely to be high (with the exception of edges).</p>	Medium (dependent upon funding)	BSC
6e	<p>South-western part of zone, along eastern edge of cemetery.</p> <p>Core areas of heathy vegetation in good condition along upper slopes. Weeds are prevalent along eastern edge of cemetery and in SW corner of subzone. Dominant weeds include Bitou bush, Umbrella tree, Ground asparagus, Mother-of-millions, Glory lily, Senna, Madeira.</p>	3-4	<p>Determine if resources are available for works in this subzone. Seek potential volunteers for follow up weed control.</p> <p>Carry out comprehensive weed control works. Work from better areas outwards to edges. Initial weed control works should be undertaken by professional bush regenerators given the density of weeds present.</p> <p>Where natural regeneration is lacking, plant with suitable low growing heath species.</p>	Medium (dependent upon funding)	BSC
6f	<p>Low-lying vegetation along grass reserve off Shelly Beach Road.</p> <p>Patches of Littoral rainforest with Swamp paperbark and patches of fernland in lower lying areas.</p> <p>Extensive works have been undertaken through</p>	5-6	<p>Continue follow-up weed control to suppress sporadic weeds.</p> <p>Overspray Lantana/Bitou at northern edge. Plant suitable littoral rainforest species where natural regeneration is lacking.</p> <p>Maintain grassland areas through regular slashing.</p>	Medium Medium As	BSC contractor and/or EBL BSC contractor and/or EBL BSC

Sub-zone	Vegetation Description	Condition	Vegetation Management Recommendations	Priority	Work to be performed by:
	this subzone including weed control and planting.			required	
6g	<p>This subzone includes patches of vegetation and scattered trees within the cemetery as well as vegetation surrounding the western and northern boundaries of the cemetery.</p> <p>Patches of vegetation and scattered trees within the cemetery grounds comprise mostly Coastal cypress pine, mixed eucalypts and Coast banksia. The larger patches of vegetation on the southern side of the cemetery entrance comprise a dense mid-storey and groundlayer of exotic species including Ground asparagus fern, Bitou bush, lantana, Umbrella tree, Painted spurge, Corky passionfruit and Mother-of-millions.</p> <p>Vegetation around the western and northern boundary of the cemetery comprises mostly Coast banksia and Coastal cypress pine with regenerating littoral rainforest species such as Tuckeroo and Yellow wood present. This grades into a heath community towards the north-eastern edge of this subzone which is dominated by Coast banksia, Black she-oak and Duboisia. Weed density is highest along Suvla Street and the north-western section, decreasing to minimal weed presence amongst the heath community. Common weeds noted include Ground asparagus fern, Ochna, Lantana, Senna, Umbrella tree, Tobacco, Coast teatree, passionfruit vines, Desmodium spp., Glycine sp., Mother-of-millions.</p>	4-6	<p>Determine if resources are available for works in this subzone.</p> <p>Carry out initial comprehensive weed control works targeting Madeira vine, Mother-of-millions, all exotic vines, woody weeds and Ground asparagus fern. Work from better areas outwards to edges. Initial weed control works should be undertaken by professional bush regenerators given the density of weeds present. Spray/drill/cut and paint native Lawyer vine where canopy is limited and the vine is smothering native saplings and preventing native germination.</p> <p>Follow-up weed control will be needed for at least 3-5 years but natural regeneration potential is likely to be high (with the exception of edges). Planting is likely to be necessary on the corner of Suvla Street and The Coast Road where weed density is high and native canopy cover is limited. Also plant open areas along The Coast Road with suitable native species to reduce herbaceous weed cover.</p> <p>Investigate options to install compost/green bins at the cemetery (if not currently available) for collection of dead flowers to prevent dumping in adjacent bushland areas. Install signs to notify the community regarding the availability of these bins.</p>	<p>Medium (dependent upon funding)</p> <p>Low</p>	<p>BSC</p> <p>BSC</p>

List of exotic species recorded in Zone 6 during surveys

Family	Botanical Name	Common Name	Cover/abundance across Zone 6
Acanthaceae	<i>Hypoestes phyllostachya</i> *	Pink polkadot plant	1
Alliaceae	<i>Agapanthus</i> sp.*		+
Anacardiaceae	<i>Schinus terebinthifolia</i> *	Broad-leaf pepper tree	+
Apocynaceae	<i>Nerium oleander</i> *	Oleander	+
Araceae	<i>Philodendron</i> sp.*	Climbing philodendron	1
Araliaceae	<i>Hedera helix</i>	English ivy	1
Araliaceae	<i>Schefflera actinophylla</i> *	Umbrella tree	2-3
Araliaceae	<i>Schefflera arboricola</i> *	Dwarf umbrella tree	+
Araucariaceae	<i>Araucaria heterophylla</i>	Norfolk pine	1
Arecaceae	<i>Syagrus romanzooffiana</i> *	Cocos palm	+
Asparagaceae	<i>Asparagus aethiopicus</i> *	Ground asparagus fern	3-4
Asparagaceae	<i>Asparagus plumosus</i> *	Climbing asparagus fern	1
Asteraceae	<i>Ageratum houstonianum</i> *	Blue billygoat weed	1
Asteraceae	<i>Ambrosia artemisiifolia</i> *	Annual ragweed	2
Asteraceae	<i>Bidens pilosa</i> *	Cobblers pegs	1
Asteraceae	<i>Chrysanthemoides monilifera</i> *	Bitou bush	1-2
Asteraceae	<i>Conyza</i> sp.*	Fleabane	1
Asteraceae	<i>Coreopsis lanceolata</i> *	Coreopsis	1
Basellaceae	<i>Anredera cordifolia</i> *	Madeira vine	1-2
Bignoniaceae	<i>Tecoma stans</i> *	Yellow bells	1
Caesalpinioideae	<i>Senna pendula</i> var. <i>glabrata</i> *	Winter senna	1-2
Cannaceae	<i>Canna indica</i> *	Canna lily	+
Commelinaceae	<i>Callisia repens</i> *	Inch plant	1
Commelinaceae	<i>Commelina benghalensis</i> *	Hairy commelina	1
Commelinaceae	<i>Tradescantia fluminensis</i> *	Wandering jew	1
Commelinaceae	<i>Tradescantia zebrina</i> *	Wandering jew	1
Convolvulaceae	<i>Ipomoea cairica</i> *	Coastal morning glory	2
Crassulaceae	<i>Bryophyllum delagoense</i> *	Mother-of-millions	1
Crassulaceae	<i>Bryophyllum pinnatum</i> *	Resurrection plant	1
Davalliaceae	<i>Nephrolepis cordifolia</i> *	Fishbone fern	1-2
Davalliaceae	<i>Nephrolepis</i> sp.*	Giant fishbone fern	2

Family	Botanical Name	Common Name	Cover/abundance across Zone 6
Dioscoraceae	<i>Dioscorea bulbifera</i> *	Air potato	1-2
Dracenaceae	<i>Sansevieria trifasciata</i> *	Mother-in-laws tongue	1
Euphorbiaceae	<i>Euphorbia cyathophora</i> *	Painted spurge	1
Euphorbiaceae	<i>Ricinus communis</i> *	Castor oil plant	+
Fabaceae	<i>Desmodium intortum</i> *	Green-leaved desmodium	1
Fabaceae	<i>Desmodium uncinatum</i> *	Silver-leaved desmodium	1-2
Fabaceae	<i>Glycine</i> sp.*		1
Lamiaceae	<i>Plectranthus verticillatus</i> *	Swedish ivy	1
Lauraceae	<i>Cinnamomum camphora</i> *	Camphor laurel	1-2
Malvaceae	<i>Eriobotrya japonica</i> *	Loquat	+
Moraceae	<i>Ficus elastica</i> *	Indian rubber plant	+
Myrtaceae	<i>Corymbia torelliana</i>	Cadaghi tree	+
Myrtaceae	<i>Eugenia uniflora</i> *	Brazilian cherry	+
Myrtaceae	<i>Leptospermum laevigatum</i> *	Coastal teatree	1
Ochnaceae	<i>Ochna serrulata</i> *	Mickey mouse plant	1-2
Passifloraceae	<i>Passiflora suberosa</i> *	Corky passionfruit	1
Passifloraceae	<i>Passiflora subpeltata</i> *	White passionflower	1
Poaceae	<i>Melinis minutiflora</i> *	Molasses grass	1
Poaceae	<i>Paspalum dilatatum</i> *	Paspalum	1
Poaceae	<i>Setaria sphacelata</i> *	Setaria	1
Sapindaceae	<i>Koelreuteria elegans</i> subsp. <i>formosana</i>	Golden rain tree	+
Solanaceae	<i>Solanum dulcumara</i> *	Climbing nightshade	1
Solanaceae	<i>Solanum mauritianum</i> *	Wild tobacco tree	1-2
Verbenaceae	<i>Lantana camara</i> *	Lantana	2-3



8.7 Zone 7 – Shelly Beach and Black Head

Geographic location/extent of zone: Shelly Beach and Black Head up to the underpass on The Coast Road. This zone has been split into four subzones (refer to **FIGURE A.14** in **APPENDIX A**)

Main vegetation communities in zone (refer to **FIGURE A.14** in **APPENDIX A**)

Littoral rainforest vegetation, including Coast banksia, dominates dune areas along Shelly Beach with smaller patches of Coastal wattle and Spinifex along the foredune. Black Head is also dominated by Littoral rainforest with mixed coastal shrubland occurring on exposed cliff sections. A small section of Swamp paperbark forest occurs within a low-lying swale adjacent to the Black Head access road. Floristic diversity is greatest at the northern end of the zone, north of Harriers Track.

Ecological values

Weed control works have greatly improved the ecological values of this zone, specifically through the continued removal of Bitou bush and Ground asparagus fern. The zone comprises Littoral Rainforest EEC (TSC Act), better areas of which are likely to meet the condition thresholds of the TEC Littoral Rainforest and Coastal Vine Thickets of Eastern Australia (EPBC Act). The swamp paperbark forest would also meet the definition of Swamp sclerophyll forest EEC (TSC Act). The NSW Wildlife Atlas database search shows records of Grey-headed flying fox as well as the Sooty oystercatcher, White tern and Little tern along the shoreline of Shelly Beach. Ballina Coastcare Inc. also has records of White laceflower, Rusty plum, Coolamon and Stinking cryptocarya in the zone. This area may provide habitat for Threatened bird species including Fruit-doves, White-eared monarch, Yellow-eyed cuckoo shrike as well as several microchiropteran bat species. The Osprey and Little tern are likely to forage along this section of beachfront.

Progress since previous VMP (EnviTE 2005)

Extensive works have been undertaken throughout this zone since the VMP was prepared in 2005 and the majority of works is now limited to follow-up and planting in open areas. Some areas of Black Head are still undergoing primary work including spraying of Bitou bush along the cliffs and Ground asparagus control in forest vegetation on Black Head.

General recommendations for zone:

Management of this zone needs to maintain and improve vegetation along the narrow coastal strip as well as control more extensive areas of weeds around and north of Black Head, including large patches of Bitou bush and Lantana. Bitou bush occurs in extensive patches on some cliff-faces. There is a relatively extensive network of informal walking tracks within this zone.

Sub-zone	Vegetation Description	Condition	Vegetation Management Recommendations	Priority	Work to be performed by:
7a	<p>Dunal vegetation along Shelly Beach comprises low wind sheared regenerating littoral rainforest.</p> <p>Extensive control of Bitou bush has been undertaken throughout this subzone. Sporadic weeds noted include Coastal morning glory, Painted spurge, grasses, Madeira, Glory lily, Fleabane, Turkey rhubarb.</p> <p>Roadside embankment adjoining Shelly Beach Road at northern end of subzone is dominated by weeds. Madeira vine, Green leaved desmodium, Siratro, Lantana and Guava present. Previous plantings of Lomandra have died and the area is dominated by Fleabane (refer to photo in Appendix I).</p>	6	<p>Continue volunteer maintenance program. Target Bitou bush seedlings, Ground asparagus fern, Madeira vine, Glory lily and Turkey rhubarb.</p> <p>Plant open areas where regeneration is lacking with suitable littoral rainforest species.</p> <p>Control weeds and undertake plantings to reduce weed cover along roadside embankment. Suggest using low growing plants and higher planting density to avoid blocking views from adjacent properties. Consultation should be undertaken as required.</p>	<p>High</p> <p>Medium</p> <p>Medium</p>	<p>BSC contractor or EBL</p> <p>EBL</p> <p>BSC contractor or EBL</p>
7b	<p>Forested areas of Black Head comprising littoral rainforest species with Coast banksia.</p> <p>Extensive works have been undertaken through parts of this subzone to control ground asparagus. Good regeneration of native species is prevalent through these worked areas.</p>	6	<p>Continue spraying of Ground asparagus fern throughout subzone.</p> <p>Follow-up treatments will be required to control seedlings which are prevalent through worked areas.</p> <p>Chase up woody weeds including Senna, Lantana, Bitou and Camphor.</p>	<p>High</p> <p>Medium</p> <p>Medium</p>	<p>BSC contractor</p> <p>BSC contractor or EBL</p> <p>BSC contractor or EBL</p>
7c	<p>Cliff line sections around Black Head and adjacent disturbed areas dominated by exotics.</p> <p>Bitou, Lantana and exotic grasses around the start of Harrier Track.</p> <p>Abseiling Bitou bush control is currently being undertaken around Black Head, working from South to North. Large area of Bitou still to be worked at northern end of subzone.</p>	4-5	<p>Continue control of Bitou bush.</p> <p>Follow-up control required in worked areas including Ground asparagus, Coastal morning glory and Bitou seedlings.</p> <p>Undertake plantings in open, exposed areas around the cliff where natural regeneration is lacking following Bitou bush control.</p>	<p>High</p> <p>Medium</p> <p>Medium</p>	<p>BSC contractor</p> <p>BSC contractor</p> <p>BSC contractor</p>

Sub-zone	Vegetation Description	Condition	Vegetation Management Recommendations	Priority	Work to be performed by:
	Works in this subzone should be carried out by appropriately qualified bush regenerators with abseiling experience given the nature of the subzone.				
7d	<p>Vegetation between The Coast Road and asphalt track from Shelly Beach Rd to underpass.</p> <p>Littoral rainforest vegetation with intact canopy cover and predominately Ground asparagus in the ground layer.</p> <p>Recent works have been undertaken at the southern end of the subzone including spraying of Ground asparagus and round up of Coastal morning glory.</p>	6	<p>Continue primary works in northern direction, spraying Ground asparagus and controlling vines and other woody weeds.</p> <p>Follow-up treatment will be required throughout subzone following primary works.</p>	<p>High</p> <p>Low</p>	<p>BSC contractor or EBL</p> <p>BSC contractor or EBL</p>

List of exotic species recorded in Zone 7 during surveys

Family	Botanical Name	Common Name	Cover/abundance across Zone 7
Asparagaceae	<i>Asparagus aethiopicus</i> *	Ground asparagus fern	0-4
Asteraceae	<i>Bidens pilosa</i> *	Cobblers pegs	1
Asteraceae	<i>Conyza</i> sp.*	Fleabane	1
Asteraceae	<i>Chrysanthemoides monilifera</i> *	Bitou bush	0-2
Asteraceae	<i>Sonchus oleraceus</i> *	Common sowthistle	+
Basellaceae	<i>Anredera cordifolia</i> *	Madeira vine	1
Caesalpinioideae	<i>Senna pendula</i> var. <i>glabrata</i> *	Winter senna	1
Convolvulaceae	<i>Ipomoea cairica</i> *	Coastal morning glory	1-2
Euphorbiaceae	<i>Ricinus communis</i> *	Castor oil plant	1
Fabaceae	<i>Macroptilium atropurpureum</i> *	Siratro	1
Fabaceae	<i>Crotalaria</i> sp.*	Rattlepod	1
Fabaceae	<i>Desmodium</i>	Green-leaved desmodium	+
Lauraceae	<i>Cinnamomum camphora</i> *	Camphor laurel	+
Liliaceae	<i>Gloriosa superba</i> *	Glory lily	+

Family	Botanical Name	Common Name	Cover/abundance across Zone 7
Malvaceae	<i>Lagunaria patersonia</i> *	Norfolk Island hibiscus	+
Myrtaceae	<i>Psidium guajava</i> *	Common guava	+
Passifloraceae	<i>Passiflora subpeltata</i> *	White passionflower	1
Passifloraceae	<i>Passiflora suberosa</i> *	Corky passionfruit	+
Poaceae	<i>Paspalum dilatatum</i> *	Paspalum	1
Poaceae	<i>Melinis minutiflora</i> *	Molasses grass	1
Poaceae	<i>Bromus catharticus</i> *	Prairie grass	1
Poaceae	<i>Chloris gayana</i> *	Rhodes grass	1
Polygonaceae	<i>Acetosa sagittata</i> *	Turkey rhubarb	+
Solanaceae	<i>Solanum dulcumara</i> *	Climbing nightshade	1
Solanaceae	<i>Solanum mauritianum</i> *	Wild tobacco tree	+
Verbenaceae	<i>Lantana camara</i> *	Lantana	1-2



8.8 Zone 8 – Angels Beach and Flat Rock

Geographic location/extent of zone: Vegetation along Angels Beach from southern underpass north to the boundary of the VMP project area. This zone has been split into six subzones based upon vegetation type and natural boundaries (refer to **FIGURE A.15** in **APPENDIX A**)

Main vegetation communities in zone (refer to **FIGURE A.15** in **APPENDIX A**)

Zone 8 comprises a variety of vegetation communities, the dominant being Littoral Rainforest, although it is in varying stages of development and condition across the zone. Large areas of good condition Swamp paperbark forest occur in low-lying areas both north and south of Flat Rock Tent Park. Fore-dune areas comprise a mosaic of Coastal wattle, Coast banksia and regenerating littoral rainforest vegetation. There are also patches of Coastal cypress pine forest south of Flat Rock Tent Park. Elevated areas directly west of the tent park comprise a Brush box/Old-man banksia dominant forest.

Ecological values

Vegetation within Zone 8 contains high ecological value with several EECs and threatened species present. These include Littoral rainforest EEC, Swamp sclerophyll forest EEC, Coastal cypress pine forest EEC, Freshwater wetland EEC and areas which are likely to meet the condition thresholds of the TEC Littoral Rainforest and Coastal Vine Thickets of Eastern Australia (EPBC Act). Threatened flora species known from the zone include Stinking cryptocarya, Scented acronychia, Durobby and White laceflower. Stinking cryptocarya seedlings are prevalent through the zone, especially around the walking track from the overpass to the tent park. Threatened fauna species recorded by Blackwood Ecology as part of previous assessments within the zone include Grey-headed flying fox, Eastern long-eared bat, Little bent-wing bat as well as several migratory species around Flat Rock including Little tern, Pied oystercatcher and Sooty oystercatcher.

Progress since previous VMP (EnviTE 2005)

Extensive work has been undertaken throughout this zone since the preparation of the previous VMP. These works have greatly reduced weed densities and resulted in a proliferation of native recruitment. Works are currently being undertaken in various parts of the zone as a result of recent grants acquired by Ballina Coastcare Inc. The majority of areas have undergone primary work.

General recommendations for zone:

Management of this zone will need to focus on the fore-dune and hind dune areas where native vegetation communities are generally less intact and are still regenerating from past sand mining impacts. The Coastal Recreation Path may be located in this area should it be approved in its current proposed location. Compensatory works associated with the Coastal Recreational Path should include weed infested areas around Sharpes Creek.

Restoration works approved to reduce erosion occurring around a stormwater channel along The Coast Road (refer to photo in **APPENDIX I**) should be given high priority given the degree of erosion evident in this area. Additional investigation of erosional issues associated with water runoff from The Coast Road, near the Angels Beach underpass, needs to be investigated by BSC (refer to Section 7.4).

An emergency 4WD track board and chain is planned to be installed at the eroded 4WD emergency access track at the northern end of Angels Beach.

There is a part of the torpedoed World War II trader “SS Limerick” located near the 4WD emergency track at the north end of Angels Beach carpark. This piece of the trader should be suitably protected and acknowledged for its marine cultural heritage and an option pursued to relocate it to a safe housing for marine heritage.

Sub-zone	Vegetation Description	Condition	Vegetation Management Recommendations	Priority	Work to be performed by:
8a	Foredune vegetation along Angels Beach and Sharpes Beach dominated by Spinifex grassland/herbland and Coastal wattle.	5-6	Continue follow-up control of Bitou bush seedlings/regrowth.	Medium	Angels Beach Dunecare Group (ABDG) ABDG
			Undertake plantings in open areas where natural regeneration is limited.	Medium	
			Spray and plant with natives the open area dominated by Molasses grass at the southern end of the subzone.	Low	
8b	Back dune areas of Littoral rainforest vegetation along Angels Beach up to overpass. Regenerating Littoral rainforest vegetation with mostly intact, wind sheared canopy. Sporadic weeds present. Contractor currently treating Ground asparagus fern through area. Car park at Angels Beach is to be upgraded and the existing one rehabilitated as part of the Coastal Recreational Path development.	6	Continue treating sporadic weeds.	Medium	ABDG
			Follow-up to be undertaken and maintained through sprayed areas of Ground asparagus (contractor) to prevent re-establishment.	Medium	ABDG
			Undertake plantings in open areas where natural regeneration is limited.	Low	ABDG
			Investigate opportunities to undertake weed control along the western side of The Coast Road (outside VMP project area) where weeds are acting as a source of propagules for this subzone.	Low	BSC
8c	Vegetation on western side of track up to Flat Rock Tent Park and bounded by Flat Rock Road and The Coast Road. Extensive primary works have recently been	4-7	Continue expanding worked areas. Undertake follow-up treatment of weeds as required.	Medium	BSC contractor
			Plant open areas where natural regeneration is lacking, particularly along roadside embankments.	Medium	ABDG

Sub-zone	Vegetation Description	Condition	Vegetation Management Recommendations	Priority	Work to be performed by:
	<p>undertaken throughout edge areas along The Coast Road.</p> <p>Area of Brush box and Old man banksia is in good condition with limited weeds.</p>		<p>Works to reduce erosion occurring around stormwater channel along The Coast Road should be undertaken as soon as possible (refer to photo in Appendix I). Rock armouring may be required along the channel with additional plantings along the top edge.</p> <p>Follow-up Ground asparagus spray throughout subzone. Target regrowth occurring along the southern edge of Flat Rock Road.</p> <p>Drill Umbrella trees located within Brush box/Old man Banksia vegetation and along edge of Swamp paperbark forest.</p>	<p>High</p> <p>Low</p> <p>Medium</p>	<p>BSC</p> <p>ABDG or BSC contractor</p> <p>ABDG or BSC contractor</p>
8d	<p>Vegetation along the eastern side of the zone from the overpass north to the end of the VMP project area.</p> <p>The majority of this subzone has been worked with minimal weed presence evident.</p> <p>A small area just north of the overpass was recently burnt. There is good germination of natives occurring through this area. A number of similar sized patches were also burnt along Angels Beach in late 2013.</p> <p>Dense infestation of weeds around Sharpes Creek.</p>	4-6	<p>Continue primary spraying of Ground asparagus through subzone, specifically in southern section amongst Coastal cypress pine.</p> <p>Undertake primary works at northern end of subzone where Lantana shrubland occurs.</p> <p>Follow-up maintenance of sporadic weeds including Bitou bush, Coastal morning glory, Ground asparagus and other herbaceous annuals.</p> <p>Trim Smilax and other vines from regenerating native saplings to prevent smothering. Spraying of prolific vines may be required until the structure is re-established.</p> <p>Continue treatment of Coast tea tree throughout dune areas.</p> <p>Undertake plantings of suitable species within open areas where natural regeneration is lacking. A number of Coastal</p>	<p>High</p> <p>High</p> <p>Medium</p> <p>Low</p> <p>Low</p> <p>Medium</p>	<p>BSC contractor.</p> <p>BSC contractor</p> <p>ABDG</p> <p>ABDG</p> <p>ABDG</p> <p>ABDG</p>

Sub-zone	Vegetation Description	Condition	Vegetation Management Recommendations	Priority	Work to be performed by:
			<p>wattle have died through this subzone and planting should be undertaken to replace these.</p> <p>Maintain burnt area to ensure weeds don't colonise bare ground.</p> <p>Dead branches overhanging the path require trimming/removal for safety reasons.</p>	<p>Low</p> <p>High</p>	<p>ABDG</p> <p>BSC</p>
8e	<p>Area of vegetation north of Flat Rock Road and inland of subzone 8d.</p> <p>Comprises Littoral rainforest and Swamp paperbark forest.</p> <p>Edge areas, specifically along The Coast Road, private paddock and Flat Rock Road comprise the highest weed presence.</p> <p>Area of Swamp paperbark forest is in good condition with minimal weeds.</p>	<p>3-4</p> <p>(7 in core areas of paperbark forest)</p>	<p>Edge adjoining paddock and The Coast Road has not been previously worked. Undertake comprehensive weed control along these edges. Weeds present include Bitou bush, Ground asparagus, Lantana, Coastal morning glory. Work outwards from core areas to edges. Maintain vines along edges to act as a buffer against weed incursion.</p> <p>Drill Umbrella trees visible along the northern side of Flat Rock Road. A number of mature and fruiting trees are present along the edge of high quality Swamp paperbark forest.</p> <p>Spray Ground asparagus through subzone. Dense regrowth is occurring along the northern side of Flat Rock Road.</p> <p>Spray and control patch of ivy along edge of Flat Rock Rd.</p>	<p>Medium</p> <p>High</p> <p>Medium</p> <p>High</p>	<p>BSC contractor</p> <p>BSC contractor</p> <p>BSC contractor</p> <p>BSC contractor</p>
8f	<p>Triangular section of vegetation on the western side of The Coast Road, opposite Flat Rock Road.</p> <p>Intact native canopy with high diversity and good regeneration potential.</p> <p>Dense Ground asparagus in groundlayer (80-</p>	<p>4</p>	<p>Weed control works in this subzone have been included as part of a Vegetation Management Plan prepared for compensation of works associated with the first section of the Shared Path West. Refer to the VMP (Blackwood Ecology 2014) for more detailed management recommendations in this subzone. Some vegetation removal along the eastern edge of this zone has been approved as part of the Shared Path West construction.</p>		

Sub-zone	Vegetation Description	Condition	Vegetation Management Recommendations	Priority	Work to be performed by:
	100% cover).		<p>Undertake primary control of Ground asparagus fern through spraying. Control sporadic woody weeds including Bitou bush, Lantana, Umbrella tree and Senna.</p> <p>Follow-up weed control will be required for 3-5 years to suppress any Ground asparagus regrowth.</p> <p>Planting may be required, although the natural regeneration potential of this subzone is likely to be high.</p>	<p>High</p> <p>Medium</p> <p>As required</p>	<p>BSC contractor</p> <p>BSC contractor or ABDG</p> <p>ABDG</p>

List of exotic species recorded in Zone 8 during surveys

Family	Botanical Name	Common Name	Cover/abundance across Zone 8
Araliaceae	<i>Schefflera actinophylla</i> *	Umbrella tree	0-2
Araliaceae	<i>Hedera helix</i> *	English ivy	+
Asparagaceae	<i>Asparagus aethiopicus</i> *	Ground asparagus fern	0-5
Asteraceae	<i>Bidens pilosa</i> *	Cobblers pegs	1
Asteraceae	<i>Tagetes minuta</i> *	Stinking roger	1
Asteraceae	<i>Chrysanthemoides monilifera</i> *	Bitou bush	0-2
Convolvulaceae	<i>Ipomoea cairica</i> *	Coastal morning glory	1
Fabaceae	<i>Macropodium atropurpureum</i> *	Siratro	1
Fabaceae	<i>Desmodium intortum</i> *	Green-leaved desmodium	+
Lauraceae	<i>Cinnamomum camphora</i> *	Camphor laurel	1
Myrtaceae	<i>Leptospermum laevigatum</i> *	Coast teatree	0-2
Passifloraceae	<i>Passiflora subpeltata</i> *	White passionflower	1
Passifloraceae	<i>Passiflora suberosa</i> *	Corky passionfruit	1
Poaceae	<i>Paspalum dilatatum</i> *	Paspalum	1
Solanaceae	<i>Solanum mauritianum</i> *	Wild tobacco tree	1
Verbenaceae	<i>Lantana camara</i> *	Lantana	1-2

9 MONITORING AND RECORD KEEPING

9.1 Introduction

Monitoring of weed control works as well as daily record taking of works and chemical use should be undertaken as part of any vegetation management works undertaken within the VMP project area.

9.2 Monitoring

Monitoring/progress reports are often required as part of grant applications to ensure allocated funds are being spent as per the grant application and works are on schedule. BSC and Ballina Coastcare Inc. have extensive experience preparing these monitoring reports for funds allocated within the VMP project area.

Additional monitoring may be required as part of a development consent, for example where offset works are proposed for the construction of the Shared Path or Coastal Recreational Path. Separate VMPs are typically prepared for these projects with specific details on works required in the offset area(s) and the maintenance and monitoring period required.

All monitoring, whether undertaken as part of a grant funding or development consent requirement, should include preparation of a monitoring report which is to be submitted to BSC and should generally include the following:

- Photographs from establish photopoints and/or any quantitative data collected from established quadrats/transects;
- Description of works performed since last monitoring event and map showing areas worked;
- Assessment of weed presence in worked areas;
- Assessment of natural recruitment and identification of areas requiring planting where this is lacking;
- Assessment of health and growth of any planted specimens, including details on losses and possible reasons for losses greater than 10%;
- Discussion on the effectiveness of weed control works and any possible areas for improvement;
- Discussion of any management problems or unforeseen issues which have arisen (eg. erosion/storm damage/dumping of green waste/vandalism/fire etc.);
- Identification of opportunities for improvement/additional works/volunteer involvement etc;

Monitoring is typically undertaken for a period of 5 years (or the length of the grant funding) with biannual monitoring events for the first two years and then annual monitoring events for the subsequent years.

9.3 Record keeping

Both volunteers and contractors are required to complete a Daily Record Sheet (DRS) for each day of works undertaken within the VMP project area. A copy of the BSC approved DRS is provided in **APPENDIX F**. The form includes details on the following:

- Names of personnel and hours worked;
- Weather conditions;
- Activities undertaken;
- Areas worked (and illustrated on a map);



- Herbicide usage and methods of application;
- Precautions taken to protect threatened species;
- Note of any incidents/near misses/accidents; and
- General observations.

Completed forms should be submitted to BSC on a regular basis either quarterly or as required.

10 REFERENCES

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Blackwood Ecological Services (2013b) Ecological Assessment for the Coastal Recreational Path, East Ballina to Lennox Head, Final report

Blackwood Ecological Services (2013c) Ecological Assessment: Ballina to Lennox Head Shared Path Skennars Head Rd SEPP14 section. A report to NSW Public Works.

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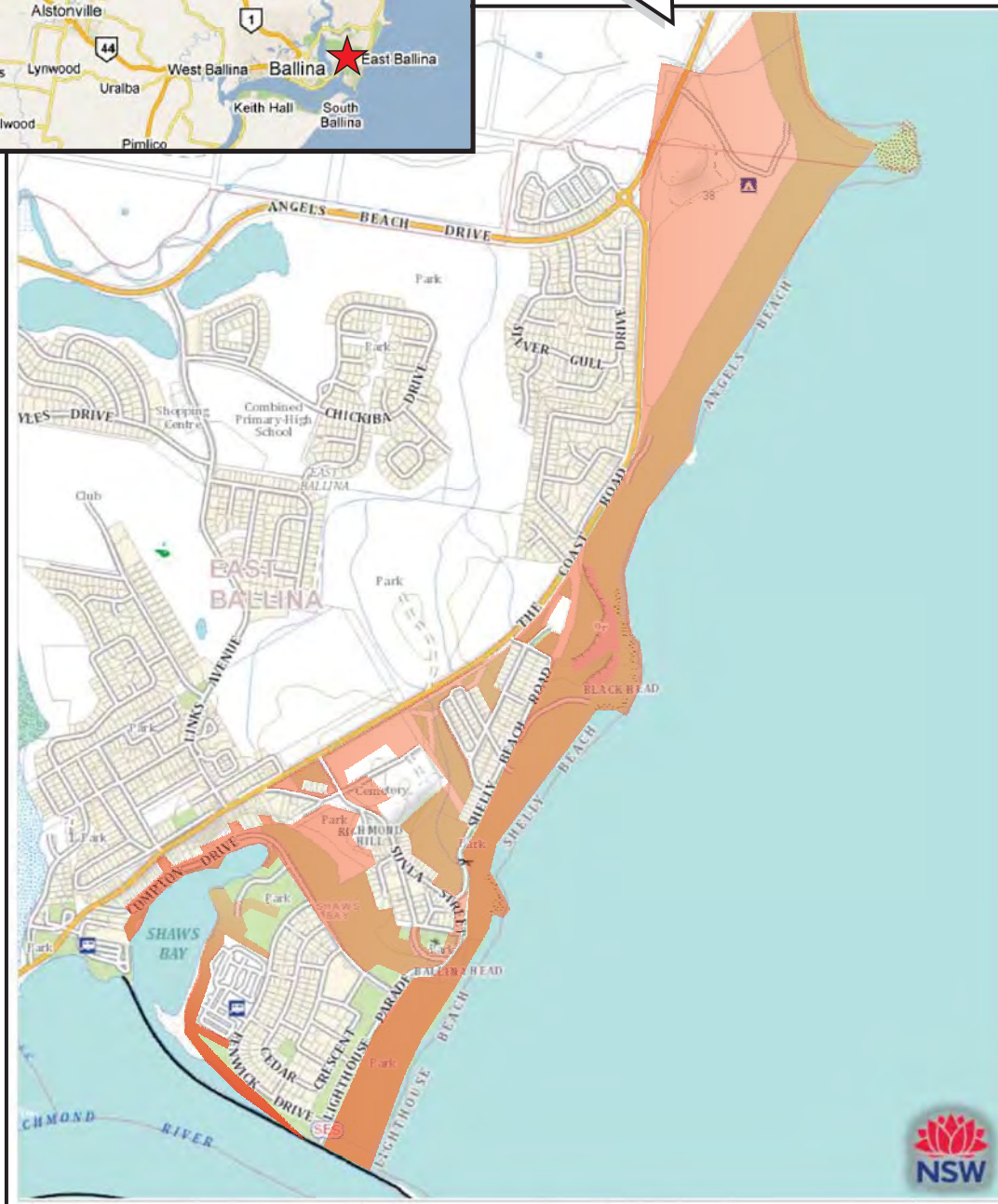
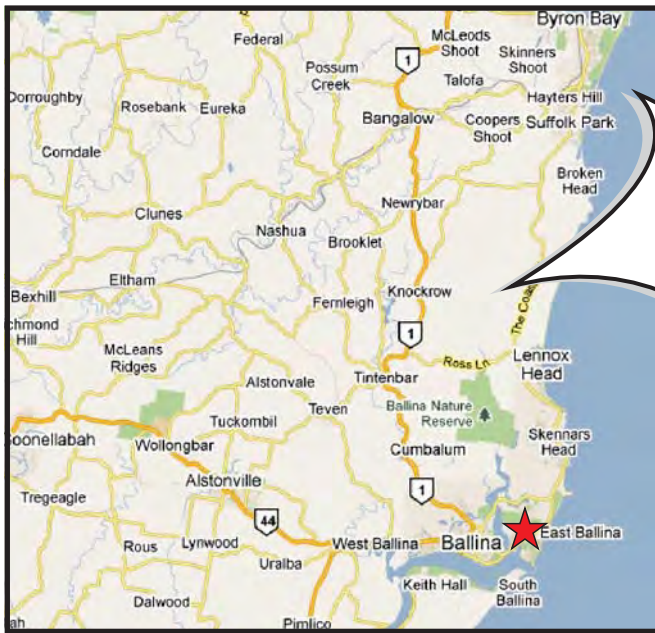
Morand D.T (1994). Soil Landscapes of the Lismore- Ballina 1:100000 sheet (Mullumbimby, Byron Bay, Casino Kyogle). Department of Conservation and Land Management, Soil Conservation Service.

NSW Office of Environment and Heritage website (www.environment.nsw.gov.au)

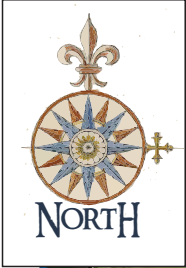
WBM Oceanics Australia (2003) Ballina Shire Coastline Hazard Definition Study Final Report. Prepared for Ballina Shire Council.

APPENDIX A

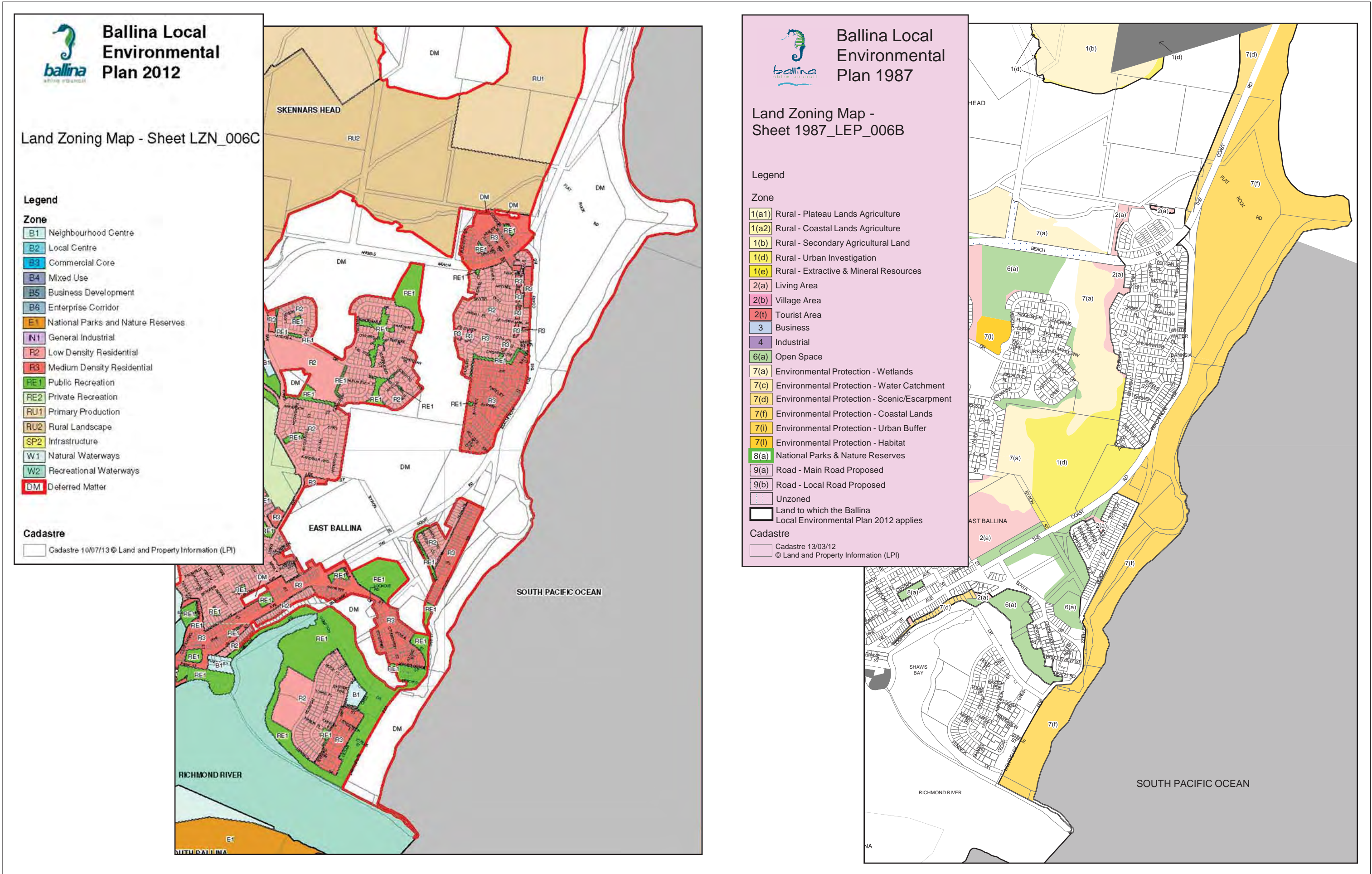
FIGURES

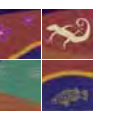


 VMP Subject site



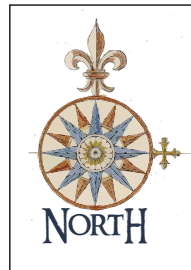
2012 Aerial Photography LPMA



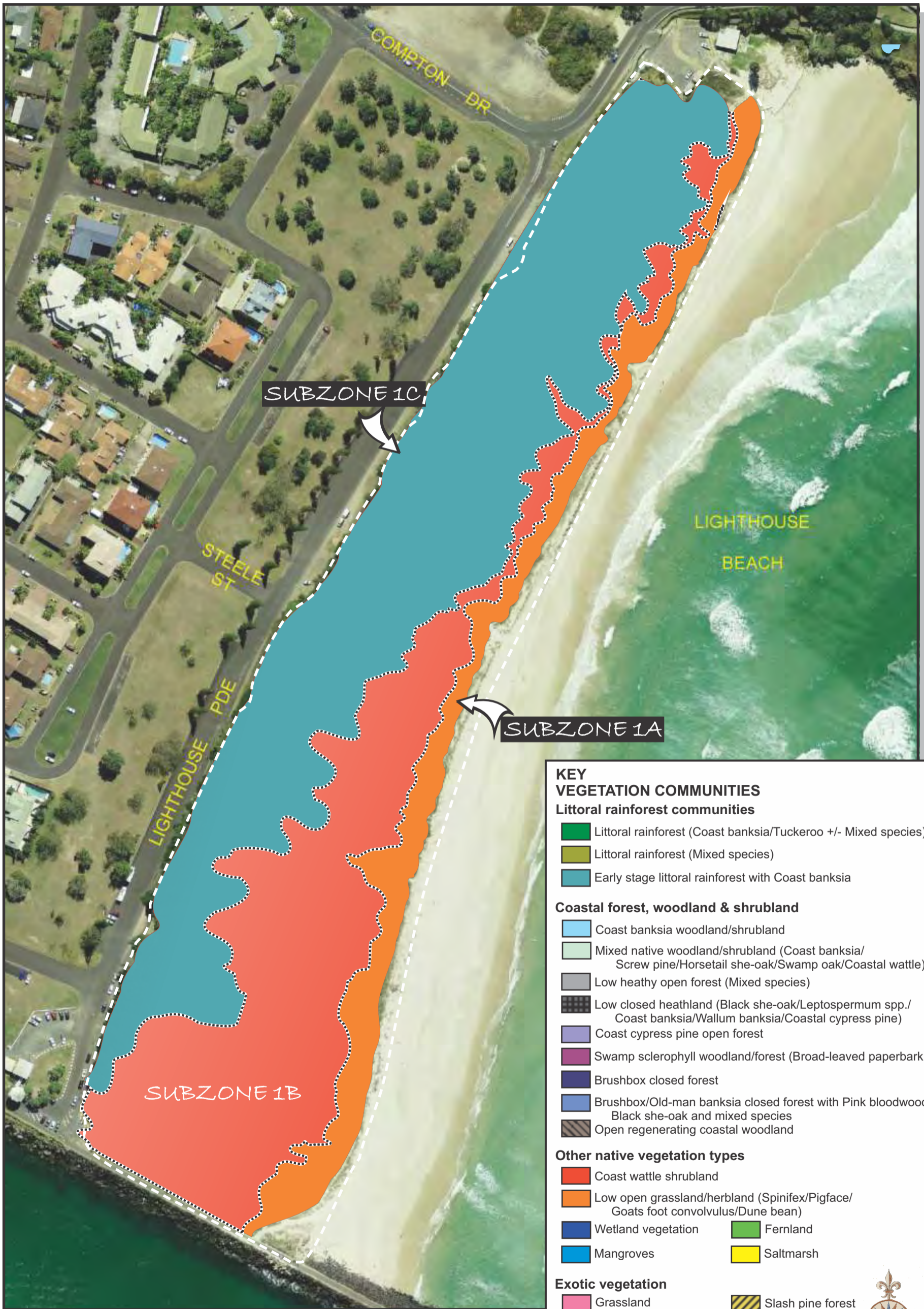
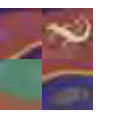












KEY VEGETATION COMMUNITIES

Littoral rainforest communities

- Littoral rainforest (Coast banksia/Tuckeroo +/- Mixed species)
- Littoral rainforest (Mixed species)
- Early stage littoral rainforest with Coast banksia

Coastal forest, woodland & shrubland

- Coast banksia woodland/shrubland
- Mixed native woodland/shrubland (Coast banksia/ Screw pine/Horsetail she-oak/Swamp oak/Coastal wattle)
- Low heathy open forest (Mixed species)
- Low closed heathland (Black she-oak/Leptospermum spp./ Coast banksia/Wallum banksia/Coastal cypress pine)
- Coast cypress pine open forest
- Swamp sclerophyll woodland/forest (Broad-leaved paperbark)
- Brushbox closed forest
- Brushbox/Old-man banksia closed forest with Pink bloodwood
- Black she-oak and mixed species
- Open regenerating coastal woodland


Other native vegetation types

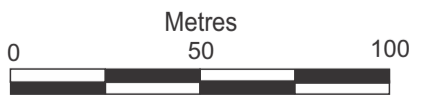
- Coast wattle shrubland
- Low open grassland/herbland (Spinifex/Pigface/ Goats foot convolvulus/Dune bean)
- Wetland vegetation
- Mangroves
- Fernland
- Saltmarsh

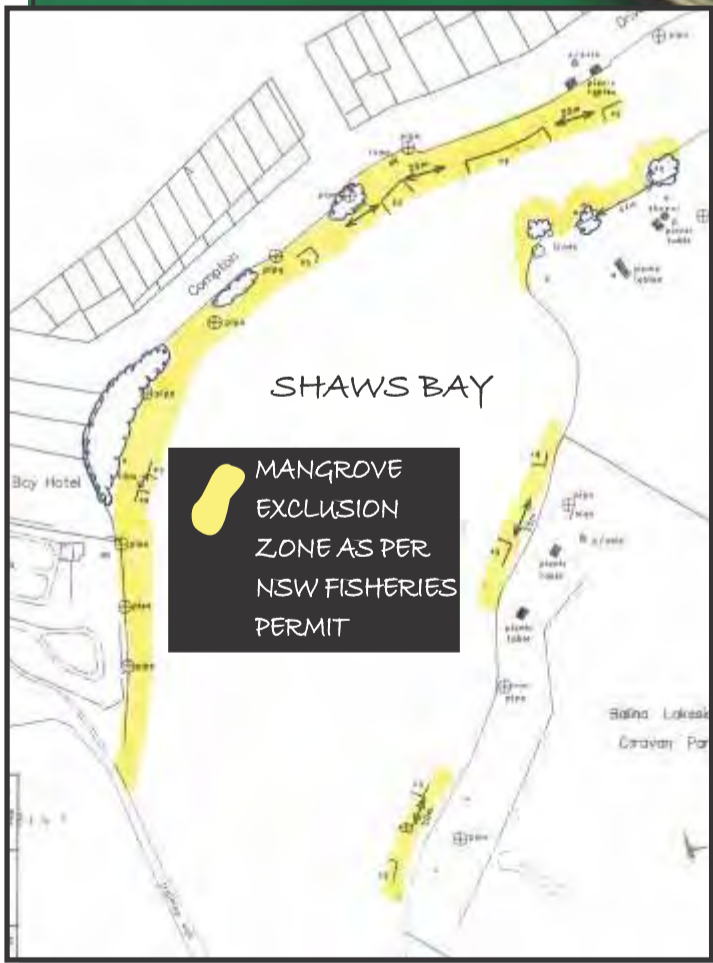
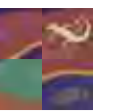
Exotic vegetation

- Grassland
- Exotic dominant shrubland (Bitou bush/Lantana)
- Slash pine forest

SUBZONE BOUNDARY


 NORTH





KEY
VEGETATION COMMUNITIES

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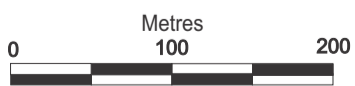
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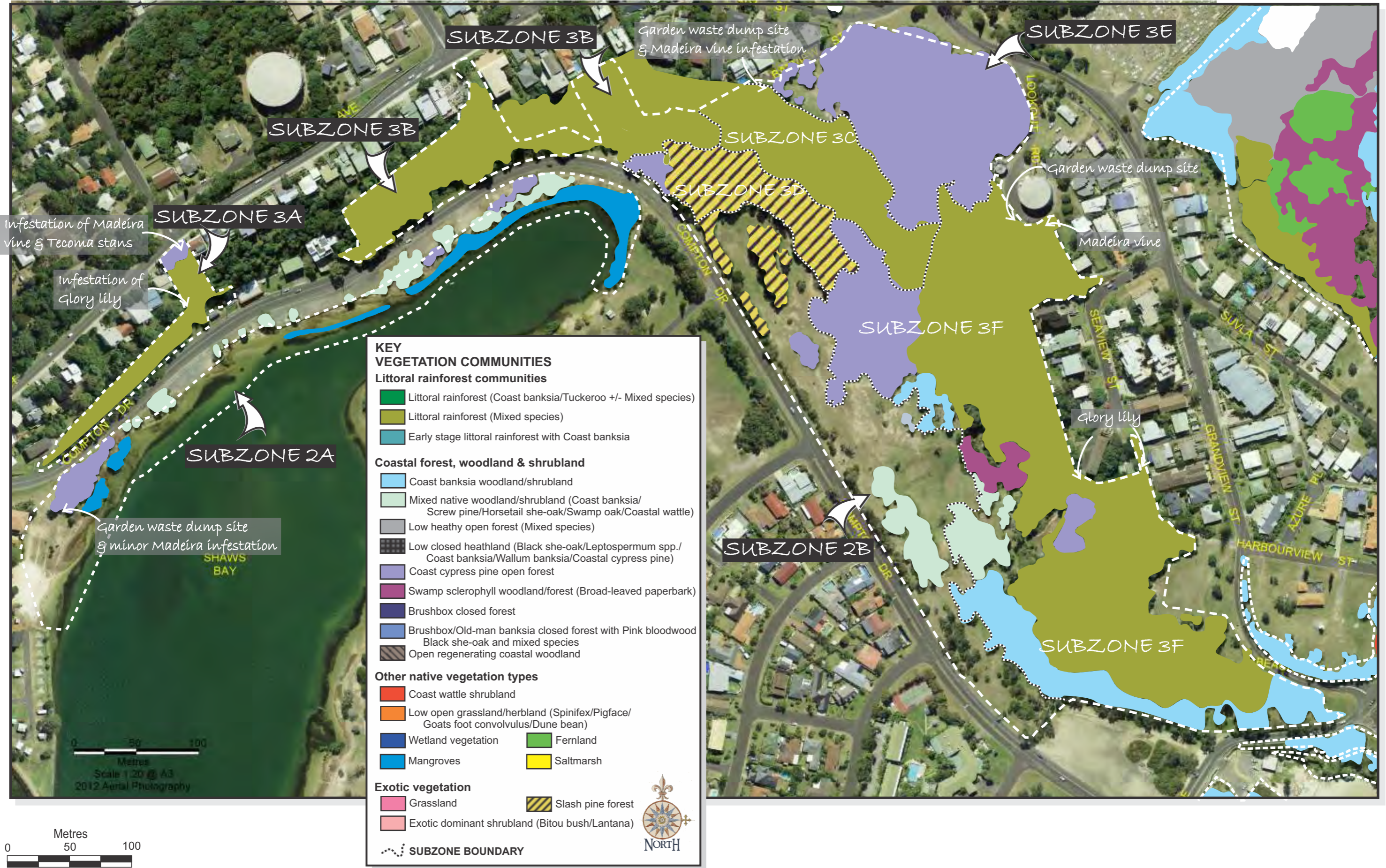
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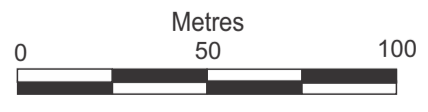
Other native vegetation types

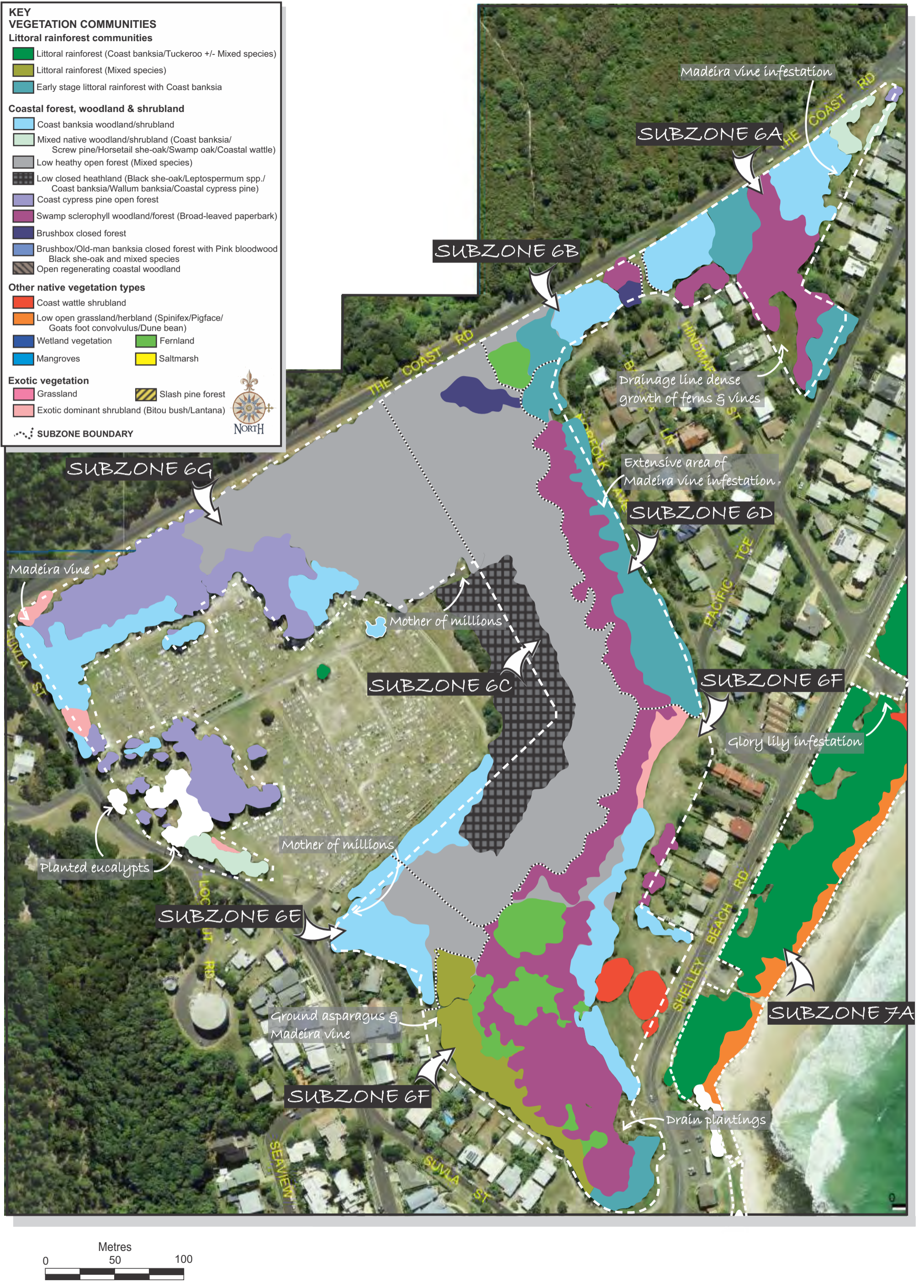
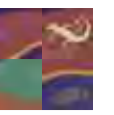
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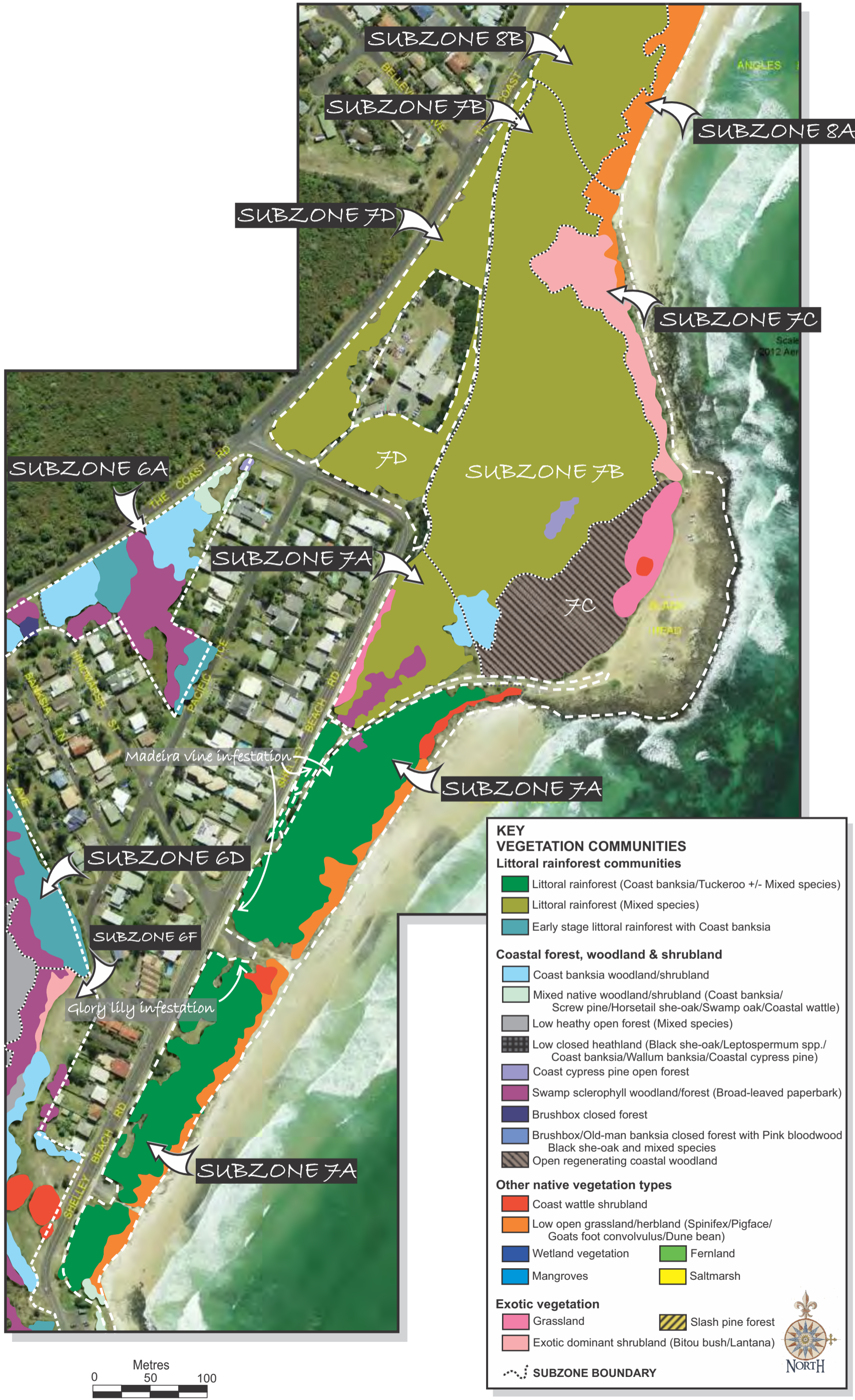
Exotic vegetation

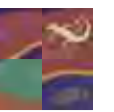
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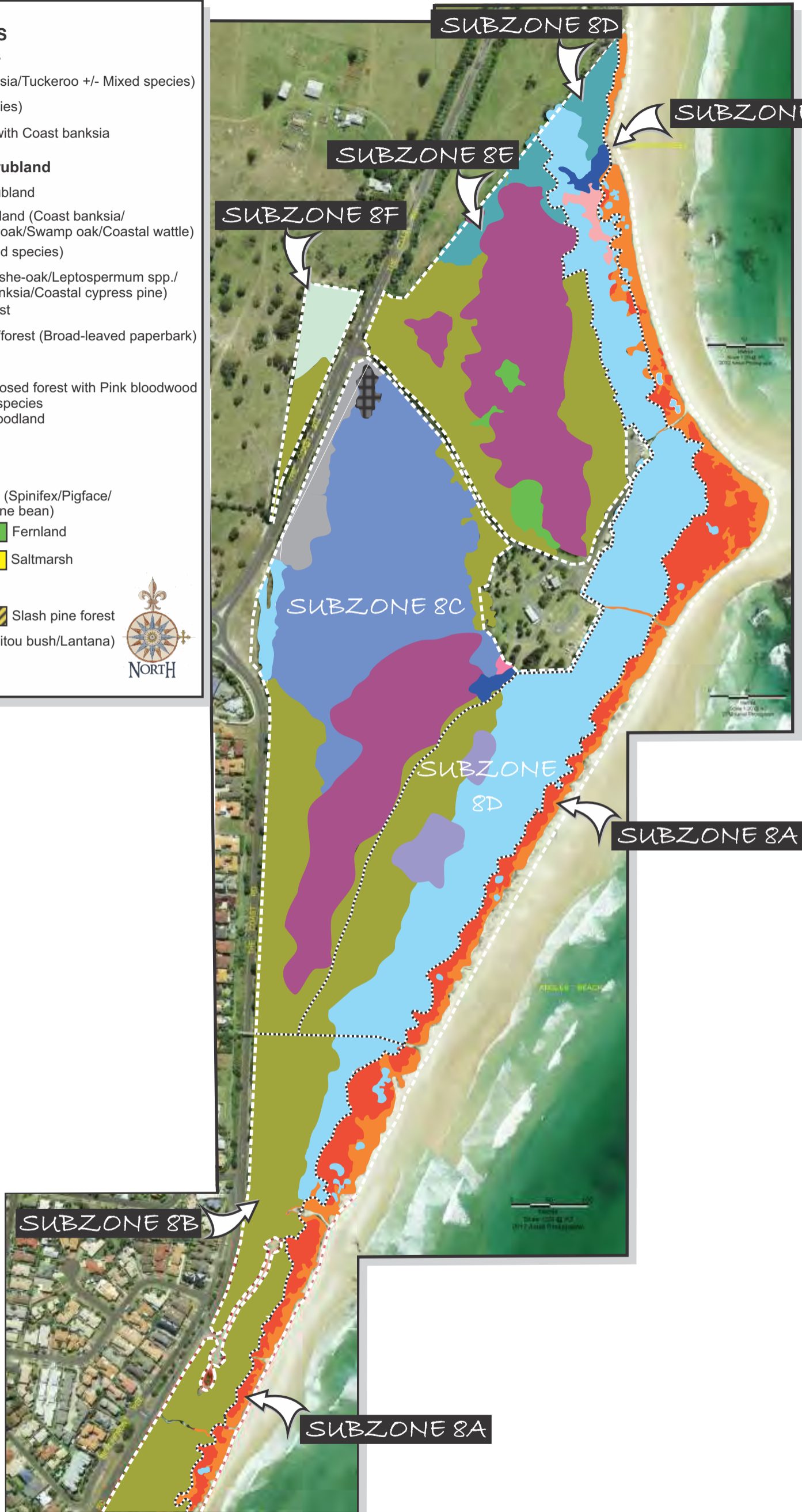
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SUBZONE BOUNDARY

NORTH





APPENDIX B

EAST BALLINA ABORIGINAL PLACE GAZETTAL

NATIONAL PARKS AND WILDLIFE ACT 1974

East Ballina Aboriginal Place

IN pursuance of the powers vested in me under section 84 of the National Parks and Wildlife Act 1974, I, the Minister for the Environment and Minister for Heritage, do, by this my order, declare such of the lands described hereunder as an Aboriginal Place.

The East Ballina Aboriginal Place is a place of special significance to Aboriginal culture and people. The Aboriginal cultural values for the place includes the recognition and commemoration of early colonial conflicts and the 1853/54 massacre of Bundjalung people associated with the area, and is regarded as being of significance to Aboriginal families of the area who have traditional connection to East Ballina and who continue to use the cemetery to be buried close to their immediate predecessors in ancestral lands. The place contains a landscape of extensive cultural features and natural resources, including former wetlands and coastal ecosystems, which provide a continuing teaching resource for current and future generations.

Note: Under section 86 of the National Parks and Wildlife Act 1974, it is an offence to harm or desecrate (harm includes destroy, deface or damage) an Aboriginal Place.

Activities or works for the conservation or protection of the Aboriginal Place that are carried out by an officer of the Office of Environment and Heritage, or under the direction of such an officer, in accord with section 87A(a) of the Act may be exempt.

Activities or works carried out in accordance with the Local Government Act 1993 which constitute the continued use of this Aboriginal Place for the purposes of public recreation and conservation that do not cause harm to, or desecrate the Aboriginal Place may be exempt.

Activities carried out in accordance with the Public Health (Disposal of Bodies) Regulation 2002 which constitute the continued use of East Ballina Cemetery as a cemetery would not harm or desecrate this declared Aboriginal Place.

Should any activities that may cause harm to or desecrate this Aboriginal Place be contemplated, consent should be sought from the Director General, Department of Premier and Cabinet.

ROBYN PARKER, M.P.,
Minister for the Environment

GOD SAVE THE QUEEN!

SCHEDULE

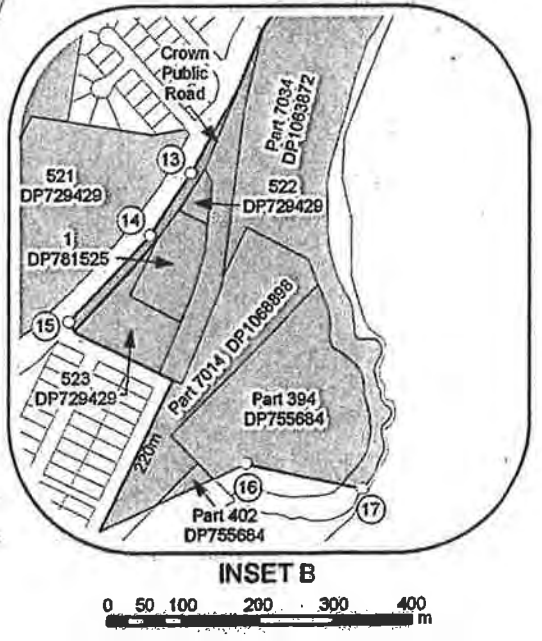
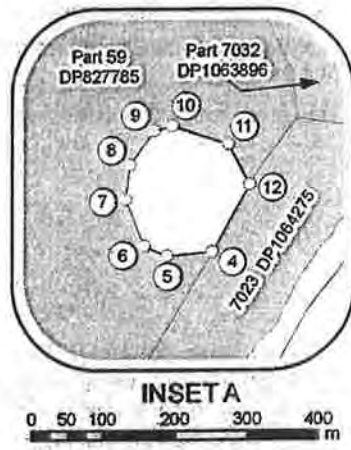
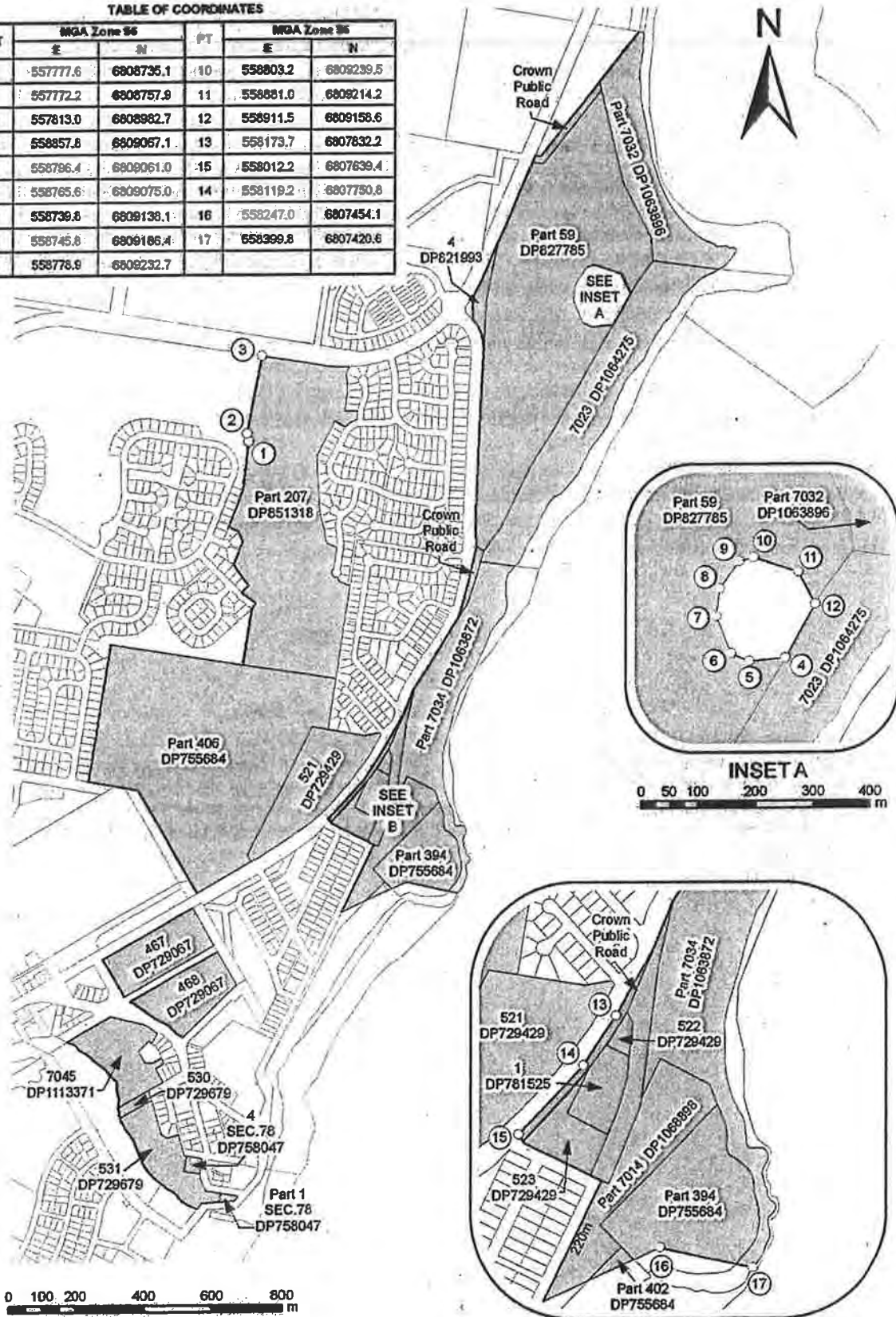
Land District – East Ballina; L.G.A. – Ballina

County of Rous, Parish of Ballina, about 162 hectares, being Part Lot 7014, DP 1068898; Part Lot 394, DP 755684; Part Lot 7034, DP 1063872; Lot 7023, DP 1064275; Lot 522, DP 729429; Part Lot 7032, DP 1063896; Part Lot 1, DP 781525; Lot 523, DP 729429; Part Lot 59, DP 827785; Part Lot 402, DP 755684; Part Lot 207, DP 851318; Lot 521, DP 729429; Part Lot 406, DP 755684; Part Lot 1, section 78, DP 758047; Lot 4, section 78, DP 758047; Lot 530, DP 729679; Lot 531, DP 729679; Lot 7045, DP 1113371; Lot 468, DP 729067; Lot 467, DP 729067 and Crown public roads, as shown shaded in diagram hereunder.

Papers: OEH/FIL 08/705.

TABLE OF COORDINATES

PT	MGA Zone 56		PT	MGA Zone 55	
	E	N		E	N
1	557771.6	6806735.1	10	558803.2	6809239.5
2	557772.2	6806757.9	11	558881.0	6809214.2
3	557813.0	6806982.7	12	558911.5	6809158.6
4	558857.8	6809067.1	13	558173.7	6807832.2
5	558796.4	6809061.0	15	558012.2	6807639.4
6	558765.6	6809075.0	14	558119.2	6807750.8
7	558739.8	6809138.1	16	558247.0	6807454.1
8	558745.8	6809186.4	17	558399.8	6807420.6
9	558778.9	6809232.7			





APPENDIX C

BSC BUSHLAND AND BEACH ACCESS TRACK MAINTENANCE GUIDELINES

Ballina Shire Council Open Spaces and Reserves

Bushland and Beach Access Track - Maintenance Guidelines

Purpose

To maintain safe access tracks for the public whilst protecting the local environment.

Environmental Constraints

Most tracks are located in high conservation value bushland areas containing vegetation communities that contain threatened species and/or endangered ecological communities listed under the NSW Threatened Species Conservation Act 1995. Maintenance of bushland and beach access tracks is predominantly consented to under the approved Vegetation Management Plan for each reserve area.

Public Constraints

The public will continue to want to use the tracks whilst maintenance may be occurring.

General Principles

These guidelines set out the maintenance requirements for the bushland and beach access tracks in Ballina Shire on public land that is under the ownership and/or management of Council.

Tracks to be maintained are those identified as numbered tracks on the maps. These tracks include a combination of hard surfaced, soft surfaced, fenced, unfenced, pedestrian, vehicle, vegetated and unvegetated tracks.

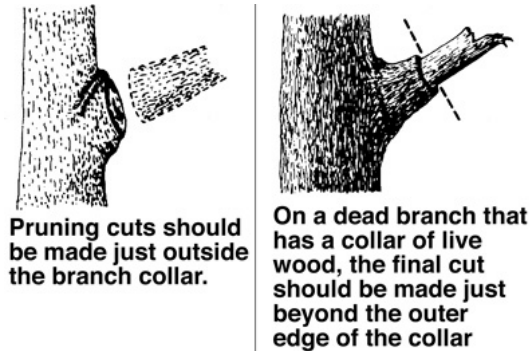
Tracks are to be maintained in the following ways that minimise environmental impact.

Tracks will vary in width and height depending on the surrounding environment and track infrastructure but should generally be maintained as per the requirements below.

Maintenance Requirements - The Aerial Corridor

- The track aerial corridor is that of which pedestrians walk through along the track.
- The aerial corridor is from the ground level up to a minimum of 2.2m height and a minimum of 1m width or to the edge of hardened surface or fencing boundary.
- The aerial corridor must be pruned to allow safe pedestrian and/or vehicle access.
- Track aerial vegetation will need to be either, pruned removed and/or sprayed so that a suitable aerial corridor is maintained.
- All branches are to be under cut then removed to avoid tearing of the bark- USE 3 STEP CUT METHOD shown.
- Branches that are pruned off shrubs and trees are to be pruned out of the aerial corridor and must be cut back to the next lateral growth point or branch collar as per the diagram.
- The branch collar will usually be located outside of the aerial corridor.

- Do not leave stubs or protruding limbs (coat hangers) on shrubs and trees pointing into the aerial corridor.



- All branches must be cut into smaller pieces, a maximum of 1m length and carefully distributed to the ground and into the adjacent bushland via placement or throwing.
- Care placing and/or throwing branch pieces must be taken to avoid native plants and particularly seedlings and also avoid placement on top of shrubs, signs and fencing.
- Avoid the piling up of branch pieces in the one spot.
- If the offending branch to be removed is the majority of or the whole shrub/tree then the whole shrub/tree may require pruning/removal. Is it obstructive to the aerial corridor causing unsafe conditions? If so, remove it.
- Some flexibility may be required to leave large limbs and/or trunks on the edges within the aerial corridor so as to minimise major localised environmental impact.
- Placement of branches across the contour may also be used in steep areas and/or where erosion is occurring from track or stormwater runoff.
- Fast growing species such as Coastal Wattle, Bitou Bush and Lantana can be pruned another 0.5m beyond the aerial corridor.
- Wherever possible weed species should be removed rather than pruned repetitively.

Maintenance Requirements - The Ground

- Track ground vegetation will need to be either cut, mowed, whipper snipped and/or sprayed so that a suitable ground surface within the width of the aerial corridor is visible and maintained.
- Trip hazards on the ground need to be identified and removed and/or mitigated.
- Trip hazards may include: Spinifex grass runners, exposed roots, sand accretion, rocks, fallen branches, worn steps, broken fencing and wire, broken glass and eroded areas.
- Holes may need to be filled in with blue metal or dirt fill and bike jumps removed.
- Large erosion areas on tracks should be reported to Council's Natural Resource Extension Officer for further remediation action.
- Where vegetation groundcovers grow over hard surfaced tracks, they will need to be sprayed if the vegetation is a risk (trips or slippery).
- Spotters and signage should be utilised when maintaining tracks to warn the public.

Maintenance Requirements - Frequency

- Tracks require pruning frequently and more often during the summer growth period and are based on the type of vegetation growing, lighting levels and after storm and windy events.
- If the tracks grass is long, snakes may hide and be trodden on.
- **Tracks should be pruned 3 three times/year. Once in November/December, then February/March and then July/August.**
- **Grass needs mowing or whipper snipping more frequently as required.**

East Ballina Aboriginal Place Protection Requirements

The East Ballina Aboriginal Place protects Aboriginal cultural heritage. No harm can occur to an Aboriginal Place or Aboriginal object. Undertake the following to ensure protection at all times.

- All workers are to be inducted about the East Ballina Aboriginal Place prior to working in it
- Maintenance works may only occur if the works are listed as exempt
- If an Aboriginal object is found or suspected, stop work at that site and contact Council's Natural Resource Extension Officer, OEH and the Jali Aboriginal Land Council.



APPENDIX D

CHECKLIST FOR BUSH REGENERATION ACTIVITIES IN THE HABITAT OF THREATENED SPECIES, ENDANGERED POPULATIONS AND EECS



Northern Directorate

Checklist For Bush Regeneration Activities In The Habitat Of Threatened Species, Endangered Populations And Endangered Ecological Communities

Background

Threatened species, endangered populations and endangered ecological communities are protected in NSW under the *Threatened Species Conservation Act 1995* (TSC Act).

It is an offence to “harm” or “pick” threatened species, populations or ecological communities, or cause “damage” to critical habitat or the habitat of threatened species, populations or ecological communities¹.

“Harm” refers to native fauna, and is defined as to:

hunt, shoot, poison, net, snare, spear, pursue, capture, trap, injure, or kill.

“Pick” refers to native flora, and is defined as to:

gather, pluck, cut, pull up, destroy, poison, take, dig up, remove or injure the plant or any part of the plant.

“Damage” is not defined but the common dictionary definition would apply.

It is a defence to a prosecution if the action was:

- authorised in accordance with a Section 120 licence or a Section 132C licence under the *National Parks and Wildlife Act* or a licence granted under Section 91 of the TSC Act (flora and ecological communities);
- authorised in accordance with a development consent under the *Environmental Planning & Assessment Act 1979*; or
- authorised by or under the Rural Fires Act 1997, or the State Emergency and Rescue Management Act 1989.

Bush regeneration activities

Areas where bush regeneration is undertaken are often the habitat of threatened species or may be an endangered ecological community (e.g. Lowland

Rainforest on Floodplain). It is understood that the intention of bush regeneration activities is to have a positive impact, however, there is a chance that these activities may adversely impact on threatened species, populations or ecological communities. This may occur where:

- a species (flora or fauna) is not known to exist on the site (e.g. cryptic species such as orchids);
- a species may be accidentally harmed or picked (e.g. by spray drift or accidental cutting);
- a species may be misidentified and is thought to be either an exotic or common native species and therefore may be removed or damaged;
- the requirements of the species, including habitat structure and components, may be temporarily adversely impacted (e.g. maintaining microclimatic conditions, connecting or sheltering habitat for fauna);

Licensing

Those undertaking bush regeneration activities may consider applying for a Section 132C licence under the NPW Act.

A Section 132C licence is issued where the NPWS considers that the proposed work is for conservation purposes.

Licence Conditions

Generally, licences are issued on an annual basis; however, shorter or longer term licences are also issued where appropriate.

The NPWS may prohibit, condition, or limit bush regeneration works in some areas where it may affect research plots. Other licence conditions may be applied after consideration of population estimates, age structure, viability and health of the population or individuals.

NSW
NATIONAL
PARKS AND
WILDLIFE
SERVICE

The Bush Regeneration Checklist

The intention of the checklist is to ensure that bush regeneration activities will **not** have a significant impact on threatened species, populations or ecological communities and their habitats. Applicants should consider attaching this standard checklist to any Section 132C licence application to assist the NPWS in assessing the significance of the proposed activity. The NPWS will assume the applicant is prepared to adhere to the guidelines in the checklist where they form part of the licence application. Detail of any proposed work additional or contrary to that described in the checklist must be provided. The NPWS then assesses the likely significance of the impact of the proposal² using the information provided in the licence application.

For the purposes of the checklist, bush regeneration is considered as all types of habitat restoration and may include such activities as manual weed removal, herbicide use, temporary damage to, or removal of native plants, planting, track work or maintenance and habitat removal or modification.

1. Threatened Species are listed under two schedules on the *Threatened Species Conservation Act*: Schedule 1 includes Endangered Species, Endangered Populations and Endangered Ecological Communities and Schedule 2 includes Vulnerable species. The *Threatened Species Conservation Act* Schedules are maintained by the NSW Scientific Committee. The most recent versions of these schedules may be obtained on the NPWS Web Site: www.nationalparks.nsw.gov.au.
2. A Species Impact Statement must be prepared where a proposed activity is assessed as likely to have a significant impact on threatened species, populations or ecological communities.
3. The Wildlife Atlas is the NPWS statewide flora and fauna database.

NPWS Checklist For Bush Regeneration Activities:

Please Note:

- 1) The checklist is provided to facilitate licence applications and to draw attention to NPWS issues of concern.
- 2) There is no requirement to use the checklist when applying for a licence. You may alternatively choose to provide details of your project and an explanation of how you will ensure there will not be a significant impact on threatened species, their habitat or on endangered ecological communities.
- 3) If you provide a negative answer using the checklist this does not necessarily mean your application will be unsuccessful. You will however need to provide a satisfactory explanation as to why you do not wish to comply with the guideline and how you will ensure there is unlikely to be a significant impact on threatened species, their habitat or on endangered ecological communities.
- 4) You may wish your licence application to cover the collection of Voucher Herbarium Specimens and Plant Material for Identification.

Management Planning:	yes	no	more info attached
The proposed activities will be in accordance with a management plan or site plan (map). <i>Please attach the plan or relevant sections of the plan or strategy to the licence application.</i>			
The project has been discussed with the relevant Landcare coordinator. <i>If not, provide details of any other professional advice you have sought, e.g. from a qualified bush regenerator.</i>			
A NPWS Wildlife Atlas database search of a 5km radius of the site has been undertaken to identify threatened flora/fauna species known or likely to occur on the site. The Wildlife Atlas is accessible on the NPWS Web Site www.nationalparks.nsw.gov.au .			See Tables 1& 2
Prior to commencing any works on site, a permit or permission will be obtained from the relevant landowner(s) or land manager(s).			
Training and supervision:			
All workers carrying out bush regeneration and associated works will be supervised by a trained and experienced co-ordinator who has completed a recognised bush regeneration course (e.g. the Certificate of Bushland Regeneration) or a minimum of 2 years bush regeneration experience. <i>If 'yes', please provide below the name and qualifications of the co-ordinator.</i> Name: Qualifications/experience:.....			See attached s132c Licence application
Other members of the group that have bush regeneration training or experience. Name: Qualifications/experience: Name: Qualifications/experience:..... Name:		See	attached s132c Licence application

Qualifications/experience:..... Name:			
Qualifications/experience:..... Name:			
Qualifications/experience:..... Name:			
All activities by workers will be regularly checked and approved by the co-ordinator.			
All workers will be informed of any threatened species or endangered ecological communities in the area or which may occur in the area and the potential impacts of activities on these species/communities. <i>e.g. vines on the edge of a littoral rainforest remnant may protect the remnant from salt-bearing winds.</i>			
	yes	no	more info attached
All workers have adequate weed and native plant identification skills. <i>i.e. all workers can identify and differentiate between weeds and native plants that occur on the site.</i>			
Workers will be familiar with the identifying features of threatened flora that are known or likely to occur in the project area. Where threatened species known from the area are similar to weed species, the distinguishing features between these will be understood prior to commencing the work.			
Access to sites			
All vehicular access to sites will be restricted to formed roads.			
Unnecessary damage to sites will be avoided. <i>e.g. avoid working in wet weather to lessen soil compaction.</i>			
Impacts on flora:			
Prior to any works being undertaken, the presence or absence of threatened flora will be determined by a thorough walking search of the area.			
All threatened flora will be tagged with highly visible flagging tape before work commences. If a number of individuals occur in a clump, that area should be marked out with flagging tape.			
Cutting or damaging of threatened flora will be avoided.			
All plants will be positively identified before they are removed (pulled, cut, poisoned etc).			
Weed removal within 2m of a threatened species will be undertaken by hand.			
To reduce the possibility of introducing plant diseases and weeds the following measures will be applied: 1. Secateurs will be sharp and cleaned with methylated spirits. 2. Footwear will be cleaned of loose soil and preferably treated with bleach between sites.			

Impacts on fauna:			
All workers will be aware of any threatened fauna that are known or likely to occur on site, and the potential impacts of the proposed activities on those species.		See	attached lists for examples
The habitat and refuge potential of weeds and rubbish will be considered prior to removal. <i>e.g. Lantana can provide cover for threatened fauna such as the Bush-hen. Dead Lantana and poisoned Camphor Laurels should, where possible, be left in situ.</i>			
Weeds will be removed gradually in areas where an infestation is extensive. <i>Ideally, 50% of weeds that may provide habitat should be left until native plant species have re-established and provide alternative refuge.</i>			
Disturbance to, and removal of rocks, logs and other potential refuge sites will be avoided.			
A herbicide registered for use near waterways will be used within 5m of waterways.			
Herbicide spraying will be prohibited within 5 metres from watercourses where threatened frogs are known or likely to occur and within a 10m radius of records of threatened frogs.			
A buffer of 1m along other watercourses will be maintained in which no herbicide will be sprayed.			
Care will be taken to minimise disturbance to shy or cryptic species. <i>e.g. the Marbled Frogmouth roosts in vine 'curtains'.</i>			
Care will be taken to minimise disturbance to the leaf litter layer.			
Reconstruction through revegetation: <i>This section does not address propagation or planting of threatened species – this activity would need to be separately addressed.</i>			
Seed collection or cuttings will be from species, populations or ecological communities other than those listed as threatened (unless licensed by NPWS).			
Prior to collecting any seed or cuttings permission will be obtained from the relevant landholder or manager of the site. <i>e.g. a licence is required to collect native plants on National Parks estate.</i>			
	yes	no	more info attached
Seed collection from any one species will be limited to less than 10% of the available crop at that site.			
Seed collection from any individual plant will be limited to less than 10% of the available crop.			
If your seed source is used by other seed collectors, has consideration been			

given to minimising any cumulative impacts to the source plants? <i>Some individual plants are known as a reliable seed source and their seed is collected extensively. This may result in – (i) a reduction in genetic diversity); (ii) an impediment to the individual's natural ability to regenerate.</i>			
When collecting propagation material from a wild population, collection will be random from as many individuals as possible across the population to ensure a representative range of genetic material is collected. Collectors will avoid selection of propagation material on the basis of physical attributes. <i>e.g. tallest, most attractive, greatest amount of seed or flowers.</i>			
Plantings will be sourced from stock of local provenance.*			
Propagated plants will be used only at the subject site. <i>i.e. excess material will only be used at other sites if it meets the provenance criteria.</i>			
A buffer of 5 metres will be maintained around all threatened plant specimens. Planting will only be undertaken outside this buffer. <i>This requirement is intended to protect the roots of the threatened plant from damage, introduction of disease or impacts of herbicide.</i>			
Care will be taken to ensure that mulch does not introduce weeds or impede natural regeneration at the site.			
Care will be taken to ensure that weeds and/or phytophthora are not introduced to a site from any plantings.			
Consideration will be given to the possible impacts of plantings on the ecological requirements of threatened species at the site <i>e.g. reduced light, competition, etc.</i>			
Species will be planted within their natural habitat and range. Plantings will be guided by the plants' local habitat preferences. <i>e.g. the species used for plantings along watercourses should be those that naturally occur in that habitat in your local area.</i>			
Herbicide use: <i>A permit from the National Registration Authority for Agricultural and Veterinary Chemicals PO Box E240, Kingston ACT 2604 may be required for herbicide use that is not consistent with conditions specified on the label.</i>	Yes	No	
A buffer of 2m will be maintained around all threatened plant specimens. Herbicide use will only be undertaken outside this buffer.			
Herbicide use will cease where there are any signs of threatened species being affected by herbicide. <i>e.g. browning off, wilting, deformed growth.</i>			
All herbicide spray operators will be capable of undertaking precise and effective weed control.			
Spray will be directed away from threatened flora.			
Herbicide will only be sprayed in suitable weather conditions when the impact of spray drift (windy) or run-off (wet) on threatened flora is minimised.			
Marker dyes e.g. 'white field marker' will be mixed with herbicide before use. <i>Marker dye enables the worker to see where the spray is landing.</i>			

Reporting and data records:			
Any new records of threatened species will be provided within three months to NPWS. These records will be in a format appropriate for entry into the Wildlife Atlas, once identification of a threatened species is confirmed by a recognised authority. <i>Wildlife Atlas cards available on request.</i>			

*Local provenance species should be regarded as those species propagated from material that has been collected from a natural wild population as close as possible to a site. For example, within the local catchment – which may be based on a local creek.

Please sign below, keep a copy for your records and attach all original pages of checklist, and any additional information, to your application form.

I, the undersigned, agree that the proposed bush regeneration activities are in accordance with all items checked above, additional information attached and the licence application form.

Name (please print)

Signature

Date

Further reading:

Buchanan, R. (1989) *Bush Regeneration: Recovering Australian Landscapes*. TAFE Student Learning publication, Sydney.

Buchanan, R. (1992) "Site assessment – a vital part of bush regeneration" in *Urban Bushland in Western Sydney*. Seminar Proceedings, Nature Conservation Council of NSW, 1992.

FloraBank (1999) *Guidelines 5: Seed collection from woody plants for local revegetation*. FloraBank, ACT.

FloraBank (1999) *Guidelines 6: Native seed collection methods*. FloraBank, ACT.

FloraBank (2000) *Guideline 10: Seed Collection ranges for revegetation*. FloraBank, ACT

Greening Australia NSW (1999) *Management principles to guide the restoration and rehabilitation of indigenous vegetation*. Greening Australia NSW, Sydney.

Harden, G. (1990-1993; 2002) *Flora of NSW, Vols 1-4*. University of NSW Press, Kensington.

Joseph, R. (1999) An integrated, systematic approach to rainforest remnant restoration. In *Rainforest Remnants – A Decade of Growth*. Proceedings of a conference on rainforest regeneration., NSW National Parks and Wildlife Service, Alstonville.

McDonald, T. (1993) Strategic plans for bush regeneration. in *Bushland in Our Cities and Suburbs Part 1: Making Planning Work*. Seminar Proceedings, Nature Conservation Council of NSW, 1993.

McDonald, T. (1994) What are we doing with ecosystem resilience and the restoration of damaged plant communities. in *Bushland in Our Cities and Suburbs Part 2: Making Bush Regeneration Work*. Seminar Proceedings, Nature Conservation Council of NSW, 1994.

NSW National Parks and Wildlife Service. (2000) *Threatened species of the lower north coast of NSW*. NSW NPWS, Coffs Harbour

NSW National Parks and Wildlife Service. (2002) *Threatened species of the upper north coast of NSW*. Vol 1. Fauna. Vol 2. Flora. NSW NPWS, Coffs Harbour

NSW National Parks and Wildlife Service. (2003) *Threatened species of the New England Tablelands and North West Slopes of NSW*. NSW NPWS, Coffs Harbour

Acknowledgements

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APPENDIX E

BEST PRACTICE GUIDELINES FOR BUSH REGENERATION PERSONNEL

- The regenerators are to ensure all tools, equipment and vehicles are to be cleaned free of weed propagules and potential pathogens, such as Phytophthora and Myrtle rust.
- If a tree on the adjacent lands is damaged, immediately assess the situation and apply appropriate level of treatment to facilitate recovery.
- Weeds are to be controlled in accordance with the Weed Control Strategy (Appendix E) or using alternative proven best practice species-specific methods.
- Procedures are to be in place to minimise potential for spillage of chemicals and any spills are to be dealt with immediately. Each vehicle should have a spill response kit.
- All herbicides use should be undertaken in accordance with the manufacturer's specifications and should be undertaken by appropriately qualified personnel. Spraying of herbicides should not be undertaken within 6 hours of rainfall and where there is likelihood of rain within 24 hours.
- Any herbicides to be used near waterways should be registered for use in and around waterways, including Roundup Bioactive™ and Weedmaster 360™. These products have improved surfactants, making them safer to use near waterways.
- Personnel undertaking bush regeneration activities should have completed a minimum Certificate II Conservation and Land Management course and also hold a current ChemCert Accreditation card for the safe application of chemicals.
- The regulatory body for herbicide use is the Australian Pesticides and Veterinary Medicines Authority which administers the registration of Agricultural and Veterinary Chemicals (AGVET) in Australia. Workers should regularly consult the AGVET Permits to check on the latest updates.



APPENDIX F

BALLINA SHIRE COUNCIL DAILY RECORD SHEET



Ballina Shire Council **BUSH REGENERATION RECORD SHEET**

ZONE / LOCATION: _____ Date: ____/____/____

NAME OF PERSONNEL / VOLUNTEER (S)	time start	time finish	signature	total hrs worked
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				

(More space provided on back of form for additional personnel/volunteers)

Daily total hours worked

Weather Conditions: (temperature, wind speed / direction, prevailing rain, cloud cover etc.)

Work Complete: (area, distance, number of plants, comments on previous works, monitoring / follow up or reminders etc.)

Did any Accidents / Incidents / Near Misses occur etc? (please circle) YES / NO (if YES please attach incident statement or give brief report)

Other Comments or Observations:

HERBICIDE APPLICATION RECORD SHEET (for chemical use only) Permit No. Used: _____

The Pesticides Amendment Regulation as part of the Pesticides Act, 1999 requires responsible personal to complete this form within 24 hours of herbicide application, and then lodged with Ballina Shire Council to be filed for 3 years.

NAME OF CHEMICAL CERTIFICATED WORKER (S)	spray time start	spray time finish	signature
1.			
2.			
3.			

TARGET WEED SPECIES: (insert common or botanic names) _____ Date of Chemical Application: ____/____/____

HERBICIDE APPLIED: (insert trade or chemical name) _____

CONCENTRATION USED: (enter as ratio e.g. 1:15) _____ **OR** _____ gm/ml per _____ litres
+ _____ gm/ml per _____ litres (if cocktail)

VOLUME APPLIED (total amount for this session): _____ litres

ADDITIONAL CHEMICAL AGENT(S) APPLIED (insert name and application rate): _____

METHOD OF APPLICATION: _____

Location of Work: (Describe area where chemical applied or mark on attached map. Incl. nearest watercourse or lake / pond)

PRECAUTIONS TAKEN TO PROTECT SUSCEPTABLE THREATENED / VULNERABLE SPECIES:

Species Name(s):	Precautions Taken:
------------------	--------------------

Insert Bush Regeneration Site Map Here:

ADDITIONAL PERSONNEL / VOLUNTEER (S)	time start	time finish	signature	total hrs worked
11.				
12.				
13.				
14.				
15.				
16.				
17.				
18.				
19.				
20.				



APPENDIX G

WEED CONTROL GUIDELINES



TABLE G1

CONTROL METHODS FOR WEED SPECIES RECORDED WITHIN THE VMP PROJECT AREA

Species	Control Methods
Aerial yam Air potato	Vines: scrape and paint (G 1:1.5), leaving stem intact; shoots: spray (G 1:200 + MM). Dig up tubers and remove from site (time-consuming but highly recommended).
African tulip tree	Saplings: cut, scrape and paint (G 1:1.5); trees: frill/inject (G 1:1.5); seedlings: spray (G 1:200).
Agapanthus	Hand-pull/dig.
Bitou bush	Larger Stems: cut, scrape & paint or Frill/Inject (G 1:1.5) Bushes: Overspray or cut down and spray regrowth during autumn (G 1:300) Seedlings: Hand-pull or spray
Brazilian cherry	Shrubs: Cut, scrape & paint (G 1:1.5) or Frill/Inject (G 1:1.5). Seedlings: Spray (G 1:50 + MM + surfactant)
Broad-leaved pepper tree	Saplings: Cut, scrape & paint (G 1:1.5) Trees: Frill/Inject (G 1:1.5) Seedlings: Hand-pull or spray (G 1:50 + MM + surfactant)
Cadaghi	Seedlings: hand-pull or spray (G 1:100 + penetrant); Small trees: Cut, scrape & paint (G 1:1.5) or Frill/Inject (G 1:1.5).
Camphor laurel	Seedlings: hand-pull or spray (G 1:75 + penetrant); Saplings: Cut, scrape and paint or basal bark (G 1:1.5); Trees: Drill (G 1:2.5)
Canna lily	Dig out entire plant or cut/slash and spray regrowth (G 1:200 + surfactant). Collect and bag seeds.
Cape ivy	Vines: hand-pull and remove from canopy; runners: roll up and hand to dry; stems: scrape and paint (G1:1.5 + MM); regrowth and seedlings: spray (G 1:200 or G 1:200 + MM + penetrant)
Castor oil plant	Shrubs: cut, scrape and paint or frill/inject (G 1:1.5); seedlings: hand-pull or spray (G 1:200)
Century plant <i>Agave</i> sp.	Dig out plant by hand or machine; cut and paint near ground (G 1:1.5) or spray (MM).
Climbing asparagus fern	Rhizomes: crown and hang to dry; stems: pull down and wind up and spray or cut and drip (G 1:1.5 + MM); spray regrowth (G 1:100 +MM)
Climbing nightshade	Seedlings: hand-pull; vines: cut, scrape and paint (G 1:1.5); regrowth and seedlings: spray (G 1:200 OR G 1:200 + MM).
Coastal morning glory	Hand-pull, roll up and hang to dry; Cut, scrape & paint (G 1:1.5) the larger stems, roots and nodes. Spray regrowth and ground layer (G 1:100 + MM)
Coastal tea tree	Trees: Frill/inject (G 1:1.5 + MM); Saplings: cut, scrape and paint (G 1:1.5 + MM); Seedlings: hand-pull or spray (G 1:100 + MM +

Species	Control Methods
	penetrant)
Cocos palm	Cut below lowest frond. Hand-pull seedlings.
Coral tree <i>Erythrina</i> spp.	Frill/inject (G 1:4 + MM) or cut and paint stumps (G 1:4 + MM); stack any fallen branches above the ground to dry and prevent re-sprouting. Follow up frill/inject sprouted branches (G 1:4 + MM) or spray regrowth (G 1:50 + MM). Trial drilling the base of large branches as well as the trunk and injecting (G 1:4 +MM) to kill branches before they fall to the ground and re-sprout.
Crofton weed	Hand-pull and hang to dry or spray G 1:50 + surfactant.
Duranta	Shrubs: cut, scrape and paint or frill/inject (G 1:1.5) or spray (G 1:100 glyphosate).
Fishbone fern Giant fishbone fern	Hand pull or crown. Spray glyphosate (G 1:100) + MM
Glory lily	Young shoots: spray (G 1:200 + MM). Best results in Oct-Nov and by using a penetrant and surfactant.
Golden rain tree	Stems: cut, scrape and paint (G 1:1.5 + MM) or spray (G 1:200 + MM); seeds: collect, bag and remove).
Ground asparagus fern	Crown or spray (G 1:75 + MM + penetrant OR MM + penetrant) Most effective if done between flowering and berries forming. Non chemical: mechanically crown out
Guava	Seedlings: Hand-pull. Trees: Stem inject (MM handmix)
Hairy commelina	Spray with (G 1:50 + MM + penetrant). 2-3 applications may be necessary. Rake and compost under black plastic.
Ivy	Stems: Cut, scrape and paint (G 1:1.5); spray (G 1:100 + MM)
Lantana	Stems: Cut, scrape & paint (G 1:1.5); bush-hook/slash and spray regrowth with glyphosate (G 1:100); over-spray (G 1:100 + penetrant) thoroughly soaking both foliage and stems or splatter gun (G 1:9 + penetrant)
Loquat	Saplings: cut, scrape and paint (G 1:1.5); trees: frill/inject (G 1:1.5); seedlings: hand-pull or spray (G 1:200 + MM OR MM only). Tends to be herbicide resistant.
Madeira vine	Ascending stems: scrape and paint (G 1:1.5 + MM); tubers gouge, scrape and paint; ground infestations: spray (G 1:50 + MM), hand-weed tubers and small vines; bag and compost or place in bin.
Mother-in-law's tongue	Hand-pull or dig. Spray (G 1:50 + MM). May require reapplication at 3 monthly intervals.
Mother-of-millions Resurrection plant	Hand-pull and compost or place in bin; plantlets: spray (G 1:50 + MM + penetrant OR MM + penetrant).
Mulberry	Trees: frill/inject (G 1:1.5). Stack cut branches above the ground to dry; saplings: cut, scrape and paint (G 1:1.5); seedlings: spray (G 1:200)
Murraya	Shrubs: cut, scrape and paint or frill/inject (G 1:1.5); seedlings: hand-pull or spray (G 1:100)

Species	Control Methods
Ochna	Stems: Cut, Scrape & Paint or Scrape & Paint or Frill/inject (G 1:1.5 + MM OR MM only handmix) Seedlings & regrowth: Spray (G 1:50 + MM + surfactant)
Paddy's lucerne	Hand-pull or spray (G 1:100 + penetrant) Stems: Cut, scrape and paint (G 1:1.5)
Passionfruit vines	Stems: Cut, scrape & paint (G 1:1.5); Regrowth: spray (G 1:75 + MM + penetrant).
Pennywort	Dab each leaf with a drop of hand mix (G 1:1.5 + MM) using a bottle applicator.
Philodendron	Soft-leaved varieties – cut stem high and low. Monitor and regularly remove newly formed adventitious roots. Fleshy-leaved varieties – trial scraping stems and painting with (G 1:1.5 + MM).
Pink polkadot plant	Hand-pull or crown; spray (G 1:50 + MM)
Prickly pear	Cut and paint or drill (G 1:1.5 + MM) or spray (G 1:50 + MM)
Rubber tree	Frill/inject (G 1:1.5) or cut and paint stumps (G 1:1.5). Stack cut branches above the ground to dry. Follow up frill/inject sprouted branches (G 1:1.5) or spray regrowth (G 1:200).
Senna (Cassia)	Seedlings: handpull or spot spray (G 1:100 +MM + surfactant) Shrubs: cut, scrape & paint stump, or stem inject (G 1:1.5 + MM)
Silver-leaf desmodium Green-leaved desmodium	Hand pull or crown. Spray (G 1:50) + surfactant. Cut, scrape & paint tuberous roots (G 1:1.5). Collect and bag seeds.
Singapore daisy	Spray MM (1.5g/10L). Repeated treatments required.
Siratro	Hand pull or crown. Spray (G 1:100 + MM)
Slash pine/Radiata pine/Norfolk pine	Seedlings: hand-pull; Saplings and trees: cut close to ground or trial Frill/Inject (G 1:1.5) ensuring thick bark is penetrated. Ringbark.
Soft herbs /grasses/annuals	Spray (G 1:100).
Tecoma, Yellow bells	Stems: cut, scrape and paint (G 1:1.5 + MM) or spray (G 1:200 + MM); seeds: collect, bag and remove).
Tobacco bush	Seedlings: hand-pull or spray (G 1:100 + MM + penetrant); Shrubs: Cut, scrape & paint (G 1:1.5 + MM) or Frill/Inject (G 1:1.5 + MM).
Turkey rhubarb	Dig up tubers and bag. Spray (G 1:50 + MM + penetrant).
Umbrella tree Dwarf umbrella tree	Seedlings: Hand-pull Trees: Scrape and paint or Frill/Inject (G 1:1.5 + MM). Locate any cut stems or seedlings off the ground and scrape and paint.
Yellow oleander	Stems: Cut scrape and paint (G 1:1.5 + MM) or frill/inject (G 1:1.5 + MM)

Species	Control Methods
Oleander Hibiscus Golden wreath wattle	Seedlings: Hand pull or spray (G 1:200 + MM + surfactant)

NOTES

- G Glyphosate
- MM Metsulfuron methyl
- (G 1:γ) Numbers in brackets are glyphosate dilution ratios
- MM ratios Spray application rate of 1.5g per 10L of water;
Hand mix application rate 1g/L with glyphosate or 2g/L without glyphosate
- penetrant Pulse is the recommended penetrant
- surfactant Brushwet is the recommended surfactant

Marker dye, such as Envirodye, should always be used when spraying.

Sources

Big Scrub Rainforest Landcare Group (2000) Common Weeds of Northern NSW Rainforests. BSRLG.
 Ensbey (2011) NSW Department of Primary Industries, Noxious and Environmental Weed Control Handbook 5th Edition.

Details of weed control methods

(Adapted from www.mullum.com.au/wilsonscreeklandcare/weeds/weeds_techniques.html)

Cut, Scrape and Paint

This is suitable for coppicing and suckering weeds such as Camphor, Bitou bush and Privet, or any weeds which are too large for hand-pulling or have long taproots such as Ochna. This method provides for no soil disturbance and weed eradication is successful.

1. Cut the stem/s 1-2 cm above ground level using either secateurs, loppers, a pruning saw or a chainsaw, depending on the thickness and toughness of the stem.
2. Immediately apply glyphosate™ (generally 1:1 or 1:1.5 or 100%) to the cut surface of the stem or, with medium and large trees, to the outside edges of the cut surface. (Herbicides need to be applied immediately after the cut is made because the ability of the plant to transport fluids ceases as soon as the tissues are severed.)
3. Search through the leaf litter to locate any exposed stem or root surface. Scrape the exposed stem or root surface slightly with a knife until a light green coloured layer is exposed (Do not scrape too deeply.) Apply the herbicide to the scraped sections, either with a brush, injector or spray bottle.
4. Follow up as required.

Scrape and Paint

This is a variation of the cut, scrape and paint technique described above, the difference being the plant is not cut but left intact and scraped. This technique ensures the translocation of the herbicide throughout the entire plant.

1. Scrape several sections of the stem along one side only, in lengths of at least 30 cm. The stem needs to be scraped firmly, exposing the fibres and/or light green coloured layer. Be careful not to sever the stem completely.
2. Each scraped section is immediately painted, prior to scraping the next section, with the recommended diluted glyphosate for the particular weed.

Frill/Inject

Use a small axe to cut into the sapwood at a downward angle. Three rows of cuts are made in a brick pattern around all multi-branches, low to the ground. 1 to 3 cuts are made before immediately injecting the cuts with a glyphosate mix dependent on tree type. The cuts need to be filled slowly to avoid chemical spills. Frilling is easy to use in readily accessible spots. Drilling may be more suitable for hard to get at multi-stems.

Penetrant denotes use of penetrant such as Pulse®. Penetrant facilitates the transfer of the herbicide through the surface tissue and is often used for plants with waxy leaves. Manufacturer's instructions should be followed when using any penetrant.

APPENDIX H

General Guide to Planting

1. STOCK

Only use fully sun hardened plant stock, and not stock direct from a shade house. Tube stock is the best as it is a cost effective plant container size, light in weight and easy to handle. Choose plants that are not root bound, do not have yellowing or discoloured leaves and that have a strong stem. Seedlings should be about 30cm in height.

Seedlings should be ordered from a local nursery 6 months in advance and the need for local provenance emphasised.

The nursery should ensure no plants showing signs of Myrtle rust are delivered to the site.

2. SPACING

Random spacing is the usual planting pattern to obtain a natural effect, rather than lines or grids. Trees are typically planted at 1 to 2m spacings. The positioning of plantings should take into account any existing trees and any natural regeneration occurring in the planting area.

3. PREPARATION OF THE SITE

Remove any grasses and weeds completely at each specific planting location in a 1m diameter circle, either manually or chemically. When the weeds/grass cover have died (after about 3 weeks if spraying) at each location planting can begin. Dig a hole in the centre of the circle 20 cm deeper than the plant container and twice as wide. Tools usually used for digging holes are augers, shovels or mattocks. The soil at the base and sides of the hole should be rough and loose to allow root penetration. Water the plants well before planting to ensure a moist root ball.

4. PLANTING

Place a generous amount of water into the hole before planting (2-4 litres if the soil is dry), as losses are reduced by planting into and providing a moist root zone. Tap the plant out of its container and loosen any pot bound or circular roots. Prune the roots if they are very bound up. Put the plant in the hole with the water and fill in with loose crumbly soil. Firm the plant in well with the feet or hands. This is very important for settling the plant roots in, and to provide a stress free start for each plant.

5. FERTILISING

For specific plant species apply approximately one handful of low-phosphorus or “native” fertiliser, preferably in the form of slow-release pellets. Place the fertiliser on the soil surface following planting, but not too close to the stem. No fertiliser is to be used on Coast banksia.

6. WATER CRYSTALS

The use of water crystals should be employed when necessary, ie: on rocky sites, west facing dry slopes or during periods of drought. Soak water crystals and place a generous handful in the base of the hole prior to planting.

7. MULCH

Individual trees should be mulched. Mulch is basically any material that can cover the bare earth



and is essential for water retention and weed suppression. The usual method of mulching is to lay the mulch material in a 0.5m to 1.0m diameter area around the plant. Take care to mulch right up to the stem, but not too heavily. If a gap is left between the stem and the mulch weeds will grow from the gap in direct competition with the plant. Only weed and seed free mulch varieties that may include woodchip and hay bales are to be used.

8. TREE GUARDS/FENCING

Tree guards or in some cases fencing should be employed where browsing fauna are considered a problem.

9. WATERING

Plants should be watered every few days for at least a fortnight following planting if there is not sufficient rain. Extra watering may be necessary if dry conditions prevail after planting.

Adapted from Greening Australia (NSW) Inc. North Coast Regional Office. (Undated) **Reforestation: Why and How.** <http://www.nor.com.au/environment/greenwork/refinfo.htm>.

APPENDIX I
SITE PHOTOS



Zone 1a

The exotic species *Hydrocotyle bonariensis* spreading through foredune area at Lighthouse Beach (around track No. 68).



Zone 2a

Dumping of garden waste at the western end of Zone 2a.



Zone 2c
Area of
Resurrection
plant along the
foreshore which
should be
controlled.



Zone 2c
Minor erosion
along the
foreshore of
Shaws Bay
opposite the
North wall.



Zone 3a
Glory lily
infestation
located on
western side of
stairs.



Zone 3c
Vegetation
dump at end of
Bayview Street,
large Madeira
infestation.



Subzone 3f
Dumping site below reservoir car park showing recent weed control works in area.



Subzone 4a
Small infestation of Madeira around base of Pandanus tree.



Subzone 5a

Dense Ground asparagus fern dominates the ground layer below Coastal cypress pine.



Zone 6d

Madeira infestation along Norfolk Avenue.



Zone 7a
Roadside embankment requires weed control and additional plantings to replace losses.



Zone 8c
Erosion occurring along a storm water drain extending from The Coast Road