From: Alison Turner
Sent: Friday, 29 July 2016 8:26 AM
Subject: Media Release - Consultation on Draft Coastal Management Plan

Shoalhaven City Council

Media Release

28 July 2016

Further consultation to be undertaken on the Draft Coastal Zone Management Plan

Shoalhaven City Council is inviting the community to provide further comment on the draft Coastal Zone Management Plan and supporting documents.

The draft Coastal Zone Management Plan has previously been provided to the community for comment and has been used by staff since its creation as a guide to the management of the City's coast, estuary and flood management activities. Additional comment is sought from the community prior to submitting to document to the State Government.

Mayor Joanna Gash said, "Shoalhaven City Council is bordered by one of the most picturesque and pristine coastlines on the entire eastern seaboard covering 109 beaches. Living on the coast brings about unique challenges and opportunities which the plan addresses."

"As part of the State Government Coastal reforms, Councils must provide a Coastal Zone Management Plan to the Minister for Planning, to enable Council to apply for grant funding."

"This funding is essential for Council to undertake works that protect these environments and our community."

"It is important that local residents take the opportunity to read the draft plan and have their say on the proposal" said Clr Gash.

The plan will be available on the council's website www.shoalhaven.nsw.gov.au together with a number of Coastal Management supporting documents. Documents can be viewed until Monday, 8 August 2016.

Comments can be made in writing to the General Manager, PO Box 42, Nowra NSW 2541 or by emailing council@shoalhaven.nsw.gov.au by the close of business on Monday, 8 August 2016.

** End **

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ATTACHMENT B

2 June 2016

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Dear Kelie,

RE – Draft Collingwood Beach Dune Vegetation Management Plan

Thank you for providing the resolutions adopted at the SCC meeting held on Tuesday 24 May 2016. While we support the proposed variations i) and iii), we cannot support the second variation:

ii) Zone 5 prune trees and tall shrubs to a height 1m-1.5m

The existing protocol specifies a minimum height of 1.5m. For trees and tall shrubs, we consider this already a very low height. At a lower height than this:

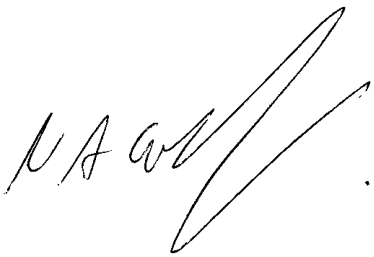
- The risk of tree mortality increases. Additional tree mortality is not desirable.

Furthermore, this could further reduce tree root penetration, resulting in less dune stability. In this case, the zone becomes more susceptible to extreme weather conditions that could result in adverse impacts to private and public assets as well as the ecological values of the reserve.

For these reasons we would like to remove our branding (Logo) from the modified report prior to public exhibition so it is clear that the suggest protocol (iii) is not at the suggestion of NGH Environmental.

We would like to further clarify that we consider the current plan to be very much a compromise in terms of accepting some level of risk to dune stability and sustaining ecological function, to ensure that views are maintained and therefore that the plan has local support. We do not recommend further changes that add to the existing level of risk.

Yours sincerely,



Nick Graham-Higgs
Managing Director

Ph 0427 260 819

NGH Environmental

Dune Vegetation Management Plan

COLLINGWOOD BEACH, NSW

JUNE 2016

CONTENTS

TABLES

FIGURES

1 INTRODUCTION

1.1 BACKGROUND

The dune vegetation at Collingwood Beach, Vincentia, has been the subject of varying public opinions for many years. There has been unapproved tree removal and poisoning of vegetation through the years. Shoalhaven City Council's (SCC) tree vandalism signs have not been effective in deterring offenders from committing further damage. SCC decided to move towards a more collaborative approach to manage the dune vegetation vandalism issue and organised a forum at Collingwood Beach with the view to establishing a Reference Group. The aim of the Reference Group was to develop a set of recommendations to help guide the restoration and future management of the Collingwood Beach dune vegetation system. This Dune Vegetation Management Plan (DVMP) for the Collingwood Beach dunes aims to primarily address the objectives developed by the Reference Group, which are:

1. The dune vegetation needs to be diversified by natural seeding and planting of local native species to support a healthy and resilient dune system; and
2. The dune vegetation needs to provide a wedge effect to ensure the retention of sand on the beach and to protect assets (public and private) located at the back of the dune; and
3. The dune management needs to be managed in a way that maximizes filtered views at appropriate locations; and
4. The dune vegetation provides from the walkway and from the beach a range of experience, with filtered views, thickets, healthy vegetation, tall occasional shade trees; and
5. The dune vegetation needs to be managed and maintained in a sustainable way, meaning it will need to be legally, financially and environmentally acceptable for present and future generations.

In addition to the reference group's objectives, this DVMP also aims to address additional expectations of key stakeholders identified through the consultation process. This includes considerations for the opinions of near residents, community groups, the broader local community, owners of holiday houses, tourists and SCC, who have the responsibility of managing the dune vegetation in an environmentally and financially sustainable manner.

2 PURPOSE OF THIS PLAN

2.1 PHYSICAL SCOPE OF THE PLAN

This DVMP targets vegetation within the Council Reserve, located seaward of private properties and roads between Susan Street in the south and Iffracombe Street in the north (the study area). The study area is approximately 4.6 hectares. It is 1.5 kilometres long with an average width of approximately 30 metres (refer to Figure 2-1 and mapping in Appendix A).

2.2 AIM

This DVMP provides a framework for managing the vegetation within the study area in a sustainable manner to achieve a positive outcome in terms of both protecting the health and resilience of the dune system and meeting the desires and expectations of the community and other key stakeholders.

In considering the specific objectives of the plan (listed in Section 1.1) this DVMP aims to provide a compromise solution which can be supported by both Council and the broader community.

2.3 DURATION OF THE PLAN

The DVMP is intended to be implemented on a five-year trial basis and would be reviewed after five years.

2.4 STRUCTURE OF THIS PLAN

Key elements of this plan include:

- The results of community consultation used to develop the plan
- Key legislative requirements of relevance to the plan
- Existing vegetation structure and composition in the study area
- The role of vegetation height and root zones to manage dune systems
- General principles to guide the delineation of vegetation management zones
- Management zones overview
- Detailed management actions for each management zone

A map set is included to show where each zone applies, in Appendix A.

The three management options presented to the community are included in Appendix C, for reference. The fact sheets developed to support the options are also included in Appendix C.

2.5 KEY INFORMATION SOURCES

Key information sources referenced in preparing this plan included:

- 17 documents pertaining to geomorphology and dune stability. This included site specific survey data from Macquarie University as well as flyers regarding dune processes and the need for dune management.
- 6 documents pertaining to revegetation including the Coastal Dune Management Manual (DLaWC 2001), a selection of dune plants used for dune rehabilitation, a selection of Macquarie University student reports on dune management.
- 20 documents pertaining to community interaction with the reserve and dune management. This included Council briefings, aspirations of local community members regarding the planting, information related to vandalism signage and surveys of the community regarding this issue.

While few documents could be directly referenced in the plan, the material formed an important context in developing management activities to meet the DVMP objectives. Specifically, it assisted in developing the three broad management options and fact sheets that were taken to the community to seek feedback that then informed this plan.

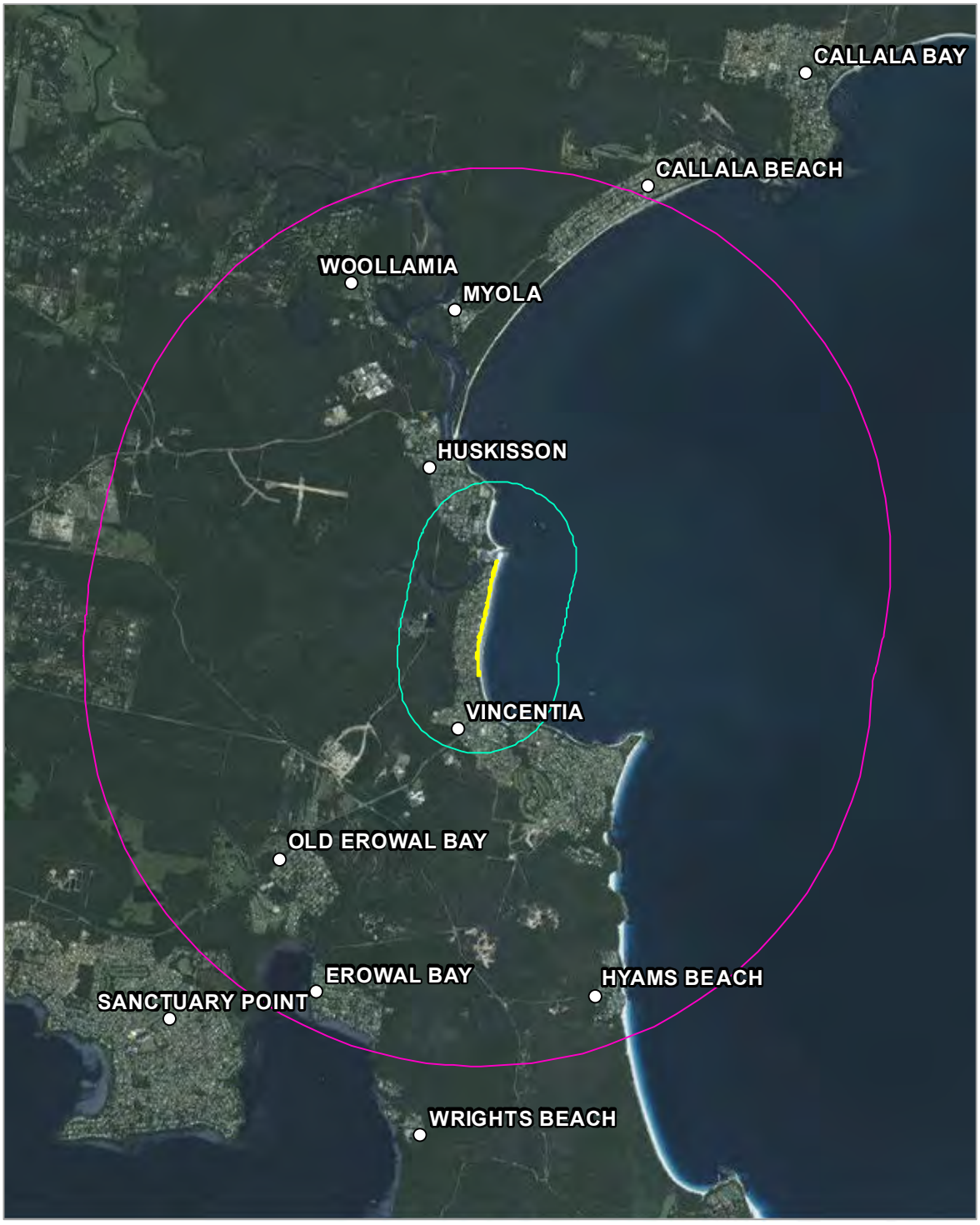


Figure 2-1 The study area in the context of the locality

3 CONSULTATION

Vegetation management must be supported by the community to be effective (Beardsmore, et al. no date). The SCC recognised this in establishing a Reference Group to assist in seeking community input into the DVMP for Collingwood Beach. Community consultation is particularly important for this project. Poisoning of trees (tree vandalism) has occurred within the Council reserve and litigation has proved expensive and deterrent signage unpopular, with the local community.

Development of a vegetation plan that reflects the values of the community was undertaken by:

- Establishing a Reference Group which would act to frame the scope of the DVMP and would act as a conduit to the broader community.
- Seeking broader community input, throughout the development of the plan.

This section outlines consultation activities that were undertaken and summarises the results of the consultation. How community feedback was included within the DVMP is also included.

3.1 REFERENCE GROUP INPUT

A Reference group was established to assist in the development of the DVMP for the Collingwood Beach. They developed the objectives detailed in Section 1.1.

As well as developing the objectives for the study, the Reference Group was involved in other aspects of the project, as follows:

- Meeting with consultants at the inception meeting to explain key issues regarding the project and be informed of the time line and steps for implementation of the plan.
- Providing input into the community consultation strategy and community consultation materials developed for the project.
- The draft VMP will be presented to the Reference Group and further comments addressed after public exhibition of the draft, in finalising the VMP.

3.2 COMMUNITY INPUT

3.2.1 Engagement activities

The community consultation materials developed for the project included:

- A set of three fact sheets, to explain key issues important to formulating a DVMP at Collingwood Beach. The topics for the fact sheets were developed after identification of knowledge gaps or commonly misunderstood issues that were important to the management of the reserve.
- A trade off poster, to explain why some dune vegetation management options did not achieve a suitable compromise between the competing objectives and could not be considered further.
- A set of three broad vegetation management options, to gauge public opinion. The options centred on management of trees and tall shrubs; thinning or planting to achieve specific tree densities, under-pruning to allow low level views beneath the tree canopy, hedging to allow views over the top of vegetation. The options considered together showed that trade-offs were required between key functions of the reserve: dune stability, views of the bay, natural habitat and aesthetics. The three options presented are included as Appendix C.

A 'kiosk' event was held over two days to engage with the broader community in the project. The kiosk event was held at the end of Berry Street on:

- Friday 6th November 1pm to 7pm and
- Saturday 7th November 8am to 11am

To advertise the event:

- Banners were placed at the intersection of Berry and Elizabeth Drive, Vincentia.
- A media release was developed
- Letter box drop (Vincentia-Huskisson)
- Mail out to non-residents along Collingwood Beach
- Email Collingwood Beach Dune Vegetation Reference Group.
- Emails to the identified interest groups
- Email Central NRFMC members
- Media release
- Eight signs along the cycleway one week prior to the event
- Signs /banners on the beach and cycleway during the event
- Council's Website
- Posters at the Vincentia shopping centre

On Friday 6th November, four SCC council staff and two NGH Environmental consultants were present to discuss the project with the community. On Saturday 7th November, three SCC staff attended. The staff and consultants discussed the vegetation management options with the community, the various trade-offs required to find a supportable plan and encouraged community members to submit feedback on the options.

3.2.2 Results of consultation

Kiosk

Approximately 95 people attended the event on Friday 6th November. Over 90 people attended the event on Saturday 7th November. Attendance (approximately 190 in total) was relatively spread out during the events, allowing individual conversations to focus of issues of interest to the attendees.

Attendees include near neighbours, cycle path users, local residents and visitors to the area. Polarisation of viewpoints was noted during the event, specifically regarding the amount of tree cover that attendees thought was appropriate. Very positive feelings for the area were noted. For many people this centred on views of the bay, both from residences and from the walkway.

Strong feelings were noted regarding vandalism, council signage and litigation regarding vandalism. It was evident that management of the reserve is of great interest and that many people feel strongly about the history of the site and the options for management of the area. It was noted that several adjacent land owners volunteered their time to assist with management activities such as pruning, given the benefits of having maintained vegetation at their boundary. Additional issues raised that were outside the scope of the DVMP but of interest to attendees included the removal of dead trees within the reserve, the removal of vandalism signage and the potential to install street furniture such as seating and viewing platforms along the walkway.

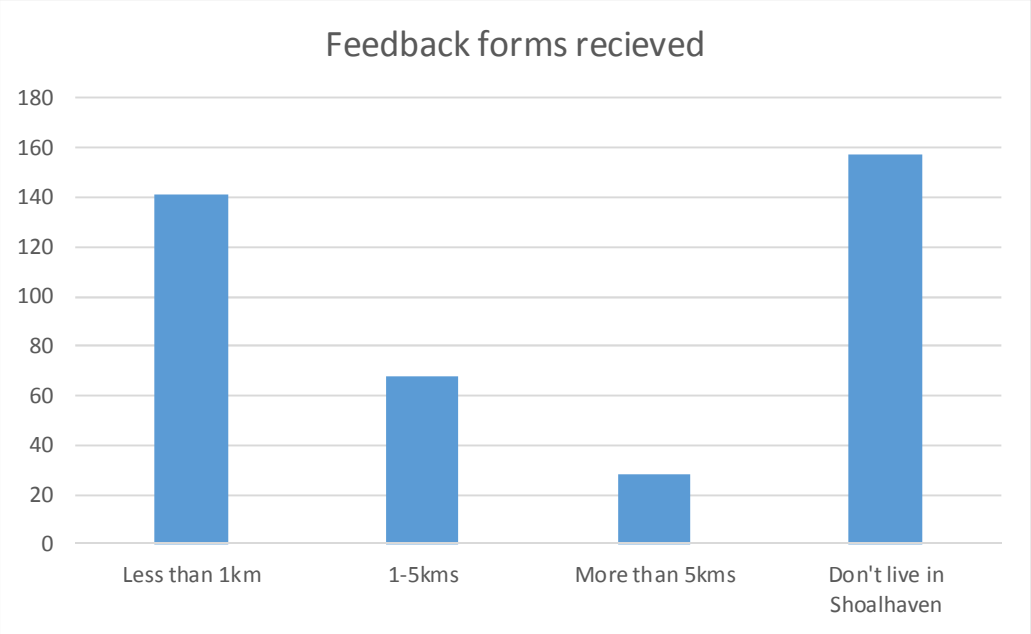
Feedback forms

394 completed feedback forms were submitted by the cut off period. To be counted, these forms needed to include a preferred option and state the respondents proximity from the reserve, allowing the analysis below. (Several additional forms were received that did not contain this information). Feedback forms were grouped by the respondent's proximity to the reserve, as this was considered to have a bearing on how the changes to dune vegetation may affect the respondent. The four categories were:

- Less than 1km: These respondents would be most impacted by current and proposed management practices. Their houses are designed to take in the views to the east, which look over the reserve. Due to their proximity, they are expected to have relatively regular views of the reserve and high use of associated cycle path and beach accesses and therefore would be most impacted by changes in the reserve.
- 1-5km: These respondents may be highly impacted by current and proposed management practices. They live close to the reserve and are generally expected to have relatively high use of the area.
- More than 5 km: These respondents may be moderately impacted by current and proposed management practices. Several locals attending the kiosk noted they use the cycle way to access local shops, as well as recreationally.
- Don't live in the Shoalhaven: These respondents may not be affected by current and proposed management practices every day, but are likely to be periodically affected, such as during seasonal recreational use of the area. They may own property in the area and be concerned about management issues.

These proximity boundaries are displayed on Figure 2-1.

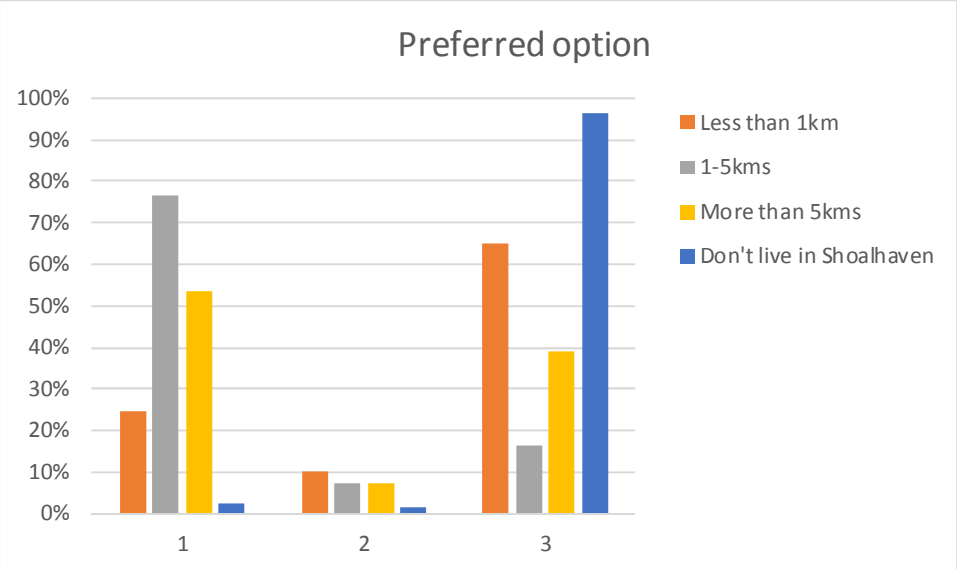
Most feedback forms were completed by respondents that were either less than 1km from the site or not local to the Shoalhaven. This demonstrates a good level of participation by residents who would be most impacted by the management of the reserve. It also demonstrates that there is keen interest by the persons who generally reside outside the local area.



Distance from beach	Less than 1km	1-5kms	More than 5kms	Don't live in Shoalhaver	Total
Respondents	141	68	28	157	394
Percentage	36%	17%	7%	40%	100%

Figure 3-1 Number of submitted feedback forms, categorised by proximity from the study area

The preferred vegetation management option of each proximity group is shown and discussed further, below.



Favourite Option	Less than 1km	1-5kms	More than 5kms	Don't live in Shoalhaven
1	25%	76%	54%	3%
2	10%	7%	7%	1%
3	65%	16%	39%	96%
Totals	100%	100%	100%	100%

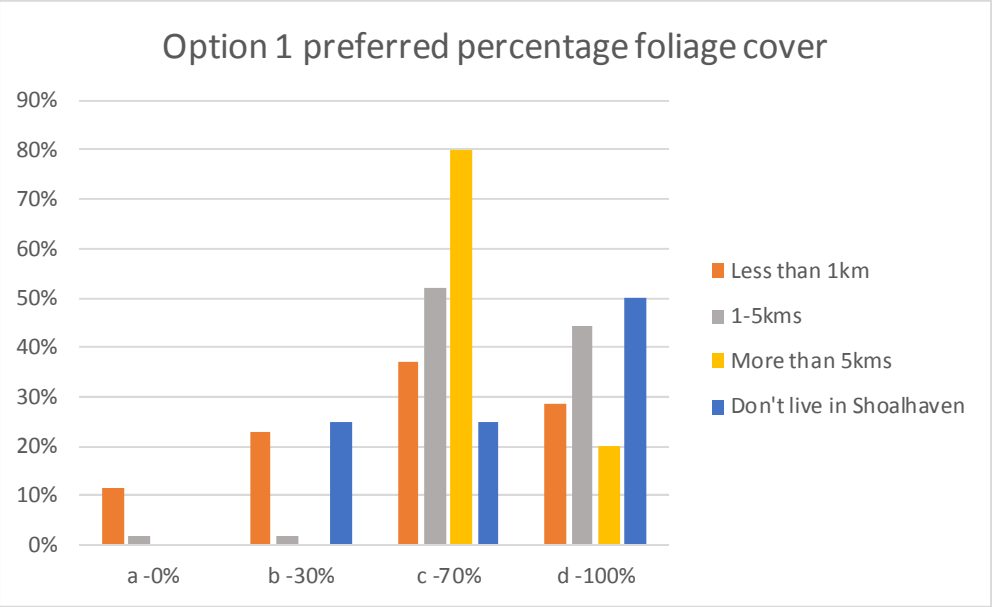
Figure 3-2 Preferred management option, categorised by proximity from the study area

It is noted that a very high number of forms were submitted by respondents outside the Shoalhaven. A great many of these were submitted by family members of local residents. All completed forms submitted by the cut-off date have been considered in the analysis.

Option 1: Banksias maintained at different densities in different areas: 0%, 30% 70% and 100% density. Low, medium and tall shrubs in between

This option received some support from most proximity groups. It was the preferred option for residents who reside 1-5km and more than 5kms from the study area.

As this option involved a range of densities, it is important to consider the breakdown, below. This shows higher density of tree cover was preferred by most proximity groups, when selecting this option.



Option 1:	Less than 1km	1-5kms	More than 5kms	Don't live in Shoalhaven
a -0%	11%	2%	0%	0%
b -30%	23%	2%	0%	25%
c -70%	37%	52%	80%	25%
d -100%	29%	44%	20%	50%
Totals	100%	100%	100%	100%

Figure 3-3 Preferred tree density in Option 1, categorised by proximity from the study area

Those that liked this option cited ecological and tourism benefits, wind protection and shade, best dune protection, low cost and stated it was the most natural looking option.

Concerns related to this option included fear that vandalism would continue, safety in areas with dense trees, creation of a barrier in areas with dense trees, difficulties in agreeing on and maintaining set densities (some respondents also said this option was too complex and difficult to understand), loss of water views and associated land value implications for adjacent residences, inequity of impact to adjacent residences (some residents would retain views and some residents would lose views of the bay).

Option 2: Lift the canopy of existing and naturally regenerating Banksias. Remove tall shrubs.

Option 2 was least preferred by all proximity groups.

Those that selected this option noted it was a good compromise option, preserving tree cover and shade, providing a feeling of safety, dune stability and views of the water.

Those that disliked it cited the following concerns: expense, too artificial looking, loss of lower strata vegetation, birds too high to be seen, not enough views of the water, not enough separation between residents and the beach – leading to disputes.

Option 3: Restrict the height of naturally occurring Banksia trees and tall shrubs (shrubs up to 3 m).

Maintaining a hedge like vegetation structure was the preferred option for residents <1km and for respondents from outside the Shoalhaven; 65% of residents <1km from the reserve selected this option, and 96% of respondents from outside the Shoalhaven.

Those that selected this option noted it was the best option to restore views along the walkway and for adjacent residents and the most likely option to stop ongoing tree vandalism. Many respondents noted the 3m height of tall shrubs was too high to maximise the benefits of this option. However, this was likely due to a misunderstanding of the option heading. The specifics of this option specified that trees and tall shrubs would be maintained at 1.5m – 2.5m. The 'shrubs to 3m' in the title is reflective of the retention of low shrubs which can on occasion grow to this height.

Concerns about this option included the unnatural appearance of pruned vegetation, cost, insufficient dune stability, ability to carry out maintenance in an environmentally sensitive manner, risk of spiky vegetation overhanging the walkway. Many respondents said the Banksias should be removed and replaced by low growing species to improve the views.

3.2.3 Summary

The results confirm some polarisation in values regarding the reserve. If the key value a respondent derived from the reserve was maintaining views to the water, they considered that views should be maximised at the expense of other factors including dune stability, natural values and other aesthetic values. Many respondents wanted the option previously excluded in the trade off poster; replacing trees and tall shrubs with only low growing species. This preference was despite clear statements in the consultation materials stating this would provide too much risk, reducing the existing dune structure and stability, and was not a tenable option. The closest option to this was Option 3 and this was shown to be the preferred option for residents <1km and for respondents from outside the Shoalhaven.

Conversely, if the respondent's key values were more nature-based, maintenance of natural habitat, natural aesthetics and dune stability were considered to override views to the water. Some respondents stated no options provided enough tree cover. The unpopularity of what was interpreted as a 'compromise option', option 2, reinforces this conclusion that the values are polarised. It is noted that the community consultation package was developed in large part to help the community understand the need for compromise so that they could support a plan that sat between these extreme viewpoints.

3.3 COUNCILLOR INPUT

A draft of the DVMP was presented to SCC Councillors on the 3 December 2015 and further workshopped with the Councillors on the 25 February 2016. It was concluded at the February workshop that a site visit where site specific characteristics and proposed vegetation management measures could be seen in context would be beneficial. The site visit took place on the 21 March 2016 and was attended by Councillors, NGH Environmental's Dave Maynard and coastal hazards expert from Advisian, Lex Nielson.

One of the key outcomes of the site visit was that Councillors present considered it was necessary to provide for views of the bay for vehicles utilising Elizabeth Street. The draft plan that was presented to Councillors had proposed to maintain existing vegetation at the ends of the streets leading down to the

beach up to 100% foliage cover, as it did not impede views from residences, provided greater protection in these more vulnerable areas (main beach access ways, stormwater outlets and wind corridors created by the roads) and reduced the area under active management. However, it was discussed onsite that all of these areas could be actively managed to provide for views and that additional measures could be implemented to compensate for the loss of vegetation in these more vulnerable locations. This is discussed further in Section 9.

3.4 HOW HAS FEEDBACK BEEN ADDRESSED?

The DVMP aims to combine / adapt the three options presented to the community to achieve a plan that could be supported by the community, while also meeting social, environmental and legal requirements for the area. The plan acknowledges the desire by the majority to afford views of the Bay from existing residences and the walkway.

Specific to community feedback, the following elements are demonstrated in the DVMP:

Option 1: Banksias maintained at different densities in different areas: 0%, 30% 70% and 100%

Retention of or allowing regeneration of up to 100% tree and tall shrub cover has been selected for 4% of the study area. In the draft plan presented to the Reference Group and Councillors, this zone covered approximately 18% of the study area but is now only applied at the very northern end of Illfracombe Avenue where views are not impeded from residences or down side streets from Elizabeth Street. The smaller area in which this option would be implemented reflects the low level of support in community feedback. Larger areas may encourage ongoing vandalism.

Thinning existing tree cover to set densities has been selected for 30% of the study area. These areas were targeted specifically to improve views for some residents where tall vegetation had blocked water views almost entirely. This addresses the inequity issue noted by many respondents that seemed to be penalising residents that did not clear vegetation in front of their houses. The higher densities adopted in this plan (50-70%; refer to Section 9) reflect community feedback for those that favoured this option. It is also more likely to maintain high levels of sand aggregation and dune structure and stability in these areas and provides important habitat values and a more natural vegetation appearance.

Option 2: Lift the canopy of existing and naturally regenerating Banksias.

Under-pruning tall trees has only been selected for areas that already lend themselves to this option. It represents 15% of the study area. This reflects it being one of the least preferred options in the community feedback. In these areas, some pruning will to improve or maintain views for some residents whose water views are largely blocked.

Option 3: Restrict the height of naturally occurring Banksia trees and tall shrubs

This option represents 51% of the study area. It maintains a high level of water views. In existing open areas that lend themselves to hedging, this option has been selected, although some compromises have been made to reduce the impacts to existing vegetation, improve the visual amenity and provide some areas with shade. This includes retention of some existing trees in these areas and limiting the linear extent of hedging by breaking up this option with Option 1 or 2.

The results of the community feedback as they apply to the vegetation management zones defined in this DVMP are further discussed in Section 9.

Key inclusions in the plan that are at odds with the feedback of many respondents included retention of Banksias and taller species in the dune vegetation community. Many respondents wanted to construct a vegetation community of lower growing species more amenable to retaining views and remove the taller species. These options were not considered appropriate on the basis of the risks to dune stability and sustainability. Firstly, the vegetation management strategy should not substantially reduce existing levels of dune stability. Removal of taller growing trees with more extensive root systems could make the dunes less stable, in contravention of Section 11 of the Crown Lands Act. Secondly, the vegetation must be self-sustaining. A natural community of species that demonstrate effective recruitment over time is required. For this reason the existing community composition (the species that make up the community) is not proposed to be altered. No additional species would be introduced to the foredune community (although some planting of Eucalypts is recommended along side streets – refer to Section 9); no native species would be eliminated from the community. Although, substantial pruning will be a commitment of the plan, to enhance views in the long-term.

4 LEGAL AND POLICY MATTERS

The dune vegetation needs to be managed and maintained in a sustainable way that meets legal requirements specific to the reserve's coastal location as well as broader issues such as impacts on native vegetation and threatened species conservation. This section outlines the key implications of legislation and policies for the management of the reserve

Item	Objectives	Implications for the DVMP
Threatened Species Conservation Act 1995	The TSC Act deals with the listing of threatened species, populations and communities, the declaration of critical habitat, recovery plans, threat abatement plans, licensing, Species Impact Statements requirements, biodiversity certification and biobanking. The objectives of this Act are: a) To conserve biological diversity and promote ecologically sustainable development. b) To prevent the extinction and promote the recovery of threatened species, populations and ecological communities. c) To protect the critical habitat of those threatened species, populations and ecological communities that are endangered. d) To eliminate or manage certain processes that threaten the survival or evolutionary development of threatened species, populations and ecological communities. e) To ensure that the impact of any action affecting threatened species, populations and ecological communities is properly assessed. f) To encourage the conservation of threatened species, populations and ecological communities by the adoption of measures involving co-operative management.	Works are likely to require assessment under Part 5 of the EP&A Act, for impacts to listed entities. The physical impacts of thinning and modifying vegetation are considered unlikely to generate significant impacts (this would be demonstrated in an Assessment of significance, 7 part test, for listed species with potential to occur and be impacted by the activities).
Protection of the Environment Operations Act 1997	The *Protection of Environment Operation Act* aims to reduce pollution of the environment and governs the way discharge of pollutants is to be managed. This includes pollution of waters. Council would be obliged to notify the relevant authorities (e.g. Environment Protection Authority (EPA) when a 'pollution incident' occurs that causes or threatens 'material harm' to the environment.	Use of herbicides and fuels for activities in the reserve would need to be managed to reduce pollution risks. Spill protocols, including notification triggers, would be required.
Water Management Act 2000	Under the WM Act, a controlled activity approval confers a right on its holder to carry out a specified controlled activity at a specified location in, on or under waterfront land (i.e in or within 40 metres of a river, lake or estuary). A public authority is exempt from section 91E (1) of the Act in relation to all controlled activities that it carries out in, on or under 'waterfront land'.	Council is exempt.
Environment Protection and Biodiversity Conservation Act 1999	This Act provides protection for matters that are considered to be of national environmental significance (NES). Specifically: • World Heritage properties • RAMSAR wetlands • Nationally threatened species and communities • Internationally protected migratory species • Commonwealth areas	Works are likely to require assessment under Part 5 of the EP&A Act, for impacts to listed entities. The physical impacts of thinning and modifying vegetation are considered unlikely to generate significant impacts.

Table 4-1 Legislation relevant to management activities in the reserve.

Item	Objectives	Implications for the DVMP
Acts		

Environmental Planning & Assessment Act 1979	The *Environmental Planning & Assessment Act* (EP&A) includes the following objectives:
	• Encourage:
	  ○ the proper management, development and conservation of natural resources for the purpose of promoting the social and economic welfare of the community and a better environment.
	  ○ the provision of land for public purposes
	  ○ the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities and their habitats.
	  ○ ecologically sustainable development
	In NSW, assessment of proposed developments is prescribed by the EP&A Act and the EP&A Regulation. A Review of Environmental Factors (REF) under Part 5 of the EP&A Act must also be written for those proposed activities that do not require development consent. Any land use proposed for an area must be consistent with the zoning that is applied to the land by Council's Local Environment Plan.
		An REF is likely to be required to assess the change of land use proposed for the reserve, any impacts (such as clearing and impacts on dune stability). The management actions would need to be assessed as consistent with land zoning outlined in LEP.

Native Vegetation Act 2003	The Native Vegetation (NV) Act regulates the clearing of native vegetation on all land in NSW except for land listed in Schedule 1 of the Act. The excluded land includes national parks and other conservation areas, state forest and reserves, and urban areas. The objectives of the NV Act are to provide for, encourage and promote the management of native vegetation on a regional basis in the social, economic and environmental interests of the State. Native vegetation means any of the following types of indigenous vegetation: • Trees (including any sapling or shrub or any shrub) • Understorey plants • Groundcover • Plants occurring in wetland Clearing of native vegetation includes cutting down, felling, thinning, logging or removing native vegetation, as well as killing, destroying, poisoning, ring barking, uprooting or burning native vegetation.	Activities by Council would be assessed under Part 5 of the EPA Act. The NV Act does not apply to any clearing carried out in accordance with this Part however, the impacts of the clearing / modification of vegetation would need to be assessed under Part 5.

Item	Objectives	Implications for the DVMP
Rural Fires Act 1997	The objects of the Rural Fires Act 1997 include (a) for the prevention, mitigation and suppression of bush and other fires in local government areas (or parts of areas) and other parts of the State constituted as rural fire districts, and (b) for the co-ordination of bush fire fighting and bush fire prevention throughout the State, and (c) for the protection of persons from injury or death, and property from damage, arising from fires, and (c1) for the protection of infrastructure and environmental, economic, cultural, agricultural and community assets from damage arising from fires, and (d) for the protection of the environment by requiring certain activities referred to in paragraphs (a)–(c1) to be carried out having regard to the principles of ecologically sustainable development described in section 6 (2) of the *Protection of the Environment Administration Act 1991*. Section 63(1) of the *Rural Fire Act* states "It is the duty of a Public Authority to take the notified steps (if any) and any other practicable steps to prevent the occurrence of bush fires on, and to minimise the spread of a bush fire on or from: a) any land vested in or under its control or management, or b) any highway, road, street, land or thoroughfare, the maintenance of which is charged to the authority."	The site is not mapped as bushfire prone, however it is Council's duty to prevent occurrence and minimise spread of bushfire at the site.
Crown Lands Act 1989	The objective of the Crown Lands Act is to ensure that Crown land is managed for the benefit of the people of New South Wales. The Lands Division, Department of Primary Industries (DPI) is responsible for the sustainable and commercial management of Crown land. This involves the management of state-owned land, linking with other agencies, local government, the private sector and communities to provide social and economic outcomes for NSW. Council is appointed Trustee for Crown Lands. Section 11 of *Crown Lands Act 1989* sets out principles for Crown land management including: • Environmental protection principles be observed in relation to the management and administration of Crown land. • The natural resources of the Crown land (including water, soil, flora, fauna and scenic quality) be conserved wherever possible. • Public use and enjoyment of appropriate Crown land be encouraged. • Where appropriate, multiple use of Crown land be encouraged. • Where appropriate, Crown land should be used and managed in such a way that both the land and its resources are sustained in perpetuity.	As administrator of the land, Council cannot recommend management actions that will not protect the site's environmental values. In this context, this includes actions that make the dune vegetation less stable or affect the vegetation mortality. Council must manage the land in the best interests of the people of New South Wales.

Item	Objectives	Implications for the DVMP
Coastal Protection Act 1979	The *Coastal Protection Act 1979* defines the boundaries of the coastal zone and provides for the preparation of Coastal Zone Management Plans by local councils, contains provisions that place additional checks on local councils when determining development applications and provides a means of restraining or remedying damage to the coast. The objects of this Act are to provide for the protection of the coastal environment of the State for the benefit of both present and future generations (a) to protect, enhance, maintain and restore the environment of the coastal region, its associated ecosystems, ecological processes and biological diversity and its water quality, and (b) to encourage, promote and secure the orderly and balanced utilisation and conservation of the coastal region and its natural and man-made resources, having regard to the principles of ecologically sustainable development, and (c) to recognise and foster the significant social and economic benefits to the State that result from a sustainable coastal environment … (d) to promote public pedestrian access to the coastal region and recognise the public's right to access, and (f) to recognise the role of the community, as a partner with government, in resolving issues relating to the protection of the coastal environment (h) to encourage and promote plans and strategies for adaptation in response to coastal climate change impacts, including projected sea level rise, and **(i)** to promote beach amenity Under Part 3, section 38 *General supervision of coastal zone,* *(1)A public authority shall not, without the concurrence of the Minister:* *(b) grant any right or consent to a person:* *(i) to use or occupy any part of the coastal zone, or* *(ii) to carry out any development in the coastal zone,* *if, in the opinion of the Minister, as advised from time to time by the Minister to the public authority, the development or the use or occupation may, in any way:* *(b1) be inconsistent with the principles of ecologically sustainable development (ESD), or* *(c) adversely affect the behaviour or be adversely affected by the behaviour of the sea or an arm of the sea or any bay, inlet, lagoon, lake, body of water, river, stream or watercourse, or* *(d) adversely affect any beach or dune or the bed, bank, shoreline, foreshore, margin or flood plain of the sea or an arm of the sea or any bay, inlet, lagoon, lake, body of water, river, stream or watercourse.*	Collingwood beach is an 'authorised location' under this act. A significant proportion of assets including public and private are at risk in this area. Council must comply with the objectives of this act which include maintaining dune stability.

Item	Objectives	Implications for the DVMP
Local Government Act 1993	The *Local Government Act 1993* (LGA Act) provides the legal framework for an effective, efficient, environmentally responsible and open system of local government in New South Wales. The purposes of the LGA Act include to give Councils • The ability to provide goods, services and facilities, and to carry out activities, appropriate to the current and future needs of local communities and of the wider public • The responsibility for administering some regulatory systems under this Act • A role in the management, improvement and development of the resources of their areas. The LGA Act also requires councils, councillors and council employees to have regard to the principles of ecologically sustainable development in carrying out their responsibilities including in the management of natural areas.	Council must have regard for the principles of ecologically sustainable development, with regard to the site.
Fisheries Management Act 1994	This Act sets out to conserve fish stocks and key fish habitats, threatened species, populations and ecological communities of fish and marine vegetation and biological diversity. Further, it aims to promote viable commercial fishing, aquaculture industries and recreational fishing opportunities. Under clause 205, '*a person must not harm any such marine vegetation in a protected area, except under the authority of a permit issue by the minister under this act*'. Marine vegetation refers to mangroves, seagrass and saltmarsh. Harm, '*in relation to marine vegetation, means gather, cut, pull up, destroy, poison, dig up, remove, injure, prevent light from reaching or otherwise harm the marine vegetation, or any part of it*'.	No harm to marine vegetation including mangroves, seagrass and saltmarsh are proposed.
National Parks and Wildlife Act 1974	The NPW Act establishes the fundamental functions of the NSW National Parks and Wildlife Service. These include the conservation of nature, objects, features, places and management of land reserved under the Act. Specifically the conservation of nature includes • habitat, ecosystems and ecosystem processes, and • biological diversity at the community, species and genetic levels, and • landforms of significance, including geological features and processes, and • landscapes and natural features of significance including wilderness and wild rivers, The Act applies to community land as well as National Park or Crown Land. The NPW Act also sets out to protect and preserve Aboriginal heritage values. Part 6 of this Act refers to Aboriginal objects and places and prevents persons from impacting on an Aboriginal place or relic, without consent or a permit.	Works are likely to require assessment under Part 5 of the EP&A Act, for impacts to native flora and fauna and Aboriginal heritage. The physical impacts of thinning and modifying vegetation are considered unlikely to generate significant impacts.

Item	Objectives	Implications for the DVMP
	• Nuclear actions The *Environmental Protection & Biodiversity Conservation Act* establishes a new legislative framework to protect and conserve nationally important aspects of the environment and to conserve biodiversity. The Act is triggered only if there is a direct action (on-ground) involved, if there is an effect on an NES matter and if the impact is significant. Should the Act be triggered, all State Government approvals are firstly required before the matter is referred to the Federal Government for final approval.	
Plans, policies and guidelines		
Sepp 71 coastal protection	This Policy has been made under the *Environmental Planning and Assessment Act 1979* to ensure that development in the NSW coastal zone is appropriate and suitably located, to ensure that there is a consistent and strategic approach to coastal planning and management and to ensure there is a clear development assessment framework for the coastal zone. The policy aims to: a) to protect and manage the natural, cultural, recreational and economic attributes of the New South Wales coast, and b) to protect and improve existing public access to and along coastal foreshores to the extent that this is compatible with the natural attributes of the coastal foreshore, and c) to ensure that new opportunities for public access to and along coastal foreshores are identified and realised to the extent that this is compatible with the natural attributes of the coastal foreshore, and d) to protect and preserve Aboriginal cultural heritage, and Aboriginal places, values, customs, beliefs and traditional knowledge, and e) to ensure that the visual amenity of the coast is protected, and f) to protect and preserve beach environments and beach amenity, and g) to protect and preserve native coastal vegetation, and h) to protect and preserve the marine environment of New South Wales, and i) to protect and preserve rock platforms, and j) to manage the coastal zone in accordance with the principles of ecologically sustainable development (within the meaning of section 6 (2) of the *Protection of the Environment Administration Act 1991*), and k) to ensure that the type, bulk, scale and size of development is appropriate for the location and protects and improves the natural scenic quality of the surrounding area l) to encourage a strategic approach to coastal management.	The reserve management must be consistent with these objectives.

Item	Objectives	Implications for the DVMP
Shoalhaven City Council Local Environmental Plan 2014	The plan establishes the framework for future development within the local government area of Shoalhaven. The aims of the plan include: • to encourage the proper management, development and conservation of natural and man-made resources, • to facilitate the social and economic wellbeing of the community, • to ensure that suitable land for beneficial and appropriate uses is made available as required, • to manage appropriate and essential public services, infrastructure and amenities for Shoalhaven, • to minimise the risk of harm to the community through the appropriate management of development and land use. The proposed works are located in the zone RE1 Public recreation. The objectives of this zone includes • 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.	The reserve management must be consistent with RE1 objectives.
NSW Coastal Policy 1997	The primary objective of the *NSW Coastal Policy* is to protect the coastline and beaches for the enjoyment of future generations and to ensure that coastal development is balanced, well planned and environmentally sensitive. The Policy addresses a number of key coastal themes including: • Population growth in terms of physical locations and absolute limits; • Coastal water quality issues, especially in estuaries; • Disturbance of acid sulphate soils; • Establishing an adequate, comprehensive and representative system of reserves; • Better integration of the range of government agencies and community organisations involved in coastal planning and management; • Indigenous and European cultural heritage; and • Integration of the principles of Ecologically Sustainable Development (ESD) into coastal zone management and decision making Provisions of this plan are included in the Shoalhaven City Council LEP 2014.	The reserve management must be consistent with this policy.

Item	Objectives	Implications for the DVMP
Draft Shoalhaven City Council Coastal Zone Management Plan	The Draft Shoalhaven City Council Coastal Zone Management Plan sets out a plan for coastal management in the region for the next 10 years. Key activities and programs include: • Regulating development in the coastal zone to make sure only appropriate development is permitted; • Ensuring a balance between beach stability and amenity; • Providing mechanisms from management and relocation of Council assets in the coastal zone; and • Ensuring the Shoalhaven coastline continues to be a valued natural asset to the local community. Strategy 4: Protect coastal biodiversity and health coastal ecosystems, actions include the following: • Establish a hierarchy of reserves where the primary management objective is biodiversity/connectivity protection or where the primary management objective is community amenity. This will involve integration of existing foreshore reserve policies, parkland policies, regional biodiversity conservation priorities and information about climate change impacts on coastal ecology. Where reserves are identified as having a biodiversity/bushland conservation orientation in their management, there will be implications for access management, invasive species management and residential edge effects management. Biodiversity conservation oriented reserves should be a priority for active management of these threats. • For reserves assigned a parkland management orientation, the focus will be on matters such as ground surface stability, visual amenity (including coastal outlooks), recreational amenity (such as shade from trees or structures, accessibility, space for recreational activities). • Maintain and enhance ecological communities on frontal dunes, considering appropriate ecological strategies for urban (foreshore recreation reserve) and non-urban areas. Manage in accordance with detailed local dune management plans, prepared in consultation with local communities and Landcare. • Manage access across frontal dune systems, closing and rehabilitating excessive pathways (including illegal tracks from private properties) that destabilise dune morphology and vegetation. • Support Bushcare activities that focus on removal of priority weed species from foreshore reserves and saltmarsh areas, in accordance with an invasive species	Activities in the reserve must comply with this plan.

Item	Objectives	Implications for the DVMP
	management plan which also specifies priority locations for building biodiversity resilience. Support training for Bushcare volunteers on weed control strategies for priority locations. • Consult with local communities about species selection for planting in foreshore reserves. This is to address both raising awareness about the form, life cycle and functions of native coastal vegetation sequences and to tailor plantings as much as possible to community values for the local area (including social functions of vegetation such as shade and scenic amenity). • Incorporate measures to protect known Aboriginal sites and cultural values in plans of management for foreshore reserves. This could include involving local Aboriginal owners and stakeholders in identifying culturally significant plants in foreshore reserves and increasing indigenous participation in Bushcare/Dunecare activities Prepare cultural awareness guidelines for Bushcare volunteers and Council officers and encourage active Aboriginal community participation in Bushcare.	
Shoalhaven City Council Community Strategic Plan Shoalhaven 2023	This plan outlines Shoalhaven City Council, in collaboration with the community, a vision for Shoalhaven in 2023. Council's mission is to enhance Shoalhaven's strong communities, natural, rural and built environments and appropriate economic activities through strategic leadership, effective management, community engagement and innovative use of resources. Core principles applied in the development of the objectives and strategies of the plan are: • ESD • Social justice principles • Effective governance • Customer service excellence • Financial sustainability Objectives of the plan are centred on people, place, prosperity, leadership, sustainable services and programs.	The development of the DVMP has included a community engagement strategy.

Item	Objectives	Implications for the DVMP
Shoalhaven City Council Foreshore Reserves Policy 2004	The purpose of this policy is to provide a management framework to guide decision making and to determine how foreshore reserves should be used and managed. Policy statements regarding vegetation removal include: • Council will raise the community's awareness of the negative impacts of vegetation removal within foreshore reserves through medial releases, regulatory/advisory signage and letter-box-drops of adjoining residences • Fallen timbers in low use non-maintained natural foreshore areas shall be made safe by Council and remain on site to provide for habitat, shelter or food for dependant organisms. • Fallen timbers in high use maintained foreshore areas shall be removed in accordance with Council's maintenance schedule to minimise evident public risk. • Council's preference is for approved remediation where illegal removal or damage to foreshore vegetation has occurred by identified person(s) prior to the use of available legal provisions. • In locations/areas where Council has identified ongoing and/or significant unauthorised removal of vegetation, Council will act to implement measures to identify the offenders to remediate/rehabilitate the damaged area. Council will also consider installation of signage or pursue other measures deemed appropriate. Policy statements regarding views include: • Where Council is required to revegetate foreshore lands following unauthorised removal of vegetation, such revegetation will be done in consultation with surrounding property owners with the aim to restore the status quo. • Where Council is required to revegetate foreshore lands in response to erosion or other identified environmental threat, it shall revegetate with a mix of tall and low growing plants with a view to preservation of amenity for residents.	The development of community consultation materials and the DVMP has considered the need to gain community support and increase knowledge regarding vegetation management.
Shoalhaven city Council, Generic Community Land Plan of Management for Natural Areas July 2001	The Plan of Management for Natural Areas covers all Community Land categorised by Shoalhaven City Council as Natural Area and the further categories of bushland, wetland, escarpment, watercourse or foreshore. The Plan's management objectives and actions are guided by the Local Government Act 1993 and Part 3 of the Local Government (General) Regulation 1999. The Core Objectives for management of community land categorised as foreshore are: ○ To maintain the foreshore as a transition area between the aquatic and the terrestrial	The reserve management must be consistent with this plan.

Item	Objectives	Implications for the DVMP
	environment, and to protect and enhance all functions associated with the foreshores role as a transition area, and ○ To facilitate the ecologically sustainable use of the foreshore, and to mitigate impact on the foreshore by community use.	
Coastal Dune Management – A Manual of Coastal Dune Management and Rehabilitation Techniques, Department of Land and Water Conservation 2001	This manual seeks to provide the information that is required for successful rehabilitation and protection of coastal dunes. It describes the techniques currently favoured in stabilising, revegetation and maintaining coastal dunes.	This manual was consulted in the preparation of the DVMP.

5 THE STUDY AREA

The study area includes all overstorey and groundcover vegetation from the walkway to where wave action precludes vegetation growth. This boundary is dynamic and will move landward and seaward variably depending on tide and climatic conditions. The study area as it is currently defined is based on the most recently available aerial imagery from 10 August 2015.

The study area is approximately 4.6 hectares, 1.5 kilometres long with an average width of approximately 30 metres (refer to mapping in Appendix A). The study area is mostly confined to the vegetation on the foredune seaward of the walkway with the exception of an area immediately north of Berry Street where native trees are regenerating within the council reserve to the west of the shared pathway. This area has also been included within the study area as the trees have been identified during the consultation process as having an impact on the views of adjacent residences.

6 EXISTING VEGETATION

6.1 HISTORIC INFLUENCES

The existing vegetation within the study area is a result of both natural and human influences. Prior to the clearing of the dune vegetation in the 1960's for the Collingwood Beach residential development, a natural coastal dune vegetation community would have occurred. Based on dune vegetation in the local area that has had little human interference (such as Myola Spit), the community that originally occupied the study area is likely to have been a form of 'Coastal Foredune Scrub'[1]. The Banksias, shrubs and groundcovers present in the study area today naturally occur within this vegetation community. However, given the clearing and subsequent sand loss (that would have contained the native seed bank) during the severe storms of the 1970's, the vegetation present today is not considered to be directly derived from the naturally occurring vegetation community.

Following the storms and resulting erosion of the dune system, a three year vegetation rehabilitation effort commenced in 1978, shaping the dune and planting grasses and trees such as Banksias to reform and create a resilient dune system. The vegetation present today is likely to be somewhat derived from what was planted during this time however, there is also likely to have been a considerable amount of natural recruitment from nearby coastal vegetation as a result of seed ingress through vectors such as wind and birds. The resulting vegetation community approximates the Coastal Foredune Scrub in composition, notwithstanding these historic influences.

6.2 VEGETATION COMPOSITION

The vegetation within the study area contains a high diversity of native trees, shrubs and groundcovers. The majority of the vegetation within the study area has become self-sustaining with most trees, shrubs and groundcovers all successfully reproducing and propagating in-situ. This demonstrates that the species that occur are suitable for the landscape position and climatic conditions experienced. Ongoing

[1] Coastal Foredune Scrub is a recognized vegetation community in the Southeast NSW Native Vegetation Classification and Mapping – SCIVI classification of Tozer *et. al.* 2010. This classification provides the most recent comprehensive vegetation classification and mapping for the Collingwood Beach area.

supplementary planting or assisted regeneration is not required for their persistence and given the existing diversity of species, further diversification is also not considered to be required.

Considering the species composition data collected by Macquarie University students in 2015, and observations by the author, the species composition of the vegetation within the study area is considered typical of a Coastal Foredune Scrub community intergrading into a Beach Strand Grassland towards the incipient foredune. Both of these communities are described in detail in Tozer *et. al.* 2010.

6.2.1 Coastal Foredune Scrub

Within the Coastal Foredune Scrub in the study area, Coast Banksia (*Banksia integrifolia*) is the dominant tree species along with occasional Black She-oak (*Allocasuarina littoralis*). A range of tall and low shrubs are present (refer to Section 6.3 below) along with a diverse groundcover, consistent with species occurring in this community. The majority of species are native however a number of exotic or 'naturalised' species are also present. In a few discrete locations, Norfolk Island Pines (*Araucaria heterophylla*) occur. These are not locally indigenous but appear to be recruiting in some areas. Three declared noxious weed species are known to occur within the study area; African Lovegrass (**Eragrostis curvula*), Fireweed (**Senecio madagascariensis*) and Ground Asparagus (**Asparagus aethiopicus*). Ground Asparagus is identified as one of the three worst weeds on the NSW coastline (DLaWC 2001).

6.2.2 Beach Strand Grassland

The Beach Strand Grassland within the study area is almost entirely dominated by Coastal Spinifex (*Spinifex sericeus*) with occasional patches of the succulent forb species *Carpobrotus glaucescens* which is typical of this community. The community within the study area is in good condition with good foliage cover and is functioning well in maintaining the incipient foredune.

6.3 VEGETATION STRUCTURE

The current structure of the vegetation within the study area varies considerably. It varies from tall dense trees with a tall shrub component to low open shrubland with no overstorey or tall shrub components (Figure 6-1). This variation in the vegetation structure is largely as a result of human disturbance. In many locations, overstorey trees and tall shrubs have been removed to facilitate views of the bay from adjacent residences. It is the uncoordinated modification of the vegetation structure in response to naturally regenerating trees and tall shrubs that is the key driver for this DVMP. Given the vegetation composition is appropriate to the DVMP objectives and is functioning well to persist in the reserve, it is the management of the vegetation structure that forms the focus of this DVMP.

Figure 6-1 Variation in vegetation structure within the study area from areas with dense trees and shrubs (left) to areas containing low shrubs and groundcovers only (right)

What constitutes a 'low' or 'tall' shrub is integral to managing the vegetation at Collingwood Beach. Low shrubs generally grow up to around 1.5 – 2 metres (occasionally taller) and along with other groundcovers such as forbs and grasses, are not considered to comprise species that require management at Collingwood Beach as they generally do not impede views. Tall shrubs can grow up to five metres or more and can present a visual barrier. Based on the species recorded at Collingwood Beach and nearby Myola Spit, the most common shrubs that do or may occur within the study area are categorised as low or tall shrubs in Table 6-1 below.

Table 6-1 Common tall and low shrubs that do or may occur within the study area at Collingwood Beach

Scientific Name	Common Name	Height (Macquarie uni data)	Height (NSW flora online)	Low shrub	Tall shrub
Acacia elongata	Swamp Wattle	up to 3m	0.5-4m		✓
Acacia floribunda	White Sallow Wattle	2-4m	3-8m		✓
Acacia longifolia var. longifilia	Sydney Golden Wattle	Not provided	1-8m		✓
Acacia longifolia var. sophorae	Coast Wattle	1m	0.5-3m	✓	
Acacia suaveolens	Sweet-scented Wattle	up to 1.5m	0.3-2.5m	✓	
Acacia ulicifolia	Prickly Moses	up to 1.5m	0.5-2m	✓	
Atriplex cinena	Grey Saltbush	1-1.5m	up to 1.8m	✓	
Banksia integrifolia subsp. *integrifolia*	Coast Banksia	6-16m	5-25m		✓ (commonly also a tree)
Bossiaea ensanta		Not provided	up to 1.5m	✓	
Bossiaea heterophylla		Not provided	up to 1m	✓	
Correa alba	White Correa	up to 1.5m	up to 1.5m	✓	
Dillwynia acicularis		1-3m	1-3m	✓	
Leptospermum laevigatum	Coastal Tea-tree	up to 8m	4m or more		✓
Leptospermum lanigerum	Woolly Tea-tree	up to 3m	5m or more		✓
Leptospernum	Round-leaf Tea-tree	up to 2m	2m or more	✓	

Scientific Name	Common Name	Height (Macquarie uni data)	Height (NSW flora online)	Low shrub	Tall shrub
rotundifolium					
Leucopogon parviflorus		up to 3m	1.2-5m		✓
Monotoca elliptica	Tree Broom-Heath	up to 3m	up to 4m		✓
Pelargonium australe	Coastal Geranium	up to 40cm	up to 0.5m	✓	
Pittosporum undulatum	Sweet Pittosporum	1.5m	up to 15m		✓
Platysace lanceolata		1-1.5m	0.6-1.5m	✓	
Rhagodia candolleana		4m	up to 4m		✓
Westringia fruticosa	Coastal Rosemary	1-1.5m	up to 1.5m	✓	

7 KEY ASPECTS OF VEGETATION MANAGEMENT ON DUNES

The following literature review investigates the role of vegetation in dune stability. Key points that have informed the development of the DVMP relate to the role of vegetation height and root systems in the stabilisation of the foredune area.

It is acknowledged that most study of dune system dynamics has focused on geomorphological research into sand erosion and supply and wind regimes (Durán and Moore 2013). Research into the dynamics of plant communities and dune building is relatively new, and for this reason, still poorly understood (McLean and Shen 2006). However, it is clear that plants play a more active role than previously thought (Durán and Moore 2013). The key interactions of vegetation with dune formation and stability relate to the effect of vegetation height and root formation on wind (NSW DLWC 2001; Wasson and Nanninga 1986; Hesp 2002; Baldocchi 2012). The wind both removes sand from the surface (erosion) and carries sand that eventually settles on the surface (accumulation or accretion).

7.1 THE ROLE OF VEGETATION HEIGHT IN SAND CAPTURE

Grasses and creepers pioneer dune formation by trapping wind blown sand particles in their foliage and runner root systems (NSW DLWC 2001; SA DEH 2005; Durán and Moore 2013). Wind speed has a direct effect on sand loss from beaches and dunes (SA DEH 2005). Plants increase the 'roughness' of the dune surface, slowing wind velocity and thereby reducing sand transport (both erosion and accumulation) (Wasson and Nanninga 1986; Hesp 2002; Durán and Moore 2013). Spinifex Grass *(Spinifex sericeus)* is a salt tolerant plant commonly found on beaches. The upright leaves of Spinifex reduce wind velocity and capture sand, with frequent burial of the leaves and stems. The plant can grow through accumulations of sand (Qld Dept Environment undated).

Pioneer species, such as Spinifex, usually colonise the lower parts of the beach, known as the incipient foredune zone (NSW DLWC 2001). Cycles of sand deposition and vegetative growth are an important feature of the dune forming process (Qld Dept Environment undated). Once established, their fibrous roots also play a role in anchoring the dunes in place (Qld Dept Environment undated; Durán and Moore 2013), although it is noted that the incipient foredune is inherently unstable (NSW DLWC 2001; McLean and Shen 2006).

Building on the work of the pioneer species, the incipient foredune can then be colonised by secondary species (NSW DLWC 2001; Qld Dept Environment undated). These are mostly shrubs and small trees and develop the dune into a semi-stable or stable 'established foredune' (McLean and Shen 2006; Hesp 2002; NSW DLWC 2001). The shrub layer further increases surface roughness to slow wind velocity and increase sand accretion, as well as presenting a 'wall' that deflects wind upward (NSW DLWC 2001; Durán and Moore 2013).

Tertiary species (taller shrubs and trees) provide a similar effect at a greater magnitude (NSW DLWC 2001; Baldocchi 2012). The 'roughness' slowing effect on wind that vegetation provides can extend vertically to two or three times above the canopy height (Baldocchi 2012). High, dense canopies are the most effective at reducing wind velocity, and thereby sand and salt transport (Hesp 2002). Thus, the taller the vegetation, the greater the protective value not for only the underlying dune, but for vegetation or structures landward of the foredune (NSW DLWC 2001). While lower canopies also reduce wind, they do so more slowly than higher vegetation (Hesp 2002). At a certain point, wind velocity and wind capture by vegetation reaches equilibrium (and therefore sand accumulation and erosion also steadies) and the foredune becomes a stable structure at its maximum height (Durán and Moore 2013).

Where shrubs and trees are not continuous but fragmented into 'clumps', for example where there are access tracks or other disturbance along the foredune vegetation, this also has an effect on the wind (NSW DLWC 2001). Within a fragmented canopy, wind is funnelled around trees and shrub clumps, with localised increases in wind velocity – 'wind tunnels' (Baldocchi 2012; Hesp 2002). As sand dunes are only as stable as the amount of vegetative cover on them (SA DEH 2005), disturbance which causes fragmentation of secondary and tertiary foredune vegetation may lead to:

- Higher wind strength at lower elevation over the foredune (Baldocchi 2012)
- Vegetation die back (NSW DLWC 2001) or asset damage (SA DEH 2005)
- Dune blow-outs and erosion (Hesp 2002; NSW DLWC 2001)
- Dune instability (Durán and Moore 2013)
- Reduced coastal protection from storm surge and climate change (Barbier et al. 2011)
- Weed invasion (NSW DLWC 2001)
- Dune migration (particularly landward) (Durán and Moore 2013)
- Development of transgressive dune sheets and bare sand (NSW DLWC 2001)

7.2 THE ROLE OF ROOT SYSTEMS IN DUNE STABILITY

The low fertility of dune soil restricts plant roots to the top layers of the soil profile where rainfall and organic matter provide moisture and nutrients (NSW DLWC 2001). Plants growing in sand dunes have developed specialised root systems to cope with these harsh conditions. The specialised roots also contribute to dune stability. Pioneer species such as Spinifex colonise the incipient foredune zone (NSW DLWC 2001). Surface runners and fibrous roots assist to anchor the dunes, holding trapped sand in place (Qld Dept Environment undated; Durán and Moore 2013). However, because of the sparse, low and relatively shallow growth of pioneer species, the incipient foredune remains unstable; the forces of wind and water can outstrip the stabilising qualities of pioneer species (NSW DLWC 2001; (McLean and Shen 2006).

A stable, established foredune develops with the growth of denser, taller vegetation such as Coastal

Foredune Scrub, with more extensive root networks. This vegetation community is characterised by the presence of small trees, dense shrubs and ground cover (French 2010). Typical species include Coastal Banksia *(Banksia integrifolia)* and wattles *(Acacia sp.)*. Adaptations of Coastal Banksia include 'proteiod' roots (NSW DLWC 2001; Watt and Evans 1999). Proteoid roots grow in dense clusters of closely spaced hairy rootlets; they allow plants to extract more nutrients from poor soils by massively increasing the surface area of the roots through fine branching and hairs (Watt and Evans 1999; Qld Dept Environment undated). The dense carpet of roots bind the upper soil profile. In this way, Banksias play an important role in stabilising the established foredune.

The dune stabilisation and soil retention role played by plant roots helps to control coastal erosion by both wind and water (Barbier et al. 2011). Recent laboratory experiments by Sigren *et al.* (2014) using live plants in a small scale wave simulation:

- Clearly showed that the presence of the plant and roots significantly reduced the volume of dune erosion and the dune scarp retreat rate by over 30%.
- Indicated through shear testing that plant roots increase the mechanical strength of non-cohesive sediments (such as dune sands).
- Found that the presence of mature plant roots doubled the amount of time before structural failure occurred and increased the cumulative shear required to break down sediment by 180% (Sigren *et al.* 2014).

This is shown graphically in Figure 7-1. While the presence of vegetation may not prevent the erosion of the dune during severe storm attacks, it may reduce the impact of more frequent minor storms and events (Sigren *et al.* 2014). This in turn retains a greater sand mass to be available as a buffer during a severe weather event. It may also assist in improving dune mitigation approaches following severe weather events (Sigren *et al.* 2014).

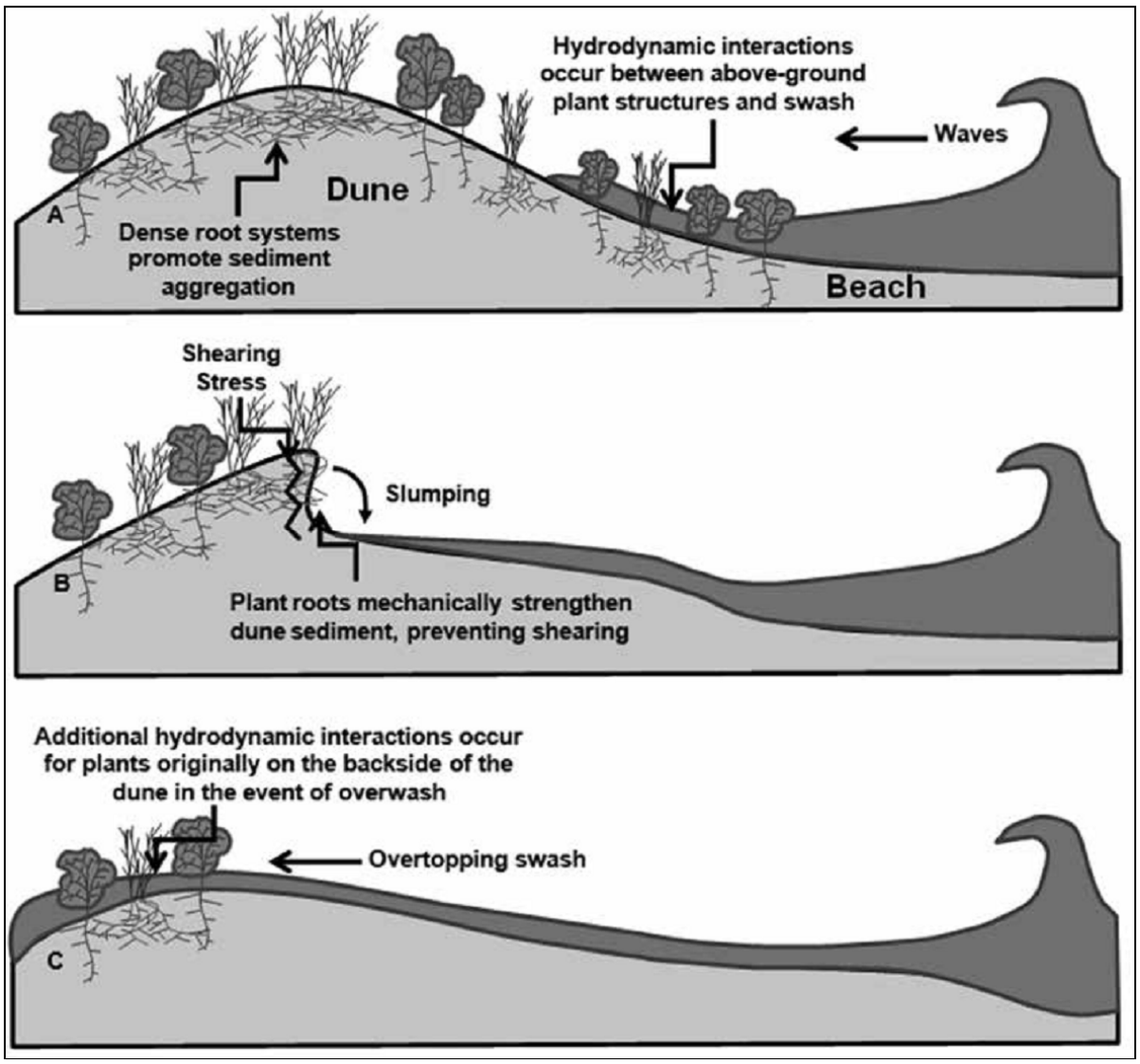


Figure 7-1 Potential wave interactions with a vegetated foredune during a storm event (Sigren *et al.* 2014)

8 APPROACH TO VEGETATION MANAGEMENT

This DVMP seeks to manage the vegetation in accordance with the aims and objectives detailed in Section 2.2. In best achieving these aims and objectives (which includes minimising cost and providing a sustainable solution), the following general principles have been applied as much as possible:

1. Retain and protect naturally regenerating vegetation
2. Work with the existing vegetation structure; no large structural changes
3. Provide an equitable result for stakeholders, guaranteeing views to the Bay in the long-term (either by pruning or thinning within specific criteria).

How these principles have been applied in this DVMP is discussed in more detail below. These principles have ultimately been employed in defining the vegetation management zones detailed in Section 9.

8.1 RETAIN NATURALLY REGENERATING VEGETATION

As discussed in Section 6, the existing vegetation within the study area comprises a community representative of the natural community that would have occurred prior to disturbance. It has the capacity to be (and is demonstrating it is) self-sustaining. Naturally occurring unmodified native vegetation is more resilient to degradation from outside influences such as extremes in climate and invasion by weeds and pests. It requires minimal management to persist and thus reduces costs.

The naturally regenerating vegetation within the study area contains trees and tall shrubs which provide the greatest benefit in terms of sand capture (dune building) from higher vegetation and dune stability (resistance to wind and wave erosion) from denser vegetation and root structures (refer to Section 7). Structurally complex and species rich vegetation also provides the most value with regards to habitat for flora and fauna.

8.2 WORK WITH THE EXISTING VEGETATION STRUCTURE

Working with the vegetation structure that exists within the study area minimises the amount of initial disturbance and modification required to achieve the aims and objectives of this plan. For example, hedging of trees and tall shrubs is not recommended in areas where there are existing mature Banksias and other trees. Creating additional areas of hedging is not considered appropriate in terms of the high levels of disturbance, intensity of labour and costs required. Nor would it increase existing soil stability. Hedging of trees and tall shrubs is considered more appropriate in areas where there is currently an absence or low density of trees and tall shrubs.

Similarly, the options of thinning trees and tall shrubs and under-pruning have been recommended where the existing vegetation lends itself to these types of management and where direct benefit to adjacent residents can be obtained. This addresses the equitability issue, discussed further below.

Working with the vegetation structure that exists is also somewhat reflective of the desires of near residents and this has been taken into account in this DVMP given they are a key stakeholder in the management of the reserve.

8.3 PROVIDE AN EQUITABLE RESULT

As documented in Section 3, extensive consultation has been undertaken with stakeholder groups[2] to identify the preferred approaches in managing the vegetation within the study area. The proportion of the study area subject to varying types of management (the management zones) is reflective of the feedback received during the consultation process (this is discussed further in Section 9 below).

The management zones have been delineated to provide some degree of benefit for near residents in almost all areas. Mostly, this in maintaining the majority of the views of the bay that currently exist or creating or enhancing views that are currently obscured. It doing this it is hoped that ongoing vegetation vandalism will cease in the reserve. This will provide benefits for biodiversity and reduce conflict in the community and with Council. The managed vegetation will provide a good level of dune protection which has benefits for all involved stakeholders.

[2] Stakeholder groups in this instance are defined by their proximity to the site. Additional stakeholder groups are identified in the Community Consultation Strategy for the project and would be invited to provide input into the publically exhibited Draft DVMP.

9 VEGETATION MANAGEMENT ZONES

As documented in Section 3, three structural management options that were considered able to meet the objectives for vegetation management within the study area were presented to stakeholders during the consultation process:

Option 1. Banksias maintained at different densities in different areas: 0%, 30%, 70% and 100% density Banksias, low, medium and tall shrubs in between.

Option 2. Lift the canopy of existing and naturally regenerating Banksias. Remove tall shrubs.

Option 3. Restrict the height of naturally occurring Banksia trees and tall shrubs to 1.5 – 2 metres with low shrubs (shrubs up to 3m)

Based on the feedback received during the consultation period and incorporating the principles discussed in Section 7, six separate management zones have been defined within the study area:

Zone 1. Option 1 up to 100% tree/tall shrub cover

Zone 2. Option 1 up to 70% tree/tall shrub cover

Zone 3. Option 1 up to 70% tree/tall shrub cover along with Option 2 (but applicable to tall pine trees)

Zone 4. Option 2 under-pruning of mature trees and removal of tall shrubs

Zone 5. Option 3 restrict the height of trees and tall shrubs to 1.5m. Maintain the density of low shrub vegetation at a maximum of 50% cover in between a height of 1.5 – 2.5m (the view window).

Zone 6. Protection of incipient foredune vegetation

Zone 6 – Protection of incipient foredune vegetation, has been included in this DVMP to provide a more holistic approach to the management of the dune vegetation. The incipient foredune is an important structural component of the dune system as well as being the most dynamic. Protection of the vegetation in this area is considered integral to maintaining a healthy, resilient dune system within the study area.

The key objectives and activities associated with the management zones are described further below. Activities such as weed control and the identification and removal of hazardous vegetation are common to all zones. The retention of felled or trimmed vegetation is also recommended for all zones as this provides habitat for fauna, additional protection from erosion, enhanced sand capture and is important for nutrient recycling.

The location and extent of each of the proposed management zones within the study area are shown on the detailed mapping in Appendix A. The area each zone covers within the study area is detailed in Table 9-1 below. Table 9-1 also provides a comparison between the relative areas covered by each zone compared to the overall results of the stakeholder consultation.

In addition to the management zones defined for the foredune vegetation, it is also recommended that consideration be given to the planting of tall Eucalypt trees at the ends of the streets leading down to the study area where they do not impede bay views from residences. This would provide for a degree of

compensation for the active management of the foredune vegetation in these more vulnerable areas which include beach access ways, stormwater outlets and focal points for wind created by the streets perpendicular to the beach. The establishment of tall Eucalypts in these areas would ultimately act as hind dune vegetation. It would assist in lifting the wind field off the dune surface, reducing the risk of wind erosion and blowouts (Lex Nielson pers. comm. at Councillor site visit 21.03.16). Suitable locations for the planting of these trees are indicated on the detailed mapping in Appendix A. Suitable species would be those Eucalypt trees that occur naturally in the hind dune vegetation in the local area. The most suitable species is likely to be Bangalay or Southern Mahogany (*Eucalyptus botryoides*) although other species such as Forest Red Gum (*E. tereticornis*) may also be suitable in certain more sheltered locations.

Table 9-1 Comparison of the areas covered by each zone within the study area

Management zone	Most like option	Area within study area (ha)	Percentage of study area (excl. Zone 6+)	Percentage of feedback in favour by proximity group			
				<1km	1-5km	>5km	Not in Shoal.
Zone 1	Option 1 up to 100% tree/tall shrub cover	0.12	3.82%	7.25%	33.44%	10.80%	1.50%
Zone 2	Option 1 up to 70% tree/tall shrub cover	0.64	20.38%	9.25%	39.52%	43.20%	0.75%
Zone 3	Option 1 up to 70% tree/tall shrub cover along with Option 2 (but applicable to tall pine trees)	0.31	9.87%	Considered to be mostly Option 1 (70%) and Included in figures above			
Zone 4	Option 2 under-pruning of mature trees and removal of tall shrubs	0.48	15.29%	10.00%	7.00%	7.00%	1.00%
Zone 5	Option 3 restrict the height of trees and tall shrubs to 1m - 1.5m**	1.59	50.64%	65.00%	16.00%	39.00%	96.00%
Zone 6	NA	1.49	NA	NA	NA	NA	NA

+ Zone 6 not included in the calculation of percentage area as this vegetation does not affect views and is not relevant to the management options presented during the consultation period.

** Includes retention of isolated mature trees, management of low shrubs and unrestricted growth of groundcovers.

9.1 ZONE 1: UP TO 100% TREE/TALL SHRUB COVER

9.1.1 Where this zone applies

This zone only applies to one area where views from residences and Elizabeth Street are not impeded; at the north of Illfracombe Avenue.

9.1.2 Objectives and key management actions of this zone

The objective of this zone is to allow the vegetation to grow as naturally and with as little disturbance as possible. An example of the existing vegetation in the area where this management zone applies is shown in Figure 9-1. Weed management is relevant, as in all zones, but composition and structure will be left to develop without active management.

All low shrubs and groundcovers would be retained within this zone.

Figure 9-1 Examples of existing vegetation where Zone 1 applies at the end of Bayswater St (left) and Berry St (right)

9.2 ZONE 2: UP TO 70% TREE/TALL SHRUB COVER

9.2.1 Where this zone applies

This zone applies in areas where there are existing mature or regenerating overstorey trees directly in front of private residences (Figure 9-2) and at the ends of the streets leading down to the beach. Minimising the extent of initial clearing required was also considered in selecting the locations of this zone. Areas of this zone have also been located to break up otherwise continuous stretches of hedged vegetation which is contradictory to the main objectives of the plan originally set by the reference group which requires that the DVMP *provides from the walkway and from the beach a range of experience, with filtered views, thickets, healthy vegetation and tall occasional shade trees* (refer Section 1.1).

9.2.2 Objectives and key management actions of this zone

The objectives of this zone are to provide filtered high level views by limiting tree and tall shrub foliage cover to a maximum of 70% between a height of 1.5 – 2.5m (the view window) while retaining all low shrubs and groundcover. Where beach access ways or stormwater outlets occur within this zone,

retention of vegetation in the immediate vicinity of these would be preferred to provide greater protection in these vulnerable areas.

The description of Option 1 presented during the community consultation suggested that only Banksias would be thinned out to any given percentage and that low, medium and tall shrubs would be in between however, it is acknowledged that the presence of tall shrubs in between trees could effectively result in 100% of the view being obscured. As such, management in Zone 2 would include the removal/pruning of tall shrubs to maintain a maximum of 70% vegetation cover from trees and tall shrubs combined. It is the objective of this zone to maintain a maximum of 70% foliage cover between a height of 1.5 – 2.5m (the view window, refer to Appendix B).

It is also acknowledged that, although a minority, there were a number of respondents who considered a 30% cover appropriate however, the majority of respondents who preferred Option 1 selected 70% or 100% as the most appropriate and therefore 70% maximum foliage cover from trees and shrubs is set as the upper limit for Zone 2. In achieving this however, it is considered reasonable that during maintenance activities, vegetation removal/pruning could be limited at most to that which achieves a 50% foliage cover which would then allow for vegetation growth up to 70% during the periods between maintenance activities.

Key management activities include the removal of select trees (preferentially retaining more mature trees) and tall shrubs, pruning and seedling removal. Further detail on how this is to be achieved is provided in the protocol for this management zone in Section 10.

All low shrubs and groundcovers would be retained within this zone.

Figure 9-2 Examples of existing vegetation where Zone 2 applies along Illfracombe St (left) and north of Berry St (right)

9.3 ZONE 3: UP TO 70% TREE/TALL SHRUB COVER ALONG WITH UNDER-PRUNING OF TALL TREES

9.3.1 Where this zone applies

Zone 3 has been allocated in two areas within the study area; north of Bayswater Street and north of Montague Street. In both instances, large mature Norfolk Island Pines occur (refer to mapping in Appendix A and Figure 9-3).

9.3.2 Objectives and key management actions of this zone

The objective of this zone is to provide filtered high level views by limiting tree and tall shrub foliage cover to a maximum of 70% between a height of 1.5 – 2.5m (the view window) and maximise low level views by removing the lower limbs on tall Norfolk Island Pines while retaining all low shrubs and groundcover. It is not considered necessary nor desirable to remove these large trees. Under-pruning would be appropriate to lift the lower level of the canopy of these trees up to a height of 3m to provide low level views. This would be a one off maintenance activity at the commencement of the plan. The trees to which this applies are identified on the detailed mapping in Appendix A.

The remaining native vegetation would be managed as per that described for Zone 2 however, the foliage cover of the Norfolk Island Pines would be taken into consideration when establishing the maximum 70% foliage cover between a height of 1.5 – 2.5m (the view window).

Figure 9-3 Examples of existing vegetation where Zone 3 applies north of Bayswater St (left) and north of Montague St (right)

9.4 ZONE 4: UNDER-PRUNING OF MATURE TREES AND REMOVAL OF TALL SHRUBS

9.4.1 Where this zone applies

Option 2 was the least preferred option identified during the stakeholder consultation however, there was still some support for this option. Given the low support for the option it has not been widely applied but there are four locations where it is considered appropriate. Zone 4 is allocated in four discrete areas; at the southern end of Illfracombe Street and at the end of Bayswater, Montague and Susan Streets. Mature Banksia trees are present in the majority of these areas which would be suitable candidates for under-pruning while retaining the trees themselves (Figure 9-4). In some cases, the zone has been extended into adjacent areas with younger vegetation to minimise the complexity of management over small areas. Being largely at the ends of streets leading down to the beach, the under-pruning also allows for low level views which are appropriate for vehicles travelling along Elizabeth Street.

9.4.2 Objectives and key management actions of this zone

The objective of this zone is to maximise low level views by lifting the canopy on mature trees to a height of 3m and removing and tall shrubs and young tree regrowth. The canopy would be lifted to a maximum

height of 3m on all trees exceeding 4m. Tall shrubs would be felled and it is considered appropriate that young Banksia trees less than 3m tall are also felled where they occur underneath the canopy of under-pruned trees. Banksias that occur in other areas within this zone would be allowed to reach a height of 4m before being under-pruned.

All low shrubs and groundcovers would be retained within this zone.

Figure 9-4 Examples of existing vegetation where Zone 4 applies south of Montague St (left) and north of Susan St (right)

9.5 ZONE 5: RESTRICT THE HEIGHT OF TREES AND TALL SHRUBS TO 1.5M, UP TO 50% LOW SHRUB COVER

9.5.1 Where this zone applies

Option 3 was the most popular option identified during the stakeholder consultation overall and this is reflected in Zone 5 being the most extensive zone within the study area. This zone has largely been located in areas where trees and tall shrubs are primarily absent (Figure 9-5) which is considered suitable as the need to fell or hedge mature trees and shrubs is minimised.

9.5.2 Objectives and key management actions of this zone

The objective of this zone is to reduce the height of regrowth trees and large shrubs to between 1 - 1.5m and allow low shrubs to grow to a maximum 50% foliage cover within the 1.5 – 2.5m view window (refer to Appendix B). Groundcovers will be allowed to grow unrestricted. In achieving a maximum of 50% low shrub cover, it is considered reasonable that during maintenance activities, vegetation removal/pruning could be limited at most to that which achieves a 30% foliage cover which would then allow for vegetation growth up to 50% during the periods between maintenance activities. Further detail on how this is to be achieved is provided in the protocol for this management zone in Section 10.

Where isolated mature trees occur, these trees would be retained. These trees are in low numbers and the clearing of these trees is considered unnecessary as they do not greatly interfere with views. It is also recommended to allow the occasional small tree to grow to provide shade and amenity. These trees to be retained in this zone are clearly indicated on the detailed mapping in Appendix A.

Through management of this zone it is expected that currently denuded areas would be recolonised with low shrub vegetation.


Figure 9-5 Examples of existing vegetation where Zone 5 applies adjacent to Illfracombe St (left) and between Bayswater and Berry St (right)

9.6 ZONE 6: PROTECTION OF INCIPIENT FOREDUNE VEGETATION

9.6.1 Where this zone applies

This zone is located along the entire study area and mostly occurs on the incipient foredune and adjacent foredune areas.

9.6.2 Objectives and key management actions of this zone

The primary objective of this zone is to minimise human disturbance to the incipient foredune vegetation to maintain a well vegetated and functional incipient foredune.

This zone is comprised of low growing shrubs and groundcover vegetation (Figure 9-6) that do not require active management. However, as it plays an important role in dune formation and resilience, protocols for protecting and replenishing this vegetation are considered appropriate.


Figure 9-6 Examples of existing vegetation within Zone 6

10 VEGETATION MANAGEMENT PROTOCOLS

The following protocols detail the management activities required to achieve the objectives of each zone. Required management activities are separated into two components:

1. Those required at the commencement of the DVMP (establishment phase)
2. Those required for ongoing maintenance

The activities required are detailed along with the recommended timing and any specific resources needed are identified. An indicative initial cost for each activity is also provided where it is outside of existing management practices conducted by SCC and will likely require specialists. These estimates would be reviewed after the first year of implementation once more accurate costs are known. Costs are based on the need to engage professional contractors with suitable equipment, licenses and insurances to conduct these specialist activities. It may be feasible for SCC or community groups under the **direction and management** of council to conduct some of the non-specialist activities if they have suitably qualified and experienced personnel. This could result in cost savings.

Recommendations for ongoing monitoring and adaptive management are provided in Section 11.

The zones to which the protocols provided below apply are shown on the site maps provided as Appendix A. The site maps are also annotated with details where specific protocols apply.

The implementation of all activities and monitoring will be the responsibility of SCC.

10.1 ZONE 1 – UP TO 100% COVER OF TREES AND TALL SHRUBS

OBJECTIVE: To allow the vegetation to grow naturally and with as little disturbance as possible

Activity	Description of management tasks	Timing	Specific resources required	Estimated annual costs
Commencement of DVMP				
Restriction of access	• Install suitable fencing to prevent inadvertent access to these areas • Install signage to inform the public that these areas are a natural regeneration area and are not to be accessed	At commencement of DVMP	• Approximately 900m of double strand fencing (although some already existing) • Signage	NA – work likely to be completed by Council utilising existing resources
Ongoing maintenance				
Weed control	• Conduct inspections to identify the presence of noxious or invasive weeds • Carry out control activities appropriate to target weed species	Annually	• Persons experienced in weed identification and qualified to employ control methods	NA – work likely to be completed by Council as part of routine weed monitoring/control activities
Identification and removal of hazardous vegetation	• Conduct inspections of trees to identify trees or limbs that pose a risk to public safety • Conduct removal of hazardous trees/limbs	Annually	• Arborist may be required to identify hazardous trees and perform removal/lopping	NA – work likely to be completed by Council as part of routine maintenance
	• Conduct trimming of overhanging hazardous vegetation along access ways and the shared pathway (including sharp leaved shrubs and grasses)	Six monthly	• Nil	NA – work likely to be completed by Council as part of routine maintenance

10.2 ZONE 2 – UP TO 70% COVER OF TREES AND TALL SHRUBS

OBJECTIVE: To provide filtered high level views by limiting tree and tall shrub foliage cover to a maximum of 70% while retaining all low shrubs and groundcover

Activity	Description of tasks	Timing	Specific resources required	Estimated annual costs
Commencement of DVMP				
Thinning of existing trees/tall shrubs	• Conduct a systematic transect along the zone area and using the foliage cover assessment methodology (in Appendix B) to identify areas where foliage cover of trees or tall shrubs is greater than 70%. • Fell trees and tall shrubs to achieve between 50% - 70% foliage cover. Trees and tall shrubs occurring immediately adjacent to existing beach access ways or stormwater outlets would be preferentially retained. In all other areas, larger, more mature trees would also be preferentially retained. • Trees and tall shrubs to be felled would be cut near the base and the stems immediately treated with herbicide to prevent subsequent re-sprouting. • Pruning of additional limbs if required to achieve between 50% - 70% foliage cover.	At commencement of DVMP	• Qualified professional required for tree/shrub removal and pruning	Approx. $57,500
Felling of standing dead trees and shrubs	• Trim large limbs and cut the main trunk of existing standing dead trees and shrubs near the base.	At commencement of DVMP	• Qualified professional required for tree/shrub removal and pruning	Included in estimated costs above

Activity	Description of tasks	Timing	Specific resources required	Estimated annual costs
Retention of felled/trimmed material	• Coarsely break up or mulch felled/trimmed material and spread thinly over the ground in the immediate vicinity (no greater than 5cm deep for mulch).	At commencement of DVMP	Qualified professional required for use of chainsaws, mulchers etc	Would be conducted as part of the above
Removal of existing vandalism signs	• Remove vandalism signs	At commencement of DVMP	• Nil	NA – work would be completed by Council
Ongoing maintenance				
Maintenance of adequate tree/tall shrub density	• Conduct a systematic transect along the zone area and using the foliage cover assessment methodology in Appendix B identify areas where foliage cover of trees or tall shrubs is less than 50% (for example due to natural senescence, storm events or intentional removal). • Identify any seedlings present that are likely to replenish foliage cover in these areas and protect them using tree guards or other appropriate measures. • If no seedlings are naturally establishing in identified area for two consecutive years, then planting of tree or tall shrubs species that naturally occur in adjacent vegetation should be implemented.	Annually	• Nil	NA – work able to be completed by Council or local community groups

Activity	Description of tasks	Timing	Specific resources required	Estimated annual costs
Seedling removal	• Systematically, walk through the zone and remove young seedlings of tree and tall shrub species that are likely to result in an excess of 70% foliage cover only. • Seedlings would be removed by pulling from the base to ensure the root system is removed. • If seedlings do not pull out easily they would be cut near the base and painted with a suitable herbicide to prevent regrowth. • Care would be taken to avoid trampling low shrub and groundcover vegetation to be retained.	Annually	• Persons able to differentiate juvenile forms of tree and tall shrub species from low shrubs and groundcovers	NA – work able to be completed by Council or local community groups
Additional pruning	• Conduct a systematic transect along the zone area and using the foliage cover assessment methodology below identify areas where foliage cover of trees or tall shrubs is greater than 70%. • Where normal growth on retained trees and tall shrubs has resulted in greater than 70% foliage cover. Select limbs would be pruned to maintain foliage cover between 50% - 70% (see foliage cover assessment methodology in Appendix B).	Annually	• Qualified professional required for tree/shrub pruning	Approx. $11,500 per year
Retention of felled/trimmed material	• Coarsely break up or mulch felled/trimmed material and spread thinly over the ground in the immediate vicinity (no greater than 5cm deep for mulch).	Annually	• Qualified professional required for use of chainsaws, mulchers etc	Would be conducted as part of the above
Weed control	• Conduct inspections to identify the presence of noxious or invasive weeds. • Carry out control activities appropriate to target weed species.	Annually	• Persons experienced in weed identification and qualified to employ control methods	NA – work likely to be completed by Council as part of routine weed monitoring/control activities

Activity	Description of tasks	Timing	Specific resources required	Estimated annual costs
Identification and removal of hazardous vegetation	• Conduct inspections of trees to identify trees or limbs that pose a risk to public safety • Conduct removal of hazardous trees/limbs	Annually	• Arborist may be required to identify hazardous trees and perform removal/lopping	NA – work likely to be completed by Council as part of routine maintenance
	• Conduct trimming of overhanging hazardous vegetation along access ways and the shared pathway (including sharp leaved shrubs and grasses)	Six monthly	• Nil	NA – work likely to be completed by Council as part of routine maintenance

10.3 ZONE 3 – UP TO 70% COVER OF TREES AND TALL SHRUBS AND UNDER-PRUNE TALL TREES

OBJECTIVE: To provide filtered high level views by limiting tree and tall shrub foliage cover to a maximum of 70%. Maximise low level views by removing the lower limbs on tall Norfolk Island Pines while retaining all low shrubs and groundcover

Activity	Description of tasks	Timing	Specific resources required	Estimated annual costs
Commencement of DVMP				
Under-prune tall trees	• Trim the lower limbs of Norfolk Island Pine trees up to a maximum height of 3m.	At commencement of DVMP	• Qualified professional required for tree pruning	Approx. $4,025 (rate $3,500/day)
Thinning of existing trees/tall shrubs	• Fell trees and tall shrubs (other than Norfolk Island Pines) to achieve a 50% - 70% foliage cover (see foliage cover guides in Appendix B). • Trees and tall shrubs to be felled would be cut near the base and the stems immediately treated with herbicide to prevent subsequent re-sprouting. • Pruning of additional limbs if required.	At commencement of DVMP	• Qualified professional required for tree/shrub removal and pruning	Approx. $21,275

Activity	Description of tasks	Timing	Specific resources required	Estimated annual costs
Retention of felled/trimmed material	• Coarsely break up or mulch felled/trimmed material and spread thinly over the ground in the immediate vicinity (no greater than 5cm deep for mulch).	Annually	• Qualified professional required for use of chainsaws, mulchers etc	Would be conducted as part of the above
Removal of existing vandalism signs	• Remove vandalism signs	At commencement of DVMP	• Nil	NA – work would be completed by Council
Ongoing maintenance				
Maintenance of adequate tree/tall shrub density	• Conduct a systematic transect along the zone area and identify areas where foliage cover of trees or tall shrubs is less than 50% (for example due to natural senescence, storm events or intentional removal). • Identify any seedlings present that are likely to replenish foliage cover in these areas and protect them using tree guards or other appropriate measures. • If no seedlings are naturally establishing in identified area for two consecutive years, then planting of tree or tall shrubs species that naturally occur in adjacent vegetation should be implemented.	Annually	• Nil	NA – work able to be completed by Council or local community groups
Seedling removal	• Systematically, walk through the zone and remove young seedlings of tree and tall shrub species that are likely to result in an excess of 70% foliage cover only • Seedlings would be removed by pulling from the base to ensure the root system is removed • If seedlings do not pull out easily they would be cut near the base and painted with a suitable herbicide to prevent regrowth • Care would be taken to avoid trampling low shrub and groundcover vegetation to be retained	Annually	• Persons able to differentiate juvenile forms of tree and tall shrub species from low shrubs and groundcovers	NA – work able to be completed by Council or local community groups

Activity	Description of tasks	Timing	Specific resources required	Estimated annual costs
Additional pruning	• Where normal growth on retained trees and tall shrubs has resulted in greater than 70% foliage cover, select limbs would be pruned to maintain foliage cover between 50% - 70% (see foliage cover assessment methodology in Appendix B).	Annually	• Qualified professional required for tree/shrub pruning	Approx. $4310 per year
Retention of felled/trimmed material	• Coarsely break up or mulch felled/trimmed material and spread thinly over the ground in the immediate vicinity (no greater than 5cm deep for mulch).	Annually	• Qualified professional required for use of chainsaws, mulchers etc	Would be conducted as part of the above
Weed control	• Conduct inspections to identify the presence of noxious or invasive weeds • Carry out control activities appropriate to target weed species.	Annually	• Persons experienced in weed identification and qualified to employ control methods	NA – work likely to be completed by Council as part of routine weed monitoring/control activities
Identification and removal of hazardous vegetation	• Conduct inspections of trees to identify trees or limbs that pose a risk to public safety. • Conduct removal of hazardous trees/limbs.	Annually	• Arborist may be required to identify hazardous trees and perform removal/lopping	NA – work likely to be completed by Council as part of routine maintenance
	• Conduct trimming of overhanging hazardous vegetation along access ways and the shared pathway (including sharp leaved shrubs and grasses).	Six monthly	• Nil	NA – work likely to be completed by Council as part of routine maintenance

10.4 ZONE 4 –UNDER-PRUNE MATURE TREES AND REMOVE TALL SHRUBS

OBJECTIVE: To maximise low level views by lifting the canopy on mature trees to a height of 3m and removing and tall shrubs and young tree regrowth

Activity	Description of tasks	Timing	Specific resources required	Estimated annual costs
Commencement of DVMP				
Under-prune mature trees	• Trim lower limbs such that foliage begins at a maximum height of 3m on all trees exceeding 4m.	At commencement of DVMP	• Qualified professional required for tree pruning	Approx. $8,050 (assumes 2.3 days @ $3,500/day)
Fell tall shrubs and young trees	• Fell all tall shrubs and young trees less than 3m tall where they occur underneath the canopy of under-pruned trees. Young trees that occur outside of the mature under-pruned tree canopy would be retained.	At commencement of DVMP	• Qualified professional required for tree/shrub removal and pruning	Approx. $10,060
Retention of felled/trimmed material	• Coarsely break up or mulch felled/trimmed material and spread thinly over the ground in the immediate vicinity (no greater than 5cm deep for mulch).	Annually	• Qualified professional required for use of chainsaws, mulchers etc	Would be conducted as part of the above
Ongoing maintenance				
Seedling removal	• Systematically, walk through the zone and remove young seedlings of all tall shrub species and tree species where they occur underneath the canopy of under-pruned trees. Tree seedlings that occur outside of the mature under-pruned tree canopy would be retained. • Seedlings would be removed by pulling from the base to ensure the root system is removed. • If seedlings do not pull out easily they would be cut near the base and painted with a suitable herbicide to prevent regrowth. • Care would be taken to avoid trampling low shrub and groundcover vegetation to be retained.	Annually	• Persons able to differentiate juvenile forms of tree and tall shrub species from low shrubs and groundcovers	NA – work able to be completed by Council or local community groups

Activity	Description of tasks	Timing	Specific resources required	Estimated annual costs
Additional under-pruning on retained trees	• Trim lower limbs such that foliage begins at a maximum height of 3m only when retained trees exceed 4m.	Annually	• Qualified professional required for tree pruning	Up to $2012 per year
Retention of felled/trimmed material	• Coarsely break up or mulch felled/trimmed material and spread thinly over the ground in the immediate vicinity (no greater than 5cm deep for mulch).	Annually	• Qualified professional required for use of chainsaws, mulchers etc	Would be conducted as part of the above
Weed control	• Conduct inspections to identify the presence of noxious or invasive weeds • Carry out control activities appropriate to target weed species	Annually	• Persons experienced in weed identification and qualified to employ control methods	NA – work likely to be completed by Council as part of routine weed monitoring/control activities
Identification and removal of hazardous vegetation	• Conduct inspections of trees to identify trees or limbs that pose a risk to public safety. • Conduct removal of hazardous trees/limbs.	Annually	• Arborist may be required to identify hazardous trees and perform removal/lopping	NA – work likely to be completed by Council as part of routine maintenance
	• Conduct trimming of overhanging hazardous vegetation along access ways and the shared pathway (including sharp leaved shrubs and grasses).	Six monthly	• Nil	NA – work likely to be completed by Council as part of routine maintenance

10.5 ZONE 5 – REDUCE THE HEIGHT OF TREES AND TALL SHRUBS TO 1.5M, UP TO 50% LOW SHRUB COVER

OBJECTIVE: To maximise high and low level views by reducing tree and low shrub height to a minimum of 1.5m. Thin low shrubs to a maximum cover of 50% while retaining all groundcovers. Retain specifically identified mature trees.

Activity	Description of tasks	Timing	Specific resources required	Estimated annual costs
Commencement of DVMP				
Retain mature trees	• Identify for retention mature trees and trees to be allowed to reach maturity as indicated on the detailed site plans in Appendix A. Tag these trees to facilitate future identification.	At commencement of DVMP	• Nil	NA
Felling of standing dead trees and shrubs	• Trim large limbs and cut the main trunk of existing standing dead trees and shrubs near the base.	At commencement of DVMP	• Qualified professional required for tree/shrub removal and pruning	Included in estimated costs below
Prune tall shrubs and young trees	• Excluding identified trees to be retained, prune all growth on young trees and tall shrubs down to a height of between 1- 1.5m. Care would be taken to avoid trampling low shrub and groundcover vegetation to be retained	At commencement of DVMP	• Qualified professional required for tree/shrub pruning	$23,000 – $46,000 depending on contractor
Thinning of low shrubs	• Conduct a systematic transect along the zone area and using the foliage cover assessment methodology (in Appendix B) to identify areas where foliage cover of low shrubs is greater than 50%. • Prune low shrubs to achieve a foliage cover within the view window of no less than 30%.	At commencement of DVMP	• Qualified professional required for shrub pruning	Included in costs above
Retention of felled/trimmed material	• Coarsely break up or mulch felled/trimmed material and spread thinly over the ground in the immediate vicinity (no greater than 5cm deep for mulch).	Annually	• Qualified professional required for use of chainsaws, mulchers etc	Would be conducted as part of the above

Activity	Description of tasks	Timing	Specific resources required	Estimated annual costs
Removal of existing vandalism signs	• Remove vandalism signs	At commencement of DVMP	• Nil	NA – work would be completed by Council
Ongoing maintenance				
Retain mature trees	• Identify for retention mature trees and trees to be allowed to reach maturity as indicated on the detailed site plans in Appendix A and previously tagged.	Annually	• Nil	NA
Prune tall shrubs and young trees	• Excluding identified trees to be retained, prune all growth on young trees and tall shrubs down to a height of between 1- 1.5m. Care would be taken to avoid trampling low shrub and groundcover vegetation to be retained	Annually	• Qualified professional required for tree/shrub pruning	$23,000 – $46,000 per year depending on contractor
Thinning of low shrubs	• Conduct a systematic transect along the zone area and using the foliage cover assessment methodology (in Appendix B) to identify areas where foliage cover of low shrubs is greater than 50%. • Prune low shrubs to achieve a foliage cover within the view window of no less than 30%.	Annually	• Qualified professional required for shrub pruning	Included in costs above
Retention of felled/trimmed material	• Coarsely break up or mulch felled/trimmed material and spread thinly over the ground in the immediate vicinity (no greater than 5cm deep for mulch).	Annually	• Qualified professional required for use of chainsaws, mulchers etc	Would be conducted as part of the above
Weed control	• Conduct inspections to identify the presence of noxious or invasive weeds • Carry out control activities appropriate to target weed species	Annually	• Persons experienced in weed identification and qualified to employ control methods	NA – work likely to be completed by Council as part of routine weed monitoring/control activities
Identification and removal of hazardous vegetation	• Conduct inspections of trees to identify trees or limbs that pose a risk to public safety. • Conduct removal of hazardous trees/limbs.	Annually	• Arborist may be required to identify hazardous trees and perform removal/lopping	NA – work likely to be completed by Council as part of routine maintenance

Activity	Description of tasks	Timing	Specific resources required	Estimated annual costs
	• Conduct trimming of overhanging hazardous vegetation along access ways and the shared pathway (including sharp leaved shrubs and grasses).	Six monthly	• Nil	NA – work likely to be completed by Council as part of routine maintenance

10.6 ZONE 6 – PROTECTION OF INCIPIENT FOREDUNE VEGETATION

OBJECTIVE: To minimise human disturbance to the incipient foredune vegetation to maintain a well vegetated and functional incipient foredune

Activity	Description of tasks	Timing	Specific resources required	Estimated costs
Commencement of DVMP				
Education of the public	• Install signage to inform the public of the importance of the incipient foredune vegetation and the need to avoid unnecessary disturbance (e.g. walking across vegetated areas, using them as boat parking areas or for other recreational purposes)	At commencement of DVMP	• Signage	NA – work likely to be completed by Council utilising existing resources
Initial vegetation management	• Access for vegetation management activities would not be gained through Zone 6 • Foot traffic would be limited to that essentially required • No equipment storage or materials laydown would occur	At commencement of DVMP	• NA	NA
Ongoing maintenance				
All maintenance in Zones 2 to 5	• Access for vegetation management activities would not be gained through Zone 6, access would be gained from the walkway and access paths only. • Foot traffic would be limited to that essentially required • No equipment storage or materials laydown would occur	At all times	• NA	NA
Weed control	• Conduct inspections to identify the presence of noxious or invasive weeds • Carry out control activities appropriate to target weed species	Annually	• Persons experienced in weed identification and qualified to employ control methods	NA – work likely to be completed by Council as part of routine weed monitoring/control activities

11 MONITORING AND REVIEW

Annual monitoring is required to determine if the overall objectives of the plan and those specific to each zone are being effectively met. As illegal tree vandalism has been one of the issues that has necessitated the preparation of this plan, monitoring would also be focussed on identifying any additional areas of illegal tree vandalism.

Monitoring would be conducted prior to annual maintenance activities. It would assist in determining the scope of the annual management. A specific image-based monitoring methodology has already been recommended within the ongoing maintenance protocols for Zone 2, Zone 3 and Zone 5. During the implementation of this methodology, it is recommended that additional photo points be established within the other management zones (Zones 1 and 4) to provide a baseline context and then a record of the response of the vegetation to management. Locations of recommended additional photo points are provided on the detailed site plans in Appendix A.

At each photo point, three high resolution digital images would be taken from the front of the adjacent property boundaries; one image 45^{o} to the left, one image directly towards the shoreline and one image 45^{o} to the right.

It is also recommended that a general annual assessment of vegetation cover and health be conducted by systematically walking the landward and seaward boundaries of the study area and noting any evidence of the following as a minimum:

- New occurrences of any vegetation vandalism[3]
- Dieback on actively managed vegetation
- Erosion or blowouts in the dune
- Areas of bare sand without or with low densities of vegetation cover

If any of the above are detected, remedial action would be considered including potential importation of sand or planting of additional vegetation to meet the stated objectives of each zone.

Annual monitoring of vegetation cover within Zone 2 in addition to the general assessment of vegetation and the photo points that would be established through the study area, would be analysed to determine if management activities are being effective in meeting the objectives of each zone. If it is determined that the objectives are not being met then alterations to the plan would be considered.

This DVMP would be reviewed at a maximum of five years from its implementation at which time more detailed assessments of the dune system may be required to inform ongoing management.

Response to severe weather events

It is the scope of this DVMP to manage the vegetation within the study area to provide as resilient a dune system possible while meeting competing objectives (primarily that of providing views). In the event of extensive wave and wind attack during a severe weather event, it is inevitable that damage to the dune structure and vegetation will occur. If such an event(s) was to occur during the initial five-year implementation of this DVMP, it is noted that any emergency protocols necessitated would override those documented in this DVMP.

[3] It is noted that tree removal as well as other activities that suppress recruitment or growth in contravention of this DVMP, such as seedling removal or pruning, would also be considered vandalism.

12 CONCLUSIONS

This DVMP has provided a compromise solution for the appropriate management of vegetation within the study area at Collingwood Beach. It has considered the competing values of stakeholder groups and reached a compromise to maintain what is considered a relatively stable and resilient dune system while providing for much desired views by near residents and the broader community.

The management zones and protocols of this DVMP have been designed to work with the existing vegetation as much as possible to minimise impacts and the amount of labour and therefore costs required to implement the plan.

It may be beneficial to implement a pilot phase of this DVMP, where an example of one or more zones is established according to the protocols in this plan, to assist public consultation and feedback. Once fully implemented, ongoing monitoring and review of this DVMP will determine if it is being successful in meeting its objectives.

A more detailed assessment of the dune system and vegetation is also recommended after the initial five-year implementation period. The aim of the assessment would be to determine if the management protocols recommended in this plan are being effective in maintaining dune structure and whether any alterations to the health and diversity of vegetation within the study area are occurring.

13 REFERENCES

Baldocchi, D. (2012) , *Lecture 18, Wind and Turbulence, Part 3, Surface Boundary Layer: Theory and Principles, Cont*, Biometeorology, ESPM 129, Ecosystem Science Division, University of California, Berkeley 2012

Barbier, E.B., Hacker,S.D., Kennedy, C., Koch, E.W., Stier, A.C. and Silliman, B.R (2011 'The value of estuarine and coastal ecosystem services' *Ecological Monographs*, 81(2), , pp. 169–193

Beardsmore, A., Gangaiya, P. and Misckiewicz, T. (no date). 'Winding Back the Clock in Dune Management at Wollongong'.

BMT WBM 2012. Shoalhaven Public Asset Coastal Risk Management Review

Collingwood Beach Dunecare Group, Vincentia Ratepayers and Residents Association and Department of Conservation and Land Management Nowra 1993. 'Are you aware of importance of the dunes?' Flyer.

Davies P.T. & Kesby N.A. (no date). Coastal Protection Hard or Soft.

Davies P.T. & Kesby 1989. 'Collingwood Beach - Ten Years On'. *Australian Journal of Soil and Water Conservation Vol. 2 November 1989.*

DLaWC 2001 Coastal Dune Management: A Manual of Coastal Dune Management and Rehabilitation Techniques, Coastal Unit, NSW Department of Land and Water Conservation, Newcastle

Durán, O. and Moore, L.J. (2013) 'Vegetation controls on the maximum size of coastal dunes' *Proceedings of the National Academy of Sciences* | October 22, 2013 | vol. 110 | no. 43 | 17217–17222

French, K (2010*) A Framework to Guide Ecological Restoration: Coastal Foredune Scrub and Temperate Littoral Rainforest*. South Coast. University of Wollongong, Wollongong.

Haskoning Australia Maritime & Waterways (2014). Shoalhaven Coastal Erosion Remediation Adaptive Works Strategy for Transitioning from "Make- Safe/Make-Good" to "End-State" Protection. Report prepared for Shoalhaven City Council, July 2014.

Hesp, P. (2011) Foredunes and blowouts: initiation, geomorphology and dynamics Geomorphology 48 (2002) 245–268

McLean, R. and Shen, J. (2006) 'From Foreshore to Foredune: Foredune Development Over the Last 30 Years at Moruya Beach, New South Wales, Australia', *Journal of Coastal Research* 22 1 28-36

NSW DLWC (2001), *Coastal Dune Management: A Manual of Coastal Dune Management and Rehabilitation Techniques*, Department of Land and Water Conservation Coastal Unit Newcastle

Qld Dept of Environment (undated) *Coastal Sand Dunes – their vegetation and management*, technical notes, accessed online at https://www.ehp.qld.gov.au/coastal/ecology/beaches-dunes/beach_conservation.html on 7 and 9 December 2015

SA DEH (2005) *Adelaide's Living Beaches: A Strategy for 2005–2025*, Department for Environment and Heritage, South Australia

Sigren J.M, Figlus J. and Armitage A.R. (2014) Coastal sand dunes and dune vegetation: Restoration, erosion, and storm protection. *Shore & Beach*, 82(4).

SMEC 2009. Coastal Hazards Studies and Plans

SMEC 2011. Site Specific Emergency Action Plans for Shoalhaven City Council. Report prepared for Shoalhaven City Council, May 2011.

Tozer M.G., Turner K., Keith D.A., Tindall D., Pennay C., Simpson C., MacKenzie B., Beukers P. and Cox S. (2010) Native vegetation of southeast NSW: a revised classification and map for the coast and eastern tablelands. *Cunninghamia* 11(3): 359–406.

Wasson, R. J. and Nanninga, P. M. 'Estimating wind transport of sand on vegetated surfaces', *Earth Surface Processes and Landforms*, vol. 11,505-514 (1986)

Watt, M. and Evans, J.R. (1999) 'Proteoid Roots. Physiology and Development' *Plant Physiology*, October 1999, Vol. 121, pp. 317–323

Woodroffe C.D. 2014. Collingwood Beach Jervis Bay, Geomorphological background. Presented at Collingwood Beach public forum.

APPENDIX A MAPS

AREA OF VEGETATION TO BE MANGED - THE STUDY AREA

Collingwood Beach Dune Vegetation Management Plan

Study area

0 100 200 Meters

A3 @ 1:5000

EXISTING VEGETATION STRUCTURE

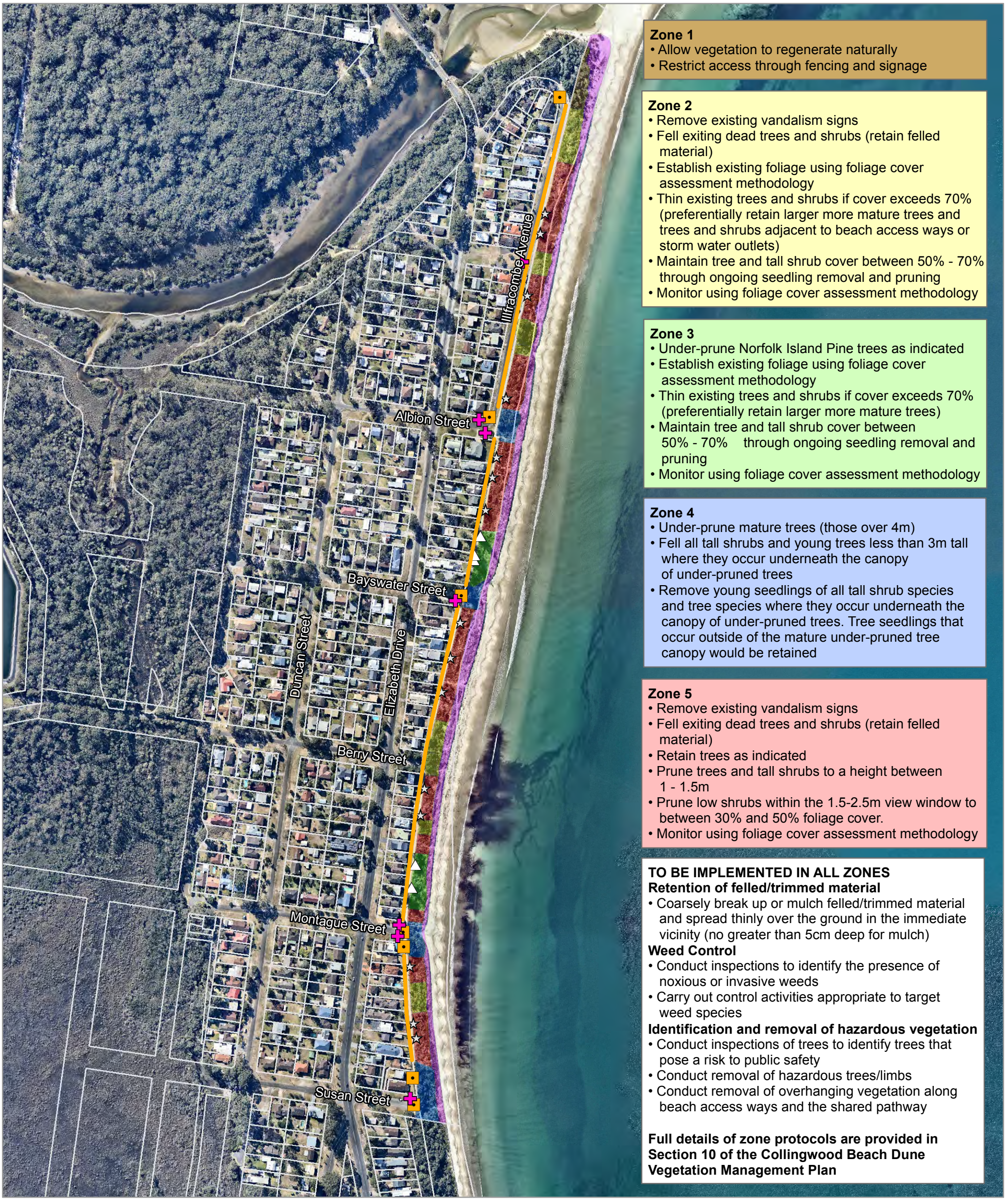
Collingwood Beach Dune Vegetation Management Plan

Existing vegetation structure
- Incipient foredune vegetation
- Relatively intact overstorey regrowth
- Modified overstorey regrowth
- Overstorey generally absent

0 100 200 Meters

A3 @ 1:5000

Notes:
- Vegetation data digitised by nghenvironmental
- Aerial imagery sourced from Nearmap
  Image date Aug 2014



Zone 1
- Allow vegetation to regenerate naturally
- Restrict access through fencing and signage

Zone 2
- Remove existing vandalism signs
- Fell exiting dead trees and shrubs (retain felled material)
- Establish existing foliage using foliage cover assessment methodology
- Thin existing trees and shrubs if cover exceeds 70% (preferentially retain larger more mature trees and trees and shrubs adjacent to beach access ways or storm water outlets)
- Maintain tree and tall shrub cover between 50% - 70% through ongoing seedling removal and pruning
- Monitor using foliage cover assessment methodology

Zone 3
- Under-prune Norfolk Island Pine trees as indicated
- Establish existing foliage using foliage cover assessment methodology
- Thin existing trees and shrubs if cover exceeds 70% (preferentially retain larger more mature trees)
- Maintain tree and tall shrub cover between 50% - 70% through ongoing seedling removal and pruning
- Monitor using foliage cover assessment methodology

Zone 4
- Under-prune mature trees (those over 4m)
- Fell all tall shrubs and young trees less than 3m tall where they occur underneath the canopy of under-pruned trees
- Remove young seedlings of all tall shrub species and tree species where they occur underneath the canopy of under-pruned trees. Tree seedlings that occur outside of the mature under-pruned tree canopy would be retained

Zone 5
- Remove existing vandalism signs
- Fell exiting dead trees and shrubs (retain felled material)
- Retain trees as indicated
- Prune trees and tall shrubs to a height between 1 - 1.5m
- Prune low shrubs within the 1.5-2.5m view window to between 30% and 50% foliage cover.
- Monitor using foliage cover assessment methodology

TO BE IMPLEMENTED IN ALL ZONES

Retention of felled/trimmed material
- Coarsely break up or mulch felled/trimmed material and spread thinly over the ground in the immediate vicinity (no greater than 5cm deep for mulch)

Weed Control
- Conduct inspections to identify the presence of noxious or invasive weeds
- Carry out control activities appropriate to target weed species

Identification and removal of hazardous vegetation
- Conduct inspections of trees to identify trees that pose a risk to public safety
- Conduct removal of hazardous trees/limbs
- Conduct removal of overhanging vegetation along beach access ways and the shared pathway

Full details of zone protocols are provided in Section 10 of the Collingwood Beach Dune Vegetation Management Plan

PROPOSED VEGETATION MANAGMENT

Collingwood Beach Dune Vegetation Management Plan

Proposed management zones
- Zone 1 - Up to 100% cover of trees and tall shrubs
- Zone 2 - Up to 70% cover of trees and tall shrubs
- Zone 3 - Up to 70% cover of trees and tall shrubs and under-prune tall trees
- Zone 4 - Under-prune mature trees and remove tall shrubs
- Zone 5 - Prune trees and tall shrubs to 1.5m high
- Zone 6 - Protection of incipient foredune vegetation

- Lot boundaries
- Foliage cover assessment methodology
- Photopoints (additional to foliage cover assessment)
- ☆ Trees to be retained in Zone 5
- △ Norfolk Island Pines to under-prune in Zone 3
- Recommended Eucalypt planting

0 100 200 Meters

A3 @ 1:5000

Notes:
- Vegetation data digitised by nghenvironmental
- Aerial imagery sourced from Nearmap
  Image date Aug 2014

APPENDIX B DIGITAL IMAGE ANALYSIS FOR MONITORING FOLIAGE COVER

Digital image analysis provides a quantifiable and repeatable methodology for determining the percent cover foliage in an area. A series of digital images can be stitched together to form a continuous image of each zone or a representative section of the zone.

For zones where it is required, a 'view window' is defined. In this case it has been set as 1.5m – 2.5m for Zones 2, 3 and 5 (refer to Figure B-1). This is the most relevant height when retaining views from the walkway and single storey residences.

Figure B-1 Example of the view window as it applies to Zone 5

Using digital image processing software, it is a simple process to determine the percent foliage cover over the background view in the view window. This can assist in determining:

- Whether management is required
- What extent of management is required

Examples are provided below for each management zone 1-5 to get an understanding of the results.

Zone 1: Up to 100% foliage cover

Existing vegetation

Before foliage cover percentage: 90%

No foliage cover reduction proposed for this zone.

Zone 2: Up to 70% foliage cover in the 1.5m-2.5m view window (including trees and shrubs)

Existing vegetation

Before foliage cover percentage: 90%

After foliage cover pecentage: 70%

Zone 3: Up to 70% foliage cover in the 1.5m - 2.5m view window, also under-pruning of tall pine trees

Existing vegetation

Before foliage cover percentage: 90%

After foliage cover percentage: 70%

Zone 4: Under-pruning of mature trees and removal of tall shrubs

Existing vegetation

Before foliage cover: 85%

After foliage cover: 67%

No target is set for this zone. The image is simply shown to understand the different foliage cover results.

Zone 5: Up to 50% foliage cover in the 1.5m - 2.5m view window (not including trees to be retained)

Existing vegetation

Before foliage cover percentage: 70%

After foliage cover percentage: 50%

APPENDIX C OPTIONS PROPOSED DURING CONSULTATION AND SUPPORTING FACT SHEETS

Option 1

Banksias maintained at different densities in different areas:

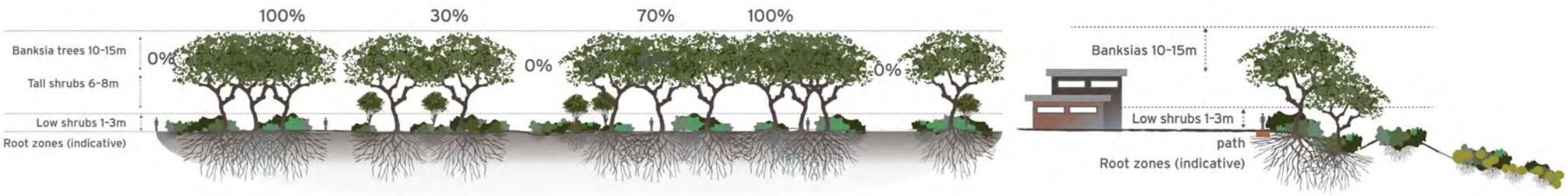
- 0%, 30% 70% and 100% density banksias
- Low, medium and tall shrubs in between

1

Searching for a compromise at
Collingwood Beach

This provides views in certain areas as well as areas with greater plant root protection where this is needed more.

Year 20 Elevation

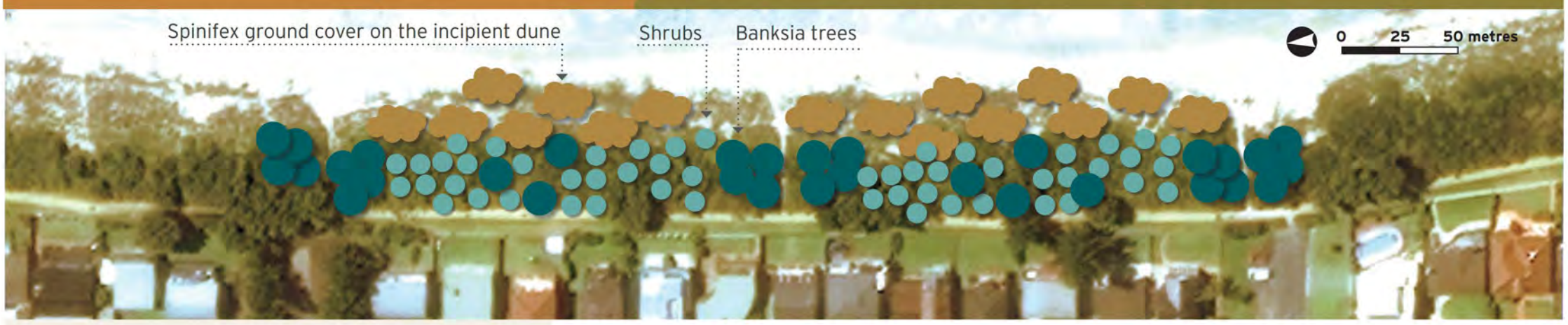


Advantages of Option 1

- Very good dune protection for areas with 70-100% Banksia tree density.
- Views maximised in some areas.
- Good fauna habitat values are retained in many areas (30-100% Banksia tree density).

Disadvantages of Option 1

- Higher likelihood of erosion and damage from storm surge in areas with 0% trees.
- Higher likelihood of degradation to residences and infrastructure from higher salt load, erosion or sand ingress in areas with 0% trees.
- Labour intensive to maintain areas within specific density parameters.
- Potential impacts to vegetation from disturbance as a result of ongoing seedling removal.



Costs & Management

- Moderate cost.
- Management centres on removing seedlings to maintain set densities.

Caveat - This scenario is an approximation of what could be achieved with specific management actions. Advice is based on general ecological and geomorphological literature and not trials at the Collingwood Beach site. Graphics are indicative.

Your feedback is important. Which option provides the best result?

OPTION 1, 2 or 3? Please fill out a feedback form and tell us. The results of your feedback will be used to develop a detailed Dune Vegetation Management Plan that may combine or adapt the options to achieve a plan that can be supported by the broader community, while also meeting social, environmental and legal requirements for the area.

Please send your feedback to:
Shoalhaven City Council
Attention Karen Rourke
Council@shoalhaven.nsw.gov.au
Or PO Box 42 Nowra, NSW 2541

ngh environmental

Shoalhaven City Council

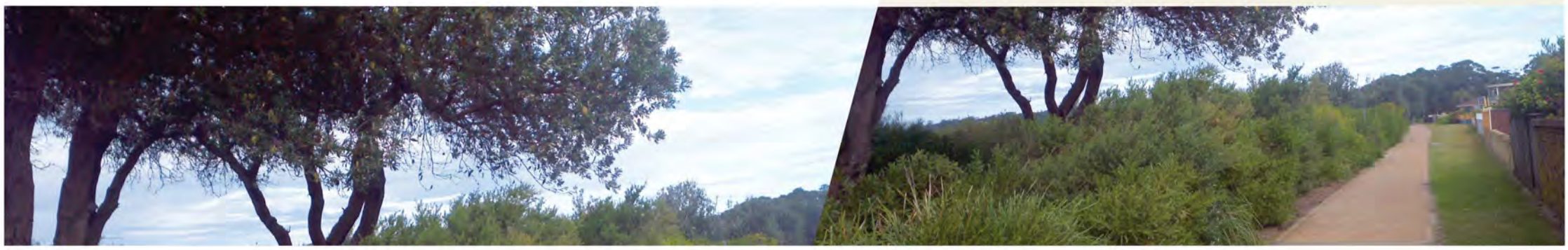
Option 2

Lift the canopy of existing and naturally regenerating Banksias. Remove tall shrubs.

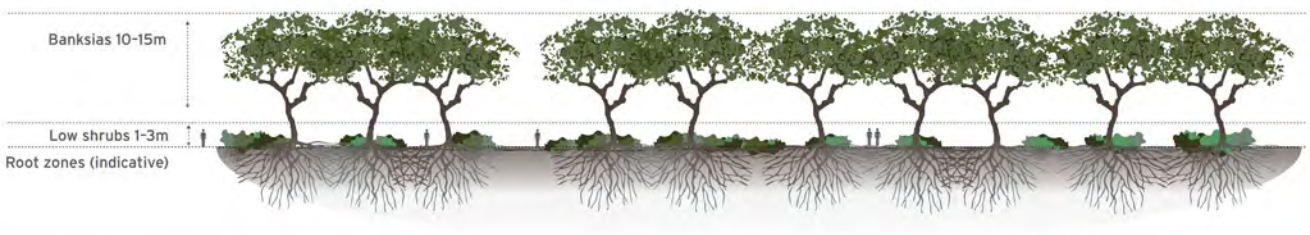
Provides good dune stability across a broad area while providing filtered lower level views. (*Note: image portrays less tree density than desirable or than will regenerate naturally*)

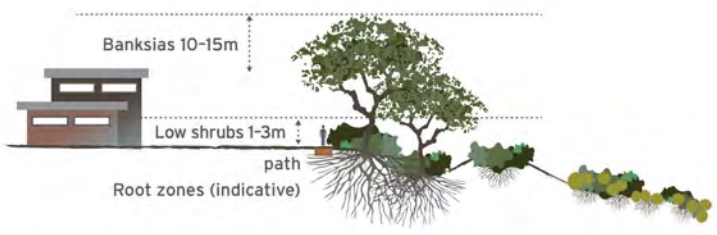
2

Searching for a compromise at
Collingwood Beach



Year 20 Elevation





Advantages of Option 2

- Very good dune protection at moderate to high Banksia tree density.
- Low level views maximised in most areas.
- Good fauna habitat values where canopy connectivity is retained.

Disadvantages of Option 2

- Time: the Banksias need to obtain a certain height before pruning can commence. Views may be obstructed during this time.
- Labour intensive management, requires ongoing pruning and removal of tall shrubs.
- Risks to long term survival of the Banksias (e.g. risk of disease from pruning, instability due to modified, top heavy tree structure).
- Potential increased risk to public safety from trees/branches falling in high wind events.
- Loss of high level views.

Costs & Management

- Moderate to high cost.
- Management centres on pruning trees and removing seedlings.

Caveat - This scenario is an approximation of what could be achieved with specific management actions. Advice is based on general ecological and geomorphological literature and not trials at the Collingwood Beach site. Graphics are indicative.

Your feedback is important. Which option provides the best result?

OPTION 1, 2 or 3? Please fill out a feedback form and tell us. The results of your feedback will be used to develop a detailed Dune Vegetation Management Plan that may combine or adapt the options to achieve a plan that can be supported by the broader community, while also meeting social, environmental and legal requirements for the area.

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Option 3

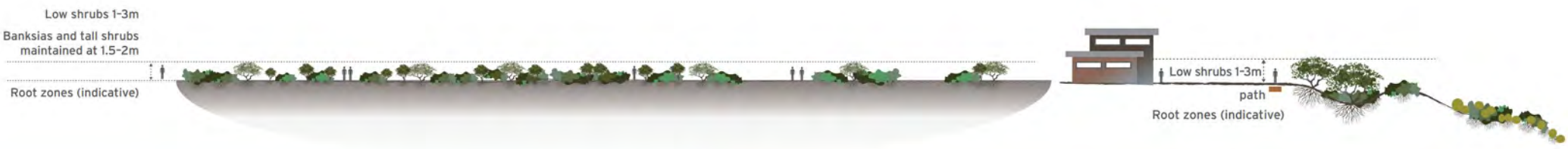
Restrict the height of naturally occurring Banksia trees and tall shrubs (shrubs up to 3 m).

Provides reasonably good dune stability across a broad area while providing for higher level views.

3

Searching for a compromise at
Collingwood Beach

Year 20 Elevation



Advantages of Option 3

- Reasonable dune stability although roots would not be as deep as for higher growing trees.
- Provides high level views .
- Provides dense connecting habitat for small birds.

Disadvantages of Option 3

- Labour intensive management, requires ongoing pruning of dense thickets.
- Risks to long term survival of the Banksias (e.g. risk of disease from pruning).
- Potential increased risk to public safety from sharp branches .
- Possibility of degradation to residences and infrastructure from higher salt load.
- Loss of amenity: 'unnatural' appearance of vegetation.
- Low vegetation less able to keep sand volumes seaward.

Costs & Management

- High cost.
- Management centres on pruning trees.

Caveat - This scenario is an approximation of what could be achieved with specific management actions. Advice is based on general ecological and geomorphological literature and not trials at the Collingwood Beach site. Graphics are indicative.

Your feedback is important. Which option provides the best result?

OPTION 1, 2 or 3? Please fill out a feedback form and tell us. The results of your feedback will be used to develop a detailed Dune Vegetation Management Plan that may combine or adapt the options to achieve a plan that can be supported by the broader community, while also meeting social, environmental and legal requirements for the area.

Please send your feedback to:
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Collingwood Beach
FACT SHEET 1

1

Your 'stake' in the decision

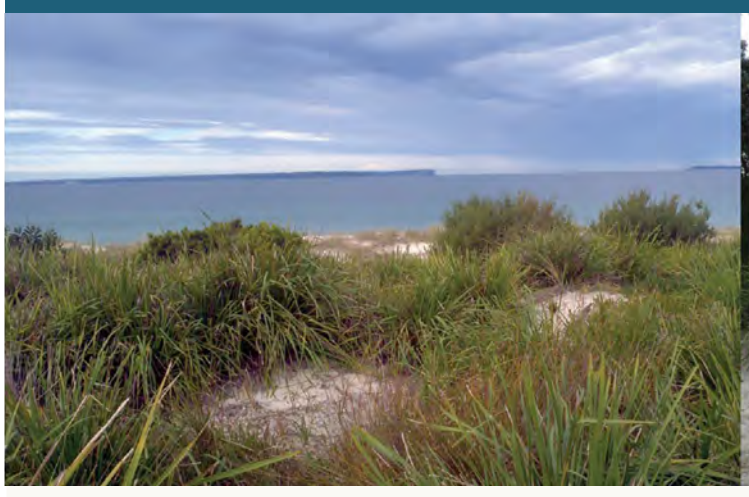
Collingwood Beach – the story so far

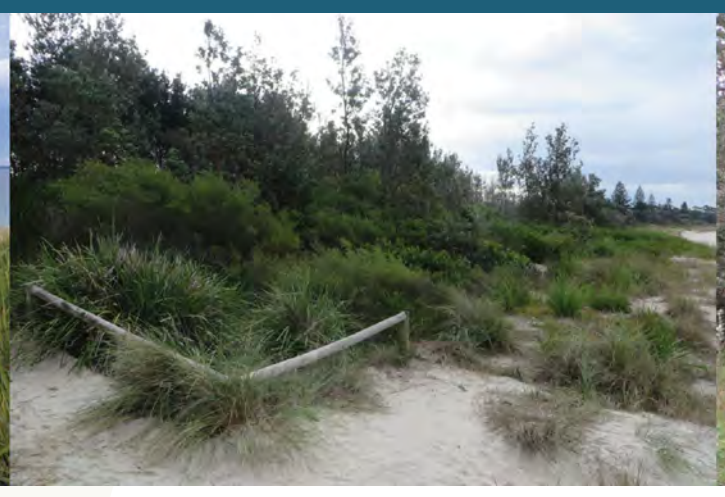
In the 1960's, dune vegetation was cleared along Collingwood Beach to make way for residential development. Storms in the early 1970's showed that the loss of a vegetated dune system has left the area vulnerable to storms and erosion. The impact of coastal erosion1 on public and private assets (these include the pathway, roads, water and sewer lines and private houses) has been identified as a high risk; about 100 private properties in this area could be affected[1]. The value of public assets at risk is approximately $2.2 million[2].

The need to compromise

The Council reserve foreshore provides many 'services' to the community. These include:

- Providing views of the bay.
- Providing natural areas.
- Protecting assets against sand ingress, erosion and salt spray during storm events.





The Collingwood Beach Dune Vegetation Management Project aims to manage the beach foreshore vegetation to address competing interests in a sustainable manner from the Northern end of Illfracombe Avenue to Susan Street.

While some dune management options sound appealing and address some of the issues, they do not address others. This is the 'compromise' problem.

Vegetation management must taking into account all issues and must be supported by the community to be effective[3]. The Shoalhaven City Council is seeking community input into the Vegetation Management Plan so that it can be supported by the broader community, while also meeting social, environmental and legal requirements for the area.

Who are the Stakeholders?

Many people will be affected if the dune fails and erosion takes away the foreshore. It is important to understand the views of everyone who will be affected. Who are the key stakeholders?

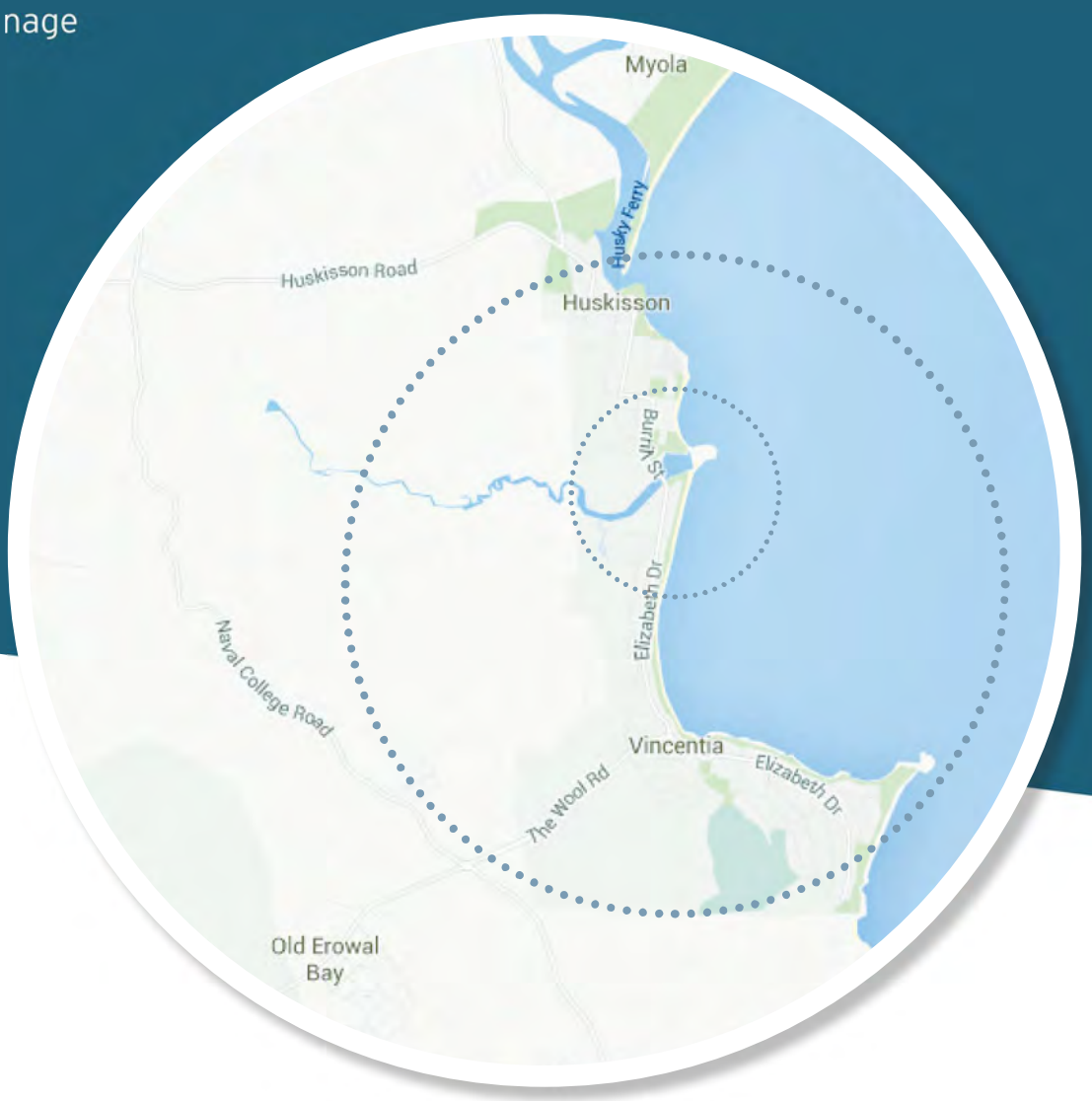
- Near residents – properties most at risk and most impacted by changes to vegetation management of the reserve.
- The local community - approximately 3000 residents in Vincentia, many of whom may also be highly impacted. From Susan Street to the northern end of Illfracombe Avenue represents about 40% of the Collingwood Beach foreshore.
- Local special purpose and special interest groups. These groups may be formed around a single issue or set of issues, important to them. For example; bird watching or paddle board clubs, residents groups.
- The broader community - including tourists and other visitors.
- The Council and other government agencies, who have responsibilities under environmental legislation to protect and appropriately manage the reserve.

In developing a plan that recognises the views of all stakeholders, we need to hear from you. What is your main interest? What do you value most about the area? What would you like to see happen?

Where to now?

Three options have been developed that aim to balance the competing issues in an acceptable way (see the separate 3 POSTER SET). Which option provides the best result in your opinion: Option 1, 2 or 3?

The results of your feedback will be used to develop a detailed Dune Vegetation Management Plan that may combine or adapt the options to achieve a plan that can be supported by the broader community, while also meeting social, environmental and legal requirements for the area.



References

1. Coastal Hazards Studies and Plans , SMEC 2009
2. Shoalhaven Public Asset Coastal Risk Management Review (BMT WBM) 2012
3. Beardsmore, A., Gangaiya, P. and Misckiewicz, T. (no date). 'Winding Back the Clock in Dune Management at Wollongong'.

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Collingwood Beach
FACT SHEET 2

2

The role of vegetation in protecting the foreshore

Dune under threat

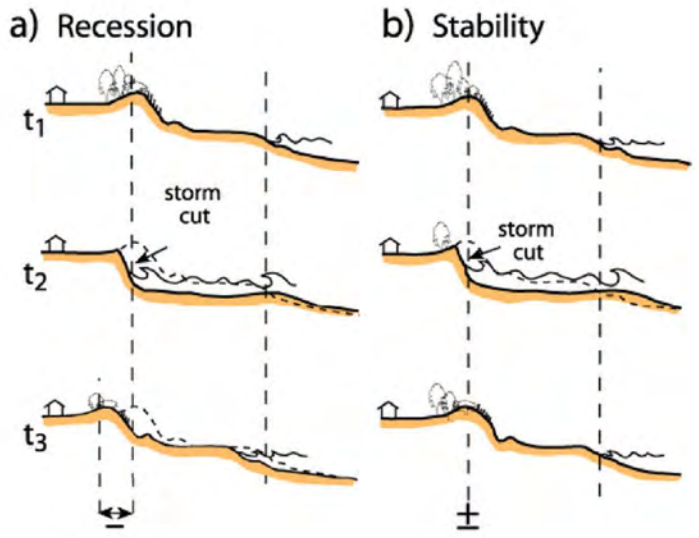
Collingwood Beach is one of the most vulnerable beaches in the Shoalhaven Local Government Area from coastal processes[1]. Specific risks include coastal erosion, coastal inundation and entrance instability at Moona Moona Creek. The erosion could affect the entire length of the beach whilst wave inundation could occur in areas where the dune is lower (between Berry and Albion Park).

The severe storms of 1974 demonstrated how erosion can threaten assets. By 1978, the effects of erosion and associated lack of vegetation on the dune included: wind-blown sand covering roads, lawns and gardens, blocking stormwater drains and causing 'sand blast' damage to houses and vehicles as well as causing ceiling collapse . These impacts are known to have affected real estate values and the wellbeing of many local residents[2]. As these type of events can be decades apart, it can be easy to forget the lessons learned and repeat historical mistakes.

The lessons

A three year vegetation rehabilitation effort commenced in 1978, shaping the dune and planting grasses and trees. Monitoring demonstrated that the results of this work could create a dune more resilient to storms[3]. It was also noted as being aesthetically and ecologically harmonious. Importantly it also fostered a 'dune care' ethic important to maintaining the support of the local community in protecting the dune.

Unstable sand is the enemy. Vegetation creates a net above and below the ground to slow its movement.



Receding beach profile compared to stable beach profile. The dotted line can be thought of as the 'risk line', moving closer to houses and other assets in picture a), above[4].

The role of vegetation

Using vegetation to manage erosion is called a 'soft' technique. It is much less expensive than 'hard' engineering solutions, such as groynes or rock walls, and does not have the negative consequences of 'hard' structures such as loss of beach, amenity and environmental impacts. As set out above, there is good evidence that 'soft' technique can work at Collingwood Beach and that it can provide additional aesthetic and ecological benefits.

Important functions that vegetation can provide include:

- Trapping airborne sand and salt – vegetation height and density is important to achieve this. The higher and denser the vegetation, the more sand and salt will be kept seaward, away from houses and public assets.
- Trapping sand at the ground surface – vegetation structure is important to achieve this. Grasses that cover the ground surface and act as a net, hold sand in place and increase stability.
- Trapping sand beneath the ground surface – root structure is important for this. The deeper the roots penetrate and denser they are, the more stable the overall land form will be.

Additionally, the shape of the dune is important. A dune that has a wedge shape (low near the water, higher near the residences) will provide better wind and salt spray protection.

Our impact on vegetation

Management activities can also have a large impact on how well the vegetation performs these functions. In developing a stable and resilient dune system, it is important to know that:

- Weeding or pruning activities that require people to walk over the vegetation, will impact the health of smaller plants, like grasses and seedlings.
- Pruning plants will increase susceptibility to disease and restricting the height of plants will affect the depth of the root ball. Both of these actions may impact on the long term stability of the dune.
- Removing plants or otherwise disturbing the soil can increase erosion and weeds.
- Taller more robust species will provide greater long term protection, although they will block out some views from the path and residences.

Where to now?

Three options have been developed that aim to balance the competing issues in an acceptable way (see the separate 3 POSTER SET). Which option provides the best result in your opinion: Option 1, 2 or 3?

The results of your feedback will be used to develop a detailed Dune Vegetation Management Plan that may combine or adapt the options to achieve a plan that can be supported by the broader community, while also meeting social, environmental and legal requirements for the area.

Comparative root systems and above ground height of trees, shrubs and ground covers at Collingwood Beach.

References

1. Haskoning Australia Maritime & Waterways (2014). Shoalhaven Coastal Erosion Remediation Adaptive Works Strategy for Transitioning from "Make- Safe/Make-Good" to "End-State" Protection. Report prepared for Shoalhaven City Council, July 2014.
2. SMEC (2011). Site Specific Emergency Action Plans for Shoalhaven City Council. Report prepared for Shoalhaven City Council, May 2011.
3. Davies P.T. & Kesby N.A. (no date). Coastal Protection Hard or Soft.
4. Woodroffe C.D. 2014. Collingwood Beach Jervis Bay, Geomorphological background. Presented at Collingwood Beach public forum.

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Collingwood Beach
FACT SHEET 3

3

Management of dynamic natural systems

Collingwood Beach – a highly modified landscape

In the 1960's, dune vegetation was cleared along Collingwood Beach to make way for residential development. The vegetation types and structure that occur in the Council reserve today are a result of:

- An extensive vegetation rehabilitation effort that commenced in 1978
- Natural colonisation from surrounding vegetation remnants
- Management actions (legitimate as well as illegal) including weeding, pruning and poisoning of dune vegetation

Over time, the vegetation can be expected to continue to change. This occurs as a natural process called 'succession' as some plants grow to outcompete or replace others. As they grow plants may create more sheltered conditions for other species to survive. A natural vegetation system that changes over time in response to natural conditions generally becomes more resilient. We can influence the vegetation types and vegetation structure but we need to work with these natural processes for it to be both resilient and cost effective.

Banksias: friend or foe?

The local coastal vegetation is derived from the 'Coastal Foredune Scrub' vegetation community. Coast Banksia (Banksia integrifolia) is the most common tree in this vegetation type. It commonly occurs in dune vegetation. It is likely to have naturally occurred prior to initial clearing for housing in the 1960s (it can be found on Myola spit which had little human interference).

At Collingwood Beach, Coast Banskia is a very successful competitor. It produces many

seedlings. Its deep and dense root system helps dune stability and it creates habitat for smaller species less able to tolerate the harsh conditions. Its height blocks airborne sand and salt, keeping it seaward. Whilst Banksias contribute to a resilient dune system, their increasing prevalence causes concern for some members of the community. In several locations, dense Banskia thickets block out views of the bay and reduce the scenic vistas that were present when the dune had less vegetation following subdivision and major erosion event of the 1970s.

Management options for the reserve

A management plan is being developed for the Council reserve, to take into account the many 'services' to the community that the vegetation provides; natural areas and wildlife habitat, protection for assets against sand ingress, erosion and salt spray during storm events whilst acknowledging community requests for more views of the bay.

Management options are influenced by the resources available. While 'soft' vegetation management is considered to have many advantages over 'hard' engineering solutions, the costs are still substantial. The vegetation that exists at Collingwood Beach today has cost the community time as well as money, as many community members have contributed to planting efforts:

- In 1978 over 2500 trees were planted, dunes were reformed, access tracks stabilised, grasses planted1
- Around $44,000 was spent between 1978 - 1981 under the direction of the Soil Conservation Service[2]
- A cost for actively managing a 2km section of dune at Woonona beach has been estimated to cost $150,000[3]
- A 'hard' engineering solution to the Collingwood Beach risks has been estimated at approximately $ 18 million and was therefore deemed to be unaffordable[4]

Where to now?

Three options have been developed that aim to balance the competing issues in an acceptable way (see the separate 3 POSTER SET). Which option provides the best result in your opinion: Option 1, 2 or 3?

The results of your feedback will be used to develop a detailed Dune Vegetation Management Plan that may combine or adapt the options to achieve a plan that can be supported by the broader community, while also meeting social, environmental and legal requirements for the area.

References

1. Collingwood Beach Dunecare Group, Vincentia Ratepayers and Residents Association and Department of Conservation and Land Management Nowra (1993). 'Are you aware of importance of the dunes?' Flyer.
2. Davies P.T. & Kesby (1989). 'Collingwood Beach - Ten Years On'. Australian Journal of Soil and Water Conservation Vol. 2 November 1989.
3. Beardsmore, A., Gangaiya, P. and Misckiewicz, T. (no date). 'Winding Back the Clock in Dune Management at Woolongong'.
4. Haskoning Australia Maritime & Waterways (2014). 'Shoalhaven Coastal Erosion Remediation Adaptive Works Strategy for Transitioning from Make- Safe/Make-Good to End-State Protection'. Report prepared for Shoalhaven City Council, July 2014.

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Shoalhaven City Council

Collingwood Beach Preservation Group
Proposed Amendments to the Collingwood Beach
Draft Dune Vegetation Management Plan

COLLINGWOOD BEACH PRESERVATION GROUP
PO Box 107
Vincentia NSW 2540

Collingwood Beach Preservation Group

The Collingwood Beach Preservation Group (CBPG) was established to ensure Collingwood Beach is preserved and enhanced through the application of sound scientific principles to ecologically sustainable development. Ecologically sustainable development includes taking into consideration, in an integrated way, the wider social, economic and environmental implications of decisions and actions without compromising the ability of future generations to meet their own needs. The CBPG is a sub-committee of the Vincentia Residents and Ratepayers Association (VRRA) which is the Community Consultative Body that represents Vincentia to the Shoalhaven City Council.

Background

From time to time Collingwood Beach experiences storm surges and consequentially wave run-up that affects the beach. The foreshore dune provides the only immediate protection for the beach. However, Collingwood Beach is an accreting beach which means that it recovers naturally from storm erosion over time as sand deposits are gradually replaced.

Collingwood Beach is a key tourist attraction for the area. Tourists in turn support the community so it is in the community's interest to maintain the views across Jervis Bay from the coastal walkway whilst at the same time ensuring the resilience of the foreshore dune.

Shoalhaven City Council (SCC) engaged a consultant to produce a Dune Vegetation Management Plan (DVMP). The CBPG was not consulted with regard to the final content of the draft DVMP and maintain that the draft DVMP does not address the primary purpose for which it was produced nor does it address the best interests of the community.

Points at Issue

For many years the community and tourists had unobstructed views over Jervis Bay however those views were progressively blocked by the planting of high growth trees along the coastal walkway. The photos below show the past and current situation in front of 1A Susan Street, Vincentia.

1A Susan Street Vincentia 2001

1A Susan Street Vincentia 2015

The planting of high growth trees has resulted in the beauty of Jervis Bay, and the iconic view of Ppint Perpendicular, being hidden from the coastal walkway. It has also resulted in vandalism of trees in front of some properties which SCC has not been able to control despite its best endeavours. The draft DVMP works with the existing vegetation structure and thus does nothing to address the issues caused by the planting of the trees.

The draft DVMP outlines a case for the need to maintain trees to assist in the build-up of sand deposits on the foreshore dune. Sections along the foreshore dune consist of some areas that have trees and other areas that do not have trees. There is however no difference between the two areas in relation to sand build-up.

The draft DVMP also outlines a case for the need to maintain trees so that sand can be bound together in the face of wave action during minor storms. There are however no records of trees planted at Collingwood Beach resisting wave action and overseas experience demonstrates that planting trees on foreshore dunes has catastrophic consequences as evidenced from the adjacent photo of Culbin in the northeast of Scotland.

Further, the draft DVMP states that dead trees and shrubs are to be retained and mulch established on the dunes however this will only create a fire load in an urban environment which as evidenced from previous bushfires in the area can lead to loss of dwellings.

The Science

The draft DVMP includes references to a wide variety of literature stated to be in support of the vegetation proposed for the foreshore dune. However, a causal link from the vegetation referenced in the literature is not drawn to the specific circumstances of Collingwood Beach, namely a very narrow dune in an urban area. In that regard it is relevant to note that the NSW Government Department of Land and Water Conservation Coastal Dune Management manual does not identify trees as a suitable for planting on foreshore dunes.

At Collingwood Beach there is no difference in dune build up between areas that have high growth trees and areas that do not. This is consistent with the literature produced by various government authorities such as the Tasmanian Department of Primary Industries, Parks, Water and Environment Coastal Works Manual which states that low-growing plants, such as grasses, are more effective at stabilising sand than trees or shrubs as 90% of wind-borne sand is transported in the 0.5m closest to the ground.

Other literature from government authorities such as publications from the Queensland Environmental Protection Authority and Beach Protection Authority state that tree roots cannot provide protection against significant wave action. This has been endorsed by SCC. The literature presented in the draft DVMP claims that trees are nevertheless needed to reduce the impact of more frequent minor storms.

Some members of the CBPG have owned their properties for over 60 years. Nobody has a recollection of an event where the trees have reduced the impact of a storm and SCC has not produced any records to support such a contention. In fact the erosion from the recent significant storms of May and September 2015 did not even come close to the trees planted along the coastal walkway. Where isolated trees away from the coastal walkway have been exposed to wave action they have provided no resistance as evidenced by the adjacent photo at Collingwood Beach near Moona Moona Creek.

Conclusion

The draft DVMP is complicated and is not consistent across the whole of the dune system. Further, the draft DVMP is not based on scientific facts and does not address the root cause of vandalism. In addition, the draft DVMP incorporates a complicated and expensive monitoring regime.

A Simple 11 Point Plan

The CBPG submits the following proposal for the DVMP:

1. Under pruning of established mature trees to be at a minimum height of 5 metres.
2. Reduction and maintenance of all vegetation outside of mature trees (defined as currently 6 metres in height) to a level of between 90cm and 1 metre tall that enables viewing of Jervis Bay by children and wheelchair users.
3. Existing clusters of banksia trees in Zones 3 and 4 to be reduced in quantity and height to a level that enables wide span views of Jervis Bay.
4. All new growth banksia trees to be removed together with existing seedlings and saplings.
5. Removal of dead wood and dead trees.
6. Removal of vandalism signage.
7. Approval of the request from Collingwood Beach property owners and residents to form a dune care management group to maintain dune vegetation consistent with the agreed DVMP.
8. Removal any trees that are potentially dangerous to pathway users or damaging the pathway with root undulation.
9. All new plantings to be grasses or coastal shrubs which have a mature height and resilient effect that are consistent with the agreed DVMP.
10. Removal of pittosporum from all of Collingwood Beach dunes which includes dunes south of Susan St.
11. The exhibition period be limited to 4 weeks.

Department of Primary Industries
Lands

Ms Kellie Lowe
Environmental Services Manager
Department of Planning and Environment

c/- Donna Hayden
Administrative Assistant
Donna.Hayden@shoalhaven.nsw.gov.au

Contact: Helen Wheeler
Email: Nowra.Crownlands@crownland.nsw.gov.au

Doc No:16/131829
Your Ref: Collingwood Beach DVMP

2 August 2016

Dear Ms Lowe

Request for review of the Draft Collingwood Beach Dune Vegetation Management Plan 2016 and REF 050716

Thank you for your email of 24 June 2016 regarding the above Draft DVMP and REF over Crown reserve R64234, managed by SCC as the Vincentia (R64234) Reserve Trust.

REF:

DI - Lands does not object to the vegetation modification proposed at the eastern end of Susan Street as a demonstration of Option 2 vegetation management, in order that the community may make an informed submission to the Draft DVMP when exhibited.

However SCC should take all reasonable steps to ensure that the proposed level of assessment under the EP&A Act is sufficient for the activities proposed.

Draft DVMP:

It is evident from the material provided and available on the SCC web site that SCC has made the relationship between dunal vegetation retention and dune stability, and the risks of reducing the dunes resilience to erosive forces, abundantly clear to the community. The division of community views is also evident, as is the difficulty in preventing unauthorised vandalism of the dunal vegetation.

It is noted that recession of Collingwood Beach and related advancement of the Zone of Reduced Foundation Capacity over time is very highly likely at this location; it appears that the DVMP aims to maintain a diverse vegetative structure until further engineering intervention is required.

Risks in the physical environment

It must be recognised that regardless of being a tree or a 'tall' or 'short' shrub, a 1.5m plant has up to a corresponding area of stabilising root mass. Larger plants provide larger areas of substrate stability; smaller plants including pruned plants have a smaller stabilising effect.

Structures on the freehold land are seated at approximately 5m AHD; high tides are up to 1.9m AHD and sea level rise in the area is predicated to be 5mm/yr. This provides up to 3m elevation of unconsolidated substrate between the water and the structures to withstand additional wave run-up from weather events.

A primary concern in the draft DVMP should be if parts of the dune system with only 30% cover of plants over 1.5m are sufficiently stable to ensure the Zone of Reduced Foundation Capacity is not prematurely enlarged by SCC actions under the DVMP.

Risks in the legal environment

DI – Lands recommend that SCC take all reasonable steps to ensure that the proposed level of assessment under the EP&A Act is sufficient for the activities proposed. SCC should fully explore both the initial legality of the proposed management actions, and the potential legal impact should physical, administrative or financial damage to private land be exacerbated by weather events, on a dune system managed in accordance with the DVMP.

Section 4 *Legal and Policy Matter* needs to be much more robust. Table 4-1 notes that the management of the reserve must be consistent with several legislative requirements, policies and plans; whereas the actual works proposed appear to be inconsistent with those instruments. This could lead to an inability to implement the DVMP in its adopted form.

Zoning and options descriptions

For clarity of treatment in the Proposed Vegetation Management map it would be ideal to take out of individual zone and put in "all areas":

- Remove existing vandalism signs *where present*.
- Fell existing dead trees *where present*.
- Monitor using foliage cover assessment methodology (establishment of current cover is a component of monitoring).

This will make the zone map and treatment descriptions simpler to interpret.

Although being currently physically different Zone 2 & 3 appear to have the same outcome treatments with under-pruned Norfolk Island Pines indicated individually on the legend. There is potential to further simplify the plan by combining these management zones.

Monitoring and review

DI - Lands is in support of the monitoring and review provisions of the draft DVMP, particularly:

a) That a baseline of data is recorded to allow assessment of the effects of Zone management on vegetation structure, cover and dune stability.
b) That monitoring will be ongoing and that based on these results remedial action may be required to meet the objectives of each zone. This is particularly relevant in Zones 4 & 5, and
c) That if the zone objectives are not achieved then the DVMP may need to be altered.

Thank you for the opportunity to comment; DI - Lands looks forward to future versions of the Collingwood beach DVMP.

Yours sincerely

Helen Wheeler
Natural Resources Project Officer
for Manager South Coast Area

From: Matt Carr <matt.carr@dpi.nsw.gov.au>
Sent: Wednesday, 3 August 2016 5:31 PM
To: Isabelle Ghetti
Cc: Frances Clements - NPWS
Subject: Collingwood Beach - Vegetation Management Plan Demonstration Site

Dear Ms Ghetti

I understand that a draft Vegetation Management Plan for Collingwood Beach is in preparation and will be publicly exhibited later in the year. I also understand that Shoalhaven City Council (SCC) propose to implement the outcomes of the vegetation management plan at a demonstration site before or during the public exhibition of the draft plan.

As the proposed demonstration site is within the locality of Jervis Bay Marine Park, S56(3) of the *Marine Estate Management Act 2014* (MEM Act) requires SCC, as the determining authority, to consider any advice given by DPI Fisheries (on behalf of the relevant Ministers) on the impact on the marine park.

DPI Fisheries would normally provide comment on the draft plan when it was exhibited for comment or otherwise referred to us. It appears SCC is considering making a determination and beginning implementation of the plan (by means of the demonstration site) prior to the plan being made available for comment and DPI Fisheries having the opportunity to provide advice. In relation to S56(3) of the MEM Act, this appears to preempt the outcome of any advice provided.

Without the benefit of having seen a copy of the draft plan, I make the following general comments:

- SCC has identified Collingwood Beach as being at risk of coastal erosion and inundation, and discussed with DPI Fisheries the potential need to beach scrape and sand nourish Collingwood Beach to protect against and mitigate the impacts of storm damage.
- altering dune vegetation has the potential to change the functioning of the dune system, and either directly or indirectly (through the need to beach scrape and sand nourish) impact on habitat within the marine park.
- In order to provide considered advice prior to SCC making a determination, DPI Fisheries requires the draft plan and REF.
- The REF should include:

    1. an assessment of the potential for changes to dune functioning and stability as a result of the proposed vegetation management at all sites in the planning area (not just at individual sites in isolation)
    2. a description of typical sand movement on Collingwood Beach and the dune system
    3. a description of storm impacts on Collingwood Beach and the dune system
    4. an analysis of how (2) and (3) may be altered by the proposed vegetation management
    5. an assessment of risk to the beach and dune system, particularly in relation to the previously forecast need to take protection and mitigation measures such as beach scraping and sand nourishment.

Please feel free to contact me should you wish to discuss any of the above comments.

Matt

Matt Carr | Manager, Jervis Bay Marine Park
Department of Primary Industries
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W: www.mpa.nsw.gov.au W: www.dpi.nsw.gov.au
Conserve, Share, Provide

DEPUTATION TO SUPPORT THE RESCISSION MOTION

File no.DA14/2579,52652E 10 th May 2016

There are many similarities, MANY SIMILARITIES, between the CBPG vegetation plan and that proposed by ngh. However, the CBPG maintain the ngh plan is complicated, inequitable, near impossible to manage, too costly to maintain, based on existing vegetation, incorrect scientific facts and fails to address the root cause of vandalism, which is the uncontrolled, overgrown vegetation in this urban area.

The CBPG put forward a simple, let's say based on THE KISS principle, for a vegetation plan. The CBPG take exception to the following issues in the plan put forward by ngh :

The plan does not adequately address the clustering of vegetation in zone 4, be it clusters of banksias, tea trees or shrubs. i.e. in some areas up to 10 Banksias within a 4square metre area

The plan does not adequately address actions to prevent a repeat of the past, in particular not removing the trees which have been allowed to grow so close to the incipient dune

The varying height of low and tall shrubs is too confusing, ALL shrubs should be maintained between 90cm and 1m to meet the science for the maximum capture of sand.

Fewer large trees should be retained.

The large trees to be retained should be under pruned so there is no canopy closer than 5m above the ground.

All saplings and seedlings of tall trees should be removed

No mention has been made regarding the removal of Pittosporum. It should be removed otherwise the inappropriate vegetation with large trees of today, will be just as bad with Pittosporum within the lifetime of the new vegetation plan. This removal should be undertaken on all of the Collingwood Beach dunes.

For the first time in the history of Collingwood beach a bulk number of owners are keen to form a dune care group.

The 6 week exhibition period is too long. Due to the confusion from the merger that never happened, it is necessary to get back to business and allow the councillors to achieve the objective they set in their term of Council, that is, solve the vegetation vandalism at Collingwood Beach. A four week exhibition period will suffice.

The objectives beyond this plan should be more innovative and look forward to the global trends and sciences to protect and preserve beaches.

TO ACHIEVE THIS

A Simple 11 Point Plan

The CBPG submits the following proposal for the DVMP:

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8) Removal of any trees that are potentially dangerous to pathway users or damaging the pathway with root undulation.

9) All new plantings to be grasses or coastal shrubs, which have a mature height and resilient effect that are consistent with the agreed DVMP.

10) Removal of Pittosporum from all of Collingwood Beach dunes which includes dunes south of Susan St.

11) The exhibition period be limited to 4 weeks.

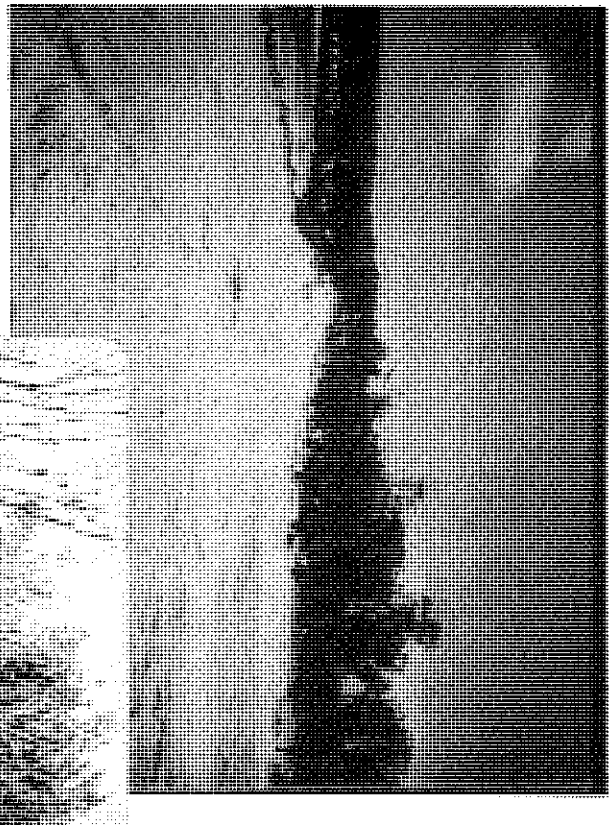
Defending Collingwood Beach dune vegetation and foreshore

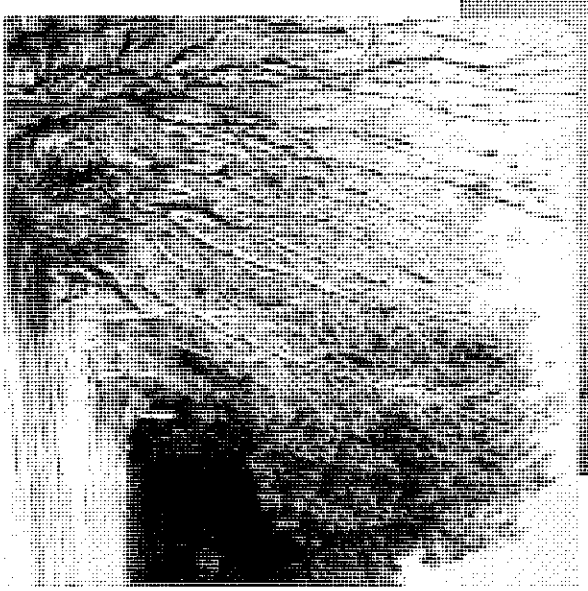
Bruce McKenzie – Chair, Vincentia Matters

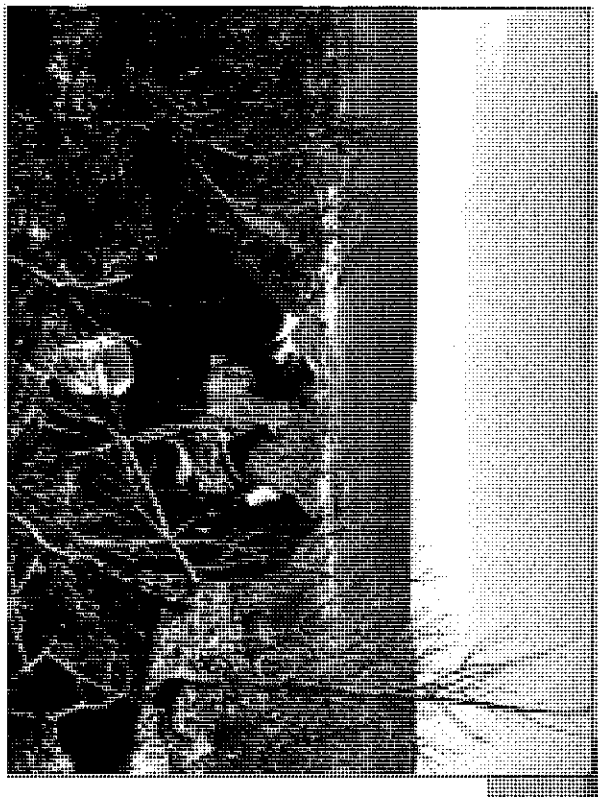
#unspoilt

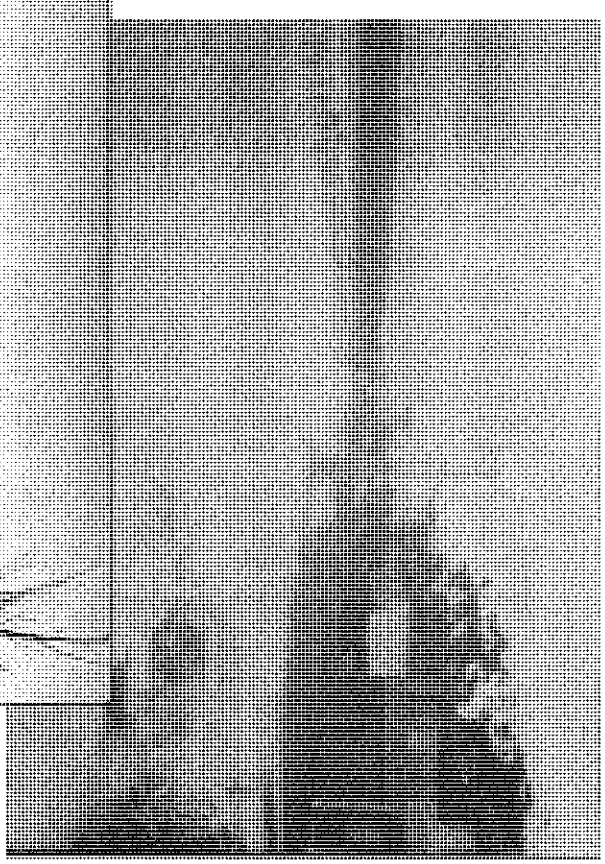
Ben Shute @Ben_Shute · 27 Dec 2015

Don't ever change **#Vincentia** #southcoastlove #southcoast #australia









#spoilt

Reference Group Consultation Process

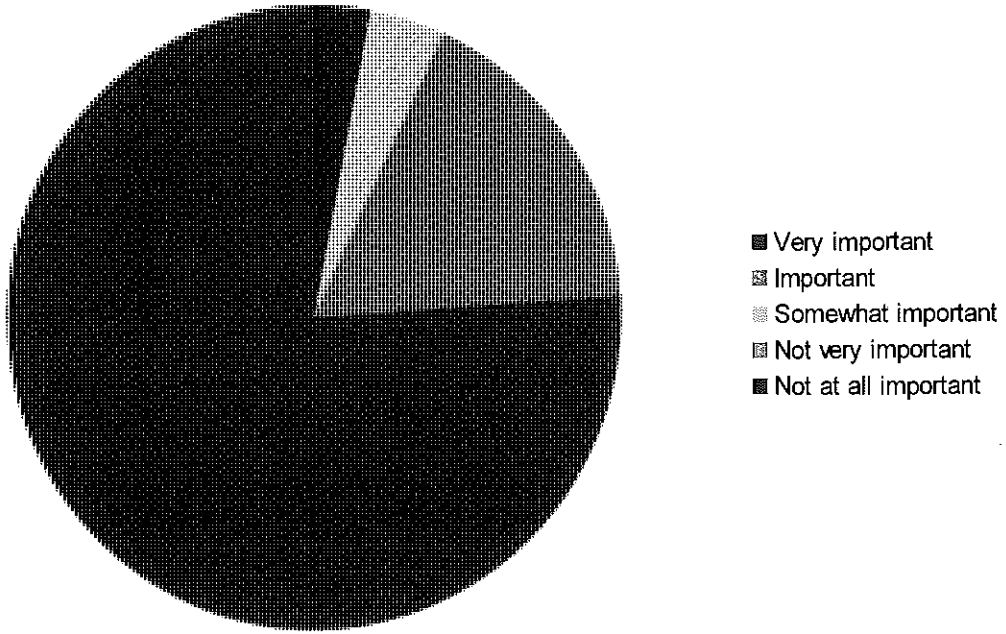
- "...The dune vegetation needs to provide a wedge effect..."
- "...The dune vegetation needs to be managed in a way that maximises filtered views..."
- "...The dune vegetation provides from the walkway and from the beach a range of experience, with filtered views, thickets, healthy vegetation, tall occasional shade trees..."

Expert opinion

Community Opinion

- **SCC Foreshore Vandalism survey – Aug 2013**

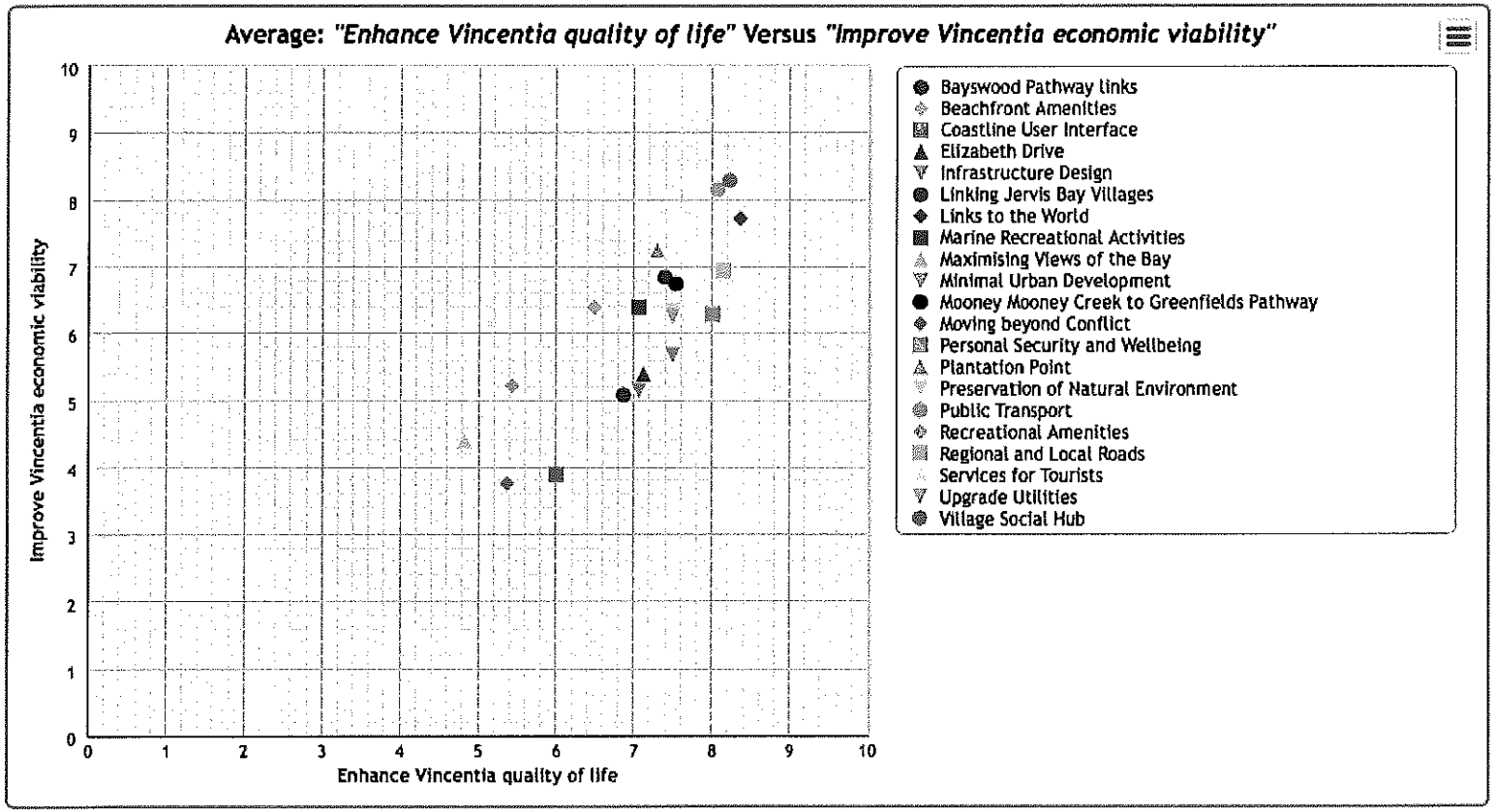
  Results from pathway users when asked, "What importance do you place on the native vegetation, including trees, growing on the sand dunes at Collingwood Beach?"



Community Opinion

- **Vincentia 2025**

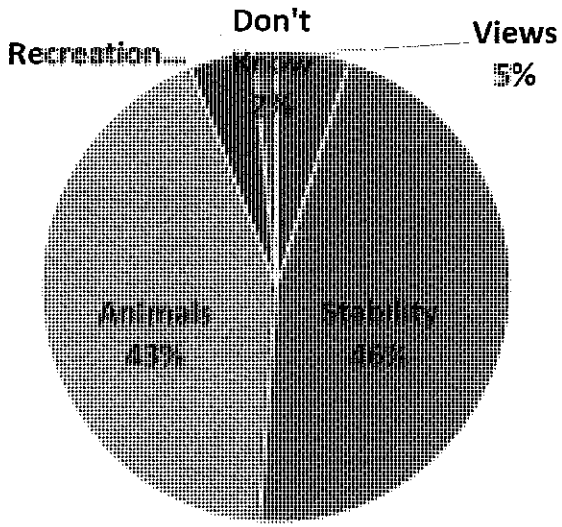
Average | Standard Deviation



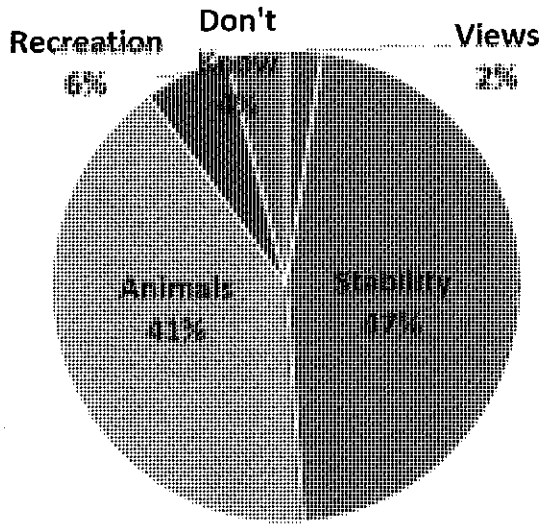
Community Opinion

- **Macquarie University Study – April 2016**

OPINIONS ON DUNE MANAGEMENT



Residents including part time



Visitors and workers

n = 254

Conclusion

- **The severity of tree and shrub management in Zone 5 of the Draft Collingwood Beach Foreshore Vegetation Management Plan (cutting banksias to 1-2 metres along >50% of the length) fails to satisfy community expectation of Council and should not be included in the exhibited document.**

Attachment H

Summary key points from submissions

	Comments
Against removal of vegetation for demonstration site prior to any public exhibition of the draft plan – public exhibition may result in Council not proceeding with the draft plan in its current format so there would be unnecessary damage to the vegetation	
Already examples along the beachfront that illustrate the effect without the need to damage vegetation	**Yes there are sites that could be used as examples of the treatment in proposed zones e.g. Montague Street**
Diminishes community's confidence in Council's public exhibition process	
Unnecessary further damage to dune – already views	
Rewarding those that vandalised beach	
Public asset not private should not be managed for private interests	
Number legal questions raised the validity of the draft plan and whether or not Council could even go ahead with the proposed works	**Legal advice obtained – see confidential report**
Council has successfully prosecuted persons for illegal tree removal and environmental harm in the past and now Council proposes to do the same with regard to the tree removal and pruning in the draft plan.	
Impact on Jervis Bay tourism and Shoalhaven's 'unspoilt' image	
Impact on dune stability – coastal erosion	
Impact on Bangalay Sand Forest Endangered Ecological Community	**Commences at southern boundary of Susan Street access to beach – need buffer**
How does the destruction of vegetation for view amenity fit within the overall Generic Plan of Management for the reserve? (Objectives for natural areas under the LG Act)	
Council now embarking on its own program of vegetation destruction to appease owners	
Need vegetation to protect houses and infrastructure from erosion – Collaroy example	
Vegetation adds to the scenic beauty of the Bay as you walk along the path	
We need shade – used by people with disabilities regularly	
Very costly plan to maintain the hedge and under pruning	
The plan disregards the views and needs/desires of the wider community	
Impact on native wildlife	
Draft plan could undo decade of bushcare works – affect volunteers morale and willingness to work for Council	
Council should go back the drawing board and review the draft plan in line with the reference group objectives.	

Rosemarie Collier

From: John Bucinskas <John.Bucinskas@environment.nsw.gov.au>
Sent: Thursday, 4 August 2016 5:41 PM
To: Kelie Lowe; Isabelle Ghetti
Cc: Aimee Beardsmore; Daniel Wiecek
Subject: Collingwood Beach comments

Hi Kelie / Isabelle

My apologies for delay in getting our advice back to you on Collingwood beach as we have had staff off on unexpected leave this week.

In regards to the proposed dune vegetation works at Collingwood Beach to promote private views, OEH makes the following broad comments to assist in immediate considerations consistent with matters previously discussed with OEH staff. It should be noted that OEH would like to reserve our right to make more detailed comments on a revised REF once final details are supplied.

- OEH is generally not supportive of the proposed dune vegetation clearing works and believes the works would be in contradiction of the objectives of the New Coastal Management Bill 2016 and coastal reforms including the draft Coastal Management Manual & toolkit including the Coastal Dune Management Manual (2001).
- OEH's position on clearing dune vegetation for views is clearly demonstrated in our Coastal and Estuary Grants Program - Application Guidelines 2016-17 (page 8), which state that 'vegetation reduction for amenity outcomes' will not be funded - http://www.environment.nsw.gov.au/resources/coasts/coastal-estuary-grant-program-guidelines-160394.pdf
- Clearing/pruning of dune vegetation works as proposed would likely increase the risk of both coastal erosion and coastal inundation from overtopping, thereby exposing private properties to greater risk from these hazards.
- Pruning of mature vegetation to low heights, as proposed, could lead to death of these plants, resulting in further issues for council such as dune instability, blowouts and the need to stabilise these areas through costly works.
- The proposed dune clearing works at Collingwood are likely to set a precedent for similar works to be undertaken at other localities in the LGA. This could create unsustainable expectations upon Council.
- Council may need to consider seeking legal advice to understand if dune clearing creates any future liability or exposure to council, particularly following any future storm event.

I trust this helps but as always feel free to call us if you require anything further

Regards

John Bucinskas
A / Senior Team Leader, Water Floodplains & Coast
Illawarra & SE Regions
Regional Operations Group (South Branch)

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