IMPLEMENTATION PLAN FOR DUNE MANAGEMENT STRATEGY

Contents

1. Background

In the first half of the 20th Century, many of Wollongong's beaches were largely un-vegetated due to previous clearing of the dune vegetation for grazing and urban development. Sand mining also occurred at several beaches including Perkins, Corrimal and Stanwell Park beaches. During a storm in the 1960s, infrastructure at City Beach was undermined. Several beaches were also heavily eroded during storms in the 1970s. Primarily in response to concerns about storm impacts on beaches and the infrastructure behind them, and to minimise sand drift onto roads, reserves and properties behind the dunes, extensive dune stabilisation and revegetation works were undertaken during the mid-1980s. This work, jointly funded by Council and the NSW Public Works Department, was undertaken by the NSW Soil Conservation Service. Ten beaches underwent substantial dune stabilisation and re-vegetation works which involved re-shaping and replanting the existing un-vegetated foredune. The existing dunes were sectioned into uniform rectangular areas and fenced to prevent further sand loss and provide protection from damage caused by pedestrian access. Chain and timber pedestrian beach access paths were constructed between these sections. At the completion of the engineering works, the landward dune face was planted with shrubs and trees (*Lomandra longifolia, Westringia fruticosa, Banksia integrifolia, Leptospermum laevigatum*, and several species of Acacia), and the seaward dune face was planted with Spinifex and Marram grasses. On-going maintenance of the dunes including weed control, fence and track maintenance has been undertaken by Council's Dune Crew.

The dune restoration works were successful and are providing ongoing protection of beaches and infrastructure against coastal hazards due to storms. However, subsequent increases in dune and vegetation heights, and the seaward extension of vegetation from the areas where the original planting work was undertaken on the beaches are conflicting with the recreational use of the beaches, and requires management.

The need to prepare a management strategy for the dunes and beaches in the Wollongong Local Government Area (LGA) arose during preparation of the Draft Wollongong Coastal Zone Management Plan (CZMP), which was completed in 2012. During the exhibition of the draft CZMP, strong community concerns were raised about coastal dune management. These concerns focused on the degradation of sight lines due to excessive dune and vegetation heights reducing the ability of lifeguards and lifesavers to properly observe people on the beach, the occurrence of dune scarping after storms, and the effect of dune vegetation extending seaward in reducing the amenity of beach users. At the Council Meeting on 9 July 2012, Council resolved to 'proceed with preparing a Dune Management Strategy to address the beach amenity, vegetation management and access issues raised by the community in their submissions'.

The draft Wollongong Dune Management Strategy for the Patrolled Areas of 17 Beaches (the draft Strategy) included a set of management options to address the deterioration of sight lines for lifeguard/lifesaver operations, the reduction in beach amenity and access issues at the patrolled beaches. At the Council Meeting on 11 June 2013, Council resolved to place the draft Strategy on public exhibition for 28 days, which occurred from 17 June to 14 July 2013, during which time 63 submissions were received. The content of the submissions were assessed and changes were made to the draft Strategy where appropriate, or considered as part of the Implementation Plan.

Several divisions of Council have a role or interest in the management of Wollongong beaches. These include Environmental Strategy and Planning Division (Environmental Planning & Conservation Services), Property and Recreation Division (Beach Services), City Works Division (Dune Crew), Infrastructure Strategy and Planning Division, and Project Delivery Division.

This document details the steps undertaken in preparing the Implementation Plan for the Wollongong Dune Management Strategy for the Patrolled Swimming Areas of 17 Beaches.

2. Multi Criteria Analysis Results

The draft Strategy Multi Criteria Analysis (MCA) scored management options for individual beaches. Table 1 provides a summary of the most highly ranked options for beaches with issues of sight line, recreational amenity and access.

Table 1. Beach specific management options (listed north to south)

Beach	Management Option	Sight Line		Recreational Amenity		Beach Access		Approximate initial cost*	Total Time to Implement ^	Implementation constraints
		Severity	Issue addressed	Severity	Issue addressed	Severity	Issue addressed			
Bulli	Build a tower		Yes		No		No	$150,000	1-3 years	
	Build a tower and remove vegetation from frontal zone		Yes		Yes		Yes	$150,000 and $50,000-$100,000	1-3 years	Risk of impacts from coastal hazards currently high. Further site investigations (e.g. structural integrity of buried seawall) and on-going monitoring required to inform timing for implementation.
	Raise level of observation area in SLSC		Yes		No		No	$100,000-$500,000	1-3 years	
Woonona	Relocate existing tower and remove vegetation from frontal zone		Yes		Yes		Yes	$10,000-$50,000 and $50,000-$100,000	6-12 months	
	Relocate existing tower		Yes		No		No	$10,000-$50,000	6-12 months	
	Raise level of observation area in SLSC and remove vegetation from frontal zone		Yes		Yes		Yes	$100,000-$500,000	1-3 years	
Bellambi	Build a tower and remove vegetation from frontal zone		Yes		Yes		Yes	$150,000 and $50,000-$100,000	1-3 years	
	Raise level of observation area in SLSC and remove vegetation from frontal zone		Yes		Yes		Yes	$10,000-$50,000 At this site the option means relocate to the first floor, no extension. And $50,000-$100,000	6-12 months	
	Reduce dune height by re-profiling		Yes		Yes		Yes	$100,000-$500,000	1-3 years	
Corrimal	Relocate existing tower and remove vegetation from frontal zone		Yes		Yes		Yes	$10,000-$50,000 and $50,000-$100,000	6-12 months	
	Reduce dune height by re-profiling		Yes		Yes		Yes	$100,000-$500,000	1-3 years	
	Remove vegetation from frontal zone		Yes		Yes		Yes	$50,000-$100,000	6-12 months	
Towradgi	Build a tower and remove vegetation from frontal zone		Yes		Yes		Yes	$150,000 and $50,000-$100,000.	1-3 years	Risk of impacts from coastal hazards currently high. On-going monitoring required to inform timing for implementation.
	Build a tower		Yes		No		No	$150,000	1-3 years	
	Reduce dune height by re-profiling		Yes		Yes		Yes	$100,000-$500,000	1-3 years	Risk of impacts from coastal hazards currently high. On-going monitoring required to inform timing for implementation.
	Remove vegetation from frontal zone		Yes		Yes		Yes	$50,000-$100,000	6-12 months	
Fairy Meadow	Relocate existing tower and remove vegetation from frontal zone		Yes		Yes		Yes	$10,000-$50,000 and $50,000-$100,000	6-12 months	
	Reduce dune height by re-profiling		Yes		Yes		Yes	$100,000-$500,000	1-3 years	
	Relocate existing tower		Yes		No		No	$10,000-$50,000	6-12 months	
Wollongong City	Reduce dune height by re-profiling		Yes		Yes		Yes	$100,000-$500,000	1-3 years	Risk of impacts from coastal hazards currently high. On-going monitoring required to inform timing for implementation.
	Build a tower		Yes		No		No	$150,000	1-3 years	
	Build a tower and remove vegetation from frontal zone		Yes		Yes		Yes	$150,000 and $50,000-$100,000.	1-3 years	Risk of impacts from coastal hazards currently high. On-going monitoring required to inform timing for implementation.
Port Kembla	Build a tower and remove vegetation from frontal zone		Yes		Yes		Yes	$150,000 and $50,000-$100,000	1-3 years	
	Reduce dune height by re-profiling		Yes		Yes		Yes	$100,000-$500,000	1-3 years	
	Build a tower		Yes		No		No	$150,000	1-3 years	

Note. Severity scales for issues Severe Moderate Minor Nil

At Woonona the sight line issue is moderate from the tower and severe from the surf club. At Port Kembla the sight line issue is nil from the tower and severe from the surf club.

*Indicative cost.

^Subject to approvals and funding.

3. Severity and Attendance

To assist in the prioritisation process for implementation of the management options, the severity of issues and/or beach usage was first considered. In the Strategy, the key recreational issues (sight line, recreational amenity and beach access) at each beach at the time of the study were rated. The level of severity for each key recreational issue is defined in Table 2, and ratings for each beach are provided in Table 3. Nine beaches were considered to have issues, and the Implementation Plan identifies beach specific management actions for these sites.

Table 2. Key recreational issues index.

	Severe	Moderate	Minor	Nil
Sight Line	Approximately 75-100% of patrol view is not visible	Approximately 25-75% of patrol view is not visible	Approximately 0-25% of patrol view is not visible	Flagged area visible at all times
Beach Access	75-100% of beach access ways, width and grade not suitable for use	25-75% of beach access ways, width and grade not suitable for use	25% of beach access ways, width and grade not suitable for use	All beach access ways, width and grade suitable for use
Recreational Amenity	No beach at high tide and/or scarps present (>2m height). Beach and dune not readily recoverable	Minimal beach width at high tide and/or moderate scarps Beach and dune could recover over time	Moderate beach width at high tide and/or scarps present which are readily recoverable	No/negligible impact on beach width or scarping

Table 3. Severity of issues at all beaches.

Beach	Sight Line Issue	Recreational Amenity Issue	Beach Access Issue
Stanwell Park	Nil	Nil	Nil
Coalcliff	Nil	Nil	Nil
Scarborough	Nil	Nil	Nil
Coledale	Nil	Nil	Nil
Austinmer	Nil	Nil	Nil
Thirroul	Nil	Nil	Nil
Sandon Point	Nil	Nil	Nil
Bulli	Moderate	Moderate	Moderate
Woonona	Moderate from tower / Severe from club	Moderate	Moderate
Bellambi	Minor	Minor	Moderate

Beach	Sight Line Issue		Recreational Amenity Issue	Beach Access Issue
Corrimal	Minor		Minor	Minor
Towradgi	Severe		Severe	Moderate
Fairy Meadow	Moderate		Moderate	Moderate
North Wollongong	Nil		Nil	Nil
City	Severe		Severe	Severe
Port Kembla	Nil from tower	Severe from club	Moderate	Moderate
Windang	Minor		Nil	Nil

Beach attendance estimates are recorded by Council lifeguards during the patrolled swimming season, which runs from the commencement of the September school holidays until the conclusion of the April school holidays. Mean beach attendance for the patrolled swimming season was calculated based on data collected over the past four swimming seasons, since 2009-10 (Figure 1). City Beach was one of the most highly used beaches and has the most severe issues. Bulli, Woonona, Fairy Meadow and Port Kembla all have issues rated as moderate, but there was no significant difference between these beaches for mean beach attendances.

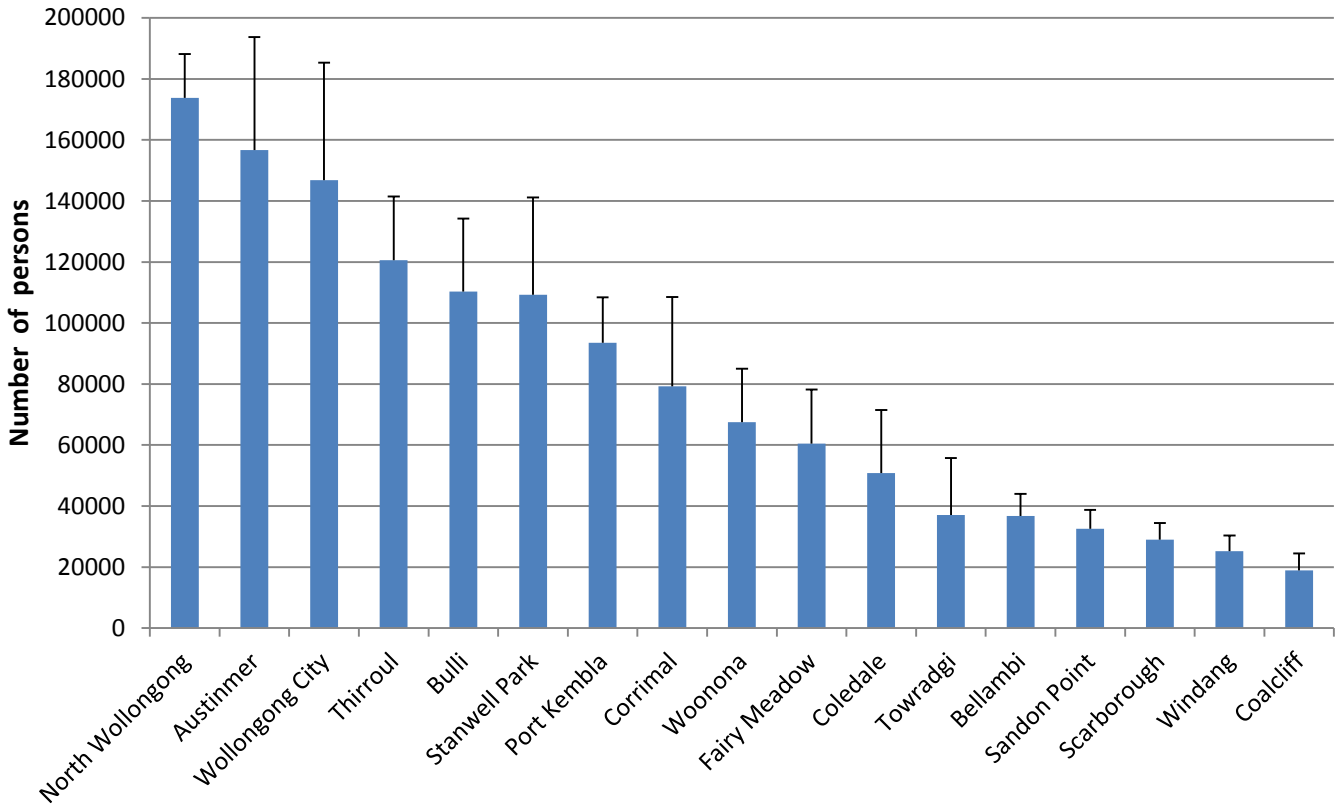

Figure 1. Average beach attendance at Wollongong's 17 patrolled beaches. Error bars are standard deviation.

4. Additional Information

Additional information about site specific issues that are not necessarily addressed in the top three management options for each beach, or may help to inform the Implementation Plan, is detailed below. This information has come from the Strategy, submissions on the draft Strategy, or internal Council investigations.

Stanwell Park

Source	Comment
Strategy	Views to the north of the club may be impacted in the future from tall growing species, especially Tea Tree and Coastal Banksia.

Coalcliff

Source	Comment
Strategy	Banksias on the slopes below the surf club may impede views in the future. An exotic Rubber Plant to the south of the club should be removed as it will disrupt the road surface.

Austinmer

Source	Comment
Submissions	Austinmer Surf Life Saving Club (SLSC) were concerned that the spinifex at the northern end of the beach is spreading southerly and easterly, and have suggested that this should be removed.

Thirroul

Source	Comment
Strategy	To the north of the patrolled swimming area, an incipient dune has formed and there are concerns that this restricts access along the beach at high tide.

Bulli

Source	Comment
Strategy	Beach access is obstructed by overgrown vegetation and steep scarps. Investigation into the structural integrity of the seawall at this site would be useful to inform which management options are suitable, as the seawall may offer protection to infrastructure from coastal hazards.
Submissions	Suggestions to restore the sandstone seawall in front of the SLSC.
Internal WCC	The SLSC are planning renovations to extend the building to the south. This is expected to commence next year. Temporary facilities will be required for lifeguards/lifesavers as the building will be inaccessible. When the entrance of Wharton's Creek opens it can flow to the north, creating a steep scarp. Managing the creek entrance could help improve this issue.

Woonona

Source	Comment
Strategy	The access paths are overgrown with vegetation.
Internal WCC	Council is currently working on arrangements to allow the SLSC lifesavers access to the tower. A storage area is required for Council equipment in the club building. The existing tower requires structural improvements before it would be safe to move it forward.

Bellambi

Source	Comment
Strategy	Beach access is obstructed by overgrown vegetation.
Submissions	Bellambi Surf Club would like removal of the introduced vegetation.
Internal WCC	The top options in the draft Strategy were build a tower or move the Council lifeguards to the first floor of the building. Considerations were given to whether vandalism of a tower could be a problem, as there have been issues in the past. The surf club building is some distance from the water and a tower would have the benefit of providing a shorter response time for rescues.

Corrimal

Source	Comment
Internal WCC	A suggested location for relocating the tower (in addition to that identified in the Strategy) is to the south side of Towradgi Creek entrance, as this may offer a better view along the beach. Towradgi Creek creates scarping when it opens.

Towradgi

Source	Comment
Submissions	It was suggested that it might be possible to maintain an emergency access path for an All-Terrain Vehicle (ATV) near the pool, as this area is somewhat protected from erosion by the rocks. Towradgi SLSC would prefer to use the current tower and remove vegetation or re-profile the dune so line of sight can be achieved from this location.
Internal WCC	Scarping is particularly severe at this site. The tower has recently been renovated.

Fairy Meadow

Source	Comment
Strategy	The access path is narrow.
Internal WCC	A site inspection found the tower would not need to be moved forward if the area around the fence was cleared of vegetation and reshaped in a stretch approximately 5m wide. The sand has currently built up around the fence. There are several dead Banksias at the back of the dunes that require removal. The SLSC have trouble getting their trailer down the access path. Widening the track would require a Review of Environmental Factors (REF), as vegetation would have to be removed from along one side.

Wollongong City

Source	Comment
Strategy	Several *Acacia saligna* at the back of the dunes have been recently removed but there is likely to be a seedbank and on-going weeding of seedlings will be required.
Submissions	Wollongong City SLSC suggested investigating the extent of the rubble so this does not delay the implementation of options in the future and also to undertake regular monitoring of the beach. There was concern that scarping and access will be an on-going issue.
Internal WCC	Scarping is particularly severe at this site and there is a need to keep an emergency access path open.

Port Kembla

Source	Comment
Strategy	The beach access path is degraded.
Internal WCC	There is room in the Council lifeguard tower to accommodate the lifesavers without the need for a new tower. Storage and improvements to the access steps are required. This would involve lockable storage cupboards, improving the surface on the stairs to make them less slippery and improved security on the pool access way.

Windang

Source	Comment
Internal WCC	Parts of the design and work to obtain approvals for the construction of a tower at this location have already been completed.

5. LGA Wide Dune Management Options

The following recommended options are not confined to the management areas of the 17 patrolled beaches. These options would benefit dune management across the local government area (LGA), as well as in the management areas.

Maintain Management

A variety of dune management activities are currently undertaken by Council. Some of these activities include; weed removal, revegetation, maintenance of vegetation around access paths, repair of fences, emergency management, renewal and maintenance of assets. This work is spread across all the beaches in the LGA and is generally undertaken by the dune crew. These dune management activities will continue to be undertaken as part of Council's on-going works schedule.

Beach and Dune Monitoring Program

The Strategy illustrates that the coastal system is complex, affected by many factors and changes dramatically over time. The monitoring program will improve Council's understanding of the behaviour of the Wollongong beaches to inform future management decisions, as well as monitor the impact of management options and inform any necessary corrective actions. Stakeholder consultation during preparation of the draft Strategy, and submissions received, showed that there is support from State Government agencies and community members for a monitoring program.

The monitoring program will involve regular beach and dune profile surveys and photopoint monitoring. Further monitoring will be carried out when storms cause significant changes to the profiles. Photopoint monitoring will be undertaken at all beaches except Coalcliff, Scarborough and Coledale, which do not have management issues. Beach and dune profile surveys will be undertaken at Thirroul, Woonona-Bellambi, Towradgi-Fairy Meadow and City-Coniston. This program commenced in July 2013.

Implementing the management options of dune re-profiling or removal of vegetation from the frontal zone will change the current beach, dune and vegetation profiles. To assess the effectiveness of these actions, monitoring of the indicators detailed below will be undertaken, before and after work is carried out at the beach

The specific aim of the monitoring program is to assess if there are any changes in the dune vegetation cover and composition over time, and how do these relate to dune volume and shape, erosion scarp location, and beach width? This will require recording the location of the vegetation front, the dune toe, the high water mark, and the erosion scarp (after a storm event) during the beach/dune surveys. Vegetation surveys will also be undertaken at regular intervals at the dune profile survey transects.

Community Engagement Program

The Strategy notes that there are a diverse range of opinions in the community regarding coastal processes and the potential impacts of management options. A community engagement program could take a variety of forms from communicating knowledge about the local beaches to involving the community in monitoring or data gathering.

A community engagement program focusing on education will be developed. Council is also developing a Volunteer Dunecare Program to involve the community in maintenance of the dune areas near the SLSCs.

Coastal Erosion Emergency Action Plan

Scarping is an issue on many of the LGA's beaches. This has raised concerns about the ability of lifeguards and lifesavers to get emergency equipment on to the beach, reduced public ability to access the beach for recreation, and personal safety issues such as scarp collapse or the possibility of people being trapped between a scarp and the ocean.

Scarping is a natural process and implementation of the management actions in the draft Strategy cannot guarantee that there will be no further occurrence of scraping. Therefore, a Wollongong Coastal Erosion Emergency Action Plan has been included in the Strategy. This outlines procedures to be undertaken prior, during and following the cessation of a Coastal Erosion Emergency.

In summary, this plan details that Council should monitor the progress of the erosion and provide information to the community through signage and media, and then take necessary risk mitigation action. Prior to likely erosion events, the local SLSCs should be informed and possible actions taken to close beaches/pools. Beach access ways may be closed and signage placed as a precaution. During the event, actions should be guided by issues relating to safety of staff. Where practical, access ways should be closed off and the community advised of hazards. Damage to assets should be monitored and repairs undertaken if permissible. After the erosion event, Council should inspect access ways and close and place warning signage where necessary. Work to repair and reopen access ways should be prioritised and fitted into Council's work program. Where scarps are over 1.5m, extent of scarps should be documented and a risk assessment undertaken. If the risk is unacceptable Council should either: regrade the scarp; fence and signpost the scarp until it recovers; or close the beach until the risk is reduced.

Council will investigate implementation of this action plan. This will include roles and responsibilities for closing access ways and beaches, warning the community, signage, risk assessment of scarps and regrading if necessary.

Species List for Planting

Concern has been raised by the community about the suitability of the species planted on the dunes. A suitable species list for planting on the incipient dune, foredune and crest and hind dune and around creek entrances has been prepared. This list will be used for future dune management works by Council's Dune Crew, bush restoration contractors and Dunecare volunteers.

Council Dune Management Procedure

Several community submissions on the draft Strategy expressed concern over Council's past management of the beaches and dunes, as well as a desire to see improved future maintenance. Management of the dunes and beaches is complex due to the natural processes impacting on these areas. Divisions involved in managing and/or undertaking work in these areas include: City Works, in particular the Dune Crew; Property and Recreation, in particular Recreation Services; Environmental Strategy and Planning; Infrastructure Strategy and Planning; and Project Delivery.

To aid the implementation of the Strategy, and improve the future maintenance of the dune area, a holistic approach to dune management is recommended by the development of a Dune Management Procedure that clearly outlines roles and responsibilities. This would provide clarity on activities that are undertaken over the whole beach and dune area including:

- Operational procedure and guidelines for vegetation management (weed and native) including suitable vegetation species to plant in different areas of the dunes.
- Operational procedure/process for replacement of fences.
- Operational procedure/process for maintenance of pathways.
- Maintenance of options implemented as part of the Implementation Plan.

6. Options for the Management Areas of the 17 Patrolled Beaches

The following options are recommended as being beneficial for the management areas of the 17 patrolled beaches.

Management of Subspecies of *Acacia longifolia**

Concern has been raised by the community about vegetation, particularly subspecies of *Acacia longifolia.* These concerns include: the *Acacia longifolia* is blocking sight lines for lifeguards and lifesavers; has extended seaward beyond the area it was originally planted; and that it was growing as a monoculture at several beaches. The Strategy noted that this species had grown to an unsatisfactory height at City, Fairy Meadow, Towradgi, Corrimal, Bellambi, Woonona and Bulli beaches. At Stanwell Park, it was suggested that sightline problems from vegetation may arise in the future and will require management.

Subspecies of *Acacia longifolia* in the management areas will be managed to improve sight lines, reduce monocultures and increase biodiversity. These activities will include removal of dead plants, plants of excessive height and seedlings, and their replacement with appropriate low growing species.

Additional Management of Noxious and Invasive Weed Species*

During development of the Strategy a flora survey was undertaken in each management area, and species list with relative abundance provided. These surveys showed that nearly all management areas contained noxious weeds and invasive species.

Additional removal of weeds and replacement with appropriate native species is recommended for the management areas. Beaches where weeds are particularly abundant throughout the management area are Bulli, Woonona, Bellambi, Corrimal, Port Kembla and Windang. The Strategy also notes specific locations where certain weeds should be targeted for removal.

Volunteer Dunecare Program*

During development of the Strategy, surf lifesaving members from some SLSCs, expressed an interest in being involved in management of the dune areas around their clubs. Consequently, as part of the public exhibition of the draft Strategy, a question on the feedback form asked whether the community would be interested in joining a volunteer program and if there were any suggestions about the program content. A list of interested SLSCs and individuals has been collated from the submissions and will be contacted once the program is developed.

Council is currently developing a Dunecare volunteer program to allow interested community members to help achieve the objectives of the Strategy. The program is based on the Bushcare model but with objectives focused on management of the dune vegetation to ensure the maintenance of sight lines and recreational amenity. The program will involve a Council supervisor working with the volunteers, and guidelines on what activities can be undertaken, where and when. The volunteer program model is being prepared by the Natural Areas Management team, with input from Environmental Planning and Recreation Services, who have regular contact with the SLSCs.

*These three vegetation management options will be guided by beach specific vegetation management plans (VMPs). For each beach, the VMP will detail the species present (both native and weeds) and their distribution across the dune, based on a field survey. Based on this assessment, the entire management zone will be divided into work zones based on the vegetation present. For each work zone, details will be documented for what vegetation management activities will be undertaken and the staging of the work activities within and between zones. For each work zone, the following information will be documented in the beach specific VMPs:

- The species present (native and weed) requiring management.
- The methods to be used for each species.
- A list of appropriate species for replanting in each zone.
- The procedure for installing plants.
- Ongoing maintenance requirements.

Assessment of Access Ways

During the consultation process for the draft Strategy, concern about access way conditions was raised for several beaches.

To ensure that beach access is adequately addressed, an assessment of access ways in each management area is recommended. This assessment will determine high usage tracks and identify any issues with infrastructure, width and grade. This will involve site assessment, and liaising with the SLSCs and lifeguards who use the access ways, to determine suitable widths and grade to get necessary equipment or rescue vehicles to the beach. Remedial works of access ways can then be prioritised and fitted into Council's works schedule.

7. Beach Specific Options to be Progressed

The top three management options identified for each beach in the Strategy were considered noting the implementation constraints and the particular issues they address. Options that could be implemented now, or may be considered in the future, were carried forward for inclusion in the Implementation Plan (Table 4).

Table 4. Beach specific management options and justification for their inclusion in the Implementation Plan

Beach	Severity	Management Option	Investigate Implementation	Justification
Bulli	moderate	1 Build a tower	Possibly	Is viable, but should be pursued after the assessment of the condition of the seawall in front of the SLSC. Temporary lifeguard amenities (site shed) with observation of the beach will be required when SLSC renovations commence, therefore Bulli options will be considered after this.
		2 Build a tower and remove vegetation from frontal zone	Possibly	Risk of impacts from coastal hazards is currently high. Requires monitoring of beach profile to determine if this option is possible in the future. The seawall may offer some protection. This option will be considered following an assessment of the status of the seawall for protection against coastal hazards.
		3 Raise level of observation area in SLSC	No	Building a tower would be a lower cost option and would achieve a similar outcome.
Woonona	moderate - severe	1 Relocate existing tower and remove vegetation from frontal zone	Yes	Is viable under the current beach conditions as the risk to coastal infrastructure is not severe.
		2 Relocate existing tower	No	Included in Option 1.
		3 Raise level of observation area in SLSC and remove vegetation from frontal zone	No	Option 1 addresses the same issues.
Bellambi	minor - moderate	1 Build a tower and remove vegetation from frontal zone	Yes	Is viable under the current beach conditions as the risk to coastal infrastructure is not severe.
		1 Raise level of observation area in SLSC and remove vegetation from frontal zone	No	Is viable under the current beach conditions as the risk to coastal infrastructure is not severe. 'Raise level of observation area' refers to relocating the Council lifeguards to the first floor. Internal consultation determined that a tower was the preferable option. This would reduce response time as the SLSC is some distance from the beach.
		3 Reduce dune height by re-profiling	No	Option 1 addresses the same issues.
Corrimal	minor	1 Relocate existing tower and remove vegetation from frontal zone	Yes	Is viable under the current beach conditions as the risk to coastal infrastructure is not severe.
		2 Reduce dune height by re-profiling	No	Option 1 addresses the same issues.
		3 Remove vegetation from frontal zone	No	Option 1 addresses the same issues.
Towradgi	severe - moderate	1 Build a tower and remove vegetation from frontal zone	No	Council has recently renewed the existing tower, therefore the preference is to use the existing facility and not construct a new tower. Refer to comment below for Option 3 – remove vegetation from frontal zone.
		2 Build a tower	No	Council has recently renewed the existing tower, therefore the preference is to use the existing facility and not construct a new tower.
		3 Reduce dune height by re-profiling	Possibly	Risk of impacts from coastal hazards is high. Requires monitoring of beach profile to determine if this option is possible in the future.
		3 Remove vegetation from frontal zone	Possibly	Risk of impacts from coastal hazards is high and vegetation removal/dune reshaping may increase the risk to the current permanent tower, or to the cycleway. A detailed assessment of the impacts on the coastal hazard line would need to be undertaken and the risks and benefits of undertaking this option carefully considered. Only a small area of dune would be altered, i.e. within the sight lines of the tower.
Fairy Meadow	moderate	1 Relocate existing tower and remove vegetation from frontal zone	Yes	Is viable under the current beach conditions. Depending on the extent of the vegetation removal, the tower may not need to be relocated.
		2 Reduce dune height by re-profiling	No	Option 1 addresses the same issues.
		3 Relocate existing tower	No	Included in Option 1.
Wollongong City	severe	1 Reduce dune height by re-profiling	Possibly	Risk of impacts from coastal hazards is currently high, placing the SLSC, function centre and pathways at risk. Requires monitoring of the beach profile to determine if this option is possible in the future.
		2 Build a tower	Yes	Is viable.
		3 Build a tower and remove vegetation from frontal zone	Possibly	Risk of impacts from coastal hazards is currently high. Requires monitoring of the beach profile to determine if this option is possible in the future.
Port Kembla	moderate - severe	1 Build a tower and remove vegetation from frontal zone	Yes	There is currently a Council tower; this option would involve making minor building alterations to enable the SLSC members to share this facility.
		2 Reduce dune height by re-profiling	No	Option 1 addresses the same issues.
		3 Build a tower	No	Included in Option 1.

8. Implementation Plan Overview

SEVERITY OF ISSUES	MANAGEMENT OPTIONS		BUDGET 2013-14 Capital	2013-14 Operational	2014-15 Capital	2014-15 Operational	2015-16 Capital	2015-16 Operational	2016+ Capital	2016+ Operational	STATUTORY APPROVALS
1	**Wollongong City Beach**										
	Build a tower	Design and DA	X								SEE, DA, referral to Crown Lands
		Construction			X						
	Beach and Dune Monitoring Program - profiles			X		X		X		X	
	Investigate extent of rubble			X							
	Reduce dune height by re-profiling or removal of vegetation from frontal zone and reshaping	Design and approvals							TBC		REF (coastal hazards)
		Implementation							TBC		
2	**Towradgi Beach**										
	Removal of vegetation from frontal zone and reshaping	Design and approvals	X								REF (coastal hazards)
		Implementation			TBC						
	Beach and Dune Monitoring Program - profiles			X		X		X		X	
3	**Woonona Beach**										
	Removal of vegetation from frontal zone and reshaping	Design and approvals	X								REF (coastal hazards)
		Implementation	X								
	Facilitate shared access to tower		X								
	Renew tower elements			X							
	Relocate tower	Design and DA			X						DA, SEE
		Implementation			X						
	Beach and Dune Monitoring Program - profiles			X		X		X		X	
3	**Port Kembla Beach**										
	Improve facilities to allow shared access to tower		X								
	Improve access path					X					REF
	Removal of vegetation from frontal zone and reshaping	Design and approvals							TBC		REF (coastal hazards)
		Implementation							TBC		
4	**Bulli Beach**										
	Assess status of seawall for protection against coastal hazards			X							
	Temporary site facilities while club building is extended				X		X				DA for temporary facilities, SEE, referral to Crown Lands
	Building a tower and/or removal of vegetation from frontal zone and reshaping	Design and approvals							TBC		DA & SEE/ REF (coastal hazards), referral to Crown Lands
		Implementation							TBC		
	Preparation of an entrance management policy for Whartons Creek *					X					
4	**Fairy Meadow Beach**										
	Widen main access path			X							REF
	Removal of vegetation from frontal zone and reshaping	Design and approvals					X				REF (coastal hazards)
		Implementation					X				
	Beach and Dune Monitoring Program – profiles			X		X		X		X	
5	**Bellambi Beach**										
	Build a tower	Design and DA					X				DA, SEE, referral to Crown Lands
		Construction							X		
	Removal of vegetation from frontal zone and reshaping	Design and approvals							TBC		REF (coastal hazards)
		Implementation							TBC		
	Beach and Dune Monitoring Program - profiles			X		X		X		X	
6	**Corrimal Beach**										
	Relocate tower	Design and DA			X						DA, SEE, Crown Lands authorisation and owners' consent
		Construction					X				
	Removal of vegetation from frontal zone and reshaping	Design and approvals							TBC		REF, Crown Lands authorisation
		Implementation							TBC		
7	**Windang Beach**										
	Build a tower	Design and DA	X								DA, SEE, referral to Crown Lands
		Construction			X						
	General										
	Beach and Dune Monitoring Program - profiles and photo-monitoring			X		X		X		X	
	Community Engagement Program			X		X		X		X	
	Coastal Erosion Emergency Action Plan implementation			X		X		X		X	REF
	Council Dune Management Procedure			X							
	Additional Management of Noxious and Invasive Weed Species			X		X		X		X	REF
	Management of Subspecies of *Acacia longifolia*			X		X		X		X	REF
	Volunteer Dunecare Program			X		X		X		X	
	Assessment of Access Ways			X							

Abbreviations for approvals: DA development application, SEE statement of environmental effects, REF review of environmental factors.

* Part funding for this option may be available through an external grant. TBC - implementation of these options will depend on the outcomes of monitoring or other studies.