Part B
Wyong Coastline Management Plan and its Implementation

In this Part

- The future of the Wyong coastline – objectives and targets
- What is proposed for the next ten years? Eight Action Plans to address high risk issues for the Wyong community
- Implementation details – how will Council make these actions happen? Responsibility, timing and costing for key actions. Sources of funding for implementation.
- Review and evaluation of progress.
- Adaptive management concepts and processes. The WSCZMP explains how Council will work with the community and its agency partners to monitor progress and how information about new science, new policy, progress with on ground works, and community awareness/capacity building and satisfaction will be taken into account in regular reviews of the strategic direction and detail of the Coastal Zone Management Plan.

5.0 The future of the Wyong coastline

What would a well managed and sustainable Wyong coastline look like? What would change from the current situation? How would we know if management of the coastline had improved to become more effective and more efficient? How would we know that management actions were delivering a resilient and positive legacy for the people of the area?

This section sets out a hierarchy of steps for thinking about what the WSCZMP aims to achieve, how the WSCZMP fits within Council's overall coastal zone strategy (**PART A**, **Section 1.3**) and how achievements will be recognised. Key concepts are:

Vision – Council's aim for the overarching character of the coastline in ten years time

Objectives – Relating to improved coastline condition and community sustainability

Principles – Core scope and direction for managing the coast

Management Targets – a checklist of strategies and actions to be achieved along the way

Current condition, threats and issues – The baseline – which parts of the coast's natural resources and built assets are in good or healthy condition and conversely, where is coastal condition being reduced or what's not working now? Details of the baseline condition of the Wyong coastline are in **PART C**, **Sections 16.0** and **17.0**.

5.1 Council's vision for the Wyong coastline

Preparing the WSCZMP is part of Council's strategy for achieving the objectives of Council's Shire Management Plan and Strategic Vision (Wyong Shire Council 2009).

Taking the objectives and principles of these Shire-wide initiatives into account, Council's overarching aim or vision for the coastline in the future is:

Continuing community enjoyment of resilient coastal landscapes in times of change

Incorporated within this vision are:

- an attractive and highly desirable place to live, work and play;
- healthy functioning of natural systems and ecology;
- quality of life improved for the Wyong community now and for future generations;
- continuing community access to the coastline and coastal landscape;
- sensitive integration of the coast's natural environment, attributes, open space areas, cultural heritage and urban development;
- recognising, protecting and promoting public land for its environmental, social, cultural and economic value;
- preserving and highlighting the history and culture of the locality, contributing to the charm and attractiveness; and
- stylish, sustainable and quality development.

5.2 Principles to give effect to the vision for the Wyong Coastline

The principles set out below are based on context provided by the NSW Coastal Policy (Department of Planning 1997), the NSW Coastline Management Manual (NSW Government 1990), Central Coast Planning Strategy (Department of Planning 2008), the Hunter-Central Rivers Catchment Action Plan (HCRCMA 2007), L&PMA Guidelines, the NSW Sea Level Rise Policy Statement (DECCW 2009), the National Sea Change Taskforce Report No. 2 (Gurran & Squires 2006), the NSW Coastal Planning Guidelines: Adapting to Sea Level Rise (Department of Planning 2010), NSW Guidelines for Preparing Coastal Zone Management Plans and Council's Strategic Vision Statement (Wyong Shire Council 2009).

Council has also taken these principles into account in developing its own draft Climate Change Policy (2010).

Council has used these principles to evaluate gaps and areas for improvement in the current management of the Shire's coastline and in identifying opportunities to achieve more sustainable coastline management (see **PART C** and **PART D**). These principles are also the foundation of the Action Plans which are presented in **PART B**.

Principles for Sustainable Coastline Management

Coastal Knowledge and Community Awareness. See the Action Plan in PART B, Section 7.0

Quality information

1. Use best available information and update regularly. This includes updating the science, updating community preferences and review of the real versus expected achievements of various implemented strategies.

Improve community awareness of coastal processes and risk management

2. Raise the awareness of residents and recreational users of the coast about coastal hazard risks and the impacts of their activities on the resilience of the natural systems that they enjoy.

Recognise the scale of variability of coastal processes and hazards, including climate change. See Action Plans in PART B, Sections 8.0, 9.0 and 10.0

3. Development must take into account the natural variability of coastal processes. Suitable designs, setbacks and buffers for development and for vulnerable ecological communities should be incorporated into all planning tools, so that dealing with variability and change becomes part of routine business.

4. Consider the landscape scale effects of climate change and sea level rise in all planning decisions – both strategic and development assessment. Make planning decisions which reduce coastal risks.

5. Be aware that the maximum possible storm event may be much larger than any recorded in historical time and consider the potential effects of extreme storm events on coastal land and property

Risk based and logic linked decision making. See evaluation of options in PART D.

6. Reduce risks associated with coastal hazards, consider risks over the life span of assets and maximise long term cumulative benefits to the community

7. Seek solutions that are appropriate (with clear benefits for the condition of the coast) effective, efficient, appropriate and robust – delivering a positive legacy

8. Seek responses which have explicit and purposeful links to the improvements in condition that are sought.

Building biodiversity resilience. See Action Plan in Section 11.0 of PART B.

Prevent degradation of healthy marine and coastal ecological systems

9. Protect and enhance/rehabilitate marine, marine shoreline and coastal habitats to protect species, populations and ecological communities from degrading and threatening processes. High quality foreshore vegetation should be protected and degraded vegetation should be rehabilitated or improved.

10. If quality coastal ecological communities must be disturbed by development, Council will seek offsets to provide a net sustainability benefit.

Community access to the coastal landscape. See Action Plans in Sections 12.0 and 13.0 of PART B

11. Protect important coastal landscapes that reflect the natural and social values of the community and maintain the community's sense of place

12. Safe public access to and along beaches is a management and maintenance priority.

13. Coastal protection works for private property must be constructed wholly on the private property and not on public land (other than certain emergency protection works, for short periods). Such private property protection works must not detract from the community access and amenity values of beaches.

5.3 Eleven Objectives for the Wyong Coastline Management Plan

To give effect to the aim and principles of sustainable coastline management for the Wyong coast and its communities, WSC has adopted eleven objectives for the coastal zone management plan. These objectives describe what the Plan intends to achieve for Council, the Wyong community and visitors to the Wyong coast.

Table 5.1 sets out the objectives for the WSCZMP and the performance targets against which progress towards these objectives will be evaluated as the plan is implemented over the next ten years. Relevant principles from **Section 5.2** are included in the first column of the table. The objectives recognise that sustainable management of the coastline requires a quality adaptive management process and objectives for the quality of the environmental outcome (condition or capacity).

Each of the Action Plans in **PART B** refers to these objectives and targets.

Information about how Council will collect information to assess progress towards the management targets is in **PART B**, **Section 7.0 (Coastal Knowledge)**. The results of this monitoring would be reported in Council's State of the Environment Report and in other local publications.

Table 5.1 - Whole of Coastline Management Objectives

Objectives for adaptive management	
Objective	**Target for evaluation**
O1 To provide for efficient and effective coastline management, based on access to best available science and information about community values and attitudes **Principles:** **(1) Quality information** **(2) Improve community awareness**	By 2012, WSC has in place an adaptive management framework for the coastline, incorporating structured actions, performance and condition monitoring and review processes. By 2015 and 2020, comprehensive reviews of the outcomes of implementing the coastal zone management plan have been completed.
O2 To inform and facilitate adaptation to climate change impacts along the Wyong coast **Principles: (3, 4 and 5) Recognise the scale of variability of coastal processes and hazards, including climate change**	By mid 2011 Councillors and Council officers are able to articulate the key risks associated with climate change impacts on natural and human systems along the Wyong Coastline. By late 2011, WSC provides competent and comprehensive advice to residents and ratepayers about the impact of climate change on council operations (planning, assets, infrastructure and emergency response) in the coastal zone and how Council will manage these risks.
O8 To develop efficient and effective strategies for minimising Council's and the community's exposure to risk in the coastal context **Principles: (6, 7 and 8) Apply risk based and logic linked decision making**	By late 2011, Council has in place a clear framework and guidance for landholders about acceptable actions and approved locations for emergency coastal protection works. By 2012, Council business planning, land use planning and reporting includes consideration of coastal process and climate change risks, integrated with other aspects of climate change risk management across the Shire. By 2012, development applications from coastal landholders demonstrate risk reduction strategies appropriate for coastal processes and predicted climate change.
O10 To identify priorities for WSC investment in capacity building and on ground works **Principles**: (**6, 7 and 8**) **Apply risk based and logic linked decision making**	By 2012, WSC has adopted and is implementing priority activities to improve the resilience and sustainability of the parts of the coastline in its direct care.
O11 To establish a clear process for monitoring review, reflection and adaptive management of the coastline **Principle: (1) Quality information**	By 2015, Council and relevant partners are monitoring the condition of key indicators of the condition of coastal systems in a systematic manner. By 2015, WSC is in a position to report to its community about the extent to which coastline management objectives and targets are being met and the extent to which improvements in the condition of key coastal natural resources have been achieved. Thereafter WSC will continue to report on the condition of coastal natural resources and assets and on the return on investment in specific natural and built systems on a regular basis.

Objectives for adaptive management	
Objective	**Target for evaluation**
O9 To support WSC planning for sustainable coastal development **Principles: (6, 7 and 8) Apply risk based and logic linked decision making**	By 2012, the Wyong LEP includes planning measures to improve the net social, cultural, economic and environmental benefits of coastal development.
Objectives for coastal condition and capacity	
O3 To enhance the resilience of coastal biodiversity values – beach, dune, shore platform, headland and marine **Principles: (9, 10) Build Biodiversity Resilience, Prevent degradation of healthy marine and coastal ecological systems**	By 2020, the health and species diversity of native vegetation communities on dunes and coastal headlands has improved (use benchmark of pre 1770 conditions and recognised indicators of ecosystem health). By 2020, species diversity on shore platforms in WSC is equivalent to best regional conditions.
O4 To maintain and enhance the condition and capacity of community assets and infrastructure **Principles:** **(9) Build biodiversity resilience** **(11, 12) Maintain community access to the coastal landscape**	By 2012, an asset condition data base is complete and detailed Plans of Management and/or Master Plans are in place for high profile, 'icon' seaside recreation areas. By 2015 Council has a funded strategy for post storm assessment and timely restoration of coastal access assets such as ramps, stairs and viewing platforms. By 2015 Council has commenced implementation of works to secure effective functioning of essential community infrastructure (such as stormwater drainage systems, sewage transport systems and water supply) in conditions of sea level rise. By 2012 Council has an agreed strategy for reducing risks associated with existing sea walls not currently designed for higher sea level conditions.
O5 To maintain and enhance safe and appropriate public access to the coastline **Principles:** **(11, 12) Maintain community access to the coastal landscape** **(3, 4 and 5) Recognise the scale of variability of coastal processes and climate change**	By 2012 all public land along the ocean frontage of WSC (dunes and bluffs) is clearly identified. As for O4 above: By 2012, an asset condition data base is complete and detailed Plans of Management and/or Master Plans are in place for high profile, 'icon' seaside recreation areas. By 2015, Council has a funded strategy for post storm assessment and timely restoration of coastal access assets such as ramps, stairs and viewing platforms. By 2012, land tenure issues on a retreating coastline are resolved, to provide for continuing legal public access to all beaches. By 2015, Council has in place a rating process (in accordance with the *Coastal Protection Act 1979*, as amended 2010) to recover costs associated with maintaining beach amenity on beaches where permanent protection structures (sea walls) have been approved.
O6 To maintain the visual, social and heritage values of significant coastal cultural landscapes **Principles: (11, 12) Maintain community access to the coastal landscape**	By 2015 detailed Plans of Management or Master Plans are in place for significant cultural places along the Wyong coastline. By 2012, The Wyong LEP includes planning measures to respect and protect the cultural, heritage and visual value of significant coastal places. By 2020, monitoring information shows a trend towards stable or improving condition of key natural, social and cultural values of the coastline.

Objectives for adaptive management	
Objective	**Target for evaluation**
O7 To enhance the awareness of residents, landholders and land users of coastal processes, climate change, impacts and adaptation measures	By 2012, there is a measurable increase in the awareness of coastal residents and landholders of the variability of coastal processes and the impacts of predicted climate change on the coastline.
Principle: (2) Coastal knowledge and community awareness	By 2015, there is an increase in the number of residents participating in coastline management programs (including Landcare, summer coast watch and coastal discovery etc. programs)

6.0 Eight Action Plans for strategic coastline management

The Wyong coastline includes beaches where both damaging coastal erosion and coastal recession are already in evidence. For other beaches, coastal recession is expected to occur as sea level rises. Coastal engineering models indicate that as sea level rises the shoreline moves upwards and landwards.

As discussed in **Section 4.0**, Council's approach to managing coastal zone risks associated with erosion and recession has three strategic components:

- Monitor real change to reduce uncertainty.
- Accommodate change and/or allow interim defence of existing coastal development.
- Planned retreat of assets and infrastructure, commencing with planning requirements that new development is located outside immediate coastal risk zones.

In practice, an adaptive, risk management approach to managing the coastline is likely to involve all three broad strategies for different locations and for different time frames. For any one location, the best option may change over time from a defence approach to an accommodation or retreat approach, with trigger points for changing management linked to monitoring of hazards and their underlying drivers. Council's strategic approach recognises these triggers for moving from one management strategy to another.

Of course, WSC is concerned not only with coastal hazard risks, but with other human activities which may create social or economic opportunities, but which may also threaten other important coastal values, creating or increasing risks.

To effectively manage coastal risks, to achieve its vision for the coastline and to meet its coastal zone management objectives, WSC has developed eight detailed and interacting Action Plans. These plans contain each of the three main strategic components and show how WSC will make adaptive decisions about moving from one broad strategy to another. This is why the Adapting to Coastal Process Hazards and Climate Change Action Plan is included in more than one strategic approach.

Eight Action Plans

Table 6.1 shows how the Action Plans relate to the three key elements of WSC's strategy for managing coastal zone risks.

Table 6.1 - Strategy and Action Plans

Strategic Approach	Action Plans
Monitor real change to reduce uncertainty	**Coastal Knowledge and Community Involvement Action Plan** (**Section 7.0**). This Action Plan sets up the adaptive framework for managing the coastline and also recommends processes for sharing important information about coastal process hazards. **Access, Recreation and Tourism Action Plan** (**Section 13.0**). This Action Plan includes selected accommodate and defend types of response, but also includes responses designed specifically to enhance recreational enjoyment of the coastline. **Protecting Cultural Landscapes Action Plan** (**Section 14.0**). This Action Plan focuses on protecting the evidence of Aboriginal occupation of the coastal landscape, as well as supporting members of the local Aboriginal community to be directly involved in looking after the coast.
Accommodate change and/or allow interim protection of existing assets and infrastructure	**Emergency Response Management Action Plan** (**Section 8.0**). This Action Plan highlights how Council will prepare for and respond to coastal emergencies. Three beaches are Authorised Locations where specific emergency protection actions may be approved. Other organisations such as OEH and SES also have important roles, separate to Council's specific responsibilities and Council will work closely with these organisations. **Adapting to coastal process hazards and climate change – Action Plan**. This Action Plan addresses coastal erosion, coastal recession and coastal inundation (**Section 9.0**). It includes actions of the 'planned retreat', 'accommodate' and 'defend/protect' types, for different locations and different time frames. It considers options to manage coastal risks in the immediate (other than emergency response), 2050 and 2100 time frames **Lake and Sea Interactions Action Plan** (**Section 10.0**). This Action Plan includes responses for issues associated with the entrance to the Tuggerah Lakes. **Geotechnical Hazards Action Plan** (**Section 11.0**). This Action Plan includes aspects of planned retreat and accommodate response types for development on cliffs and bluffs.
Planned retreat	**Adapting to coastal process hazards and climate change – Action Plan**. This Action Plan addresses coastal erosion, coastal recession and coastal inundation (**Section 9.0**). It includes actions of the 'planned retreat', 'accommodate' and 'defend/protect' types, for different locations and different time frames. The **Geotechnical Hazards Action Plan** also includes planned retreat actions, particularly for new development. **Building Biodiversity Resilience Action Plan** (**Section 12.0**). This Action Plan includes aspects of the 'planned retreat' and 'accommodate' response types for ecological communities on coastal dunes, headlands and rock platforms.

6.1 Background on management approaches for the coastline

6.1.1 Risk

Coastline management is, in essence, about managing risk to coastal values. **Table 6.2** shows the interaction between values and consequences that contribute to risk. The table also highlights the range of individuals and organisations which will be affected by coastal

risks and can contribute to risk reduction solutions. More details about risk assessment are included in **Section 18.0** in **PART C**.

Table 6.2 - Values and Consequences

Whose values?	Examples of the consequences of coastal process hazards
• Beach front and near beach front landowners • Businesses such as tourist accommodation, coastal recreation and fitness, restaurants and cafes, beach clothing • Council • State government • Visitors and recreational users from all over the Shire and elsewhere • Scientists • Conservation organisations • Traditional Aboriginal owners	• Safety of beach users and residents • Financial cost to landholders (e.g. from loss or devaluation of property, or loss of development opportunity) • Financial costs to Council and State government in relation to protection or relocation of major infrastructure and maintenance of other protection works • Loss of access and amenity, including loss of coastal open space as ocean frontage reserves are eroded • Loss or gain of economic opportunities • Loss of biodiversity as dunes are eroded or roll landward over current back dune communities • Reduced recreational opportunity such as changes to fisheries, no access to rock platforms • Loss of cultural places • Loss of ability to comply with statutory requirements.

6.1.2 Moving between strategies

'Planned retreat', 'accommodate change' or 'defend existing development and uses of the coastline' are key strategic responses when the coastline is expected to recede either due to limited and reducing sand supply or in response to sea level rise.

- **Planned retreat** (also sometimes called managed retreat) is planning to **avoid** risk associated with the impact of erosion and recession on houses and commercial buildings, and public assets such as roads. New development is placed outside coastal risk areas relevant to the life of the development, or is designed to be relocated over time. Existing development is removed or relocated according to a schedule based on asset life (infrastructure such as roads, pipelines, and private assets such as house, pool, etc.) and the likelihood of a hazard impacting on the asset.

- **Accommodation** of coastline change means that activities and assets are modified to take the expected coastal recession (or inundation) into account. The accommodation approach includes designing new development with higher floor levels or with different foundations, which can withstand the various threats from coastal processes. It could also mean an enhanced monitoring and maintenance schedule. Beach nourishment can also be an accommodation strategy.

- **Defence** of coastal development means 'drawing a line in the sand'. This approach aims to maintain existing development and to allow future development to occur in the same locations, by building structural defences (sea walls). These structures can be used to

protect major community infrastructure (such as sewerage lines) or to protect private property.

Council's policies for coastal management and the Coastal Zone Action Plans recognise that coastal erosion and recession are episodic and there is a lot of 'noise' in the record of erosion, deposition and recession along the coast, caused by events that occur at different but overlapping timeframes.

For instance, the coastal erosion hazard assessment for Wyong shows that, for most locations, there has been limited coastline recession to date (as measured over the last 30 to 40 years), although sea level has risen approximately 15 to 20 centimetres on the east coast over the last century.

Measured average recession rates along the Wyong coastline vary within the range 0 to 0.5 metre per year, with most beaches having measured recession of less than 0.1 metre per year. Coastal landforms themselves appear to be accommodating change. The episodic nature of coastal erosion, tied to major storms or series of storms, is part of the explanation of the measured trends. Since the very large storms in 1974 and 1978, storms have been relatively infrequent and of relatively low intensity.

The measured recession rates mean that for some beaches, the position of the frontal dune is now in close to the same position as it was before the major storm bite episodes of the 1970s. However, for beaches like North Entrance, the current position of the frontal dune is 10 to 15 metres further landward than it was in the early 1970s. The recession of the dune at North Entrance and the previous extent of erosion at Hargraves Beach are sufficient for the NSW Government to list these beaches as coastal erosion hot spots and Authorised Locations for emergency coastal protection works (see **Section 8.0** for details).

However, if sea level continues to rise as predicted, it is expected that the accommodation or buffering capacity of coastal landforms will be consumed and real retreat will become apparent on many beaches. The exact trigger and timing of this shift is not currently known. To be practical and cost effective, coastline managers need to monitor vigilantly and management needs to be flexible enough to take the shift into account.

The WSCZMP recognises that step changes in coastal condition are likely and that these changes will affect the type of response that is appropriate. For some areas, other management change triggers are also being considered. For example, in **Section 9**, a trigger distance for removal or relocation of existing development is suggested, in accordance with OEH guidelines. Other triggers for a change from an accommodation strategy to a planned retreat strategy include the cost of maintaining functional community services to areas that are affected by permanent inundation, frequent erosion or a clear recessionary trend. For instance, the functionality of stormwater and sewerage services is vulnerable to rising sea level. Council may also choose to use the trigger of asset life to relocate assets landward out of coastal risk areas.

The responses that Council has considered in preparing the WSCZMP are of six main types within these the three broad approaches (see **Table 6.3**). Each of the six types of response takes a different approach to risk reduction and each has various benefits and problems. A detailed analysis of the benefits and constraints associated with the full range of options that Council has considered is in **PART D**.

Separate to the management responses that involve works to address hazards are a range of management responses that are about coastal knowledge – additional scientific studies to improve understanding of threats; communication and information sharing; and the overall management process – how Council and the community will assess progress and ensure continuous improvement.

Figure 6.1 (adapted from the New Zealand Ministry for the Environment) shows how different types of response vary in their management of risk over time.

Table 6.3 - Six main types of response to coastal hazards and risks

<table>
<tr><th colspan="3">Monitor coastal condition, actual change and outcomes of responses</th></tr>
<tr><td>Planned retreat</td><td colspan="2">Manage the change transition for existing development
Accommodate, Defend or protect</td></tr>
<tr><td rowspan="2">Type 1: Statutory, policy and development assessment controls; timed development consent.
Zoning to allow roll back of coastal ecological communities and recreational land uses.
Redevelopment/relocation schedules for major public assets linked to asset life and balancing defence costs against relocation costs</td><td>Type 4: Vegetation management and dune enhancement</td><td rowspan="2">Type 5: Construct sea walls – rock revetments with asset life of 20 years or more
Construct temporary protection with asset life of 5 to 10 years.
Emergency protection during storms</td></tr>
<tr><td>Type 1: Planning controls – type of development and design requirements</td></tr>
<tr><td>Type 2: Compulsory and voluntary acquisition</td><td>Type 6: High level of emergency response preparedness</td><td>Type 3: Beach nourishment – major campaigns or emergency management, maintain dune height and volume, maintain beach amenity</td></tr>
</table>

Council has also considered a 'do nothing' option for the Wyong coastline. Under this option, Council would not amend the clauses of its LEP and DCP to require that sea level rise and other aspects of climate change are taken into account for new development. Council and the community would rely on emergency response to protect property and safety. Council would invest in repair of public assets after storms. This approach cannot be seen as a long term risk management approach and does not meet Council's obligations under the *Coastal Protection Act 1979*, the *Environmental Planning and Assessment Act* or the *Local Government Act*. All three Acts require that Council takes sea level rise and climate change into account in its planning decisions. Councils are required to inform themselves and their local communities of the best available information about the extent of the hazard.

6.2 Scope of responses - overview

Each of the main response strategies involves multiple subsidiary choices and also has variety of benefits and constraints. Council has used the best information currently available to it to identify the actions that are best suited to managing coastal risks along the Wyong coastline. **Table 6.4** summarises matters that have been taken into account. A full analysis of the merits of all potential management responses is in **Part D**.

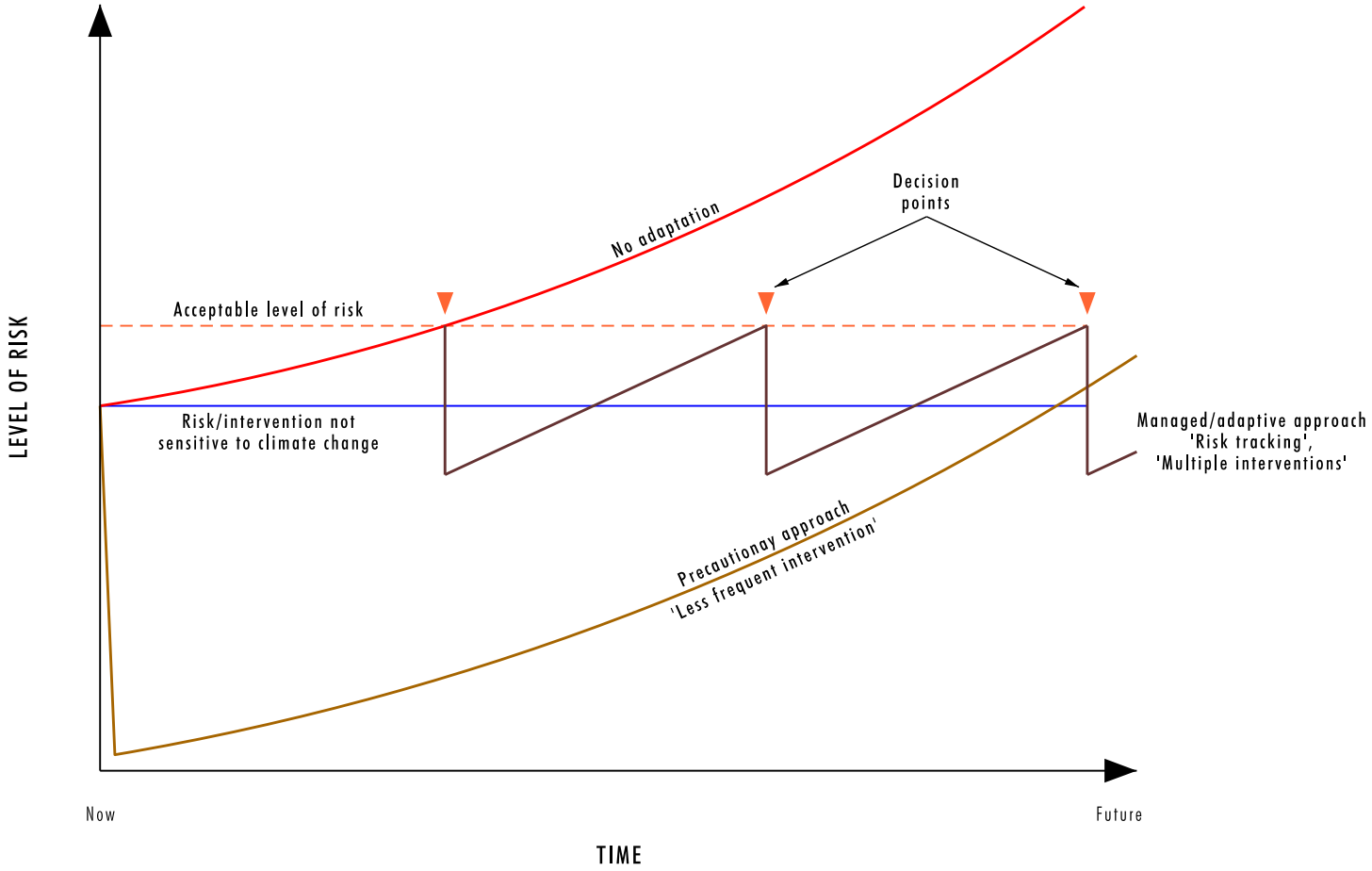


FIGURE 6.1

Different Approaches to Adaptation and Risk Reduction Over Time

Source: New Zealand Ministry for the Environment

Table 6.4 - Potential responses to coastal hazard risks – Scope and issues

Type/aspect of response	Issues that Council has considered
Planned retreat (Type 1) – Zoning and development controls	
Planned retreat incorporates: • Notification of land owners using s149 certificates and rate notices • New development in immediate coastal risk areas prohibited (specified in LEP, e.g. as a coastal risk area zoning) • Design and set back requirements for 2050 and 2100 planning periods (specified in LEP and DCP) • Timed development consents, linked to asset life and coastal risk (specified in LEP and DCP) • Trigger points for relocating major community infrastructure, such as roads, sewer systems. Major investment scheduled to asset life. The same principles and requirements would apply to public assets/development and private assets/development.	• Impact on existing landholders – ▪ Maintenance of existing development ▪ Loss of land value ▪ Insurance cover issues Broader economic development issues where tourism infrastructure/assets are affected Land tenure issues on retreating coastline Timeframes for land managers and planners to develop appropriate designs and for land owners to adapt to new planning concepts.
Planned retreat - Voluntary or compulsory acquisition (Type 2)	
State or local government purchase of affected properties	Not currently state policy for properties in coastal risk areas, although the concept has been applied previously in floodways. Very high cost for government at current market values. Purchase of all affected properties would have a significant impact on council rate base (capacity to meet other responsibilities) and/or the State budget. Timing issues – when would property be acquired? What uses are suitable for land in immediate coastal risk areas? Are there any uses which could offset acquisition costs?
Accommodation and defence - Beach nourishment (Type 3) Beach nourishment means adding sand to the beach and /or frontal dune system. This increases the buffering capacity of the beach and dunes to coastal erosion events and long term recession. No new sand from coastal river systems is currently being added to the coastal sediment compartments in this area.	
Extract sand from tidal deltas (in entrance of coastal lakes) and place on nearby beaches	• Limited volume available – recycling sand volume from beach to lake entrance, but changing the timing of sand relocation – more gradual process, rather than only during major scouring floods. • Potential impacts on recreational safety in the entrance channel • Biodiversity conservation values of the Budgewoi sand mass – a relic tidal delta • Sand quality issues – potential organic and ASS content
Beach scraping – moving sand back from the intertidal zone to shore up the dune face	No actual change in sand volume, but enhances the proportion of sand stored in the frontal dune system, rather than in the intertidal and subtidal parts of the beach.

Type/aspect of response	Issues that Council has considered
Terrestrial sand from old dune fields	• Remaining dune sand in Wyong in this geomorphic context is primarily in national park or State conservation area management • Sand extraction is not permitted in National Parks • Sand grain size and mineralogy of dune sand may not be compatible with open ocean applications • Dune deposits have significant commercial value – for construction sand and glass making • Significant transport distances and costs if sand must be sourced outside the local area (e.g. from Stockton Bight) • Biodiversity value of vegetated dune fields.
Offshore sand – extracted from the continental shelf	• A large volume of sand is believed to be present on the shelf, but it is very difficult to access – special technology such as deep water dredges is required • Sand extraction from the shelf for commercial purposes is currently prohibited in NSW • An exploration licence application off the Central Coast was rejected in December 2009 on environmental grounds. • AECOM (2009) studied the feasibility of using offshore sand to nourish three 'icon' Sydney beaches. Costs are very high – estimated $300 million for the first nourishment campaign of 12 million cubic metres of sand, with ongoing nourishment costs of approximately $120 million every ten years. These costs are likely to be prohibitive for most beaches outside the metropolitan area. • Biodiversity issues – dredge sites, transport routes and storage areas.
Accommodation and defence - Dune Management (Type 4)	
Beach scraping, sand fences or other activities to trap and retain sand in the incipient frontal dune and frontal dune.	• Limited sand volume available from beach scraping, but can shift the balance of sand distribution from subtidal to incipient foredune. Beach scraping may impact on beach face fauna if done regularly.
Vegetation management, including control of invasive species, revegetation with local native species	• Vegetation management programs have multiple benefits in the short to medium term; they enhance habitat connectivity and enhance the resilience of coastal vegetation and ecological communities. Restored vegetation can provide shade for recreational users and can add to the scenic value of coastal dunes (note that in some locations revegetation with tall species can also lead to conflicts about views). • Well vegetated dunes with maximum feasible dune volume in the local context can provide a short to medium term buffer to coastal recession. However, in the long term, even well vegetated dunes cannot prevent coastal recession.
Manage beach access ways that traverse coastal dunes, by fencing, design etc.	• Like vegetation management, the management of beach access ways across dunes is designed to enhance the short to medium term resilience of coastal vegetation communities and to reduce losses of dune sand into the back dune area (such as onto roads, from where it is scraped up and taken to the tip). Well managed beach access ways clearly provide recreational benefits in the short to medium term. They will not stop coastal recession, but good planning and management of access ways may reduce ongoing maintenance costs.

Type/aspect of response	Issues that Council has considered
Defence - Structural protection (Type 5)	
Structural protection includes: • Sea walls constructed from rock, such as already built at The Entrance and proposed for Cabbage Tree Harbour. • Geotextile bag sea walls or structures • Groynes (shore normal structures) • Offshore artificial reefs built with geotextile bags or other materials	Issues include: • Coast of rock walls – Cabbage Tree Harbour proposal is coasted at $2 million for about 200 metres of low wall. Geotextile bags cost about 50% of the cost of rock walls, but are generally less robust, particularly in open coast situations. • Require specialist engineering design and generally imported materials – large rocks from quarries. Some materials used in the past (by private landholders) are dangerous and considered to be pollutants. Geotextile bags need a supply of suitable sand. • Geotextile bags are rounded and may have less impact on recreational safety; they can be moved or topped up more readily, so can be good for emergency and short term protection. • Sea walls affect the hydrodynamics of creek and lake entrances; they also affect offshore bar and rip processes, where waves bounce off the wall. This applies to both rock structures and geotextile structures. • Sea walls tend to transfer the erosion hazard further along the beach and/or reduce sand volume in front of the wall – reducing recreational access and amenity. Trade-offs between private and public benefit. • Maintaining recreational values (sandy beach, rather than formal promenade) will usually require concurrent beach nourishment. New legislation changes mean benefitting landowners can be levied to meet the cost of this work. • Artificial reefs can provide fish habitat, surfing breaks and beach protection, if properly designed and maintained. • All structures have some impact on biodiversity.
Defence - Emergency response (Type 6)	
Emergency response preparedness is an important part of risk management, regardless of which other options are chosen. However, it is generally not a stand-alone response.	• Emergency engineering works can have long term impacts. All works are to be carried out in accordance with new statutory requirements, Ministerial Guidelines and Code of Practice (DECCW 2011a). See **Section 7.0** in **PART B** and **Section 15.0** in **PART C** for details about current requirements. • Suitability of emergency works such as short term sand dumping, emergency geotextile structures is partly dependent on the location – how easy is it to safely place structures or sand in the lead up to or during a major coastal emergency event? • Council is required to be consistent in its approach, so for beaches where planned retreat is the major strategy, there are likely to be limitations to emergency protection works. • Compliance and regulation costs for Council where emergency works are carried out by private landowners – for instance, if emergency works are carried out on Crown land, or using unsuitable materials.

6.3 Implementation information for Action Plans

Council will maintain a coastal zone management coordinator position, to facilitate streamlined implementation of key strategies. The coordinator will (amongst other things) facilitate action, maintain records and report to senior officers and to the TLEC&FMC.

To assist in implementing the strategic direction of the WSCZMP, each Action Plan incorporates the following information:

- The coastal management objectives and targets to which the Action Plan relates.
- Preferred management actions and why they are important (intent and logic). Key actions have been selected because they provide the most effective and efficient response to the major issues and there is a high level of confidence that they will deliver the required improvements to the sustainability of the Wyong coastline.
- How the proposed approach is different to 'business as usual' for the management of the Wyong coastline.
- Wyong Shire Council has a lead role for most actions identified in this plan. However, in many cases, Council does not have the financial capacity or the statutory power to achieve the desired outcomes on its own. Key partners are identified for relevant strategies and actions.
- An indication of the cost of each action and relevant sources of funding.
- An indication of the timing of actions within the ten year time frame of the Management Plan.
- How and when progress will be monitored, evaluated and reported.
- Trigger criteria for changing management, where relevant.
- Links to other related strategies or actions.

6.4 Costs of coastline management

The total investment required to implement the strategies identified in the WSCZMP is beyond WSC's own resources. The scale of some management issues requires a response at a larger institutional scale than local government.

6.4.1 Costs of structural protection

There is no doubt that capital costs of major structural works on a dynamic coastline are very high. All structural protection options also require ongoing maintenance of the engineering works and to protect beach amenity.

Examples of the indicative costs of structural aspects of coastline management activities are noted below. The magnitude of these costs for managing existing development highlights the importance of sound risk avoidance management for new development.

- Construction of temporary (emergency) protection works - either by beach nourishment or by installation of geotextile bag walls, costs approximately $2000 per linear metre. However, properly designed and engineered geotextile revetments, intended to provide

protection for several years, can cost up to $8000 per linear metre, depending on the site and its exposure to high energy waves (for instance, see Restall, Heerten and Jackson 2001).

Under the 2010 amendments to the Coastal Protection Act in NSW, temporary emergency protection works may only be installed once, for a maximum period of 12 months. If an emergency protection geotextile wall were to be installed at North Entrance Beach to protect residences that are within the immediate coastal hazard zone, it would need to extend for approximately 1000 metres along the frontal dune system (and potentially for two to three times that distance, if the structure were also to protect the undeveloped dune crest from rapid recession).

- Construction of permanent rock walls to protect built assets. Gosford Council identified rock wall protection as the best management option for part of Wamberal Beach. Estimated capital costs for 1350 metres of rock wall are $7.3 million (as costed in 2003). These costs were based on a unit cost of $5250 per linear metre. If the sea wall were constructed, approximately 20,000 cubic metres of sand per year would also need to be added to the beach to maintain the beach profile that provides for beach amenity. Gosford Council cannot build this protection structure without significant grant input from State or Australian government or a large contribution from landholders. Similarly, if Wyong Council and its community determine that construction of a rock sea wall is the best option for managing risks along parts of the Wyong coastline, the level of investment would likely require financial inputs from State and Australian governments, Council and residents.

6.4.2 Other costs for accommodating coastal erosion and recession

- Preliminary feasibility assessment work on accessing offshore (shelf) sand deposits for beach nourishment at high profile beaches in the Sydney Metropolitan Area have identified indicative costs of $25 per cubic metre. The cost of an initial nourishment campaign is estimated at $300 million (Withycombe, Walker, Neilsen, Pinzone and Morrison 2009). Costs for beach nourishment of Wyong/Central Coast beaches, using offshore sources, are expected to be of the same order of magnitude.

- Relocation of major infrastructure such as roads or sewerage transport systems is also expected to cost in the order of millions of dollars.

- In 2010, council estimated the cost of relocation of surf clubs so that the club buildings are outside the immediate coastal erosion hazard zone at up to $2.5 million per club.

- Design and construction of residences on ocean frontage land in a manner that permits relocation may add to the cost of a single residence (new development) to retrofit an existing residence.

- Development and installation of signage about coastal processes and coastal habitats could be achieved for around $20,000 (as a first pass).

- Detailed design, construction and signage of a coastal walkway/cycleway could be achieved for approximately $2-3 million, depending on how much existing road or pathway can be used. For comparison, the final stage of the Fernleigh Track cycleway, from Redhead to Belmont (Lake Macquarie) was costed in 2009 at $4.6 million. Fernleigh Track construction has been funded by a partnership between the Australian government, NSW Government and local government.

- Reconstruction of beach access ways could be achieved for around $5000 to $10,000 per access way (depending on location and length), mostly for materials.

- Options for upgrading ocean launching access for recreational vessels was estimated in 1999 at:

  - More than $1 million for a breakwater at Norah Head (Cabbage Tree Harbour)
  - $13 million to $28 million for breakwaters and major channel dredging in the entrance of Tuggerah Lake.

  Note: These cost estimates, now more than ten years old, could be expected to have doubled. Any structures in these locations would also now need to be designed to accommodate sea level rise.

6.4.3 Funding partnerships

The WSCZMP identifies key partnerships that will add value to the implementation process and also identifies a wide range of funding programs that will assist WSC to implement important strategies. By completing a comprehensive Coastal Zone Management Plan in accordance with Government policy and guidelines, WSC is well positioned to build strong partnerships and to attract private and public investment in its coastal assets.

WSC will deliver the key strategies in the WSCZMP in partnership with its residents and with State organisations such as the Hunter-Central Rivers Catchment Management Authority (HCRCMA), Office of Environment and Heritage (OEH), State Emergency Service (SES), Department of primary Industries (relevant sections of former L&PMA) and Department of Planning and Infrastructure (DP&I). Council will also work on building its partnership with the Australian Government, particularly in relation to climate change and emergency management.

6.4.4 Funding options

Implementation of the Coastal Zone Management Plan will primarily be the responsibility of Council's Environment and Natural Resources team, in the Environment and Planning Services Department. However, implementation of the Plan also has implications across several other divisions of Council (such as Community and Recreation Services and Infrastructure Management) and for other agencies and organisations. Implementing the WSCZMP is a major budget item for WSC over the next 10 years.

Funds for the implementation of the WSCZMP are available from a range of local, State and Australian government sources, administered by EOH, DP&I, DSEWPC (for instance through Caring for Our Country) and DCCEE (Australian Government) and other government organisations. Most funding programs involve competition for investment with other projects in the region or across the state – including other catchment based activities as well as coast and estuary activities. Matching funding applications to the key objectives and priorities of each program is critical.

Potential sources of implementation funds include those listed in **Section 6.6.6** and **Section 6.6.7**.

6.4.5 Local government rates and levies and community contributions

Council can use part of its rate base, special levies and community partnerships to fund coastline management works.

- Council rates.

  WSC regularly invests part of its general rate revenue in various aspects of natural resource management. There is some potential to vary the relative investment in natural resources and Council's other responsibilities.

  Some other Councils have established a special levy to facilitate implementation of important estuary or coastal zone management programs, for instance where there are severe geotechnical hazards, or heritage structures in coastal hazard zones. Lake Macquarie City Council used a special levy, in conjunction with targeted state grants, to fund major lake restoration works managed by the Office of Lake Macquarie and Catchment Coordinator.

  Wyong Council is considering the need for a special levy to provide additional funds for protection, strengthening or relocation of Council assets in coastal hazard zones. In general, these works are not needed immediately, but are expected to be necessary in the 2050 and 2100 time frames. Examples include strengthening the sea wall that protects the Esplanade at The Entrance, raising the level of the Central Coast Highway, relocating sewerage and water infrastructure, relocation of surf clubs and reconstruction of beach access ways.

- Coastal Protection Service Charge (proposed)

  Recent amendments to the *Coastal Protection Act 1979*, Local Government Act and other legislation create further statutory opportunities for Council to require that land holders contribute to the cost of ongoing maintenance of coastal values, where landholders have initiated the construction of a sea wall to protect their private property. The intent of these amendments is that council will be able to charge benefiting landholders, to recover the costs of ongoing beach nourishment or other maintenance that may be necessary to maintain important community values of the coastline. On a receding coast, sea walls will generally result in a loss of beach volume, loss of beach area at high tide and may also result in erosion further along the shoreline.

  The specific advice from DECCW 2010 (www.environment.nsw.gov.au/coasts/QuestionsandAnswers.htm) is as follows:

  > 'Landholders who have initiated coastal protection works will need to pay to build and maintain these works. They will also have to pay for managing any impacts on beaches. Where a public benefit is involved, landowners and councils may agree to jointly fund works, providing that appropriate arrangements are in place to fund ongoing maintenance and management of these works.
  > Landholders will not be required to build coastal protection works – participation in any scheme to build works is voluntary. Any charges issued by Councils relating to protection works will only apply to land where the current or past landholders have voluntarily agreed to contribute to the cost of building the works and the works have been constructed since the commencement of the Act.
  > Councils may also decide to undertake the works themselves, and may choose to recover all or part of these costs from benefitting landowners through a special variation under the Local Government Act. This existing arrangement requires the prior approval of the Minister for Local Government.'

- Council and community partnerships

  In addition to council funds, there is significant potential for partnerships with landholders and community organisations at the local scale. These partnerships may contribute in kind resources such as volunteer labour for invasive species programs.

As an example, the Central Coast Community Environment Network was successful in applying for Australian government grants from the 2009 Caring for our Country funds (see below for the general intent of this program). By supporting a strong partnership between the CMA and Community Environment Network, Council and the other organisations can all gain leverage over and above the capacity of their own resources.

Recent CEN grants that contribute to managing the Wyong coastline include:

- Central Coast reef watch program.

  This program is described as follows: It engages both teachers and students initially in monitoring intertidal areas. The primary objectives are to engage and educate individuals and community groups about the ecology of intertidal rocky shores, to obtain long-term baseline data on intertidal areas that will provide assistance in decision-making and management, to characterise flora and fauna communities, and to determine the nature and magnitude of changes in species populations and communities over time.

- South Budgewoi beach coastal stabilisation project.

  This project undertakes primary weed control, hazard reduction burns in selected areas to promote native plant regeneration, minor reshaping, replanting of five thousand endemic tubestock and seedling plants. It also includes an upgrade of the existing beach access, and ongoing follow up weed control. Installation of fenced off car park areas and signage indicating appropriate beach usage has been used to define paths and manage public access across the dunes. Once weeds are removed and the area is revegetated an increase in the biodiversity and stability of the dune system is expected.

- 9.1 Community action in rehabilitating dune systems on the central coast.

  This project undertakes dune rehabilitation works in the Gosford and Wyong Local Government Areas by working in partnership with local Councils and existing Dunecare groups. Foreshore vegetation impacts on several of the sand transport pathways, and therefore influences the rate of shoreline recession and dune rebuilding. As climate change predictions increase the pressure on these fragile systems, it is necessary to improve the knowledge, skills, and awareness of coastal processes within the community, as well as increasing their participation in dune rehabilitation activities.

6.4.6 NSW Government programs

- OEH programs, such as the Estuary Management Program, Coastline Management Program and Floodplain Management Program.

  The preparation of the WSCZMP has been 50 per cent funded from the OEH Coastline Management Program. The program has also previously invested in a range of works along the NSW coast to protect community or government assets. However, the fund is quite limited relative to the level of future protection works that may be required.

- OEH also has a lead role in researching and communicating the impacts of climate change on the NSW coast and highlighting the implications of change for risk-averse land use planning and land management. Results of these specialist OEH projects will flow through to WSC and other councils. OEH has established monitoring sites/plots in coastal zone reserves to provide a reference point for changes to the condition of Endangered Ecological Communities, or distribution of threatened species.

- NSW Environmental Trust Fund (administered by OEH). OEH identifies the objectives of the Environmental Trust, which is funded from Environment Protection Licence Fees as:

  - to encourage and support restoration and rehabilitation projects;
  - to promote research into environmental problems of any kind;
  - to promote environmental education in both the public and private sectors;
  - to fund the acquisition of land for the national parks estate;
  - to fund the declaration of areas for marine parks and for related purposes;
  - to promote waste avoidance, resource recovery and waste management (including funding enforcement and regulation and local government programs);
  - to fund environmental community groups; and
  - to fund the purchase of water entitlements for the purpose of increasing environmental flows for the State's rivers and restoring or rehabilitating major wetlands.

  In 2008, the Environmental Trust programs had a budget of approximately $35 million. Funding is provided for projects in eleven categories, several of which are relevant to WCC's management of the coastline.

- OEH sustainability funds. In addition to the Environmental Trust fund which is administered by OEH, OEH also assists local government and communities with programs including:

  - Climate change fund (established in July 2007).

    This fund principally supports projects to mitigate climate change by improving the efficiency of use of key resources and reducing emissions of greenhouse gases, such as water efficiency and energy efficiency projects. Central Coast projects are eligible for $2 million per year for water savings measures.
  - City and country environment restoration program.
  - Climate Action Grants Program.

    The Climate Action Grants Program provides funds to technology development and community programs. Successful projects in the first two years of funding include research on quantifying the values of urban beaches and regional climate change adaptation.

- OEH is also a significant land manager along the Wyong coastline, through National Parks and State Conservation Areas. There are significant benefits associated with collaborative management of issues that cross land tenure boundaries, as well as benefits from transfer of technical expertise.

- DPI (relevant sections of the former L&PMA) supports sound land management through its Public Reserve Management Fund, Dredging Program, Heritage funds and natural disaster funding. These funds target capital development on maintenance projects on Crown reserves and for public assets. Reserve Trusts can apply for the funds. For instance, L&PMA provided $20,000 to the Norah Head Lighthouse Reserve Trust for upgrading works in 2007.

- DPI (relevant sections of the former L&PMA) also provides support through its own investment in coastal feral animal and weed programs (including the Public Reserve Management Fund). The Land and Property Information Division provides geocoded urban and rural addresses, topographic information, cadastral information, digital imagery, survey of infrastructure improvements, other online imagery and mapping services, as well as technical advice on a range of relevant land management issues.

- HCRCMA.

  Most HCRCMA funds are obtained from the Australian government Caring for our Country Program and the NSW Catchment Action Program. The CMA leverages these funds by partnerships for investment in activities which will contribute to natural resource targets. HCRCMA has already invested in studies to better understand the condition of coastal and marine natural resources in the Wyong area (such as its vegetation mapping and shore platform studies), and in a variety of on-ground coast and marine rehabilitation and enhancement projects, such as a major Weeds of National Significance Project with local Landcare groups. HCRCMA is a key partner for Council in all monitoring and review processes. The HCRCMA Incentive Program is a potential funding option for implementing the natural resource management components of the WSCZMP. Effective implementation of the WSCZMP will assist HCRCMA to achieve its management targets and contribute to the achievement of State-wide natural resource management targets (see **Section 1.0** in **PART A**). In relation to the coastal zone the HCRCMA invests in projects that meet the Guiding Principles for Estuary and Marine Coastal Management Targets of the CAP, which include:

  - MT3 – Treat Weeds
  - MT4 – Threatened Species Work
  - MT5 – Manage Aboriginal Cultural Heritage and Landscapes
  - MT27 – Dune Stabilisation
  - MT28 – Protect marine Habitat
  - MT31 – Enhance Marine Shorelines

- NSW Better Boating Program. The Better Boating Program (BBP) is a State Government grants program (managed by NSW Maritime) aimed at providing recreational boating infrastructure, such as new and improved boat ramps, wharves, jetties, pontoons, dinghy storage, public moorings and vessel waste pump-out facilities, for the benefit of the boating community on New South Wales waterways. The BBP, which commenced in July 2009, consolidates the three grants programs previously run by NSW Maritime.

  NSW Maritime utilises revenue raised from registration and licence fees to fund the grants program.

  Since the inception of infrastructure grant funding in 1998, the State Government has provided over $30 million for around 500 boating infrastructure improvements across NSW (including Sydney). The Regional Grants component, which would be relevant to Wyong, has invested around $2.5 million per year, with 50 per cent of infrastructure costs met by councils.

- I&I Recreational Fishing Grants.

  All money raised by the NSW Recreational Fishing Fee is placed into the Recreational Fishing Trusts and spent on improving recreational fishing in NSW. These trusts are regulated by law and overseen by two committees made up of recreational fishers - one for saltwater and one for freshwater.

6.4.7 Australian Government Programs

- Australian Government Natural Resources Funding Program – Caring for our Country.

  Caring for our Country is the Australian government's natural resource management funding program. It will provide $2.25 billion in funding over five years from 1 July 2008 to June 2013. The program integrates a number of previous natural resource management measures into a consolidated initiative. These include the Natural Heritage Trust, the National Landcare Program, the Environmental Stewardship Program, and elements of the Working on Country program.

  Three of the priority investment areas in the Caring for our Country program are relevant to the coast and may provide opportunities for partnering the funding projects in the WSC area:

  - coastal environments and critical aquatic habitats.
  - community skills, knowledge and engagement.
  - biodiversity and natural icons.

  The Caring for our Country program releases a Business Plan each year inviting proposals from relevant organisations (at all levels of government) and partnerships to undertake activities that will achieve outcomes against the priority areas. The first Caring for our Country Business Plan, covering the 2009-10 financial year, was released in November 2008 (Commonwealth of Australia 2008). This identified outcomes for priority areas for the period to 2013, as well as short term targets. The 2008 investment priorities included $100 million for 'repair fragile coastal ecosystems', with a focus on improved community engagement. Recent grants to the Central Coast Community Environment Network (from Caring for our Country) are described above.

  The 2010-2011 Caring for our Country Business Plan indicates that the Australian Government's priorities for coastal systems are focused on coastal lake systems (Commonwealth of Australia 2010). The Great Lakes waterway is the only current 'hotspot' in NSW, although Botany Bay and the Hunter estuary have received funding from this program in the past.

- Part of the Caring for our Country Program, Community Coastcare is intended to contributing to the Australian government's priorities in coastal environments and critical aquatic habitats. The Australian government has advised that priorities for Community Coastcare funding will focus on enhancing community skills, knowledge and engagement with Indigenous Australians, volunteers and coastal communities. Grants are for amounts between $5000 and $20,000.

- Australian Government Recreational Fishing Grants. The Program seeks to assist recreational fishers to contribute to responsible and sustainable use of fishery resources, including helping to maintain fish habitat. Funding of up to $100,000 (GST inclusive) is available within a three year program. Applicants are also asked to contribute, generally, on a dollar for dollar matching basis. In-kind contributions are acceptable.

  The Program will invest in a broad range of activities, including the following areas as they relate to recreational fishing:

  - improvements to infrastructure, including establishing fish cleaning tables, boat wash down facilities and upgrading tracks and paths used by recreational fishers to access fishing spots;

- support of local initiatives to enhance recreational fishing, such as restocking or resnagging waterways;
- to protect the environment at the water's edge by, for example, protecting sensitive habitats;
- to establish and upgrade volunteer marine rescue groups and associated infrastructure;
- for education and awareness raising projects such as biofouling, aquatic pest translocation, increasing survival rates of released fish, and sensitive species; and
- to increase the capacity of local recreational fishing groups and communities through activities such as monitoring programs, tagging projects and data collection.

- Australian government natural disaster mitigation funds. A wide range of natural disaster mitigation works, measures and related activities qualify for funding under the Natural Disaster Mitigation Program. These include:
  - natural disaster risk management studies;
  - disaster mitigation strategies;
  - disaster warning systems;
  - community awareness and readiness measures;
  - land and building purchase schemes in high risk areas;
  - investment in disaster resilient public infrastructure; and
  - structural works to protect against damage (e.g. cyclone shelters, flood levees and retarding basins, bushfire asset protection zones).
- The Australian Government (through the Department of Climate Change) is investing up to $126 million in the National Climate Change Adaptation Program.

  For instance, in early 2010, the Department of Climate Change summarised its support of the following research and assessment programs, which include specific support for local government and for enhancing the climate change skills of environmental professionals:
  - National Climate Change Adaptation Research Facility, at Griffith University – funded $20 million over four years;
  - Local Adaptation Pathways program – $2 million for local government adaptation projects;
  - Integrated assessment of human settlement sub program – climate change capacity building for local government; and
  - Climate change adaptation skills for professionals – professional development and accreditation.

7.0 Coastal Knowledge Action Plan

The Coastal Knowledge Action Plan is the key to continuous improvement in the management of the coastline, through adaptive management practices. It draws together the knowledge management aspects of the other Action Plans.

It incorporates:

- Maintaining the appointment of a coastal zone coordinator, to facilitate streamlined implementation of key strategies.
- The continuation of the TLEC&FMC as a community forum for coastal zone issues.
- Institutional arrangements to ensure that Council managers have access to the best available information about the condition of the coastal system, changes to coastal science and feedback about the performance of the management program.
- Capacity building and training for Council officers and Councillors.
- Benchmarks for management and an effective and flexible record keeping and data management system for coastal information.
- Monitoring of outputs and outcomes of the implementation of the WSCZMP.
- How the community and other stakeholders will contribute to the monitoring, evaluation and review process.
- How information about coastal processes, hazards, climate change, responses and evaluation of coastal condition or risk outcomes will be provided to residents, landowners and visitors.
- How Councillors, State government and Australian government partners will be kept informed of progress and emerging science, policy or issues.
- How the Coastline Management Plan will be reviewed, refocused and updated over time.
- How Council will keep abreast of new science, new techniques and new policy that are relevant to its coastal management.
- Research projects to clarify how specific coastal processes are driving change along the Wyong coastline.
- How routine reviews will include implementation outcomes (did actions achieve what was expected?), review of expenditure and review of community support and satisfaction.

Regular acquisition of new LiDAR and LADS data, at interval of approximately five years, is a key knowledge management task for the WSCZMP. Ongoing updates of this high resolution, digital spatial data will underpin effective adaptive management of the coastline. The data will facilitate:

- the monitoring of change to coastal landforms, both terrestrial and submarine;
- analysis of the effects of sea level rise on coastal terrain;
- analysis of the effects of management actions;
- review of the LEP;
- refined emergency management for areas subject to inundation; and

- streamlined vegetation mapping (community and condition), including invasive species and indigenous species.

7.1 Contribution to relevant coastline objectives and targets

Table 7.1 shows how the action in this plan will contribute to achieving relevant coastline management objectives and targets.

Table 7.1 - Achieving objectives and targets

Objective and relevant targets	Action Summary
O1 To provide for efficient management, based on access to best available science and information about community values and attitudes **Targets** • By 2012, WSC has in place an adaptive management framework for the coastline, incorporating structured actions, performance and condition monitoring and review processes. • By 2015 and 2020, comprehensive reviews of the outcomes of implementing the WSCMP have been completed.	A83: Secure funding for and maintain a coastal zone management coordinator position, to facilitate streamlined implementation of key strategies in the WSCZMP A1: Council will work with Hunter Councils and the NSW Government to acquire new high resolution LiDAR data at regular intervals. LiDAR data, combined with aerial photogrammetry and satellite imagery provides a rapid process for evaluating changes to coastal terrain and terrestrial coastal ecology as sea level rises. Supplement with detailed survey at selected beach profiles immediately after major storm events. A12: Establish an asset register and maintenance program for major Council infrastructure such as stormwater systems and sewage pumping stations. See Also A45 A13: Conduct research into specific coastal process issues. A15: Conduct a regular technical review of the validity and effectiveness of management actions A35: Council will contribute to the development of new tools such as high resolution digital terrain models and other information to refine models for safe community egress during coastal emergencies and communicate new warning and egress models to affected residents. A38: Council will review and update its assessment of coastal erosion and recession hazards as new information from IPCC and the national and State governments becomes available. Council will also use updated modelling and analysis techniques, in conjunction with the NSW Government and new baseline data (DTM using new LiDAR data).

Objective and relevant targets	Action Summary
O7 To enhance the awareness of residents, landholders and land users of coastal processes, climate change and impacts **Targets** • By 2012, there is a measurable increase in the awareness of coastal residents and landholders of the variability of coastal processes and the impacts of predicted climate change on the coastline. • By 2015, there is a 10% increase in the number of residents participating in coastline management programs (including summer coast watch, coastal discovery, community monitoring programs). Note that this objective is directly consistent with Council's Sustainability Management Plan	A4: Train relevant Council officers in coastal hazard management for coastal risk areas, from strategic planning to emergency response activities and timeframes. At this stage Council Officers will not be designated as Authorised Officers for regulation of coastal protection works under the Coastal Protection Act A5: Enhance community awareness of coastal hazards and of emergency response management actions. Tools include regularly updated web pages that are accessible from Council's web site. This would include maps, resource reports, and links to new policies, information sheets, media coverage, information boards at beach access ways, and information on rate notices. A33: Council will place notation on the s149 certificate for all properties within immediate, 2050 and 2100 coastal risk areas (coastal erosion) and also on properties seaward of the 2100 low hazard line for geotechnical hazards. Council will also inform affected ratepayers via information supplied with rate notices. A56: Continue the role of the Tuggerah Lakes Estuary, Coastline and Floodplain Management Committee as a forum for community/agency/council liaison and review of natural resource values and natural hazards in the council area. A14: Involve community in data collection and record keeping through community NRM monitoring programs (also addresses Objective O11)
O8 To develop efficient and effective strategies for minimising Council's and the community's exposure to risk in the coastal context **Target** • By 2012, Council business planning and reporting includes consideration of climate change risks (for coastal landscapes but integrated with other aspects of climate change risk management across the Shire).	A17: Council will report the outcomes of its management decisions and investment in coastal management to the community on a regular basis

Objective and relevant targets	Action Summary
O11 To establish a clear process for monitoring, review, reflection and adaptive management of the coastline **Targets** • By 2015, WSC is in a position to report to its community about the extent to which coastline management objectives and targets are being met and the extent to which improvements in the condition of key coastal natural resources have been achieved. • Thereafter WSC will continue to report on the condition of coastal natural resources and assets and on the return on investment in specific natural and built systems.	A17: Council will report the outcomes of its management decisions and investment in coastal management to the community on a regular basis A56: Continue the role of the Tuggerah Lakes Estuary, Coastline and Floodplain Management Committee as a forum for community/agency/council liaison and review of natural resource values and natural hazards in the council area. A16: Council will set up a schedule of annual progress reviews and a program review at intervals of approximately 5 years. This performance review will be linked wherever possible to assessments of coastal condition (natural, social, cultural and economic assets/values) so that the effectiveness of investment can be evaluated. These condition reviews may be undertaken by management partners such as OEH or HCRCMA.

7.1.1 Why are these objectives and targets not being met now?

Council has been making progress towards achieving these objectives and targets. However, many challenges remain, including:

- issues about availability and transfer of information – within Council, between Council and agencies, between Council and the community;
- limited availability of local scale research and concerns about the relevance of state and national scale 'first pass' assessments to managing issues at the local scale;
- lack of community awareness of coastal risks generally and of the potential impacts of climate change on the Wyong coastline;
- uncertainty about appropriate climate change parameters and how to respond to the different risk levels associated with the various rates of change;
- uncertainty and changes to statutory responsibilities and training requirements; and
- limited application of a structured and transparent decision making process for adaptive management of coastline risks. WSC has gained useful experience through the estuary program.

7.2 Who will be involved in making a difference?

Effective management of coastal information and communication about coastal process risks will be driven by WSC's Environment and Natural Resources Unit, reporting to the Director of Planning. Council will maintain a coastal zone management coordinator position to facilitate streamlined implementation of the Plan.

Senior managers in all other sections of WSC will also be involved.

Council will also continue to develop partnerships with OEH and DPI (relevant sections of former L&PMA), as well as with local community organisations.

For effective knowledge management, everyone in the community is also involved in making a difference.

7.3 What is proposed for the next ten years?

Council will focus on:

- making coastal process and climate change information part of the mainstream of Council business;
- ensuring council staff have the knowledge and skills to manage coastal processes, climate change and other risks that impact on the values of the Wyong coastline;
- raising community awareness and understanding of coastal processes, coastline management issues and how different responses will contribute to sustainable management of the Shire's natural, social and economic assets; and
- establishing a clear and adaptive system for reviewing and prioritising issues and responses.

Council's immediate priorities are:

- Notations on s149 certificates for properties affected by coastal erosion in the immediate 50 year and 100 year timeframes.
- Provide hard copy information about management of coastal hazard risks to affected land owners.
- Make coastal hazard information readily accessible on Council's web site and in signage at popular recreational beaches.
- Ensure that Council assets in the immediate coastal hazard zone are registered in a management system, which will be developed to include other management information and schedules.
- Train relevant council officers in current emergency management procedures. Note that Council has decided that it will not train its officers to be Authorised Officers under the *Coastal Protection Act 1979*.
- Secure funding for an ongoing coordinator position

7.3.1 Implementation planning

Actions to enhance knowledge of the coastline and to deliver effective knowledge management are summarised in **Table 7.2**.

Table 7.2 - Effective Adaptive Management of Coastal Knowledge

<table>
<tr><td colspan="4">Step 1 Benchmark condition:
A1: Council will work with Hunter Councils and the NSW Government to acquire new high resolution LiDAR data at regular intervals. LiDAR data, combined with aerial photogrammetry and satellite imagery provides a rapid process for evaluating changes to coastal terrain and terrestrial coastal ecology as sea level rises. Supplement with detailed survey at selected beach profiles immediately after major storm events.
See also A73, and A38</td></tr>
<tr><td colspan="4">Intent and logic
This is a key action within WSC's strategic approach. It provides the data to understand how the coast is changing and to adapt planning and management measures accordingly.
Provide baseline and benchmark for assessing ongoing trends in beach and dune sand volumes and stability, and the success of other management actions to protect dune forms. LiDAR provides terrain data at a resolution suitable for monitoring change associated with sea level rise and storms. It reduces field survey requirements and provides data for ongoing modelling and evaluation.</td></tr>
<tr><td>Responsibility and key partners</td><td>When - Priority</td><td>Where – locations for investment</td><td>Indicative cost and source of funding</td></tr>
<tr><td>WSC Environment and Natural Resources Unit
Support from OEH, DP&I</td><td>High priority activity, but to be done at five yearly intervals, plus after major storm events
Review period: after two follow up LiDAR surveys</td><td>Whole of Wyong coastline, to 10 m above sea level</td><td>Allow $20,000 for data collection and a further $30,000 for data processing/analysis every five years.
When is funding needed: 2 to 5 years
Source: NSW or Australian Government</td></tr>
<tr><td colspan="4">Step 2: Take Action to Reduce Risk
A83: Secure funding for and maintain a coastal zone management coordinator position, to facilitate streamlined implementation of key strategies in the WSCZMP</td></tr>
<tr><td colspan="4">Intent and logic
Coastal zone management is a major issue for WSC, with implications for many aspects of Council's operations and for the well being of residents. Council has multiple responsibilities in the coastal zone, spread across several different directorates. The coordinator role would guide the implementation of the WSCZMP. The coordinator (reporting to manager within the Planning Directorate) would be the first point of contact for the community about coastal zone management issues and would work with all relevant sections of Council to deliver approved actions on time and on budget.</td></tr>
<tr><td>Responsibility and key partners</td><td>When - Priority</td><td>Where – locations for investment</td><td>Indicative cost and source of funding</td></tr>
<tr><td>The coordinator is currently within the Environment and Natural Resources Unit within the Planning Directorate.</td><td>A commitment to continuing the current role into the implementation phase of the WSCZMP is a high priority.
The role would be reviewed within Council's existing performance review process. The coordinator would be involved in the review of implementation annually and after approximately five years.</td><td>The role would guide implementation of the WSCZMP for the entire Wyong coastline.</td><td>Allow approximately $80,000 per year. The role would continue for 10 years.</td></tr>
</table>

Step 2 Take action to reduce risk:

A4: Train relevant Council officers in coastal hazard management for coastal risk areas, from strategic planning to emergency response activities and timeframes. At this stage Council Officers will not be designated as Authorised Officers for regulation of coastal protection works under the Coastal Protection Act

Intent and logic

Support an informed and consistent approach to coastal erosion issues and coastal emergencies across all sections of Council. This builds on existing Council programs.

Responsibility and key partners	When - Priority	Where – locations for investment	Indicative cost and source of funding
WSC Environment and Natural Resources Unit (and/or other staff as determined by Council). External trainers, including OEH	Schedule to be developed immediately and implemented over 18 months	Applies to all planning and environmental staff and specifically to officers authorised for regulatory activities under the *Coastal Protection Act 1979*. Awareness raising and training also for councillors	Allow $10,000 per annum From Council resources
	Review period: 3 to 5 years – see Actions A13 and A14		

Step 2 Take action to reduce risk

A5: Enhance community awareness of coastal hazards and of emergency response management actions. Tools include regularly updated web pages that are accessible from Council's web site. This would include maps, resource reports, and links to new policies, information sheets, media coverage, information boards at beach access ways, and information on rate notices.

Intent and logic

This is a key action for the first 2 years of the WSCZMP. It will enhance community capacity to make informed decisions about land use and property management, to act appropriately during coastal emergencies and to provide feedback to council on coastal management actions.

Community understands risk management principles and accepts planning responses that impact on the use and financial value of coastal land.

Responsibility and key partners	When - Priority	Where – locations for investment	Indicative cost and source of funding
WSC Environment and Natural Resources Unit Support from WSC media manager	Commence immediately and maintain flow of information throughout the implementation of the Plan	Applies to all residents in Shire, but people within the immediate and 2050 coastal risk areas are the first priority and require more intensive information opportunities	Allow $50,000 for first three years (average $17,000 per year); resource needs will decline once key information is in place. From Council resources. Funds may also be available from NSW Environmental Trust and HCRCMA
	Review period - 3 to 5 years, see Actions A13 and A14		

Step 2 Take action to reduce risk:

A12: Establish an asset register and maintenance program for major Council infrastructure such as stormwater systems and sewage pumping stations. See Also A45

A45: Develop an asset data base for all coastal access infrastructure, including GIS information about location, and data on condition, materials, context, when last maintained, extent of usage, known safety incidents.

Intent and logic

These two actions (for major public infrastructure and beach access assets) jointly contribute to streamlined future asset and infrastructure management in coastal risk areas. This action is part of Council's ongoing asset management. It will make sure that the impacts of storm events on community infrastructure along the coast are thoroughly recorded and that data can be readily retrieved.

Responsibility and key partners	When - Priority	Where – locations for investment	Indicative cost and source of funding
WSC Environment and Natural Resources Unit and Asset Manager	Immediately and maintained throughout the implementation of the Plan Review period: approximately 5 years – See Actions A13 and 14	Whole of coastline	Within role of Council asset manager and environment/natural resources manager

Step 2 Take actions to reduce risk:

A33: Council will place notation on the s149 certificate for all properties within immediate, 2050 and 2100 coastal risk areas (coastal erosion) and also on properties seaward of the 2100 low hazard line for geotechnical hazards. Council will also inform affected ratepayers via information supplied with rate notices.

Council will inform all affected land holders when this notation is to be applied. Notification may be by advice with a rate notice or by a direct letter with mapping. See also Action A4 regarding community awareness activities.

Associated elements of planning measures to reduce risk are in A5, A16a, A16b **(Section 9.0)**

Intent and logic

Notations on s149 certificates provide a permanent record of the coastal erosion, inundation or geotechnical hazard constraints to use of the land. To ensure that landholders are aware of the constraint, council will notify all affected landowners directly. It is likely that such notations will affect the type of development for which finance can be obtained and will also affect insurance over of the affected properties. These are important elements of risk for affected land owners.

Responsibility and key partners	When - Priority	Where – locations for investment	Indicative cost and source of funding
WSC General Manager	Within 12 months Review period: Approximately 5 years. Updated notations will be linked to ongoing tracking of actual impacts of climate change on the coast, updated hazard assessments and to reviews of the LEP.	2100 coastal risk area for whole of coastline	Within the responsibility of existing Council staff.

Step 3 Enhance knowledge and monitor achievements:

A38: Council will review and update its assessment of coastal erosion and recession hazards as new information from IPCC and the national and State governments becomes available. Council will also use updated modelling and analysis techniques, in conjunction with the NSW Government and new baseline data (DTM using new LiDAR data).

Intent and logic

This action is part of the suite of actions that will use future LiDAR data, such as Action A1 and Actions A68, A35, A37 and A73 (where new modelling techniques are available). The intent is to improve the accuracy of coastal recession estimates, assisting ocean frontage landowners with greater certainty about the extent of land loss to coastal recession over time. The action is consistent with the principle of using the best available science and information about coastal processes to support decision making.

Council will refine coastal hazard assessments for areas where bedrock underlies the beach and dunes at shallow depths and would affect the accuracy of erosion models for sandy coasts.

Responsibility and key partners	When - Priority	Where – locations for investment	Indicative cost and source of funding
WSC Environment and Natural Resources Unit Support from OEH	Reviews to follow new IPCC sea level rise and other climate change predictions and adoption of new sea level rise benchmarks by NSW government. Expect to occur in 2013 and thereafter at approximately 6 year intervals. Link the review of hazards to updating the Plan (Approximately 5 years).	Whole of coastline	Allow $80,000 for each review of coastal hazards with new parameters and data. Council will need support from the NSW Government for these reviews.

Step 3 Enhance knowledge and monitor achievements

A13: Conduct research into specific coastal process issues.

Partner actions are A35, A61 and A68. Issues for investigation include future sediment dynamics at The Entrance under the influence of sea level rise; potential hydrodynamic impacts of breaching of the sandy barrier at Budgewoi; and how different types of frontal dune system (varying morphologies and sand volume) will respond to sea level rise.

Other options for research include further research into the feasibility of off shore sand supplies for beach nourishment – for instance to maintain the barrier at Lakes Beach/Budgewoi sand spit, or to protect residential development at North Entrance or Hargraves Beach.

Further information about these studies is in **Section 9.0 (PART B)** and in **Section 16.0 (PART C)**
A35: Council will contribute to the development of new tools such as high resolution digital terrain models and other information to refine models for safe community egress during coastal emergencies and communicate new warning and egress models to affected residents.

This action would be integrated with flood risk management responses, and managed jointly by Council and SES.

Intent and logic

Council will need this information to make sound decisions about the management of The Entrance channel as sea level rises. Climate change has the potential to affect sediment supply/sediment dynamics in the entrance channel.

There are currently few if any major terrestrial sources of sand that could be used for beach nourishment in Wyong, so in the long term a clear understanding of offshore sources and risks associated with offshore sand extraction is essential.

Responsibility and key partners	When - Priority	Where – locations for investment	Indicative cost and source of funding
WSC Environment and Natural Resources Unit with Tuggerah Lakes Estuary and Coastline Management Committee OEH and SES will also be involved.	Before the next review of the WSCMP. Examples include entrance processes for Tuggerah Lake, offshore sand sources for beach nourishment.	Whole of coastline	Allow $150,000 in the first five years of implementing the Plan – for appointment of specialist researchers/consultants Funds could be sourced from OEH: Environmental Trust, Coast and Estuary Program
Step 3 Enhance knowledge and monitor achievements: **A14**: Involve community in data collection and record keeping through community NRM monitoring programs			
Intent and logic See Also Actions in the Biodiversity Resilience Action Plan. The aim is to improve understanding of coastline condition and the effectiveness of management actions, as well as to enhance community involvement in coastline management. Community involvement in monitoring means that additional data can be collected, which would not otherwise be cost effective; however the process must also recognise community capacity (time, skills and commitment required) and the types of data that community groups can collect. Dunecare groups already provide a good model for how this involvement could occur.			
Responsibility and key partners	**When - Priority**	**Where – locations for investment**	**Indicative cost and source of funding**
WSC Environment and Natural Resources Unit with Tuggerah Lakes Estuary and Coastline Management Committee	Investigate options within the first three years of implementing the WSCMP	Whole of coastline	Management of this program is within the responsibility of existing Council staff. Allow $10,000 per year for program support, such as community consultation and training.
Step 3 Enhance knowledge and monitor achievements: **A37**: Council will continue to work with the NSW Government (OEH) to provide the most up to date method for assessing coastal erosion and coastal recession hazards, including the interaction of coastal recession and processes operating at the entrance to Tuggerah Lake.			
Intent and logic See also A68. More reliable models of coastal processes provide better predictions of the actual behaviour of beaches and dunes in storm conditions, as exacerbated by climate change. Council does not intend to directly fund local scale research on coastal process modelling, but would consider being a party to a broader research project, which would deliver results of benefit to Wyong Shire. Council will review and refine hazard assessments for beaches and dunes that have bedrock at shallow depths, which affects the accuracy of erosion models.			

Responsibility and key partners	When - Priority	Where – locations for investment	Indicative cost and source of funding
WSC Environment and Natural Resources Unit Support OEH	As necessary. Note that coastal hazard assessments will be reviewed in response to new sea level rise and other climate change impact predictions from IPCC, as adopted by the NSW Government. WSC will use its LiDAR data as part of the hazard review process	Sandy beaches along the whole of coastline. Separate refinement of geotechnical models could also be achieved by making better use of detailed geology, terrain data and slope mechanics equations.	Allow $5,000 per year. This work is primarily the responsibility of OEH and University researchers.
Steps 3 and 4: Status review and progress evaluation, enhance knowledge and monitor achievements **A56**: Continue the role of the Tuggerah Lakes Estuary, Coastline and Floodplain Management Committee as a forum for community/agency/council liaison and review of natural resource values and natural hazards in the council area.			
Intent and logic Continues the role of the Committee as a regular venue for liaison between key stakeholders for implementing the Coastline Management Plan (Action Plans) and for integrating the Coastline Action Plans with the Estuary Action Plans and Flood Risk management plans, all within the 'coastal zone'			
Responsibility and key partners	**When - Priority**	**Where – locations for investment**	**Indicative cost and source of funding**
WSC –Environment and Natural Resources Unit to manage and facilitate. Committee is chaired by the Mayor.	Immediate and ongoing	Committee meets at Council and has oversight and reference panel roles for all of the Wyong coastline and the Tuggerah Lakes estuary	No additional cost. This is a continuation of an existing role for council staff.
Step 4 Status review and progress evaluation: **A15**: Conduct a regular technical review of the validity and effectiveness of management actions			
Intent and logic This review process will apply to all technical management actions. It draws together monitoring data and other aspects of the scientific evaluation of management. Helps reduce the likelihood of continuing investment in actions that are not meeting expectations or are not cost effective. The focus of this review is on the science – whether the actions have achieved the predicted improvement in coastline condition or resilience.			
Responsibility and key partners	**When - Priority**	**Where – locations for investment**	**Indicative cost and source of funding**
WSC Environment and Natural Resources Unit Support from OEH, WSC Engineering Services, WSC Strategic and Development Assessment Planning and external technical specialists	Approximately every 5 years. This action feeds into the review of the effectiveness of the WSCZMP. Timing of reviews and reporting would be linked to Council's other reporting schedules and the regular review and update of regional NRM plans (also applies to A16).	Whole of coastline	Allow $5,000 per year for engaging technical specialists to provide advice on the science of management actions. Other costs are within responsibilities of existing Council staff.

Step 4 Status review and progress evaluation:

A16: Council will set up a schedule of annual progress reviews and a program review at intervals of approximately 5 years. This performance review will be linked wherever possible to assessments of coastal condition (natural, social, cultural and economic assets/values) so that the effectiveness of investment can be evaluated. These condition reviews may be undertaken by management partners such as OEH or HCRCMA.

The status review would be aligned with other Council review and reporting processes. The review of the implementation of the Coastline Management Plan would be conducted in consultation with the Tuggerah Lakes Estuary, Coastline and Floodplain Management Committee.

Intent and logic

This review process applies to the entire coastline management plan. Annual reviews relate to tracking whether intended actions have been completed and keeping a record of any specific constraints. The 5 year reviews, which would be aligned with other Council and NRM reviews and reporting, is intended to support strategic adaptive management of the coast.

The review provides the reflection and evaluation needed with key stakeholders for effective adaptive management. A regular review of the overall management program reduces the risk of poorly targeted council investment and allows for community feedback on appropriate priorities.

Responsibility and key partners	When - Priority	Where – locations for investment	Indicative cost and source of funding
WSC Environment and Natural Resources Unit with Tuggerah Lakes Estuary and Coastline Management Committee. May require appointment of specialist advisors	Main reviews at approximately 5 year intervals, following technical review (Action A13) and any updates of coastal erosion modelling.	Whole of coastline	Allow $10,000 per year for appointment of specialist advisors if necessary. From Council resources

Step 4 Status review and progress evaluation (reporting):

A17: Council will report the outcomes of its management decisions and investment in coastal management to the community on a regular basis

Intent and logic

This is a follow on from A15. It is designed to inform the community about progress in the management of the coastline and of the reasons for any changes to the proposed management approach and actions. The reporting process will keep the community informed about how risks are being managed and raise awareness of why some actions are more effective than others. It also reduces the risk that Council will continue an action that has significant community disapproval, without further work on attitudes, awareness or science.

Responsibility and Partners	When - Priority	Where – locations for investment	Indicative cost and source of funding
WSC Environment and Natural Resources Unit	At approximately 5 year intervals, linked to WSC State of the Environment Report Report. Interim achievements can be reported on WSC web site and local media (as for A4)	Whole of coastline	Allow $5,000 per year for preparation of reports (not including printing costs). Tasks are generally within the responsibility of existing Council staff.

8.0 Coastal Emergency Response Management Plan

Under Section 55C(1)(b) of the *Coastal Protection Act 1979*, councils are required to prepare a Coastal Emergency Response Management Plan for the whole of their coastline as part of their CZMP.

Erosion associated with major storms over the last 40 years has threatened residential development and associated infrastructure along some parts of the Wyong coastline. Coastal erosion hazard studies completed during the preparation of the WSCZMP confirm that 62 residential properties and 53 houses are at least partly within the immediate coastal erosion hazard zone.

The NSW government recognises beaches where several houses are within the immediate hazard zone as Coastal Erosion Hot Spots or 'Authorised Locations' for emergency protection works and priority locations for the preparation of Emergency Response Management (sub) Plans. North Entrance Beach, Hargraves Beach and Cabbage Tree Harbour are currently identified as Authorised Locations. Five residences at Blue Bay are also partly or wholly affected by the immediate zone of wave impact and slope adjustment. Blue Bay is not currently identified as an Authorised Location for emergency coastal protection works, but could be included with an amendment to the regulations.

For Authorised Locations, Council is required to prepare a Coastal Emergency Action Sub Plan, providing specific details about appropriate emergency response actions.

More information about the amendments to the *Coastal Protection Act* 1979 in relation to emergency response is in **Section 15.0** of **PART C**.

Appendix 2 of the WSCZMP contains a draft Coastal Emergency Response Management Plan for the whole of the Wyong coastline. The structure and content of this draft takes into account recent legislation, regulation and policy advice from OEH, including *Coastal Protection Act 1979*, Guides and Code of Practice (2011a).

The Plan includes Emergency Action Sub plans for Hargraves Beach, North Entrance Beach and Cabbage Tree Harbour. **Figures 8.1**, **8.2** and **8.3** also show proposed emergency response measures for these Authorised Locations and are a one page summary of each subplan. Supporting information for these sub plans is in **Section 8.3.2**.

Proposed emergency coastal protection works at Blue Bay are included in the draft Coastal Emergency Response Management Plan for the whole coastline.

Source: SMEC (2010)
Note: Contour Interval 0.5m

0 25 50 100m
1:2 500

Legend

- Immediate Limit of Zone of Wave Impact and Slope Adjustment
- Immediate Limit of Zone of Reduced Foundation Capacity

FIGURE 8.1a

Emergency Protection Works
at North Entrance
(Private Property)

File Name (A4): R03_V1/1869_114.dgn

Source: SMEC (2010)
Note: Contour Interval 0.5m

0 25 50 100m
1:2000

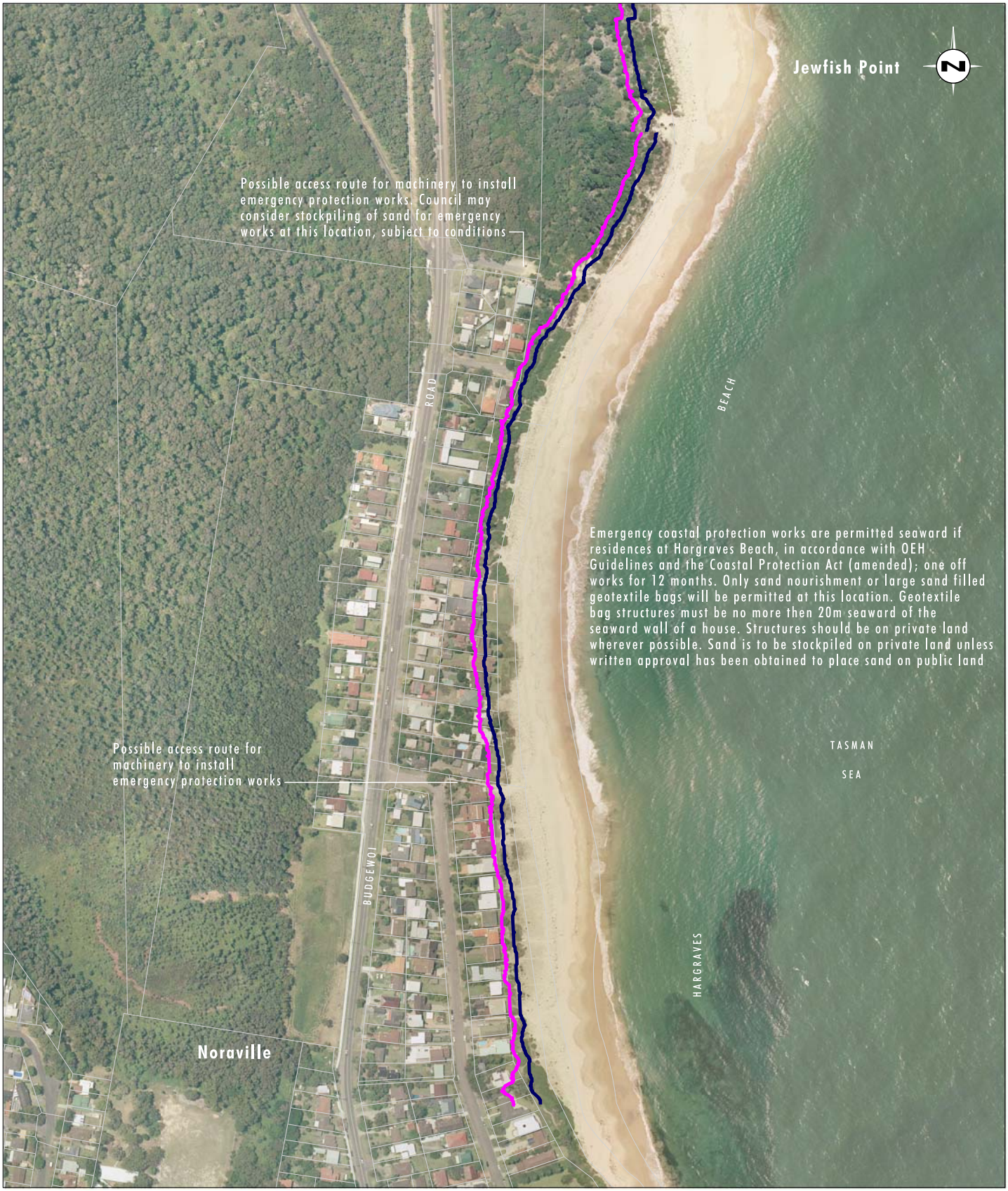
Legend

- Immediate Limit of Zone of Wave Impact and Slope Adjustment
- Immediate Limit of Zone of Reduced Foundation Capacity

FIGURE 8.1b

Emergency Protection Works at North Entrance (Private Property)

File Name (A4): R03_V1/1869_115.dgn



Source: SMEC (2010)

0 100 200 250m
1:5000

Legend

- Immediate Limit of Zone of Wave Impact and Slope Adjustment
- Immediate Limit of Zone of Reduced Foundation Capacity

FIGURE 8.2

Emergency Protection Works for Private Property at Hargraves Beach

Source: Shirley Consulting Engineers Pty Ltd

0 50 100 150m
1:3000

Legend
- Immediate Low Hazard Line
- Immediate High Hazard Line

FIGURE 8.3

Emergency Protection Works at Cabbage Tree Harbour

File Name (A4): R03_V1/1869_161.dgn

8.1 What is a coastal emergency?

Coastal emergencies occur during severe coastal storms and may occur during periods of very high oceanic water level. A coastal emergency would also occur if a tsunami hit the local coast. Coastal storms can damage public and private assets and infrastructure in several ways, such as:

- Wave cut into dunes, undermining and eroding fences, swimming pools, decks, and houses on private property; public steps, ramps, pathways and viewing platforms; surf club buildings and associated facilities; sea walls; roads; sewerage or other major community infrastructure; promenades and boardwalks. As discussed in **PART C**, **Section 16.0**, wave cut (storm bite) may be followed by slumping and slope adjustment as the sand drains and dries. Coastal erosion hazard studies have not been completed for the entire length of beaches in Wyong Shire. Council and OEH identified key location for which hazard studies would be prepared, at the outset of the project. Generally, these locations correspond with areas of residential development or locations of community infrastructure.

  Based on the assessment recommended by OEH, **Figures 8.4** to **8.10** show areas, outside the recognised Hotspots or Authorised Locations, which are considered to be subject to immediate coastal erosion hazard along the Wyong coast. Severe coastal erosion could occur in these areas at any time.

- Land slip and rock fall caused by saturated soils, high waves or following tree throw (see **Section 11.0**).

- Wind-blown sand being deposited across road ways, park land and residential or commercial development.

- Wind damage such as tree fall and loss of roofing. Storm bite can also cause tree throw.

- Inundation of low lying land by wave overtopping of dunes or wave set up/storm surge in the entrance. For some parts of Wyong Shire's coastline, inundation due to wave overtopping adds to other inundation hazards associated with high lake water levels, driven by prolonged catchment rainfall and runoff. This is most apparent at North Entrance.

- Injury to residents or other people moving through the affected area.

All of these impacts can cause inconvenience, injury and upset to residents. However, for the purpose of specifying Council's involvement in coastal emergency response management, a **coastal emergency** is confined to:

- **Erosion caused by storm waves or by very high oceanic water levels**, which impacts on private or public assets to the extent that:

  - structures (residential buildings) on private property have collapsed or are in imminent danger of collapse onto the beach or the rock platform;

  - structures (such as surf clubs or promenade walls) on Crown or community land have collapsed or are in imminent danger of collapse onto the beach or the rock platform;

  - there are immediate, imminent significant threats to public safety if people venture onto the beach or foreshore reserves (for instance, if people are swept off the beach or rock platforms by storm waves);

Source: SMEC (2010)

0 100 250 500m
1:10 000

Legend

- Immediate Limit of Zone of Wave Impact and Slope Adjustment
- Immediate Limit of Zone of Reduced Foundation Capacity

FIGURE 8.4

Area Affected by Immediate Coastal Erosion Hazard Shelly Beach

Source: SMEC (2010)

0 100 200 250m
1:5000

Legend

- Immediate Limit of Zone of Wave Impact and Slope Adjustment
- Immediate Limit of Zone of Reduced Foundation Capacity

FIGURE 8.5

Area Affected by Immediate Coastal Erosion Hazard Toowoon and Blue Bays

Source: SMEC (2010)

0 100 250 500m
1:10 000

Legend

- Immediate Limit of Zone of Wave Impact and Slope Adjustment
- Immediate Limit of Zone of Reduced Foundation Capacity

FIGURE 8.6

Area Affected by Immediate Coastal Erosion Hazard The North Entrance

Source: SMEC (2010)

0 0.5 1 1.25km
1:25 000

Legend
- Immediate Limit of Zone of Wave Impact and Slope Adjustment
- Immediate Limit of Zone of Reduced Foundation Capacity

FIGURE 8.7

Area Affected by Immediate Coastal Erosion Hazard
The North Entrance

Source: SMEC (2010)

Legend

- Immediate Limit of Zone of Wave Impact and Slope Adjustment
- Immediate Limit of Zone of Reduced Foundation Capacity

FIGURE 8.8

Area Affected by Immediate Coastal Erosion Hazard Soldiers Beach

Source: SMEC (2010)

0 100 200 400m
1:7500

Legend

- Immediate Limit of Zone of Wave Impact and Slope Adjustment
- Immediate Limit of Zone of Reduced Foundation Capacity

FIGURE 8.9

Area Affected by Immediate Coastal Erosion Hazard Hargraves and Lakes Beach

Source: SMEC (2010)

0 100 200 250m
1:5000

Legend

- Immediate Limit of Zone of Wave Impact and Slope Adjustment
- Immediate Limit of Zone of Reduced Foundation Capacity

FIGURE 8.10

Area Affected by Immediate Coastal Erosion Hazard North of Lakes Beach

  - untreated sewage or other contaminants are discharging or are likely to discharge onto the beach; and
  - residents are likely to be isolated from important community services. For instance, residents are cut off from power or water supplies or elderly residents are or will be cut off from medical assistance.
- **Tsunami** as communicated by the Australian Government Tsunami Warning System.
- **Geotechnical events (land slip or rockfall)** which impact on private or public assets such that:
  - there are significant and immediate threats to public safety, such as if pathways, lookouts or stairs are in imminent danger of collapse;
  - residential property is damaged or is in imminent danger of being damaged in a way that makes it dangerous and uninhabitable; and
  - untreated sewage or other pollutants are discharging directly into the environment (e.g. from a broken reticulation system).

8.2 How is the Coastal Emergency Management Response Plan different to existing management?

Council has a DISPLAN and has prepared risk assessments for various natural hazards that affect the people and assets of the Shire.

Council has not previously prepared a detailed emergency management plan for coastal emergencies, developed in cooperation with OEH and SES, but dealing specifically with Council's responsibilities. The draft Emergency Management Plan in **Appendix 2** has the following scope:

- Planning to minimise exposure to coastal emergencies.
- Planning for efficient, effective and timely responses during coastal emergencies. This includes planning for emergency beach nourishment, such as identification of sand sources, obtaining approvals, preparing stockpiles of suitable material.
- Clear lines of communication between response organisations and between relevant sections of Council during coastal emergencies.
- Clear communication and warning systems for residents.
- Clear advice to land owners about the types of emergency action that they may take to protect their property and the types of approval process that apply to different types of action, different locations (on Crown land or on private property) and different expected permanence (e.g. sand dumping, simple sand bag structures, large geotextile walls). Details of recent amendments to the *Coastal Protection Act 1979* and related legislation, affecting these matters, are in **Section 15.0** of **PART C**.
- Clear guidance for land owners about Council's (or OEH) regulatory powers if land owners take action that is outside the regulatory framework (for instance if land owners place unapproved rock or rubble on a beach during a coastal emergency).

- Internal protocols and processes for regulation and enforcement of the planning framework for emergency structures or other emergency actions to protect private property.

- Clean up and review protocols, including future arrangements to address climate change impacts.

8.3 Council's priorities for the next ten years

The draft Coastal Emergency Management Plan addresses:

- Medium to long term planning to reduce the likelihood that coastal emergencies will occur

- Preparing for coastal emergencies, including training, communication and organisation of materials and approvals

- Effective implementation during coastal emergency events

- Follow up actions, including both on ground clean up and review of the success of procedures.

Over the next 10 years, Council will focus on:

- improving its own knowledge of how different types of emergency event will affect the coastline and how risks will change over time. This includes changes to emergency events because of climate change and an improved understanding of tsunami risk management;

- enhancing community understanding of coastal emergencies, particularly in the context of climate change;

- providing up to date advice to landowners about statutory requirements and the consequences of illegal protection works;

- refining planning and communication about coastal emergencies;

- ensuring that emergency management actions do not detract from outcomes of other coastal management initiatives, such as Dunecare vegetation regeneration; and

- Improving its cooperative relationship with OEH, DPI (relevant sections of former L&PMA) and SES in relation to coastal emergencies including developing effective and innovative communication systems for coastal emergencies in Wyong Shire.

8.3.1 Immediate actions

Actions to take effect as soon as possible include:

- Seek certification of the coastal emergency subplans for Hargraves Beach, North Entrance Beach and Cabbage Tree Harbour.
- Train council officers about relevant issues and coordination required to implement the *Coastal Protection Act 1979* during coastal emergencies. Council officers will not be trained as Authorised Officers under the *Coastal Protection Act 1979*.

- Ensuring residents and landowners in Authorised Locations are aware of the erosion (and landslide) hazards affecting their properties and of the options available to them for emergency protection from coastal erosion.

8.3.2 Emergency Management sub plans for Hargraves Beach, North Entrance Beach and Cabbage Tree Harbour

Hargraves Beach, North Entrance Beach and Cabbage Tree Harbour are identified as Authorised Locations for emergency coastal protection works. **Box 8.1** explains the process for undertaking emergency coastal erosion protection works at these beaches.

Note that currently:

- Hargraves Beach has a well developed incipient foredune, but residences are located on a low foredune. The 1974 erosion scarp removed the incipient foredune and cut into the foredune.

- There is no incipient foredune buffer in front of houses on Curtis Parade or the southern end of Hutton Road. Houses at Curtis Parade are seaward of the alignment of the incipient foredune immediately to the south.

- HCRCMA is sponsoring a number of Dunecare projects on frontal dunes at North Entrance Beach. Landholders wishing to access the beach for installation of emergency protection works through these areas must demonstrate to Council and OEH that beach access will not impact on the agreed project outcomes for Council contracts with HCRCMA.

- Council is constructing a permanent protection structure at Cabbage Tree Harbour. This structure will protect the toe of the unstable slope from wave impact and will assist drainage.

BOX 8.1: Emergency Management at Authorised Locations

One off emergency protection works may be approved at certain locations at Hargraves Beach and North Entrance Beach and Cabbage Tree Harbour.

All works must be conducted in accordance with the *Coastal Protection Act* (as amended 2010) and relevant Codes and Guidelines. Emergency works must be consistent with the strategies set out in the WSCZMP.

Requirements for these one off works are set out below.

What emergency protection works are permitted?

Sand nourishment, large geotextile bags, filled with sand. Council will not support the placement of emergency protection works which use small 'sandbag' type bags to protect private property on open ocean beaches. Placing of rock, concrete or other rubble material is not permitted.

Approvals required

Landholders who wish to undertake one off emergency protection works must apply to OEH for a certificate permitting the works to take place. OEH may place conditions on the certificate. Landholders must notify council before approved works commence. Where works are on public land, the owner or manager of the public land must be notified.

Applications for a certificate must include information about the materials to be used, concept designs for placement and where the works will be placed. If stockpiling of materials is necessary, the application must state where materials will be stockpiled. Acceptable locations are shown in **Figures 8.1**, **8.2** and **8.3**.

Locations:

Only those properties where the coastal erosion escarpment is within 20 metres of the maximum seaward extent of residential buildings (not including decks, fences, pergolas). In specific circumstances, a land owner may place emergency protection works in front of an immediately adjoining property, with the consent of the land owner.

When:

Emergency protection works may only occur when the wave erosion escarpment is no more than 20 metres from the most seaward wall of the residential building.

For safety reasons, placement of sand or sand filled geotextile bags is not to occur during major storm events.

Emergency protection measures must only be placed on the beach and/or dune when it is safe for machinery to be on the beach. In general, this implies at low tide and outside peak beach usage periods and in advance of periods when erosion is likely to occur. See the OEH web site for the most up to date specifications.

Materials specifications

In accordance with the OEH draft statutory requirements, only clean sand in the grain size range 0.15 to 0.5 millimetre may be used for beach nourishment or to fill geotextile bags. Council expects that any sand which is used for filling geotextile bags will eventually become part of the beach or dune sand.

Sand for emergency protection works must not be extracted or removed from local coastal dunes, except if it is obtained from an existing, licensed or approved sand quarry. No such quarried exist in Wyong Shire. Examples of quarries which may be able to provide suitable sand are located in the Stockton coastal barrier, north of Newcastle.

Sand for emergency protection works may be obtained from dredging of shoals in the entrance of Tuggerah Lake. Such sand must be extracted and placed in accordance with the Entrance Management Strategy and Dredging Management Plan for the entrance channel.

Rock, gravel, soil or other extractive materials must not be used for beach nourishment or to fill geotextile bags which will be placed on the beach. Use of rubble or other unspecified waste or fill is prohibited.

Where can materials be stockpiled?

Council prefers that stockpiles of sand or geotextile bags are stored on private property. The nature of existing development at Hutton Road and Curtis Parade North Entrance is such that stockpiling of materials on private land may not be feasible. Where there is vacant private land, other landholders may come to an agreement with the owner of the vacant private land to stockpile sand materials, subject to relevant legal advice.

Landholders may stockpile sand for emergency protection works on public land only when no private land options are available. The intention to stockpile sand on public land must be notified in the application for a certificate. Details of where the sand will be placed, measures to prevent wind blowing sand off the stockpiles, and the period of stockpiling must be stated.

Figures 8.1 and **8.2** show public land at Hargraves Beach and North Entrance Beach where stockpiling will be considered. No locations for stockpiling of sand are identified at Cabbage Tree Harbour.

Which beach access ways may be used to move materials into place?

Figures 8.1, **8.2** and **8.3** show the beach access ways which OEH may approve for use to move emergency protection works onto the beach. Landholders applying to OEH for a certificate must nominate which beach access ways will be used. Council and OEH expect that where a public access way is used, its proper condition will be reinstated after use.

What equipment may be used?

Sand and sand filled geotextile bags must be placed using suitable machinery which can operate on soft sand. Machinery must be operated by qualified operators with current, relevant safety training. Care must be taken to prevent geotextile bags being pierced or ripped during placement.

Acceptable designs

DECCW (2011b) provides generic guidance on suitable designs for emergency protection works on open beaches. Bag sizes and stacking procedures are presented in (from DECCW 2011b).

When must emergency protection works be removed?

The *Coastal Protection Act 1979* as amended in 2010 allows one off emergency protection works at Authorised Locations for a maximum of 12 months, to give landholders time to consider longer term options. Short extensions are possible if a land holder has an application with Council or the Coastal Panel for permanent protection works. Permanent works must be in accordance with a certified Coastal Zone Management Plan.

DECCW will have officers authorised to enforce the requirements of the *Coastal Protection Act 1979*. If in the opinion of an authorised officer, emergency coastal protection works are causing erosion elsewhere on the beach or are impeding safe public access to the beach, the authorised officer may issue a notice requiring that the works are removed after less than twelve months.

What permanent protection works may be permitted?

Permissible permanent coastal protection works are discussed in **Section 9.0**.

8.3.3 Geotextile bag structures for coastal reinforcement or protection

The NSW government (DECCW 2011b and OEH 2011) has recently released guidelines which specify designs for use of geotextile structures for emergency and short term (emergency) protection of property on frontal dunes at certain beaches. Details of the policy and guidelines are in **Appendix 2** and in **Section 15.0** in **PART C**.

Sand filled geotextile bags have been used to build engineered coastal protection structures in Australia and overseas for at least 20 years and may have application for medium term protection in specific circumstances. Examples of the use of large geotextile bags in eastern Australia include the North Kirra groyne, Maroochy River groynes, Stockton Beach (Surf Club) revetment and the Narrowneck offshore reef (G. Heerten *et al.* 2000; Renstall *et al.* 2002).

The engineers who have developed the concept of sand filled geotextile bag structures have noted a number of benefits of this type of construction over traditional rock sea walls. These include:

- flexible structures can be built to accommodate local changes in topography;
- much lower cost than rock walls (estimated to be about 50 per cent of hard rock construction, for the Narrowneck reef in Queensland);
- surface is rounded and reduces the risk of injuries to surfers or others using the wall/groyne; and
- able to be topped up with sand and/or moved relatively easily.

In general, the design life of a geotextile structure is much less than a properly engineered rock revetment. However, many of the existing geotextile installations have performed for much longer than their original design life. For instance, the groyne at North Kirra was originally designed for five years, but has remained robust for more than three times that period. Its long life is assisted by beach nourishment. The structure at Stockton Surf Club was the first of the engineered sandbag revetments used to protect open ocean frontages. It was built in emergency circumstances, prior to the completion of the Newcastle Coastline Management Plan and (at the time) required less complex approvals than a conventional rock wall.

Notwithstanding the cost, safety and flexibility benefits of sand filled geotextile bags for sea wall construction, these structures still have several similar disadvantages to rock walls, particularly when they are engineered to be robust in high energy conditions. The disadvantages include:

- impacts on beach access and amenity through loss of sand;
- transfer of erosion risks along shore – to the end of the structure; and
- potential changes to the pattern of bars and rips off the beach, when waves impinge on and are reflected by the structure.

In this context, although sea walls constructed with sand filled geotextile bags are less expensive and potentially less intrusive than rock walls, if used to protect individual private properties or short sections of beach, they are likely to have the same detrimental impacts as other sea wall structures and the same beach nourishment requirements should apply if beach amenity is to be maintained.

The WSCZMP proposes that properly engineered geotextile bag structures may be appropriate to protect existing property in immediate coastal risk areas, for periods of around 10 years, to provide landholders with time to adjust to long term coastal recession and retreat strategies.

Much smaller geotextile bag structures have been widely used in the past to protect the seaward toe of beach access ways (such as stairs and wooden ramps), and around stormwater drains and small creek entrances that cross beaches. These geotextile bag structures are simple and relatively inexpensive to install. Geotextile fabrics are more robust than traditional ‘sandbag’ fabrics. These small structures may be a useful tool for protecting local scale structures, in relatively low energy locations, from small storm events. In this context, they could reduce maintenance requirements for Council. They are not appropriate for protection of major local structures and infrastructure during major storms on high energy open coast beaches and will be undermined and eroded during storms that exceed their design.

8.3.4 Preparing for the impacts of tsunami

Tsunami are rare events, but the consequence of a major tsunami event in terms of risks to human lives, property and infrastructure is devastating. Should a large tsunami occur, its potential impacts on low lying coastal land are much greater than coastal storms (affecting both land based and marine elements) and multi agency coordination of a wide range of services would be essential. A wide ranging tsunami warning system has been developed and has been tested on a few occasions over the least three years.

SES is the nominated Combat Agency for tsunami in NSW.

The NSW Tsunami Emergency Subplan follows the format of other NSW DISPLAN documents, with procedures for preparedness, response and recovery. NSW SES prepared the Plan in consultation with relevant State agencies and subsequently conducted regional briefings for emergency managers.

Council has a number of roles in the recovery process from a future large tsunami. In relation to erosion management, however, the currently available hazard information makes it difficult to specify exactly what would be required. In this context, Council's management response to tsunami comprises its measures to address severe coastal storm erosion, supplemented by a precautionary, watching brief, maintaining liaison with SES, OEH and Geoscience Australia, so that its erosion control and inundation response can be refined.

As information at a relevant scale and level of resolution becomes available, WSC will develop local scale tsunami risk assessments and ensure that its coastal and emergency management personnel have an up to date awareness of the NSW Tsunami Emergency Subplan. WSC will include information about currently understood tsunami risks on the coastal page of its website.

8.4 Who will be involved in making a difference?

Improvements to Council's preparedness for coastal emergencies are likely to involve Council staff from the Environment and Natural Resources Unit and Shire Services (foreshore reserves, asset management, roads and drainage etc). The work will also involve staff from Council's community development and communication units.

Council must work closely with SES, OEH and DPI (relevant sections of the former L&PMA) in preparing any emergency response strategy. Some roles are clearly defined in the legislation; others require careful coordination at the local scale.

OEH and SES both have role in research and risk refinement, in addition to their operational roles during a coastal emergency. OEH and Council also have regulatory roles in relation to emergency protection works.

Landholders and residents in immediate coastal erosion hazard areas and in immediate geotechnical hazard areas are also key partners in improving the resilience of coastal assets and values to the impacts of major storms.

In relation to tsunami, WSC will continue to work with SES through regional DISPLAN processes.

Figure 8.11 shows steps and responsibilities for action and communication during emergency response events.

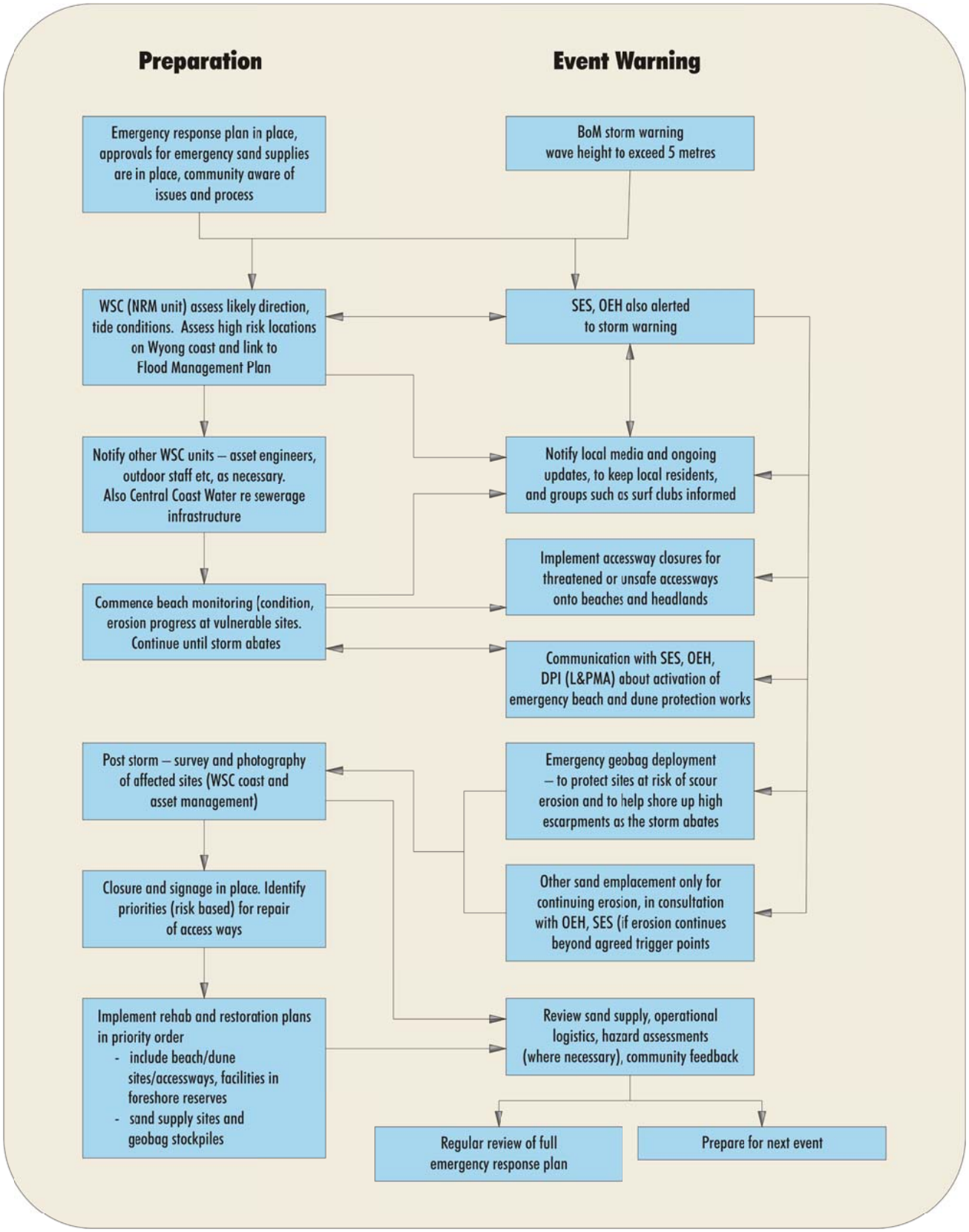


FIGURE 8.11

Responsibilities During Emergency Events

8.4.1 Preliminary indication of Council responsibilities in coastal emergencies

The key organisations in emergency management are SES, Council, OEH, Bureau of Meteorology and Land and Property Management Authority and land owners.

Wyong Council's responsibilities in relation to emergency planning are noted in **Table 8.1** below.

Table 8.1 - Preliminary Council responsibilities in emergency response

Pre storm planning	During emergency events	After emergency events
Prepare Coastal Zone Management Plan and Emergency Response Management Plan (including sub-plans for Authorised Locations). The Plan must address emergency actions for coastal erosion during storms, but also measures to reduce the potential consequences of exposure to coastal emergencies. Consult with affected communities re the CZMP and also about proposed emergency management measures for coastal erosion. Coordinate community and agency liaison on the implementation of the CZMP Collaborate with SES on community awareness and education programs Ensure approvals are in place (e.g. for dredging of creek entrances) if emergency sand supplies are likely to be required as part of the emergency response. Ensure that other short term protective measures, such as geotextile bag structures, are in place or available at short notice, with relevant approvals (e.g. from L&PMA as the land owner)	Monitor at risk locations during the storm. Liaise with SES about support for potential evacuations. Liaise with 'Engineering Services Functional Area Coordinator' (ESFAC) (OEH) before any physical erosion mitigation works (to provide temporary protection for property or other assets) commence. Monitor and install hazard barriers at compromised locations. Damaged access ways will remain closed until repair works can be carried out.	Remove all temporary erosion mitigation structures and rehabilitate/restore access. Liaise with OEH re changes to risk assessments. Update CZMP as necessary, in consultation with community and agency stakeholders. Survey and photo monitoring of affected sites and enter into data base.

8.5 Contribution to objectives and targets

Preparation of a Coastal Emergency Response Management Plan addresses the following objectives of the WSCMP (**Table 8.2**):

Table 8.2 – Meeting objectives and targets for managing coastal emergencies

Objective and relevant targets	Action summary
O5: To maintain and enhance safe and appropriate public access to the coastline **Target** • By 2015, Council has funded a strategy for post storm assessment and timely restoration of coastal access assets such as ramps, stairs and viewing platforms.	See **Section 7** re asset data bases for maintaining records of coastal access infrastructure. See also **Section 9.0** See detail in **Section 8.3.2**
O7: To enhance the awareness of residents, landholders and land users of coastal processes, climate change and impacts **Target** • By 2012, there is a measurable increase in the awareness of coastal residents and landholders of the variability of coastal processes and the impacts of coastal processes and predicted climate change on private and public assets on the coastline.	A5: Enhance community awareness of coastal hazards and of emergency response management actions. Tools include regularly updated web pages that are accessible from Council's web site. This would include maps, resource reports, and links to new policies, information sheets, media coverage, information boards at beach access ways, and information on rate notices. A60: Keep Tuggerah Estuary, Coastline and Floodplain Management Committee informed of progress in implementing the CERMP and of any significant changes to supporting information, hazard assessment etc, including (for instance) new research on tsunami incidence or tools to predict and alert communities to coastal storm behaviour A13: Conduct research into specific coastal process issues. See also **Section 7.0**

Objective and relevant targets	Action summary
8: To develop efficient and effective strategies for minimising Council's and the community's exposure to risk in the coastal context **Target** • By late 2011, Council has in place a clear framework and guidance for landholders about acceptable actions and approved locations for emergency coastal protection works	The Emergency Action Plan (and subplans) is Council's principal response. In the longer term, planning provisions will reduce the risk of exposure to coastal hazard risks by controlling the location of new development. A86: For properties where existing structures are inside the immediate coastal erosion risk area, land holders may apply for consent to construct interim protection (for up to ten years), pending further evidence about sea level rise recession on the Wyong coastline. Such works must be designed to withstand at least a 1 in 20 recurrence interval storm. Structures must be removed after ten years, unless an extension of the consent is granted. Landholders who build structures may be liable for a levy to be paid to Council for ongoing maintenance of beach amenity. A57: Identify sand sources which may be used for emergency coastal protection works, either by private landholders or by Council. Ensure necessary approvals are in place to access this sand. A58: Continue to work with SES, OEH and Geoscience Australia to refine understanding of tsunami risks and appropriate warning and emergency response mechanisms. Incorporate best available information into local scale disaster management planning. A3: Integrate Coastal Emergency Response Management Plan with other elements of Council's DISPLAN A35: Council will contribute to the development of new tools such as high resolution digital terrain models and other information to refine models for safe community egress during coastal emergencies and communicate new warning and egress models to affected residents.

8.6 Implementation information

Table 8.3 provides a summary of the tasks involved in the preparation and implementation of the Coastal Emergency Response Management Plan. **Table 8.3** contains the urgent actions and actions to improve emergency response measures over time.

Section 8.3.1 provides an indication of Council's responsibilities in relation to planning, preparedness and implementation of emergency response.

All action and outputs within this Action Plan will be reviewed on a regular basis, as for all other parts of the Coastline Management Plan, as set out in **Section 7.0** (Knowledge Management Action Plan)

Table 8.3 - Managing Coastal Emergency Response

<table>
<tr><td colspan="4">Step 2: Take action to reduce risk
A3: Integrate Coastal Emergency Response Management Plan with other elements of Council's DISPLAN</td></tr>
<tr><td colspan="4">Intent and logic
This action streamlines Council's emergency management procedures and ensures a consistent approach. It also helps to ensure that adequate resources are available for effectively managing Council's emergency management response responsibilities.</td></tr>
<tr><td>Responsibility and key partners</td><td>When - Priority</td><td>Where – locations for investment</td><td>Indicative cost and source of funding</td></tr>
<tr><td rowspan="2">WSC Environment and Natural Resources Unit and Asset Manager (Council Services)</td><td>Within the first 2 years of the Plan</td><td rowspan="2">Applies to whole of coastline</td><td rowspan="2">WSC funds: within existing Council responsibilities</td></tr>
<tr><td>Review period.
After the Coastal Emergency Response Management Plan is adopted and integrated, review overall DISPLAN at intervals of not more than 5 years.</td></tr>
<tr><td colspan="4">Step 2: Take action to reduce risk
A5: Enhance community awareness of coastal hazards and of emergency response management actions. Tools include regularly updated web pages that are accessible from Council's web site. This would include maps, resource reports, and links to new policies, information sheets, media coverage, information boards at beach access ways, and information on rate notices.</td></tr>
<tr><td colspan="4">Intent and logic
Effective emergency response requires not only that tactical organisations are well prepared, but that landholders and residents understand the risks and their responsibilities – for instance, what emergency protection works are permitted and in what circumstances. Residents also need to be aware of how evacuation warnings will be provided and the locations of safe evacuation routes and places during major coastal emergencies.</td></tr>
</table>

Responsibility and key partners	When - Priority	Where – locations for investment	Indicative cost and source of funding
WSC Environment and Natural Resources Unit and Media Manager	A series of awareness raising and guidance messages over the first 3 years of the Plan Review period: Review level of community awareness of coastal emergencies and response processes after 3 years	All surf clubs, North Entrance residents, Hargraves Beach residents, Cabbage Tree Harbour residents as priorities, with follow up at Blue Bay, Toowoon Bay and other beaches.	See A4
Step 2: Take Action to reduce risk **A85**: OEH will approve emergency protection works at North Entrance and Hargraves Beach in accordance with the 2010 amendments to the Coastal Protection Act 1979 and related Guidelines and Requirements and in accordance with an Emergency Management Plan for those beaches.			
Intent and logic Council's coastal strategy includes provisions to give landholders in immediate hazard locations time to adjust to new information about threats to their assets. This includes provision for emergency protection in accordance with the 2010 Ministers Requirements. WSC also proposes that landholders in some locations will be able (with consent and with conditions) to construct interim protection works, for up to ten years. These works are discussed in **Section 9.0** (Action A86).			
Responsibility and key partners	**When - Priority**	**Where – locations for investment**	**Indicative cost and source of funding**
WSC Environment and Natural Resources Unit and planning Units within the Planning Directorate. Private landholders	Emergency protection works in accordance with the Coastal Protection Act and Minister's Requirements can be built at any time. There are time limits on the duration of the protection works. Council will work with the NSW government to monitor and review the success of these emergency protection works over the next five years.	Only at beaches which are Authorised Locations	Private landholders will fund works.
Step 2: Take action to reduce risk **A57**: Identify sand sources which may be used for emergency coastal protection works, either by private landholders or by Council. Ensure necessary approvals are in place to access this sand.			
Intent and logic This action is part of the overall emergency response plan for the coast, but is also relevant to other aspects of beach amenity management on Wyong Beaches. For instance, see also **Actions A28** and **A61** regarding research and feasibility studies for offshore sand sources and maximising the effectiveness of dredging at the entrance for beach nourishment.			

Responsibility and key partners	When - Priority	Where – locations for investment	Indicative cost and source of funding
WSC Environment and Natural Resources Unit and Shire Services unit	Short term sand supply options to be specified within 6 months of approval of this Plan. Longer term sand supply options will depend on the results of further studies and changes to legislation.	See **Section 10.0** regarding dredging schedules at The Entrance.	Within the responsibility of existing Council officers. Council also needs to identify sand sources for its own emergency coastal protection works.
Step 2: Take action to reduce risk **A58**: Continue to work with SES, OEH and Geoscience Australia to refine understanding of tsunami risks and appropriate warning and emergency response mechanisms. Incorporate best available information into local scale disaster management planning.			
Intent and logic Tsunami occur infrequently along the NSW coast and there is little evidence of significant impacts on coastal communities in historical records, so awareness of potential risks in NSW are low. Evaluation of impacts at the local scale is still progressing. Council will ensure that the best available local scale information, warning systems and recovery plans are in place for its local communities.			
Responsibility and key partners	**When - Priority**	**Where – locations for investment**	**Indicative cost and source of funding**
WSC will work with SES, OEH and geosciences Australia	Ongoing Review period: Risk assessments and response measures will be reviewed at approximately 5 year intervals.	Applies to the entire Wyong coastline	Watching brief and liaison requires little additional investment.
Step 3: Enhance knowledge and monitor achievements: **A59**: Liaise with SES and OEH about shared training and coordinated management of coastal emergencies Subject to agreements with the NSW Government, Council officers may be authorised officers in relation to regulation of emergency protection structures (see also Action A4). However, WSC has decided not to take up the option of training its officers to be Authorised Officers under the *Coastal Protection Act 1979*.			
Intent and logic Emergency response planning and implementation is shared between local government, SES and OEH. This action helps to maintain a high level of liaison and supports a consistent and coordinated approach across all organisations.			
Responsibility and key partners	**When - Priority**	**Where – locations for investment**	**Indicative cost and source of funding**
WSC Environment and Natural Resources Unit WSC Asset Managers Both in conjunction with: OEH SES	Establish a training schedule within 6 months and then ongoing as necessary Review period: In accordance with Council and SES training schedule requirements for emergency response	Applies to emergencies along the entire Wyong coastline	Within existing WSC staff roles

Step 3: Enhance knowledge and monitor achievements:

A60: Keep Tuggerah Estuary, Coastline and Floodplain Management Committee informed of progress in implementing the CERMP and of any significant changes to supporting information, hazard assessment etc, including (for instance) new research on tsunami incidence or tools to predict and alert communities to coastal storm behaviour

Intent and logic

The Tuggerah Estuary, Coastline and Floodplain Management Committee is an important interface between Council and the community for coastal zone management issues. By keeping the Committee fully informed about emergency management, Council will support broader community awareness levels.

Responsibility and key partners	When - Priority	Where – locations for investment	Indicative cost and source of funding
WSC Environment and Natural Resources Unit	Agenda item at all Committee meetings – proposes continuing Committee meetings at 3 monthly intervals Review period: Updates on new science and management protocols to be provided at least annually.	Applies to all areas exposed to coastal emergencies along the Wyong coastline.	Briefings to the Committee are within existing Council staff roles.

Step 3: Enhance knowledge and monitor achievements:

A35: Council will contribute to the development of new tools such as high resolution digital terrain models and other information to refine models for safe community egress during coastal emergencies and communicate new warning and egress models to affected residents.

See **Section 7.0**. This action is one of a suite of actions that will use regularly acquired LiDAR data. Others include A13, A68, A73.

Intent and logic

LiDAR data can be used to develop high resolution digital terrain models. These allow various egress scenarios to be tested. For high risk areas – frequently or severely flooded/eroded, or occupied by frail or disabled residents, having a clear and certain pathway for emergency evacuations is very important.

Responsibility and key partners	When - Priority	Where – locations for investment	Indicative cost and source of funding
WSC In consultation with SES, OEH Maintain liaison with Australian Government Settlement, Infrastructure and Climate Change Working Group and also Emergency Management and Climate Change working group.	Within 5 years for locations where there are significant egress risks, such as Budgewoi, North Entrance Review period: Review adequacy of knowledge after 3 years, in context of most up to date information about coastal storms and flooding.	High risk locations are a priority: North Entrance	Allow $30,000 for preliminary modelling OEH Australian government – emergency management. This is an issue where Australian Government climate change funds may be available.