Appendix F Referenced Information from the WCZMP 2011 and WCZMP Supporting Information (Umwelt 2011a, 2011b)

The following appendix reproduces (verbatim) the sections listed in Table F-1 from the WCZMP 2011 Supporting Information (Umwelt, 2011b) which provides background information that remains relevant to the this current Wyong CZMP 2017.

Table F-1 Reference to Information in the WCZMP 2011 and WCZMP Supporting Information (Umwelt, 2011b)

Information	WCZMP Supporting Information (Umwelt, 2011b) Report Part/Section reference	Refer to Section (this Appendix)
Purpose and Objectives for WCZMP 2011	Part A Section 1.1 Section 1.4 Part B Section 5.1 (Vision) Section 5.2 (Principles) Section 5.3 (Objectives)	F.1
Legislative Context of a CZMP, including local, state and federal legislation and policies that govern the coastal zone: and set out the process for preparing a CZMP.	Part A Section 1.2-1.3 Section 3.1 Part C Section 15.1 (Land Tenure) Section 15.3 (Table 15.1 – Legislation and associated Council responsibilities) Section 15.4 (incl. Table 15.4 – Legislation and associated NSW Government roles) Section 15.6 (Australian Government)	F.2
Approach to preparation of the WCZMP 2011	Part A Section 1.5 Section 3.2	F.3
Study Area, and description of the coastal zone	Part A Section 2.1-2.3	F.4
Community and Stakeholder Engagement	Part A Section 3.3 Part C Section 15.2 (Description of Stakeholders)	F.5
Description of Coastal Management Issues, including: • Impact of coastal processes on valued coastal landscapes • Increasing population and demand for access to coastal 'services'	Part A Section 4.1 Section 4.2	F.6
Implementation Schedule, detailing actions to be implemented	WCZMP 2011	F.7

Referenced Information from the WCZMP 2011 and WCZMP Supporting Information (Umwelt 2011a, 2011b)

Information	WCZMP Supporting Information (Umwelt, 2011b) Report Part/Section reference	Refer to Section (this Appendix)
Management Action Plans • Coastal Knowledge Action Plan • Coastal Emergency Response Management Plan, and the EASPs • Coastal Erosion and Recession Action Plan • Coastal Inundation Action Plan • Lake and Sea Interactions Action Plan • Geotechnical Hazards Action Plan • Building Coastal Biodiversity Resilience Action Plan • Recreation and Tourism Action Plan • Cultural Landscapes Action Plan	Part B (Chapter 7.0 – 14.0) • Chapter 7.0 (Table 7.2) • Chapter 8.0 (Table 8.3), EASP in Appendix 2 of the WCZMP 2011 • Section 9.3 (Table 9.3, Table 9.4 – Potential Future Actions) • Section 9.4 (Table 9.5) • Chapter 10.0 (Table 10.2) • Chapter 11.0 (Table 11.2) • Chapter 12.0 (Table 12.2) • Chapter 13.0 (Table 13.2) • Chapter 14.0 (Table 14.2)	F.8
Potential Funding Sources and Options	Part B Section 6.4.4-6.4.7	F.9
Summary of Condition and Status of Biodiversity, Settlement and Land Use	Part C Section 17.1 (Biodiversity Values) Section 17.2 (Land use and assets, including residential property value; and recreational activities and assets) Section 17.3 (Cultural and heritage values)	F.10
Risk Assessment, including assessment of: • Coastal erosion and inundation risks • Other risks to coastline values	Part C (Chapter 18.0) • Section 18.2, 18.3 • Section 18.4	F.11
Evaluation of Management Options, including evaluation of: • Options for immediate erosion and inundation risks • Options for future recession and inundation Risks • Options for managing lake and sea interactions • Options for managing current and future geotechnical hazards • Options for enhancing the resilience of coastal biodiversity • Options for managing risks associated with community use of the coast • Options for managing heritage and cultural values of the coast	Part D (Chapter 19.0) • Section 19.3 (summary in Table 19.2) • Section 19.4 (summary in Table 19.3) • Section 19.5 (summary in Table 19.5) • Section 19.6 (summary in Table 19.6) • Section 19.7 (summary in Table 19.7) • Section 19.8 (summary in Table 19.8) • Section 19.9 (summary in Table 19.9)	F.12

F.1 Purpose and Objectives for WCZMP 2011

The following reproduces (verbatim) the sections listed in Table F-2 from Umwelt's (2011b) *Coastal Zone Management Plan for the Wyong Coastline: Supporting Information,* which refer to the Purpose and Objectives of the WCZMP 2011. References mentioned within the below reproduced text by Umwelt refer to Sections, Figures, Tables etc. presented in their 2011(b) document.

Table F-2 Reference to Information in the WCZMP Supporting Information (Umwelt, 2011b)

Information	WCZMP Supporting Information (Umwelt, 2011b) Report Part/Section reference
Purpose and Objectives for WCZMP 2011	Part A Section 1.1 Section 1.4 Part B Section 5.1 (Vision) Section 5.2 (Principles) Section 5.3 (Objectives)

BMT WBM highlights the below reproduced text has been copied verbatim from Umwelts' (2011b) 'Coastal Zone Management Plan for the Wyong Coastline: Supporting Information' and is included within this document on request by Council. Intellectual property rights of the below material remain with Umwelt Pty Ltd.

1.1 The coastline is a highly valued and dynamic landscape

The coastline of Wyong Shire Council extends approximately 33 kilometres from just south of Catherine Hill Bay to Crackneck Point, incorporating an attractive landscape of sandy beach and coastal dune systems, rock platforms headlands and bluffs (see Figure 1.1). The coastline has been a recreational, social, cultural and economic focus for the local community and thousands of visitors for many generations. Like other urbanised coastlines, there has been high investment in homes and community infrastructure right up to the edge of the sea and demand for residential and recreational access to the coastline continues to grow.

The coastline is a dynamic environment, subject to a wide range of wind and wave conditions, including major storms that have in the past caused severe erosion that threatened property and community access (see Plates 1.1 and 1.2, which show storm waves eroding Wyong beaches in 1974 and 2009). Predicted sea level rise and other aspects of climate change over the next 100 years and longer, will increase the likelihood of both long term coastal recession and short term severe storm erosion of beaches and dunes. In accordance with NSW government requirements and reflecting the lack of certainty about actual coastal responses to climate patterns, WSC has taken a relatively conservative and risk averse approach to assessing coastal process hazards. Council will review coastal hazard and risk assessments as new information becomes available.

The variations in the intensity and impact of coastal processes are a major challenge for Council, the local community and other land managers. Sustainable adaptation of coastal development, infrastructure and coastal lifestyles to the complex variability of and interactions between natural coastal systems is an overarching goal for the management of the coastline.

Sustainable adaptation of coastal communities to a changing environment means things cannot stay the same as they are now. Changes to land use and land management will be necessary.

The Wyong Shire Coastal Zone Management Plan (WSCZMP) is not a statutory land use plan, and issues such as urban boundaries and urban footprints are not within the scope of coastal sustainability issues that it can address. However, the WSCZMP is concerned with the interaction of coastal development and coastal hazards and with maintaining safe community access to a scenic coastal landscape, promoting community well being and economic success. The final WSCZMP will be certified by the NSW Minister for the Environment and will then have statutory power. Figure 1.2 provides an overview of the interactions between community change and coastal process changes that are the focus of the WSCZMP.

1.1.1 Climate change and the coast

Beaches change continually in response to tides, wave energy, ocean currents, winds, storms, rainfall and runoff. Locally, it is apparent that beaches change daily, weekly and monthly in response to tides and short term weather patterns. The volume of sand and its distribution along the beach also varies with medium term weather patterns such as el nino/la nina. These changes can mask longer term trends, occurring over decades, centuries or longer. Sea level rise and fall associated with climate change is one of these longer term trends.

The biggest changes to the NSW coastline in the last 150,000 years have been associated with climate change (see Figure 1.3). Long term climate change is not new, but it continues to influence the shape and stability of the coastline.

Sea level rise is perhaps the most recognised effect of climate change in coastal landscapes, but coastal processes are also affected by other aspects of climate change, such as increased water temperatures; changes to storm frequency, seasonality, type (e.g. cyclone or east coast low) and intensity; warmer winters and more extreme temperature days in summer. Figure 1.4 summarises the ways in which climate change affects the coast (Short & Colin D. Woodroffe 2009; Department of Climate Change 2009a). Being prepared for these potential changes to already variable coastal processes is a sound approach to managing the risks to Council and community assets and to private property along the coastline.

Sea level and tide gauges on Australia's east coast have recorded a clear trend of rising sea level over the last century, increasing in rate over the last 30 years (John A. Church & White 2006). Figure 1.5 shows the tide records for Fort Denison in Sydney Harbour, which has the longest continuous tidal record in Australia, supplemented by satellite altimeter records. Figure 1.5 also shows predicted sea level rise for the central part of Australia's east coast, based on the best available science (e.g. John A. Church & White 2006; IPCC 2007).

Over the last decade there have been many different predictions of the future rate of sea level rise and estimates of total sea level rise remain uncertain (Department of Climate Change 2009a). The Intergovernmental Panel on Climate Change (IPCC) has prepared low range, medium range and high range global models of sea level rise. Recent monitoring of sea level indicates that the rate of rise is tracking at the high end of predictions.

CSIRO and Bureau of Meteorology (BOM) (2010) have extended and refined the global models for the eastern Australian context and conclude that for eastern Australia, sea level rise is likely to be greater than the global average.

In 2009 and 2010, the NSW Government released a suite of policies, directions and guidelines to provide direction for effective management of coastal process hazards and risks, in the context of climate change and sea level rise. These include:

- NSW Sea Level Rise Policy Statement (DECCW 2009), which sets sea level rise benchmarks for planning purposes of 40 centimetres above 1990 level by 2050 and 90 centimetres above 1990 levels by 2100.
- Coastal Planning Guideline – Adapting to Sea Level Rise (Department of Planning 2009)
- Amendments (2010) to the NSW Coastal Protection Act 1979
- Coastal Risk Management Guide – Incorporating sea level rise benchmarks in coastal risk assessments (DECCW 2010)
- Code of Practice under the Coastal Protection Act 1979 (DECCW 2011)
- Guide to the Statutory Requirements for Emergency Coastal Protection Works (DECCW 2011)
- Guidelines for Preparing Coastal Zone Management Plans (DECCW 2010)
- Coastal Zone Management Guide Note- Emergency Action Subplans (OEH 2011, Consultation Draft)

Wherever possible, for clarity and efficient management, Council will align its policies and plans with the strategic coastal zone frameworks established by the NSW and Australian governments (see Section 1.2).

WSC has adopted the NSW Government sea level rise benchmarks for planning purposes (DECCW 2009). These benchmarks are based on the best available science, including measured sea level rise and trends over the last 100 years.

The benchmark figures are 40 centimetres above 1990 levels by 2050 and 90 centimetres above 1990 levels by 2100, with an expected trend of continuing sea level rise after that time. Council has also developed a draft Climate Change Policy (2010) which takes the predicted sea level rise and other climate change factors into account. Council will review the coastal hazard assessments and its policy responses as new information confirming rates of sea level rise and the impact of higher sea levels on the coast becomes available.

Climate change, and particularly sea level rise, has very serious implications for the Wyong coastline. As shown in Plates 1.1 and 1.2, some development on the coast is already affected by severe erosion threat. Predicted climate change will make these threats worse.

1.4 How will implementing the plan be different to what happens now?

WSC has diverse responsibilities as a decision maker, landowner and land manager along the coastline. These responsibilities are managed by different sections of Council, and are also shared with different State and National authorities.

The WSCZMP provides a new and consistent framework for managing the coastline, building on and integrating existing programs. The Plan:

- Provides an overarching vision for the future of the Wyong coastline
- Sets out clear objectives for future management, together with targets against which progress can be measured
- Is based on the best available science about coastal processes and the coastal environment
- Is based on a systematic assessment of risks and a range of potential management options that are designed to reduce risks associated with coastal hazards
- Is designed to be reviewed and updated as significant new information becomes available, particularly in relation to climate change and sea level rise
- Will enhance coordination and integration of coastal issue management across all sections of Council
- Informs Council's planning requirements for coastal development so that landholders have clear and accurate advice about where development can occur and relevant controls.
- Provides information about the costs of maintaining coastal infrastructure and other assets for the benefit of the community (including visitors).
- Explains Council's options for raising funds to invest in capital cost and maintenance of coastal protection works and other actions to maintain and improve the condition and function of natural and built assets.
- Will position Council to develop funding partnerships with the State and Australian governments (as has been achieved for the Tuggerah Lakes Estuary for instance)

- Presents a prioritised program for upgrading community assets along the coast, so that safe and appropriate access to the coast is available for everyone to enjoy.

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.

Objectives for adaptive management	
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.
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.

Objectives for adaptive management	
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.
O7 To enhance the awareness of residents, landholders and land users of coastal processes, climate change, impacts and adaptation measures **Principle: (2) Coastal knowledge and community awareness**	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 an increase in the number of residents participating in coastline management programs (including Landcare, summer coast watch and coastal discovery etc. programs)

F.2 Legislative Context of a CZMP

The following reproduces (verbatim) the sections listed in Table F-3 from Umwelt's (2011b) *Coastal Zone Management Plan for the Wyong Coastline: Supporting Information Volume 1,* which refer to the Legislative Context of the WCZMP 2011, as they were current in 2011. References mentioned within the below reproduced text by Umwelt refer to Sections, Figures, Tables etc. presented in their 2011(b) document.

Table F-3 Reference to Information in the WCZMP Supporting Information (Umwelt, 2011b)

Information	WCZMP Supporting Information (Umwelt, 2011b) Report Part/Section reference
Legislative Context of a CZMP, including local, state and federal legislation and policies that govern the coastal zone: and set out the process for preparing a CZMP.	Part A Section 1.2-1.3 Section 3.1 Part C Section 15.1 (Land Tenure) Section 15.3 (Table 15.1 – Legislation and associated Council responsibilities) Section 15.4 (inc. Table 15.4 – Legislation and associated NSW Government roles) Section 15.6 (Australian Government)

BMT WBM highlights the below reproduced text has been copied verbatim from Umwelts' (2011b) 'Coastal Zone Management Plan for the Wyong Coastline: Supporting Information' and is included within this document on request by Council. Intellectual property rights of the below material remain with Umwelt Pty Ltd.

1.2 Council's role in coastal zone management

All levels of government have a role in managing the coast, but local government has a key role in land use planning and on ground works for coastal communities. Local government is required to integrate state and national government policies, priorities and statutory requirements in its local planning decisions, advice to local communities and in managing public land in its control.

Local government (such as WSC) has the major implementation role in coastal zone management. Councils plan and do on-ground works for their communities. Councils must properly consider coastal process hazards in their local land use planning, natural resource management and planning and community development planning.

WSC has a central role and a strong commitment to sustainable management of the coastline:

- it gives effect to National, State and regional legislation and policy in its land use and land management decisions and in emergency response for coastal emergencies;
- it has a commitment to sustainability in all its activities
- it is a land manager in its own right;
- it is the government interface for the community; and
- it provides diverse services and facilities for community enjoyment of the coast.

State legislation requires that Wyong Shire Council prepares a coastal zone management plan for its local government area. Local Environmental Plans (LEPs) and Development Control Plans (DCPs) implement strategic land use decisions from the coastal zone management plan. Council owns and/or manages coastal land on behalf of local communities. Council works in partnership with community organisations to manage coastal vegetation and to provide safe and attractive beach access facilities for residents and visitors.

The **Australian Government** manages matters of national importance, sets broad policy direction and priorities for Australia's coast, funds and conducts research into coastal process impacts and provides some funding for on-ground works through the Caring for Our Country Program.

The current Australian Government framework for coastal zone management is outlined in Section 15.5 of PART C.

The **NSW State Government** sets the statutory and policy context for coastal zone management and for related land use planning, environment protection and natural resource management in NSW. It prepares Guidelines and Directions and sets standards to drive a consistent approach to issues affecting the coastal zone. It provides some funding to local government for the preparation of coastal zone management plans and emergency action sub-plans that are required by the Coastal Protection Act and also contributes to funding for on ground works.

The current NSW coastal zone planning framework is discussed in Section 15.4 of PART C.

Diverse sections of Wyong Shire Council have been involved in the preparation of the Coastal Zone Management Plan, and many sections of Council have a role in the implementation of the Plan. The overall implementation process will be managed by Council's Environment and Natural Resources Unit, reporting to the Director of Environment and Planning Services. Policies and strategies across Council will be aligned to provide a clear local scale coastal management framework for the community.

Council does not have the resources or the statutory power to achieve all the changes needed to achieve sustainable management of its coastline. In addition, not all of the proposed changes to land use, land management and asset management are currently funded in Council's budget. Council will consider a number of potential funding sources so that essential risk reduction works can be implemented in a timely manner.

To ensure timely and coordinated delivery of the priority actions in the WSCZMP, Council will foster its partnerships with key State agencies such as Department of Primary Industries (coastal lands, incorporating sections of the former Land and Property Management Authority (LPMA)) and Office of Environment and Heritage (OEH), the Australian Government Department of Sustainability, Environment, Water, Population and Communities (DSEWPC), DCCEE and with land holders and community based organisations along the coast.

1.2.1 Role of the WSCZMP

The Plan is designed to guide, integrate and coordinate Council's actions so that:

- Council officers and Councillors are aware of their responsibilities under the relevant NSW legislation and policies and implement those responsibilities in ways that lead to sustainable coastal communities
- State agencies are aware of Council's objectives for the coastline and the principles that Council seeks to implement to protect and enhance the condition of valued coastal assets (including natural environment, biodiversity, vibrant and resilient communities, a robust economy) in its care.
- Local communities and visitors have access to information about coastal processes and the scale and scope of their impact on current and future lifestyles and activities.
- Local communities and visitors understand the rationale for Council's proposed coastline management strategies and priorities and how this rationale influences Council's decisions about land use and development along the coast.
- Local communities have clear direction about Council's requirements for future development along the coastline, where coastal hazards must be taken into account.
- All stakeholders appreciate the consequences of alternative approaches to the management of the coastline in the context of changing environmental and socio-economic conditions. In particular, all stakeholders recognize that the best available science indicates that some management responses have a significantly lower likelihood of delivering measurable protection and improvement of the condition of the coastline than other management responses.
- All stakeholders share an awareness of an adaptive approach to managing the coastline, with regular evaluation and reporting of progress. The details of management responses are adjusted to accommodate new information about the drivers of change, the consequences of management responses and whether expected improvements to the condition of the coastline have been achieved.

1.3 Council's policies and strategic approach

Based on the best available information, Council expects that many assets along the Wyong coastline and the natural systems and community systems in which they are set will be vulnerable to coastal processes in coming decades. However, the rates of change to pressures associated with coastal process are still uncertain.

To manage change and uncertainty, Council's coastal strategy has three main components.

Council's strategic approach to coastal hazard management

- **Monitor actual change** so that Council can use best available real information in its coastal zone management. Keep the community informed of new knowledge about coastal hazards.
- **Allow some interim protection of public and private assets** in immediate hazard zones, to give residents and businesses time to develop adaptive coastal land uses. This will also reduce the risk of sterilizing coastal land unnecessarily.
- In the longer term, **Council favours retreat of assets and infrastructure** out of coastal hazard zones

These three components are set in an **adaptive management framework (Section 1.5).** By taking an adaptive management approach, Council acknowledges a quality plan will reflect new knowledge gathered over the life of the Plan and beyond. Regular reviews and updates will take new information into account and ensure that the Plan remains focused and relevant.

1.3.1 Council's policies for coastal zone management

Within this broad strategic approach, Council will design responses that are guided by the following policies:

- Council will seek flexible options for managing hazards and risks that facilitate ongoing appropriate use of vulnerable land until risks become unacceptable. Council will not sterilise valuable coastal land unnecessarily. This will require careful monitoring and evaluation of actual change and well understood triggers for action.
- In managing coastal hazard risks, Council will give priority to actions which can be implemented with its own resources and which have the effect of controlling risks in the immediate and longer term timeframes. Planning controls for new development are therefore a priority for the coast.
- Council will use a suite of land use planning tools (LEP and DCP clauses, design guidelines) to ensure that new development does not increase the risks associated with coastal hazards in the 2050 and 2100 planning horizons.
- In general, Council planning controls for the coast will use a 2050 planning period for new residential development on land already appropriately zoned and a 2100 planning period for major infrastructure, new subdivisions and strategic studies.
- Council will inform and consult with residents and landholders about coastal zone management issues affecting their property and their enjoyment of the coast.
- In general, in the longer term, Council will apply adapt or retreat strategies to coastal development and infrastructure. This requires relocation of assets to outside coastal risk zones and/or redesign of assets

and infrastructure so that they are more resilient to coastal erosion and recession. Council may approve temporary or short term protection works for public and private assets in immediate hazard zones, to allow landowners time for adapt and retreat strategies to be refined and implemented.

- Council will not approve protection of existing assets or private development where the works would increase risks to other land owners or to community use of the coastal landscape. Council will consider the public and private costs and benefits of protection works, retreat and adapt strategies.
- Council is adopting the NSW Government policy that private landholders should contribute to the cost of constructing and maintaining coastal protection works that benefit them. Council also proposes that in the longer term all Shire landholders should contribute in some way to the costs on managing community infrastructure in coastal hazard zones, so that services (both ecosystem services and infrastructure services) that are broadly enjoyed are able to be maintained.
- Council accepts that to maintain coastal biodiversity, coastal ecological communities must have room to migrate (roll back landward) and adjust to new climate and sea level conditions. Council's policy is to maintain buffers zoned to enhance ecological resilience, wherever practicable. Council will also continue to support projects that enhance the resilience of important coastal ecological communities.

1.3.2 Strategic actions

Council has carefully considered a range of potential management responses that could reduce or control the identified issues and risks. The responses that are proposed in the eight Action Plans in PART B are those expected to effectively and efficiently manage important risks with a minimum of unanticipated side effects. All recommended actions are supported by a clear logical path from current status and trends, to objectives, to anticipated management outcome and ways to measure and evaluate progress, so that Council and its communities can be confident that the Plan will continue to provide a best practice pathway towards a resilient and sustainably managed coastline.

In overview, Council proposes strategic responses within three time frames. The relationship between broad strategic component and implementation time frames is shown in Table 1.1. All timeframes are subject to resources being available. Details about actions relevant to each strategy and their implementation are in PART B.

Table 1.1 - Timing and strategy

Strategy/Timeframe	2 years (Urgent) Most actions for this period will use Council funds ESTABLISH SYSTEMS AND PLANNING CONTROLS	5 years (High priority) Diversity funding sources for coastal zone management IMPLEMENT SYSTEMS AND PLANNING CONTROLS – CONSOLIDATE AND REINFORCE	10 years (medium priority) Maintain and diversity funding sources for coastal zone management IMPLEMENT, EVALUATE PROGRESS AND REVIEW THE PLAN
Monitor actual change	• Establish systems for adaptive management • Establish community awareness and communication programs • Secure the role of coastal coordinator	• Collect quality data about climate change, coastal process responses and impacts. • Keep abreast of all relevant new policy and guidelines for coastal zone management • Enhance collaboration with local Aboriginal knowledge holders	• Review assumptions, progress and strategic approaches • Use best available monitoring and change evaluation techniques, such as digital terrain models based on regularly collected LiDAR and LADS data.
Allow some interim protection of public and private assets This approach includes 'accommodation of change' and 'defence of existing coastal development'. Both strategies involve maintaining existing land uses, at least until certain trigger conditions are met. See Section 6.1.2 for more information	• Allow interim protection of **existing** assets (in accordance with legislation and guidelines) that are affected by hazards now, so that landholders can prepare for longer term change. • Strengthen the ecological resilience of the coast using beach nourishment, dune enhancement and vegetation management.	• Continue to allow interim structural protection measures, in accordance with legislation and guidelines • Continue to strengthen the ecological resilience of the coastal zone. • Integrate management of coastal processes and flood hazards in the coastal zone	• Evaluate the cost/benefit of alternative sand sources to buffer coastal ecological communities and private assets against climate change induced coastal recession • Evaluate the viability of coastal protection structures

Strategy/Timeframe	2 years (Urgent) Most actions for this period will use Council funds ESTABLISH SYSTEMS AND PLANNING CONTROLS	5 years (High priority) Diversity funding sources for coastal zone management IMPLEMENT SYSTEMS AND PLANNING CONTROLS – CONSOLIDATE AND REINFORCE	10 years (medium priority) Maintain and diversity funding sources for coastal zone management IMPLEMENT, EVALUATE PROGRESS AND REVIEW THE PLAN
Retreat of assets and infrastructure to outside coastal hazard zones This strategy is known as 'planned retreat'. See Section 6.1.2 for more information	• Prepare for planned retreat -Use precautionary planning tools to reduce future coastal hazard risks for **new development**. • Advance planning for coastal recreation facilities such as coast walking track and Plans of management for coastal reserves (with any new facilities located outside of relevant coastal risk areas).	• Implement and monitor LEP and DCP requirements in the coastal zone – planned retreat from receding immediate hazard zone. • Continue to facilitate visitor attracting recreational access infrastructure, outside immediate hazard zones (such as planning for the relocation of priority surf club facilities)	• Implement, monitor and review LEP and DCP requirements in the coastal zone – planned retreat from receding immediate hazard zone. • Continue to facilitate visitor attracting recreational access infrastructure, outside immediate hazard zones (such as relocation of surf clubs)

3.1 Background (Preparing the Coastal Zone Management Plan

WSC has recognised the importance of an integrated approach to the management of the Shire's coastline for more than a decade. An evaluation of coastal erosion hazards along the Wyong coastline was completed in 1996 (AWACS 1995). It provided the scientific basis for the current Development Control Plan (DCP) 77 (Wyong Shire Council 2005b).

Since 1996 the population of WSC has increased, investment in coastal residential property has continued to grow, and community use of beaches has continued to be a major recreational activity which also brings employment and wealth to the local community.

Significant changes to coastal science and to the policy framework for coastal zone management in NSW have occurred over the last 10 to 15 years. Important examples include:

- The magnitude of climate change risks, and particularly sea level rise, for coastal landscapes and community assets has been revised upwards several times as the science of climate change is refined. WSC has now adopted the NSW Sea Level Rise Policy Statement (DECCW 2009) for it coastal zone planning. The policy sets benchmarks for sea level at 40 centimetres above 1990 levels for 2050 and 90 centimetres above 1990 levels for 2100. These figures, based on recent science, require planning for about twice as much sea level rise as was commonly accepted a decade ago. The NSW sea level rise policy statement also notes that higher rates of rise are possible and that sea level will continue to rise after 2100. Partner or supporting policy documents, designed to assist local government and communities by providing clear direction and risk management advice (DECCW 2010a; 2010b; Department of Planning 2010). This policy framework is discussed in PART C, Section 15.4.2.
- In response to evidence of current and future climate change, both the NSW government and the Australian government have invested in studies to refine understanding of specific processes which will help planners to understand which coastal landforms, landscapes and communities are most vulnerable to climate change impacts. This research is ongoing. In late 2009, the Australian Government released its first pass assessment of the vulnerability of Australia's coast to climate change (Department of Climate Change 2009a). This research identifies Wyong Shire as one of the most vulnerable in NSW to coastal erosion, in terms of the number of residential buildings at risk. The research has driven a strengthened emphasis on risk based coastal management.
- Concurrent with research on processes and impacts, State, Australian government and regional scale natural resource management organisations have invested in studies and guidelines about adaptation responses.
- The Australian government released an extensive report of the House of Representatives standing Committee on Climate Change, Water, Environment and the Arts – Managing our Coastal Zone in a Changing Climate in October 2009 which makes 47 recommendations (House of Representatives Standing Committee on Climate Change, Water, Environment and the Arts 2009). The Australian government is already acting on some of these recommendations which have the potential to change the governance arrangements and the policy framework for the coastal zone. In February 2010, the Australian government released preliminary conclusions from the deliberations of the Coast and Climate Change Council and also released a new Position Paper Adapting to Climate Change in Australia (Department of Climate Change 2010)

- Both of these documents make it clear that past assumptions about the stability of the coastline, about a stable sea level and about patterns of storms are no longer valid. The Australian government's position is that management of climate change risks is mainstream business that all individuals, businesses and governments need to take into account. Climate change risks will vary from one locality to another and in most places they exacerbate erosion and inundation risks that were already present.
- At the State level, responsibility for climate change and coastal zone management is shared in NSW between OEH, which is currently responsible for climate change research, sea level rise policy and coastal management guidelines (see PART C, Sections 15.4.2 to 15.4.4) and DP&I, which is currently responsible for the NSW Coastal Policy 1997 (Department of Planning 1997), SEPP No. 71 – Coastal Protection and coastal design guidelines and the NSW Coastal Planning Guidelines: Adapting to Sea Level Rise (Department of Planning 2010) (see PART C, Section 15.4.5). OEH has also introduced amendments to the Coastal Protection Act 1979 and Local Government Act 1993 (October 2010), linked to proposed changes to the Infrastructure SEPP (DoP, 2010). These amendments clarify the circumstances in which Councils and private landholders may construct coastal protection works and also clarify how the costs of construction and maintenance, including maintaining beach amenity, can be recovered.

  In October 2009, the NSW Government released preliminary policy guidance on the management of coastal erosion, with a particular focus on high risk sites. Two of the nineteen high risk sites (Coastal Erosion Hotspots) recognised in this announcement are on the Wyong Coastline: Cabbage Tree Harbour and North Entrance.

  In November 2009, the NSW Government released new risk management guidelines and coastline planning guidelines. These new policy documents supersede much of the Coastal Hazards Policy 1988 and parts of the Coastline Management Manual 1990.
- In 2006, the role of Catchment Management Authorities in coastal zone management was clarified and strategies to enhance natural resource management along the coast were included in Catchment Action Plans. The Hunter-Central Rivers Catchment Management Authority (HCRCMA) has developed specific objectives and management targets for coastal natural resources, consistent with the NSW State Plan, and is currently implementing programs to improve awareness, understanding and management of natural resource assets in the coastal zone (HCRCMA 2007). Features of this program of works include on-ground works to enhance/rehabilitate coastal areas, studies of rock platforms, including shorebird habitats and community learning activities. The principles and objectives of the HCRCMA Catchment Action Plan (CAP) have been taken into account on developing Council's objectives and targets for the future management of the Wyong coastline.
- Several Regional Organisations of Councils and the Local Government and Shires Association have collaborated to commission region-specific studies of climate change risks and general adaptation principles. Adaptation principles describe how communities can reduce their exposure to climate change risks and can increase the resilience of social and economic assets. Whilst detailed guidance on effective adaptation measures is still developing, an adaptive approach is the best way for local communities and local councils to deal with uncertainty about change.

Table 3.1 shows the time line of WSC coastal zone management projects since the mid 1990s and the concurrent changes to coastal science and policy that have influenced the local coastal planning process.

Table 3.1 - Local coastal planning in an evolving science and policy context

Science and policy framework	Year	WSC coastline planning activity
• Coastal Protection Act 1979 • Environmental Planning and Assessment Act 1979 • National Parks and Wildlife Act 1974	1996	• AWACS (1995) study of coastal hazards completed for Wyong urban beaches: Coastline Hazard Definition Study: The Entrance North and Noraville. This complements *Toowoon and Blue Bays Historical Beach Behaviour* (Wyong Shire Council Public Works Department 1992).
• NSW Coastal Policy (Department of Planning 1997) • SEPP No. 14 - Coastal Wetlands and SEPP No. 26 - Littoral Rainforests	1997	• Preliminary steps towards preparation of coastline management study, suspended 1998
	1999	• DCP No. 77 - *Coastal Hazards*
• IPCC 2001 report with sea level rise predictions (IPCC 2001)	2001	•
• NSW Coastal Protection Package (Department of Planning 2002) • SEPP No. 71 - *Coastal Protection* • *EPBC Act 1999* (Australian Government)	2002	•
• Studies commissioned and completed for NSW Comprehensive Coastal Assessment (Department of Planning 2003) e.g. cultural landscapes, coastal erosion hazard	2003	• WSC obtains State funding and commissions new coastal hazard assessments, management studies and plan.
• Studies commissioned and completed for NSW Comprehensive Coastal Assessment	2004	• Draft geotechnical and coastal erosion hazard assessments completed. • Initial community consultation about coastal values and issues.
• Studies commissioned and completed for NSW Comprehensive Coastal Assessment • Commencement of CMAs and introduction of coastal natural resource management issues in CAPs.	2005	• OEH review of hazard assessments and ongoing discussion about appropriate risk management approaches
• SEPP No. 71 - *Coastal Protection* provisions included in Part 3A changes to *Environmental Planning and Assessment Act 1979* • Department of Planning template for standardised LEPs for all Councils and requirements for new LEPs within set timeframes.	2006	• OEH review of hazard assessments and ongoing discussion about appropriate risk management approaches

Science and policy framework	Year	WSC coastline planning activity
• IPCC 2007 Report on climate change with increased estimates of the rate of sea level rise (IPCC 2007). • CSIRO and UNSW studies on coastal process impacts completed for OEH. • NSW Government LiDAR project for first pass climate change (sea level rise) risk assessment for central coast and lower Hunter. • SEPP *(Infrastructure) 2007* • Australian government Department of Climate Change created, with specific Minister.	2007	• OEH review of hazard assessments and ongoing discussion about appropriate risk management approaches • WSC commences preparation of new LEP. • Tuggerah Lakes Estuary Management Plan completed and adopted (Wyong Shire Council 2006). • Significant erosion and inundation at North Entrance June 2007
• Sydney Coastal Councils, Hunter Councils and others prepare detailed local scale case studies and risk analysis. • Sydney Coastal Councils commissions study of the feasibility of offshore sand extraction for beach nourishment (AECOM 2009). • Central Coast Regional Strategy released (Department of Planning 2008). • Lower Hunter Regional Strategy released, with Conservation Plan (Department of Planning 2006) • OEH community meetings and briefings on regional climate change parameters and implications.	2008	• Negotiation about new scope of work and funding for coastal hazard assessments, coastline management studies and Plan to incorporate new sea level parameters and other changes to the planning framework. • WSC secures major funding for implementation of the Tuggerah Lakes Estuary Management Plan.

Science and policy framework	Year	WSC coastline planning activity
• NSW Sea Level Rise Policy Statement, Coastal Erosion Hotspots and supporting technical information, superseding the NSW Coastal Hazards Policy and parts of the Coastline Management Manual (DECCW 2009; 2010a) • NSW coastal guidelines, replacing the NSW Coastline Management Manual (Department of Planning 2010) • NSW DP&I Planning Guidelines to incorporate climate change • First Pass National Assessment on climate change risks to Australia's coast (Department of Climate Change 2009a) • Australian Government House of Representatives Inquiry into Managing our Coastal Zone in a Changing Climate. (House of Representatives Standing Committee on Climate Change, Water, Environment and the Arts 2009) • Further case studies on coastal vulnerability to climate change at state, regional and local scales. • Australian Government sponsored research groups addressing vulnerability and adaption priorities, including emergency response and land use planning	2009	• WSC prepares draft sustainability policy (2009) and draft climate change policy (2010). • WSC Strategic Vision • The Entrance Peninsula Planning Strategy released (Wyong Shire Council & Dickson Rothschild Pty Ltd 2009). • New coastal hazard studies completed. • New community consultation about coastal values and issues. • Application for funding for construction of a toe drainage structure at Cabbage Tree Harbour to protect Council assets and stabilise slope in poorly consolidated sand • Two coastal erosion 'hotspots' were initially highlighted along Wyong coastline. The July 2010 amendments to proposed changes to the *Coastal Protection Act 1979* revised beaches considered to be priorities for emergency coastal protection works, but two beaches along the Wyong coastline are still identified as 'Authorised Locations' (see **Sections 8.0** and **9.0** in **PART B** and **Section 15.0** in **PART C** for details)
• Finalised NSW coastal planning guidelines with sea level rise • OEH code for emergency actions – coastal emergencies • Amendments to *Coastal Protection Act 1979*, Local Government Act and EP&A Act to clarify and streamline regulation, approval and funding of coastal protection works. • New Coastal Zone Management Guidelines released December 2010 • Australian Government response to the House of Representatives Inquiry into the Coastal Zone released in November 2010.	2010	

15.1 Land tenure

Figure 15.1 shows the main types of land tenure along the Wyong coastline:

- Private land
- Crown land (Crown Reserve)
- Council owned community land

- Crown land under the care and control of Council
- National Park or State Conservation Area
- Vacant Crown land subject to an Aboriginal Land Rights claim

Also shown in Figure 15.1 is the coastal risk area as defined by coastal hazard studies (see Section 16.4), applying the sea level planning figures in the NSW Government sea level rise policy statement (DECCW 2009).

The figure shows that at several locations, predicted coastal recession for the 2050 and 2100 time frames will result in existing Crown land and Council land along the ocean foreshore being removed.

15.3 Wyong Shire Council roles and responsibilities

Specific Council roles in aspects of coastline management are set out below. Council shares responsibilities for many of these roles with State agencies. Strong partnerships and close co-operation between all levels of government are essential for sustainable outcomes.

Table 15.1 shows Council's responsibilities in the coastal zone, the legislation and policy underpinning the responsibilities and how Council responds now.

Table 15.1 - Council responsibilities in coastline management

Council roles and responsibilities	Legislation and policy requiring or guiding this responsibility	How Council meets this now
Coastal Hazards		
Emergency response during major erosive storm events and coastal inundation events. Council is responsible for coastal erosion mitigation works for protection of coastal property during storms.	NSW State Disaster Plan (State Emergency Management Committee 2009) *Coastal Protection Act 1979 (including recent amendments)* *State Emergency and Rescue Management Act 1989* *Local Government Act 1993* *Environmental Planning and Assessment Act 1979* (LEP and local development assessment) *Crown Lands Act 1989* Estuary Management Plan (Wyong Shire Council 2006) Coastal Zone Management Plan Flood Risk Management Plans Coastal Reserve (Foreshore) Plans of Management (e.g. Wyong Shire Council 1994) Emergency Management Plans for Coastal erosion hotspots (to be prepared by end December 2010)	Council is a member of the Local Emergency Management Committee, which has prepared a DISPLAN. The DISPLAN has several sub-plans, including one for flooding, for which SES is the lead combat agency. Council provides resources to assist the lead agency in emergencies and has an internal emergency response procedure. There is currently no emergency response sub-plan to address coastal erosion. Council's current emergency response to coastal erosion events is built on public safety as the first priority (removal of debris, fencing eroded scarps and unsafe beach access ways etc). In general, Council does not take action to reduce erosion to protect public or private property during storm events, although it has once used emergency sand emplacement when severe erosion threatened Council land and infrastructure at Karagi Point in The Entrance channel. Council supports dune management (encouraging accretion and revegetation) as a preventative measure to reduce coastal erosion impacts. Recent proposed amendments to the *Coastal Protection Act 1979* clarify council's obligations and opportunities in relation to emergency works (See **Sections 15.3.4** and **15.4.4**).
Notify land holders and occupiers of known coastal hazards	*Local Government Act 1993* *Coastal Protection Act 1979* *Environmental Planning and Assessment Act 1979* NSW Sea Level Rise Policy Statement (DECCW 2009)	DCP 77 is an interim development control measure to inform residents of coastal hazard threats and relevant planning requirements. s149 certificates of affected properties are annotated with respect to coastal hazards.
Minimise future risk by noting hazard constraints in the local planning system.	*Environmental Planning and Assessment Act 1979* NSW Coastal Planning Guidelines for Sea Level Rise (Department of Planning 2010)	DCP 77 refers to previous coastal hazard assessments, completed more than ten years ago. These hazard assessment have been updated with current environmental inputs as part of the Coastline Management Plan project.

Council roles and responsibilities	Legislation and policy requiring or guiding this responsibility	How Council meets this now
Manage erosion hazards that affect coastal foreshore reserves under Council's control	*Local Government Act 1993* *Crown Lands Act 1989* NSW Sea Level Rise Policy Statement (DECCW 2009) Coastal Reserve (Foreshore) Plans of Management (e.g. Wyong Shire Council 1994)	Remediation of access ways after major storms. Council currently places sand dredged from the entrance of the Tuggerah Lakes onto North Entrance beach, helping to build up a buffer of sand to protect reserves and private property during erosive storms.
Manage risks to Council infrastructure in the coastal zone, including, for instance, sewer and water lines, sea walls and steps/ramps.	*Local Government Act 1993* *Coastal Protection Act 1979* NSW Sea Level Rise Policy Statement (DECCW 2009)	Council has previously conducted hazard assessment in planning for the location of desalination plant Council has responsibility for the maintenance of sea walls at The Entrance. Council considers coastal hazards when planning the locations of pump stations and other sewerage infrastructure
Protect coastal urban communities and key habitats from bushfire hazards	*State Emergency and Rescue Management Act 1989* *Environmental Planning and Assessment Act1979* and relevant bushfire assessment circulars *Rural Fires Act 1997*	Bushfire risk assessments are required for all new development whether on the coast or inland
Biodiversity		
Management of foreshore reserves, including Plans of Management and general maintenance activities	*Local Government Act 1993* *Crown Lands Act 1989* *National Parks and Wildlife Act 1974* *Threatened Species Conservation Act 1995*	Council has in place several generic Plans of Management for coastal reserves. These also address the heritage value of places in coastal reserves and the recreational value of these areas – both of which potentially have conservation and business aspects.
Land use planning and regulation for edge effects of private development along the coast, including tree preservation orders and planting policies.	*Environmental Planning and Assessment Act 1979* *Local Government Act 1993*	Council applies development consent conditions to new development. Council has prepared a range of guidelines, policies and regulations which are enforced.
Manage and support local Bushcare/Coastcare activities	*Linked to Catchment Management Act and the Catchment Action Plan* (HCRCMA 2007)	Council supports activities by Landcare groups working on coastal dunes, particularly where those activities contribute to the stability, scenic amenity and accessibility of the coastline.
Contribute to recovery programs for threatened species and Endangered Ecological Communities	*Threatened Species Conservation Act 1995* *Fisheries Management Act 1994*	WSC has mapped/ground truthed EECs along the coast and identified opportunities to promote the recovery of these communities, for instance, by encouraging Landcare activities and community awareness.

Council roles and responsibilities	Legislation and policy requiring or guiding this responsibility	How Council meets this now
Contribute to programs to protect the habitat of protected species such as migratory shorebirds that are covered by international conservation agreements	*Environment Protection and Biodiversity Conservation Act 1999*	Several species that are protected under international agreements visit the Wyong coastline. Council has worked with HCRCMA to identify important breeding and roosting areas.
Entrance management for Tuggerah Lakes as it affects estuary and marine ecology and water quality	*Local Government Act 1993* *Crown Lands Act 1989* *Fisheries Management Act 1994* Tuggerah Lakes Estuary Management Plan (Wyong Shire Council 2006)	Entrance management for Tuggerah Lakes is addressed principally in the Tuggerah Lakes Estuary Management Plan. However, entrance processes and entrance management such as dredging also interact with the management of the coastline. They affect sand supply to North Entrance Beach and The Entrance beach and patterns of scouring during storms.
Sustainable communities		
Land use planning Advice to landholders about coastal hazards that may affect their property	*Environmental Planning and Assessment Act 1979* *Local Government Act 1993* *Coastal Protection Act 1979* NSW Sea Level Rise Policy Statement (DECCW 2009)	LEP land use zoning for the coastline. Council has prepared a draft Climate Change policy (2010) which, amongst other things, sets out planning controls for coastal risk areas (sea level rise and other aspects), such as prohibited development within coastal hazard areas. Changes to Complying Development conditions within coastal hazard areas. DCP requirements for development applications within coastal hazard areas. Notations on s149 certificates about the spatial extent of coastal hazard impacts on coastal properties
Strategic land use planning to give effect to the Central Coast Regional Strategy and to minimise future risks by providing a framework for land uses compatible with coastal land capability and coastal hazards	*Environmental Planning and Assessment Act 1979* *Local Government Act 1993* *Coastal Protection Act 1979* NSW Sea Level Rise Policy Statement (DECCW 2009) NSW Coastal Planning Guidelines for Sea Level Rise (Department of Planning 2010)	Council has an existing LEP and multiple DCPs. It is preparing a new LEP which will be consistent with the Statewide template and will reference the most up to date coastal risk area information, in accordance with the DP&I coastal planning guidelines (2009)
Coastal access and amenity for diverse user groups. Manage beaches and reserves for the benefit of diverse users including disabled people and people wishing to exercise pets (social values of the coastline)	*Local Government Act 1993* *Companion Animals Management Act 1998*	Gazetted dog exercise areas at Lakes Beach, away from the surf club, North Shelly Beach and part of Bateau Bay Beach (see **PART C**, **Section 17.2.7.1**). Council manages many parks along the coastline. Locations are discussed in **Section 17.2.7**.

Council roles and responsibilities	Legislation and policy requiring or guiding this responsibility	How Council meets this now
Provide recreational assets and facilities for beach users (e.g. surf club buildings and beach patrols)	*Local Government Act 1993*	Council maintains six surf club buildings along the Wyong coast (see **Figures 1.1** and **15.1**). These provide both beach patrol services and broader community services such as meeting and function rooms overlooking the coast.
Identify and protect significant cultural heritage items and places	*Heritage Act 1977* *National Parks and Wildlife Act 1974*	Places listed as having local or State heritage significance have been identified (see **PART C**, **Section 17.3**).
Provide information about coastal management to the local community and opportunities to be involved in on ground works	*Local Government Act 1993* *Catchment Management Act 1989*	Council has provided the local community with a large amount of information about the management of the estuarine/coastal lakes part of the coastal zone. It is working towards more detailed information for the community about coastal erosion hazards. Council will continue to support community involvement in on ground woks along the coast, such as Landcare projects.
Plan for and encourage strong communities and sustainable economic development, including tourism	*Local Government Act1994* NSW State Plan (NSW Government 2010)	These are important aspects of a sustainable coastal community and Council has identified these aspects in its sustainability policy (2009). See **PART A**, **Section 2.0** and **PART C**, **Sections 17.2.3** to **17.2.6**.
Implement sustainable resource use, including water, waste and energy.		The WSCMP is one of the tools to give effect to Council's sustainability policy (2009) and climate change policy (2010).
Foster a well informed community which has the capacity to act sustainably	*Local Government Act 1993*	Council's sustainability principles for the Shire are in **PART A**, **Section 2.1**.
Manage and maintain assets and facilities for the community's enjoyment of the coast, including sea walls, ramps, steps, pathways etc.	*Local Government Act 1993*	Council has an asset register and maintains these assets after storms. Major community assets such as the sea wall at The Entrance are subject to more detailed assessment, planning and upgrade as necessary to maintain high levels of safety and amenity.

15.4 Sustainability is a key part of Wyong Council's Strategic Vision

15.4.2 WSC Strategic Vision

Wyong Council released Our Shire Our Future, a Strategic Vision document, in 2009 after extensive consultation (Wyong Shire Council 2009). The document makes it clear that the coastline is viewed by the local community as a key asset that attracts them to the Wyong Shire area. Sustainability is an important part of the Strategic Vision, incorporating environmental, social and economic values.

Council has prepared six draft Sustainability Principles, which will guide Council's work, including:

- Successfully integrate economic, social and environmental outcomes
- Protect the environment to maintain healthy ecological systems
- Build partnerships by engaging and listening to the community
- Lead by example and support actions for sustainability

Council intends that the preparation and implementation of the WSCMP will be consistent with these principles.

Council has also identified eight key sustainability objectives and in broad terms discusses how these objectives will be delivered. Direct and indirect references to the coastline or coastline values include those listed in Box 15.1.

Box 15.1 - Wyong Shire Council and Sustainable Management of the coastline

PROTECT NATURAL VALUES

Areas of natural value in public and private ownership will be enhanced and retained to a high level in the context of ongoing development.

This will be achieved by (amongst other things):

- Preserving threatened and endangered species, as well as ecological communities and biodiversity (on the coastline and elsewhere)
- Expanding and continuing programs focused on restoring degraded natural areas in our community (on the coastline and elsewhere)
- Developing and implementing a natural resources sustainability strategy for the Shire (note that Council's draft Climate Change Policy (2010) and this Coastline Management Plan will feed into the natural resources sustainability strategy)

ENGAGE THE COMMUNITY IN ENVIRONMENTAL ISSUES AND MANAGEMENT

There will be a sense of community ownership of the natural environment through direct public involvement in environmental programs

This will be achieved by (amongst other things):

- Creating and promoting a network of renowned natural trails, for instance, a world class 'Beach and Cliff Walk' and a 'Mountains to the Sea' trail.
- Establishing an annual 'Celebration of our Environment' event based around our lakes and beaches
- Actively supporting and encouraging volunteer environmental champions

AN AWARE AND KNOWLEDGEABLE COMMUNITY

The community will be well educated, innovative and creative. People will attain full knowledge potential at all stages of life.

This will be achieved by (amongst other things):

- Establishing and maintaining a committed network of education, community, business and government representatives on values including the natural environment (including the coastline).

Lower level, related objectives, which are directly relevant to the management of climate change issues along the Wyong coastline, are:

A high level of information about the natural environment and environmental change will be maintained and available.

Community knowledge of sustainability and environmental issues impacting on Wyong Shire will be comprehensive

The Coastline Management Plan and follow up actions will assist Council to deliver on these objectives.

15.4.3 Council structure for delivering sustainable coastline management

Responsibility for managing coastline values and assets sustainably lies with many different sections of Council. Major roles for coastline management are managed by the Shire Planning section.

Table 15.2 shows the various components of Shire Planning and also shows the other Council sections whose activities influence or are influenced by coastal processes and hazards.

Table 15.2 - Shire Planning and managing coastline issues

Environment and Planning Services Department	Examples of roles: All of these roles have a coastline management element
	Overall positioning of Council's activities, Council leadership and community engagement
Environment and Natural Resources	Shire ecology, coastal ecological resilience, stream health, soil condition. Implement the Estuary Management Plan; climate change policy; manage coastal processes; sustainability policy
Development assessment, Land use planning and policy development	Strategic land use planning (LEP, DCP) and development assessment – how Council will determine DAs in coastal risk areas
Regulation and Compliance, building certification and health	Building services; decisions about forced relocation of buildings
Place management	Master Plans and Plans of Management for high profile, high usage coastal reserves
Corporate Services Department	Communication with rate payers and customer service; Council strategic obligations
Corporate governance	Transparent decision making processes and community access to information about the coast
Finance	Allocation of budget to coastal zone management actions
Information management	Management systems for records of coastal condition and for other review, assessment and reporting strategies
Economic and property development	Evaluation of economic risks to the Shire of management decisions about coastal property in immediate and short to medium term coastal risk areas
Integrated planning	Strategic land use decisions for the Shire

Environment and Planning Services Department	Examples of roles: All of these roles have a coastline management element
Community and Recreation Services Department	
Open Space, sport, leisure and Recreation	Foreshore reserves and other parks, and their use
Community and cultural Development	Community well being and respect for diverse cultural attachment to the coast
Community engagement	Community information and opportunities to contribute to issue management and decision making
Community buildings	Includes surf clubs
Infrastructure Management Department	
Roads and stormwater	Manage drainage to not enhance geotechnical hazards or reduce water quality; protection of road assets affected by sea level rise and coastal recession
Design and Project management	Special projects, including in coastal risk areas
Asset Management	General asset maintenance, including in coastal risk areas – this would include beach access ways and viewing platforms
Waste, water and sewerage	Relocation of water supply and sewerage assets that are in coastal risk areas – scheduling in relation to timeframe for risk.
Plant, fleet and depots	Ensuring plant is available and crew trained for managing coastal emergencies
General Manager's Department	
Legal and risk service	Assessing risk to Council associated with coastal process hazards, including climate change
Major projects	Coastal projects requiring major council investment or with high risk

15.4.4 Natural hazards and coastal emergencies

WSC shares responsibility for planning, preparation and response to coastal emergencies with SES and OEH.

Further information about the definition of coastal emergencies and council's existing assessment of a range of emergencies arising from natural hazards is included in Table 15.3 (below). Council's proposed strategy for future management of coastal emergencies is in Section 8.0 of PART B.

Further information about options that have been considered in relation to management of coastal emergencies is in PART D.

15.4.4.1 Previous assessments of natural hazards and coastal emergencies, Wyong Shire

WSC prepared a draft Emergency Risk Management Report in 2007 (WSC and Echelon 2007). Table 15.3 summarises the results of the risk assessment for a range of hazards affecting coastal development and people. The risk assessment considered impacts on people, property, animals and the environment. The assessment is based on current hazards – as they were understood prior to the completion of the hazard assessments for this Coastline Management Plan and it does not appear to take longer term climate change hazards into account.

As shown in Section 16.0, more homes or community assets are now understood to be located in the immediate coastal erosion hazard zone, and the number of affected properties and structures is predicted to increase significantly by 2050, with sea level rise at the NSW planning bench mark. Risks, as understood with recent studies, and as modified by predicted sea level rise and other aspects of climate change are discussed in PART C Section 18.0.

Table 15.3 - WSC emergency risk management – coastal (from Wyong LGA Local Emergency Management Committee & Echelon 2007)

NOTE: this assessment predates the coastal hazard assessments completed for the Coastline Management Plan

Hazard	Risk assessment	Explanation	Who leads emergency management actions
This hazard relates to the Tuggerah Lakes and creek lines more than the open coast. A **1 per cent AEP flood** could result in inundation of properties and possible evacuation of up to 10,000 people, infrastructure damage, displacement of livestock etc.	High	Severe floods known to have occurred in 1949, 1964, 1990 and 1992. Refers to multiple flood studies and flood risk plans for creeks and Tuggerah Lakes. Notes need to develop an evacuation plan for large scale evacuations. A related risk is failure of infrastructure such as the sewer system, because of inundation of pumping stations and reticulation system, loss of power.	SES

Hazard	Risk assessment	Explanation	Who leads emergency management actions
A **tsunami** could result in possible human fatalities and injuries, damage to property, infrastructure and the environment. Evacuations of coastal and urban community.	High	Thirty tsunami (New South Wales State Emergency Service 2006) have been experienced on the NSW coast over the last 200 years, mostly with very small effects that have barely been noticeable. No loss of life or major damage has been noted. The largest tsunami (a 1 metre tidal fluctuation at Fort Denison) occurred in 1960. Financial, resources and operational management consequences rated as catastrophic.	SES
Storm surge could result in possible human injuries, damage to the environment, property and infrastructure	High	Major consequences for evacuation, community services and financial resources identified. Resources consequence identified as catastrophic. Impacts are similar to flooding, although source is oceanic waters rather than catchment runoff.	SES
Coastal storm- severe coastal erosion resulting in damage to property and evacuation of up to 150 people (North Entrance)	Low	Severe coastal storms known to have occurred in 1945, 1974, 1978, 1984-86 and also 2007 (after this draft report was prepared), with severe damage to only a few properties on each occasion. Environmental, resources and operational management consequences identified as moderate. Most consequences rated minor or insignificant.	SES
Prolonged heavy rain may lead to landslip at Norah Head, with damage to property, environment and utilities. Up to 50 people affected with possible evacuations.	Low	Ongoing history of landslip, linked to local geology and groundwater conditions. Localised landslips can occur suddenly. Environmental and financial consequences rated as major. Other consequences minor on insignificant.	LEOCON

15.4.5 Wyong Shire Climate Change Policy

Council's Environment and Natural Resources Unit prepared a draft Climate Change Policy for the Shire in 2009 (Wyong Shire Council 2010). Whilst the draft Policy has been available on Council's web site, it is not currently adopted by Council as a formal policy.

The document provides a summary of the scope of potential climate change impacts on the Shire and on Council's responsibilities and activities. The draft policy has six objectives, which focus on improving Council and community understanding of climate change issues as they affect the local area, formal adoption of climate change projections to provide certainty (i.e. clear standards and benchmarks) in planning for Council and landholders, and measures to reduce both Council's carbon footprint and the vulnerability of the hire to climate change consequences.

In relation to the coastline and estuary, the draft Policy adopts the current (2009) NSW government sea level rise planning benchmarks and technical guidelines, but also considers how asset life can be used in conjunction with sea level rise projections to guide appropriate development and minimise risk.

15.6 Australian government requirements and initiatives

The Australian Government has diverse interests in the sustainable management of Australia's coastline, and has increased its focus on coastal management issues in response to potential climate change and sea level rise. In October 2009, a House of Representatives Standing Committee released its report 'Managing our Coastal Zone in a Changing Climate' (House of Representatives Standing Committee on Climate Change, Water, Environment and the Arts 2009). The report includes 46 recommendations. Many of the recommendations address high level governance issues. Recommendation 19 suggests further studies by the Australian Productivity Commission into the impacts of climate change on insurance matters. New policy that may emerge as a result of this further inquiry would be relevant to those properties along the Wyong coastline that are within the 2050 and 2100 coastal risk areas.

The Australian government has indicated that it will respond to the recommendations of the House of Representatives Inquiry by the end of 2010.

The Department of Climate Change (now Department of Climate Change and Energy Efficiency - DCCEE) released a first pass national coastal vulnerability assessment, Climate Change Risks to Australia's Coast in November 2009 (Department of Climate Change 2009a). The assessment assumed 1.1 metres of sea level rise and used medium resolution elevation data, and in NSW, an allowance for a 1 in 100 year storm tide event. At this scale and with the assumptions made, Wyong and neighbouring Lake Macquarie and Gosford councils were found to be the most at risk local government areas to coastal inundation, principally because of the amount of residential development around lake and estuary shorelines, below 2.5 metres AHD. Based on the same sea level rise parameters and considering soft (unconsolidated sandy) land within 110 metres of the current shoreline, Wyong Shire Council ranked 7th in NSW (generally the most at risk local councils are in the Sydney Metropolitan Area). The 110 metre distance is indicative of the amount of shoreline retreat on sandy coastlines due to sea level rise, by 2100.

For more information about Australian government research, reports, policy and guidelines, visit the DCCEE web site, at www.climatechange.gov.au.

Table 15.6 summarises the Australian Government legislation and policy which provide context for managing the Wyong coastline.

Table 15.6 – Australian Government policies and legislation

Department	Relevant legislation, policy or plans	Requirements and responsibilities
Emergency Management Australia (EMA)	Australian government Emergency Management Policy Statement	The Australian government supports the states in managing emergencies (including reducing the likelihood that emergencies will occur). EMA administers natural disaster relief arrangements to assist State and Territory governments cover costs associated with disaster relief and recovery. EMA prepares guidelines for nationally consistent approaches to emergency planning and management. EMA runs courses and provides information on risk management to build capacity for specific types of emergencies. EMA provides funding though the Disaster Mitigation Program and Regional Flood Mitigation Program to address priority risks. Funding can be used for disaster risk assessment, mitigation strategies and measures, resilient infrastructure and community awareness and warning systems.
Commonwealth Bureau of Meteorology (BoM)		The Bureau of Meteorology provides oceanographic climate, storm, hydrology and other data to predict and provide warnings about severe weather conditions such as tropical cyclones and east coast lows.
Australian Government Department of Sustainability, Environment, Water, Population and Communities	*Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Australian Government Coastal Policy (Department of the Environment and Water Resources 1995) Australian Government Bilateral Agreements for migratory birds (JAMBA, CAMBA, ROCKAMBA) (Department of Sustainability, Environment, Water, Population and Communities	A number of migratory shorebird species nest, feed and roost along the Wyong coastline in summer. Places of Indigenous cultural heritage value and historical value are identified in the National Heritage List and previously in the now closed Register of the National Estate (fully registered or as Indicative Places). There are no such places identified along the Wyong coastline. These factors trigger assessments under the EPBC Act for development proposals. HCRCMA has completed projects along the

Department	Relevant legislation, policy or plans	Requirements and responsibilities
	2009) Administers community and CMA grants for environment projects	Wyong coastline; for instance building knowledge about the ecological values of local rock platforms.
Australian Government Department of Climate Change and Energy Efficiency	Responsible for climate change *mitigation* research and development of statutory and policy responses and for climate change *adaptation* research and policy development.	Investment in studies to improve understanding and preparedness for climate change, particularly sea level rise and changes to storm intensity/frequency. Investment in planning and other activities to reduce risk. Recent documents produced by DCC (&EE) include: Climate Change Risks to Australia's Coast: A First Pass National Assessment (2009a) and the Preliminary Conclusions of the Coast and Climate Change Council (see below)
Geoscience Australia See www.ga.gov.au/marine for details of Geoscience Australia programs and research projects.	Australian Oceans Policy Seas and Submerged Lands Act 1973 EPBC Act 1999	Geoscience Australia (Marine and Coastal Group) prepares research and management reports to assist the Australian government to set policy and provide resources for the management of natural hazards, including coastal erosion. In addition, Geoscience Australia administers the Australian government *Offshore Minerals Act 1994*. This Act provides the framework for exploration and production of minerals on the continental shelf, beyond the jurisdiction of the States.

15.6.1 Coast and Climate Change Council

The Department of Climate Change and Energy Efficiency established a Coast and Climate Change Council in 2009. The Council delivered its preliminary conclusions in early 2010. Parts of these conclusions are reproduced below, because they make a strong case from the Australian Government for risk reduction measures to help communities adjust successfully to climate change.

Preliminary conclusions from the Coast and Climate Change Council, 2010
(from www.climatehchange.gov.au/government/adaptat.aspx)

Coastal climate change – tackling the challenge

Coastal Australia is confronted with an immense array of risks from climate change. These risks will challenge all sectors of society, the economy and the environment.

The Government report Climate Change Risks to the Australia's Coast identifies up to 247,000 residential buildings across all states, at a value of $63 billion, at risk of being inundated or eroded this century. In

addition there are the risks to public infrastructure and businesses as well as adverse impacts on treasured environmental values and amenity facilities that have not yet been quantified.

Australia is a coastal nation where most people live, work, and recreate. Population in city, regional and even some remote coastal locations continues to grow. Some coastal places are already subject to periodic damage by floods, storm wave erosion and now even higher king tides. These impacts will be exacerbated by the forces of climate change and are already becoming evident in certain sensitive locations.

Development around the Australian coast assumed that sea level and storm events would function as they have in the past. We designed our housing estates, business sites and public utilities as if the coastline and tidal levels would not change. ***Such assumptions are no longer valid.***

As a nation we cannot ignore the evidence that climate change during this Century will have significant adverse impacts on living conditions, the economy and the environments of coastal regions. The insurance industry is taking steps now to raise rates in some areas deemed to be at increasing risk, with implications for the value of properties.

It is time for Australia as a whole to grasp the new reality. Action should begin now to prepare Australia to respond to the challenge and to ensure that our children and future generations are best positioned to cope.

There is an urgency to start now in building the resilience of Australia to climate change. The existing risks are large, and decisions are continuing which will likely increase those risks and increase the burden we are placing on future generations and budgets.

Improve understanding of response options

Although managing coasts and coastal communities vulnerable to coastal risks has been core business for many local communities and agencies overtime, adaptation to coastal climate change impacts is a new agenda and there is considerable uncertainty as to what action should be taken and when. There needs to be clear guidance on public and private obligations and options in responding to and preparing for climate change, both in terms of managing changes with existing developments and for new investments.

Decision-makers need access to information on the costs and benefits of response options, and mechanisms which facilitate the sharing of lessons learned from taking action. Ready access to such robust information will help local communities to manage their exposure to climate change impacts.

Enhance general consistency across governments

Emerging issues such as planning and legal matters, property valuation, insurance availability and building standards will have a direct impact on many Australians. A number of communities are particularly vulnerable because of social disadvantage or because they are located in areas that are facing immediate threat, for example low lying Australian island settlements.

Many individuals and communities are currently confused about what may constitute effective action to reduce their own risks due to inconsistent instruments and approaches between governments.

There is an urgent and continuing need to reduce uncertainty and enhance consistency in coastal planning and decision-making. At the same time, it will be important to address the different degrees of exposure that will be evident at different places around the coast – sea level rise will not be uniform, different extreme events like storm surges and cyclones have regional characteristics, and the form of development differs between places.

15.6.2 Australian Government investment in adaptation to climate change

The Australian Government (through the Department of Climate Change) initiated the National Climate Change Adaptation Program, with a budget of $126 million.

As examples, in early 2010, the Department of Climate Change summarised its support of the following research and assessment programs:

- 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
- Climate change adaptation skills for professionals – professional development and accreditation
- National coastal risk assessment
- Biodiversity vulnerability assessment
- Implications of climate change for Australia's World Heritage properties
- Implications of climate change for Australia's National Reserve System

These programs operate at a national scale and are not intended to provide direct local scale advice for local councils such as Wyong. However, the outcomes of the current Australian Government programs will support the introduction of consistent condition and threat assessment, risk management processes and effective actions across all jurisdictions. This has the effect of increasing certainty for local government and communities.

F.3 Approach to Preparation of the CZMP 2011

The following reproduces (verbatim) the sections listed in Table F-4 from Umwelt's (2011b) *Coastal Zone Management Plan for the Wyong Coastline: Supporting Information Volume 1,* which refer to the Approach to Preparation of the WCZMP 2011. References mentioned within the below reproduced text by Umwelt refer to Sections, Figures, Tables etc. presented in their 2011(b) document.

Table F-4 Reference to Information in the WCZMP Supporting Information (Umwelt, 2011b)

Information	WCZMP Supporting Information (Umwelt, 2011b) Report Part/Section reference
Approach to preparation of the WCZMP 2011	Part A Section 1.5 Section 3.2

BMT WBM highlights the below reproduced text has been copied verbatim from Umwelts' (2011b) 'Coastal Zone Management Plan for the Wyong Coastline: Supporting Information' and is included within this document on request by Council. Intellectual property rights of the below material remain with Umwelt Pty Ltd.

1.5 An adaptive approach

The WSCZMP is the result of a systematic analysis of the best available information on coastal hazards as they affect the Wyong coastline now and for planning timeframes of 50 years, 100 years and beyond. The impact of coastal hazards has been used to better understand risks that Council and other stakeholders manage along the coast – risks involving private and public assets, natural and built assets, recreation and employment, risks involving community values and private values.

The Plan sets out a strategy for reducing key risks, by implementing priority actions over the next 10 years. It also recognises significant uncertainty about how changes to coastal hazards will unfold and establishes a framework for adaptive management of the coastline for decades to come. The adaptive framework means that as new knowledge becomes available (or other changes to the management framework, such as new legislation, are introduced), Council will update priority actions in consultation with community and government stakeholders.

Figure 1.6 (from NSW NRC 2005) shows the components of a quality focussed adaptive management cycle, which aims to continually improve how the coast is managed.

The four step adaptive management framework for ongoing improvement of the WSCZMP is outlined below.

Step 1: Benchmark current condition (accessing and using the best available information in planning)

Actions that ensure that sufficient data is available to make an informed decision. Establishing data management systems and systems to understand change are also part of Step 1.

The Coastal Knowledge Action Plan (Section 8.0) shows how the various studies, monitoring and reporting are connected.

Step 2: Select and implement actions to reduce risk to property, community assets, safe community recreational access to beaches and Council infrastructure.

Reduction of the risks associated with coastal hazards may involve any of the options outlined in Section 6.0. Other risks will be reduced by awareness raising, education or community development activities.

Actions identified as part of Step 2 in each Action Plan are those identified through the evaluation process set out in Part D as providing the best benefits relative to costs at the community and landscape scale.

Some actions are locality specific. Some actions apply to the whole of the coast. Actions of different types will contribute to sustainable management. For some issues multiple actions are necessary for effective risk reduction. For instance, a combination of community awareness raising, community capacity building, land use planning, and investment in on ground works may be necessary.

Step 3: Enhance knowledge and monitor achievements

This step is about keeping track of what has been done and what those actions have achieved, as well as filling critical gaps in knowledge that will make management more effective. For instance:

- Conduct research into specific coastal process issues
- Monitor significant changes in the science underpinning coastal zone management, such as new IPCC (Intergovernmental Panel on Climate Change) reports.

- Data collection and record keeping, such as Council, State government and community monitoring programs (for instance photography and water quality sampling, vegetation assessment). Support Landcare/Coastcare group involvement in on ground works and also in community based monitoring programs.

Step 4: Status review and progress evaluation, to improve programs

This step is about reflection on whether actions continue to be appropriate and cost effective. Changes can be made to take into account well targeted, local scale knowledge as it accumulates. This step includes:

- Technical review – do the actions reflect quality science?
- Review progress and focus at approximately three to five yearly intervals (align with other Council reporting processes) by Council Coastline Management Committee
- Report progress, achievements and new challenges to the community

3.2 Key steps in preparing the WSCZMP

Coastal zone planning in NSW has been guided by the Coastal Protection Act 1979 and Coastal Hazards Policy 1988 (NSW Government 1988), supported by the NSW Coastline Management Manual since 1990 (NSW Government 1990) and the NSW Coastal Policy since 1997 (Department of Planning 1997).

The NSW Coastline Management Manual (NSW Government 1990) sets out a seven step process to be followed by local councils when preparing coastal zone management plans, which are plans under the Coastal Protection Act 1979.

As noted in Section 1.0, this single document includes the information from the coastal hazards study, coastline management study and coastline management plan steps of the process.

Plan making steps which guided the preparation of the WSCZMP are summarised in Figure 3.1. Announcements in late 2009 and in 2010 foreshadow some changes to these key steps. OEH released new Guidelines for preparing Coastal Zone management plans in December 2010. Recent amendments to the Coastal Protection Act 1979 and associated regulations, directions and guidelines clarify State and local government objectives and powers in relation to the management of coastal erosion. Amendments to the Coastal Protection Act passed through the NSW Parliament in October 2010, and will commence early in 2011.

Details about the new elements of the framework for coastal zone management are in PART C, Section 15.0, but are still evolving. The new framework elements will change the process of preparing a coastal zone management plan (in terms of the information required, consultation with coastal communities and matters to be considered), increasing the focus on risk based planning and modifying the statutory powers available to implement actions in the coastal zone management plan.

As far as is possible, WSC has incorporated the requirements of the new NSW coastal zone planning framework, including the December 2010 Guidelines, into the preparation of the WSCZMP.

3.2.1 Certification of the WSCZMP

Since 1990, where a council has prepared and adopted a Plan made in accordance with the Coastline Management Manual, it is afforded 'good faith' liability protection by the NSW government. Coastal Zone

Management plans could be gazetted by the NSW Government, but very few have been through this process.

The most recent amendments to the Coastal Protection Act 1979 include a new provision (replacing gazettal) that Coastal Zone Management Plans can be certified by the Minister for the Environment as having been prepared in accordance with the Coastal Protection Act 1979 and the Minister's Guidelines. Councils may seek certification of plans for individual beaches (such as Authorised Locations) or for the whole of the coastline in their local government area. When a Plan has been certified by the Minister, Council is indemnified against a range of issues.

In addition, when a council has a certified Coastal Zone Management Plan, then the council is the consent authority for applications for long term coastal protection works within the area covered by the certified Plan

WSC will apply for certification of the final WSCZMP for the entire coastline of the Shire.

Volumes 1 and 2 of the Supporting Information provide the background and rationale for measures that are included in the final WSCZMP, which is a separate stand alone document. These documents show how the final WSCZMP is based on information required by the NSW Government Guideline for Preparing Coastal Zone Management Plans 2010.

F.4 Study Area

The following reproduces (verbatim) the sections listed in Table F-5 from Umwelt's (2011b) *Coastal Zone Management Plan for the Wyong Coastline: Supporting Information Volume 1,* which describes the Study Area. References mentioned within the below reproduced text by Umwelt refer to Sections, Figures, Tables etc. presented in their 2011(b) document.

Table F-5 Reference to Information in the WCZMP Supporting Information (Umwelt, 2011b)

Information	WCZMP Supporting Information (Umwelt, 2011b) Report Part/Section reference
Study Area, and description of the coastal zone	Part A Section 2.1-2.3

BMT WBM highlights the below reproduced text has been copied verbatim from Umwelts' (2011b) 'Coastal Zone Management Plan for the Wyong Coastline: Supporting Information' and is included within this document on request by Council. Intellectual property rights of the below material remain with Umwelt Pty Ltd.

2.1 Where does this Plan apply?

The WSCZMP applies to the coastline of Wyong Shire. The coastline is part of the 'coastal zone' (see Section 2.2). The Plan uses 'coastline' in the same sense as the NSW Coastal Hazards Policy (NSW Government 1988) and the NSW Sea Level Rise Policy Statement (DECCW 2009). 'Coastline' in this context refers places that are directly impacted by coastal processes such as waves, currents, tides and wind. The landward extent of the coastline is as far inland from the shoreline as the hazard impacts of very large storms and other process threats, taking into account the effects of sea level rise to 2100. These hazards include beach erosion, shoreline recession, coastal entrance instability, vegetation degradation and sand drift, coastal inundation, slope and cliff instability and stormwater erosion.

In preparing the coastal zone management plan, Council commissioned detailed studies of coastal hazards for locations along its coastline where coastal processes were considered likely to impact on existing development or land zoned for development. The hazard studies do not cover the entire coast; for instance the coastal erosion hazard studies do not cover national park or open space where there is no access infrastructure.

The 'primary objective' of the NSW Sea Level Rise Policy statement (which sets sea level rise planning benchmarks to 2100 are beyond) is to minimise the social disruption, economic costs and environmental impacts resulting from long term sea level rise'.

The area considered in the coastline management plan is the area where long term land use or other community value would be affected by sea level rise to the extent that adaptive risk mitigation planning and/or on ground works would be necessary to protect the values of the coastline.

In general, the core area covered by the WSCZMP includes all coastal reserves and the land between Mean High Water and the first street landward of coastal landforms, although in some areas coastal hazards present serious risks and land and property further from the shoreline.

Council shares management of its coastline and its coastal zone with OEH for national parks and with the Department of Primary Industries (former sections of L&PMA) for Crown land (including the ocean floor, State Parks and some coastal reserves). Land and sea managed by these stakeholders is shown in Figure 2.1. Where specific amendments to policies or operational activities within Crown land or national parks would be needed for Council to meet the management targets of the WSCMP the WSCMP highlights the inconsistencies and suggests amendments that would support better co-ordinated, sustainable natural resource management along the entire coast of the Local Government Area (LGA).

2.2 Distinctive coastal landscapes

The Wyong coastline comprises multiple localities with distinctive character, based on the physical quality of the landscape (e.g. landforms, local relief), the nature of views, the history of use and development, and community identity. The WCZMP recognises these local scale landscapes and communities. The Plan identifies ten planning areas. The rationale for these planning areas is summarised in Table 2.1, and further background information can be found in Section 17.0 in PART C. These localities are shown in Figure 1.1.

In combination, the eight Action Plans in Part B show how the character and key landscape values of these coastal precincts will be managed.

Table 2.1 - Wyong coastline – distinctive coastal landscapes

Locality	Key defining characteristics
Expansive ocean beach and dunes *Indigenous cultural heritage* Munmorah State Conservation Area	Managed by OEH Rocky coastline with small embayments. High visual quality Conservation and habitat value of rock platforms and reefs Principally used for low key recreation and conservation. Managed by OEH – NPWS, not Council.
Expansive ocean beach and dunes Birdie Beach	Approximately 3.5 km open ocean beach, forming the low barrier which encloses Budgewoi Lake and Lake Munmorah. Dunes were formerly mined for mineral sand in the 1960s. Popular for beach fishing. Part in Munmorah State Conservation Area (managed by OEH - NPWS), part Crown land Includes the Lakes Surf Club – very popular recreational beach
Residential coast Noraville and Cabbage Tree Harbour; Hargraves Beach	Long established residential area on high cliffs; significant local heritage value. Ocean access boat ramp. Coastal erosion hotspot at Cabbage Tree Harbour – geotechnical hazards, exacerbated by future sea level rise. Significant immediate coastal erosion hazard affecting properties at Hargraves Beach.
Residential coast *Indigenous cultural heritage* Norah Head	Eastern most point in the Shire, heritage and conservation value (rock platform bird habitat). Norah Head Lighthouse Very popular area for low key recreation and tourism
Expansive ocean beach and dunes Soldiers Beach	Popular recreational beach. No development other than surf club. Caravan park accommodation above beach (important for tourism). Rock platform and reefs have significant habitat value. Severe erosion experienced in 1974 storms.
Expansive ocean beach and dunes *Indigenous cultural heritage* Tuggerah Beach (part in Wyrrabalong National Park)	Like Birdie Beach, approximately 3.5 km of open ocean beach, forming the barrier which encloses Tuggerah Lake; backed by a stabilised transgressive dune field (at the northern end, in Wyrrabalong National Park – managed by OEH-NPWS). Outside the National Park, the dune system has been heavily disturbed by uses such as former mineral sand mining, waste disposal site. It is now rehabilitated and developed as a golf course and resort.
Residential coast North Entrance	Residential, tourism and local business centre, with important foreshore reserves on the entrance channel frontage and ocean beach access. Potential for further tourism development (see Wyong Shire Council & Dickson Rothschild Pty Ltd 2009, Precincts 1 and 2). The area includes low lying land subject to inundation. Important view corridors. The ocean frontage has high value properties, often redeveloped within last 10-15 years. Coastal erosion hotspot, severely affected in 1974 and with numerous homes within the immediate coastal hazard area.

Locality	Key defining characteristics
Historic to modern recreation and tourism *Residential coast* The Entrance	Oceanside recreational destination for residents and visitors. Major tourism draw card for the shire. Long history as a coastal tourism destination, with heritage listed ocean baths and surf club buildings. Major commercial development along the coastline. Outstanding coastal views. Strong links between entrance channel area and open coast. See The Entrance Peninsula Planning Strategy, Precincts 4, 9, 10 (Wyong Shire Council & Dickson Rothschild Pty Ltd 2009)
Historic to modern recreation and tourism *Residential coast* Shelly Beach, Blue Bay, Toowoon Bay and Bateau Bay	Well established residential areas, with some waterfront reserve properties with outstanding ocean views. High value properties, often redeveloped within last ten years. Popular tourist accommodation and popular protected beaches in peak holiday periods. See The Entrance Peninsula Planning Strategy, part Precincts 12 and 16 (Wyong Shire Council & Dickson Rothschild Pty Ltd 2009).
Expansive ocean beach, dunes and cliffs Wyrrabalong National Park (Crackneck)	Steep bluff and coastal cliffs, extensive rock platform. Major conservation values plus passive recreation. Attracts tourists. Managed by OEH (NPWS), not by Council.

2.3 Coastal Policy definition of the coastal zone

The Wyong Shire coastline is part of the NSW coastal zone. The broader coastal zone includes the Tuggerah Lakes system and their catchment, as well as ocean waters and the sea bed. WSC has previously prepared and is implementing a management plan for the Tuggerah Lakes. The WSCZMP is designed to integrate seamlessly with plans for the sustainable management of the broader coastal landscape (see Section 2.2.1 and Figure 2.2).

The NSW coastal zone is formally defined by the NSW Coastal Policy (Department of Planning 1997). It is defined on maps prepared by the then Department of Planning and includes:

- Three nautical miles seaward of the mainland and offshore islands;
- One kilometre landward of the open coast high water mark;
- One kilometre around all bays, estuaries, lakes, lagoons and islands;
- The tidal waters of coastal rivers to the tidal limit or to the upstream limit of mangroves.

An even broader concept of the coastal zone is adopted by the Hunter-Central Rivers Catchment Management Authority (HCRCMA) in developing its Catchment Action Plan (CAP) (HCRCMA 2007), incorporating coastal catchments and local government areas to focus attention on the interconnectedness of all parts of the catchment. A broad definition of the coastal zone is also adopted in the NSW State Plan (NSW Government 2006).

2.3.1 Integration of coastline and coastal zone

The WSCZMP is one of a suite of strategic management plans to guide management of the Wyong Shire's coastal zone. The relationship between these plans is shown in Figure 2.2. All of these plans contribute to achieving the targets for natural resource and community priorities under the NSW State Plan (2010), particularly Priority A4 and Priority A8 (for more details, see Section 15.4 in PART C).

Management of the entrance to the Tuggerah Lakes is addressed in both the WSCZMP and the Tuggerah Lakes Estuary Management Plan (Wyong Shire Council 2006) which Council is currently implementing with funding assistance from the State and Australian governments. Issues include inundation of low lying areas by marine waters, shoaling of marine sand in the entrance channel and erosion of the frontal dune system by floodwaters discharging from the lake entrance. The WSCZMP adopts the same approach as the Estuary Management Plan in the way it considers these issues, but provides up to date information about the effects of sea level rise.

Other complementary plans for the coastal zone include floodplain risk management plans, emergency management plans, the Wyong LEP (currently being updated) and detailed special purpose plans such as Plans of Management for foreshore reserves (prepared in consultation with the Land and Property Management Authority), fisheries and recreational boating. Council coordinates its responsibilities for management of the coastal zone by considering its role in the development and implementation of all these plans in the WSCZMP.

In this broader context, the WSCZMP will:

- Provide specific guidance on the sustainable management of risks associated with coastal hazards, as they relate to biodiversity, coastal development, safe recreational access, infrastructure and other natural and cultural coastal assets.
- Complement the estuary management plan and entrance management strategy that has been prepared for the Shire's coastal lakes, which are also part of the coastal zone.
- Contribute to improvements in the health of marine waters and habitats that interact with the coastal hazard zone (i.e. potentially to the full three nautical mile width of the coastal zone). This supports Priority A4 of the NSW State Plan (2010).
- Contribute to the resilient coastal ecosystems that underpin sustainable ongoing population growth and economic development in the Council area. This is consistent with Priority A4 of the NSW State Plan (2010).
- Contribute to the maintenance of coastal landscapes and coastal access for recreation, in keeping with Priority A8 of the NSW State Plan (2010).
- Contribute to the implementation of the HCRCMA CAP (2007) and the Lower Hunter Regional Strategy (LHRS) (Department of Planning 2006) as their priorities relate to Wyong Shire Council.
- Be consistent with the Central coast Regional Strategy and specific local area settlement strategies such as for The Entrance.

F.5 Community and Stakeholder Engagement

The following reproduces (verbatim) the sections listed in Table F-6 from Umwelt's (2011b) *Coastal Zone Management Plan for the Wyong Coastline: Supporting Information Volume 1,* which refer to the Community and Stakeholder Engagement completed for the WCZMP 2011. References mentioned within the below reproduced text by Umwelt refer to Sections, Figures, Tables etc. presented in their 2011(b) document.)

Table F-6 Reference to Information in the WCZMP Supporting Information (Umwelt, 2011b)

Information	WCZMP Supporting Information (Umwelt, 2011b) Report Part/Section reference
Community and Stakeholder Engagement	Part A Section 3.3 Part C Section 15.2 (Description of Stakeholders)

BMT WBM highlights the below reproduced text has been copied verbatim from Umwelts' (2011b) 'Coastal Zone Management Plan for the Wyong Coastline: Supporting Information' and is included within this document on request by Council. Intellectual property rights of the below material remain with Umwelt Pty Ltd.

3.3 Community and stakeholder engagement

As shown in Figure 3.1 and set out in the principles and objectives of sustainable coastline planning (PART B, Section 5.0), stakeholder and community engagement and active involvement in planning and decision making is an essential part of effective coastline management.

The coastline is a focal point for the lifestyle of many residents of the Central Coast. The Central Coast beaches also attract large numbers of visitors over summer weekends and peak holiday periods (see PART C, Section 16.0). All these individuals have an interest in how the coastline is managed.

Table 3.2 summarises the types of stakeholders with an interest in the future management of the Wyong coastline and the scope of that interest.

Section 3.3.1 discusses opportunities for Council and agency stakeholders to contribute to the development of the WSCZMP.

Section 3.3.2 outlines opportunities for the community to contribute to the preparation of the coastline management plan and Section 3.3.3 presents comments made by community representatives at a range of community meetings held during the preparation of the WSCZMP.

Table 3.2 - Stakeholders and broad areas of interest

Who?	Scope of interest and responsibility
Council – Environment and Planning Services, Corporate Services, Community and Recreation Services, Infrastructure management Departments. (see **Section 15.3** in **PART C**)	Strategic planning and leadership Coastal land use planning Coastal asset management (e.g. sewer and water infrastructure, sea walls, stairways, ramps, swimming pools etc.) Emergency response during coastal storms Protection of important ecological communities Protect significant cultural places Safe community access to and usage of beaches, rock platforms and headlands Support economic development and employment Provide recreational spaces and facilities suitable for diverse users Keep local communities informed about risks and about Council decisions or actions Support and encourage sustainable coastal communities Research and monitoring at the local scale Reporting on environmental condition at the local scale

Who?	Scope of interest and responsibility
NSW Government, including OEH, DP&I, NSW Maritime Authority, DTIRIS, DPI (relevant sections of former L&PMA) and HCRCMA (see **Section 15.4 in PART C**)	Set objectives and targets for natural resource management and for community development in the coastal zone, through the NSW State Plan and Catchment Action Plans. Whole of coastline guidance on important coastal processes, policy responses and best practice management responses (e.g. sea level rise, climate change and appropriate planning requirements) Technical advice on coastal processes Encourage transparent and risk based decision making by local government Manage Crown land (including the sea bed) and National Parks, Nature Reserves and State Conservation/Recreation Areas. Provide targeted funding for management actions under relevant state programs Provide guidance and support for effective responses to coastal emergencies Identify and set frameworks for protection of important coastal ecological communities and heritage places (ecological communities and heritage places of State significance) Manage and maintain key coastal infrastructure such as ports (e.g. roads, power supply, breakwalls) Set statutory requirements for performance of coastal infrastructure such as sewage treatment plants and discharge points/processes Set standards and benchmarks for environmental quality, development quality and community health Funding of projects to encourage sustainable communities Conduct research and monitoring programs at scale not achievable by local councils.
Australian government (see **Section 15.5** in **PART C**)	National scale research and reporting on the impacts of climate change on coastal communities – vulnerability and preparedness Research on coastal adaptation to climate change, including emergency management Protection of natural and cultural assets of national significance (i.e. items on the National Heritage lists or identified in schedules of EPBC Act) Funding to State and local organisations for projects that address National natural resource priorities Set National Standards and benchmarks for environmental quality
Non Government Organisations (Peak – National, State and regional scale) (See **Section 15.1** in **PART C**)	Highlight important conservation and sustainability issues Support local community groups to become engaged in decision making and management Conduct research and provide information on issues Lobby for changes to statutory and policy frameworks

Who?	Scope of interest and responsibility
Local community organisations – environmental and community development (see **Section 15.1** in **PART C**)	Assist with documentation of the condition of community assets (built and natural) in local areas Identify and describe coastal values such as scenic amenity, attachment to place etc. Provide advice on the type of development in local communities – scope of acceptable change Access to beaches and headlands and guidelines for use (e.g. dog exercise areas) Direct involvement in restoring ecological communities, removing weeds etc. – improve or maintain coastal vegetation and habitats.
Chambers of Commerce and local businesses	Coastal development requirements Tourism opportunities and support (including public facilities) Economic development and employment opportunities Risks to coastal assets
Insurance industry	Coastal hazards and related risk profiles for development on coastal dunes, low lying coastal land and headlands Risk profiles for beach users (safety of beaches and rock platforms that are open to the public)
Landholders (see **Section 3.3.3** for a summary of the issues raised and comments made by landholders), including those in the project area and those Wyong residents who live away from the coastline, but benefit from access to the coastline.	Property values Development and redevelopment opportunities and constraints on private ocean frontage land or land affected by other coastal hazards Lifestyle – access to beaches and headlands, visual quality, environmental quality, access to other community facilities, security, quality of life Protection of coastal scenery and access to socially valued places such as long favoured family holiday locations. Recreational uses – boating, surfing, swimming, fishing, walking, jogging, bird watching etc.
Indigenous residents	Protection of coastal places of cultural heritage value, including Aboriginal heritage sites, gazetted places, places associated with stories and traditional knowledge, places which illustrate the resources utilised by traditional Aboriginal people in the past and still used by Aboriginal people today.
Tourists/visitors.	Quality of facilities for recreation and tourism Scenic amenity Safe beach access to beaches, dunes, headlands and rock platforms for users with a variety of capacities (age/health etc.) and for a range of recreation uses, such as fishing, swimming, boating, surfing, walking, jogging etc – as for residents. Value for money of holiday opportunities

3.3.1 Council and agency stakeholder participation and perspectives

3.3.1.1 How have Council and agencies contributed to the Plan?

Multiple NSW government agencies have an interest in the future management of the coastline (see Section 15.3 in PART C for details of statutory responsibilities, policies and plans). Key agencies are included in the membership of the Tuggerah Lakes Estuary, Coastline and Floodplain Management Committee (see Section 3.3.2.1) and support the committee with technical advice about advances in coastal science, coastal management and new policy or statutory controls.

Agency representatives have contributed to discussion about the draft WSCZMP as part of the Committee.

During the preparation of the coastline management plan all relevant agencies were also invited, in writing, to contribute information about key issues from their perspective, as well as current or upcoming management initiatives. Information from State agencies, provided in response to these invitations, is included in Section 15.3 in PART C.

OEH has assisted Council with technical review of coastal hazard studies, to ensure that data and methods are in accordance with NSW standards. OEH has also assisted Council with advice and feedback about potential planning responses to climate change risks.

A wide range of Council planning staff have participated in discussion of how Council can best manage risks to its existing assets and to public land (Crown land and community land) for which it is responsible along the coastline. Council officers have also provided input about planning responses to manage development proposals for public infrastructure and for private residential or commercial development in coastal risk areas.

Implementation of the WSCZMP will require commitment from diverse sections of Council, to deliver integrated risk management and to ensure that Council benefits from the opportunities flowing from sustainable management of the coastline.

More information about Council's responsibilities and current management approach is in PART A, Section 2.1 and in Section 15.2 of Part C.

3.3.2 Community engagement

WSC values the input of residents, ratepayers and community groups in the preparation of the WSCZMP. Community involvement provides two way benefits, such as:

- Increased awareness and understanding of coastal processes and how they shape the coastal landscape at different time scales.
- Contributing information that helps to define coastal values – what's important to the community, what should be protected for future generations and why.
- Helping to 'ground truth' – hazard studies with experience of coastal condition after past storms, where other evidence, such as suitable timed aerial photos is not available.
- Contributing to the process of setting objectives for the future of the coastline in their local area.
- Contributing ideas about how the coast should be managed and how specific issues should be addressed.

- Contributing information which helps to sort effective management responses from less effective management responses.
- Implementing actions – community involvement in Landcare, Coastcare and Waterwatch activities are examples, as well as actions that require communities to modify their behaviour (such as in relation to vehicles on beaches or access tracks across dunes).
- Contributing to monitoring of progress, review of the effectiveness of the plan in delivering agreed objectives and reshaping priorities if necessary.

Section 3.3.2.1 discusses how WSC has involved the local and regional community in the preparation of the WSCZMP.

3.3.2.1 Opportunities for involvement

WSC established the Tuggerah Lakes Estuary, Coastline and Floodplain Management Committee (TLEC&FMC) more than 15 years ago. Committee members represent Council, agencies, local community organisations and landholders. The Committee is a key mechanism for Council to work with its community on a range of issues affecting the coastal zone (i.e. the coastline and the Tuggerah Lakes estuary). The Committee meets monthly. Members helped develop the scope of work for the preparation of the WSCZMP and the Committee is regularly briefed about progress.

At the commencement of the coastline planning project in late 2003, Council and consultants used a project launch event, press releases and a project web site to invite community input about variable coastal processes, coastal landforms, coastal activities and coastal values.

Information about the project launch is included in Appendix 1. Following the Project Launch event, 22 community group representatives attended an initial project briefing and field day. This included a briefing session at The Lakes Surf Club and inspections of several important locations (chosen by residents), such as Budgewoi dunes and North Entrance area with local residents. Interest groups attending included Coastcare, Precinct Committees, Progress Associations, Fishing Clubs, Surfrider Foundation, Dunecare, Residents and Ratepayers Association, Bushcare, SES, Norah Head Search and Rescue and Norah Head Lighthouse Community Trust.

Issues and comments from this introductory community day are included in Appendix 1.

In November 2004, following the completion of preliminary draft coastal hazard studies, residents affected by coastal hazards were invited to attend a briefing. The presentation included geotechnical issues and coastal erosion issues. About 50 people attended this presentation at Long Jetty Senior Citizens Club. The draft coastal erosion studies discussed at this meeting were based on Intergovernmental Panel on Climate Change (IPCC) 2001 sea level rise predictions and modelling using ‘sBeach’. A workshop style component of this meeting allowed residents to comment on coastal values and how they could be affected by the predicted coastal hazard scenarios. Most resident attention was focused on the impacts of coastal processes on homes and property values. A summary of comments made at this meeting is provided in Appendix 1.

Due to the rapidly evolving scientific, technical and policy context for coastal zone management, WSC placed the coastline project on hold until 2007, but continued to progress its estuary management planning process.

The coastline planning process was fully reinstated as a project in mid 2009. Council invited residents to attend a briefing and workshop in November 2009. The project web site was also reinstated at this time. This workshop was used as an opportunity to brief residents about the many changes to coastal zone science and the management framework which would now influence the development of the Coastal Zone Management Plan. The workshop was also a new opportunity for residents to provide comments about coastal land uses, coastal values and coastal issues. Comments made at the briefing are summarised in Section 3.3.3.

Council held a second community meeting in March 2010. Approximately 60 people attended this meeting. At this meeting, OEH provided a briefing about sea level rise and why it is a significant issue for the NSW coast. Council's consultants provided a briefing about the types of responses that are available for managing risks associated with coastal process hazards and discussed some of the aspects of these options that make them effective for certain applications and impractical for other applications. Attendees then had an opportunity to discuss in small groups how the various management options could be applied to the Wyong coastline. Notes from the discussion are included in Appendix 1. A brief summary of the community comments about the merits of various management options is included in Section 3.3.4.

3.3.2.2 Other consultation opportunities

Since 2009, residents and ratepayers have been able to contribute comments about coastline management in Wyong Shire via Council's web site and blog.

Separately to consultation about the WSCZMP, Council has consulted residents and ratepayers about the preparation of its Climate Change Policy (Wyong Shire Council 2010). Because of the vulnerability of coastal property to aspects of climate change, there is some cross over between the issues considered in the two processes.

Council's natural resources and sustainability officers have made a number of presentations to precinct committees about issues considered and progress towards both the climate change policy (Wyong Shire Council 2010) and the CZMP. Section 3.3.5 outlines the results of discussion at these meetings.

3.3.2.3 Exhibition of draft hazard studies, management study and Plan

After review by Council's Coast, Estuary and Floodplain Committee and approval by Council, the draft WSCZMP will be exhibited for approximately ten weeks. Council will conduct community information sessions during the exhibition period and will welcome comments in writing – by email, letter or on the Council blog.

All feedback will be collated and reviewed, for discussion with the TLEC&FMC, and will be included in a new appendix to the Plan.

Preparation of a final draft of the Coastal Zone Management Plan will follow endorsement of proposed amendments to the exhibition draft by the TLEC&FMC and OEH.

The final draft Plan, endorsed by the Committee, will be recommended for adoption by Council.

3.3.3 Consultation about the coastline management plan - issues

This section summarises the key issues and themes from community comments made during initial consultation about the coastline management plan in 2004 and more recent consultation in 2009. Appendix

1 contains copies of community brochures and presentations made during the preparation of the WSCMP. Also in Appendix 1 are detailed notes of comments made by community representatives at meetings, field days and briefings from 2004 to 2010.

Key issues and themes of concern to residents and coastline users are:

Coastal erosion and inundation threaten private property

- Homes and properties at North Entrance are threatened by coastal erosion, which is predicted to become more severe. What will Council do to help landowners protect their assets?
- Homes and properties at Cabbage Tree Harbour are affected by landslip issues. What will Council do to help people protect their assets?
- What will happen to the value of property and people's assets if erosion is not controlled?
- Some properties on low lying land are predicted to be affected by lake and ocean flooding as sea level rises. Predicted hazards are greater than when land owners first acquired these properties. Landowners are concerned that policies set to address climate change hazard will constrain the use of their land.
- The need for Council and agencies to take coastal erosion hazards seriously and to manage impacts on both public and private land
- The quality of sand and the merit of placing sand dredged from the lake entrance on North Entrance or The Entrance Beaches

Climate change science

- What is the evidence that climate change is affecting the Wyong coastline? Some residents were distrustful of reported climate change science. In particular, some land owners are distrustful of predicted sea level rise and of reports of sea level rise and temperature change that has occurred over the last century. Some residents are also concerned that the methods used to assess coastal erosion and recession hazards have significant error margins and lead to conservative assessments of coastal risks that they regard as misleading for land holders.

Community contributions to coastline management

- Residents and long term visitors have a strong attachment to the coast, across multiple generations in some families. They want to feel that this sense of attachment is respected in the planning process.
- The valuable contribution of community groups to the management of the coastline, in terms of submissions about important issues, keeping agencies accountable, and long term commitment to on ground works (e.g. Dunecare and Bushcare) and the level of support provided by agencies and Council. See Section 15.1 in PART C for examples of on ground projects.

Development and natural landscape

- The importance of balancing the development, commercial, recreational and social values of the coastline with its natural and conservation values. For instance, threatened species such as Little Terns nest on some beaches.

Coordinated and accountable management

- The need for a close partnership between agencies with responsibilities for managing the coastline – particularly between WSC and the Land and Property Management Authority

Recreational uses and amenity

- The importance of maintaining safe, quality, robust and integrated facilities, such as steps, ramps, seating, playground facilities, shade, toilets, fish cleaning tables, boat ramps to the ocean etc., particularly in popular and high usage locations.
- The value of surf club facilities to the community and the diverse social, safety, communication and economic roles of these facilities.
- Appropriate landscaping for coastal reserves – for instance, are Norfolk Pines the right species? Where and how should bitou bush be removed and what should replace it?
- Potential conflicts between different beach users such as commercial fishers and walkers/swimmers.
- The impact of beach access ways on dune stability (blowouts).
- The importance of maintaining safe beach access – for instance the need for robust access ways or rapid reinstatement after storm erosion.
- Sewage pump stations on coastal dunes sometimes overflow, and may impact on water quality. Stormwater can also affect water quality and exacerbate erosion problems.
- The importance of safe access to the coast for community well being.
- The importance of an attractive, safe and well maintained coastline to well being and economic prosperity.
- The importance of maintaining public access to beaches and dunes, as the coast recedes with sea level rise.

3.3.4 Community comments - options

At the community meeting on 31 March 2010, participants were able to question Council, OEH officers and Council's consultants about all aspects of coastal science, climate change and potential management responses.

Small groups of participants discussed a range of generic management options for the coastline. Each group considered the locations along the Wyong coastline where the various management options could be applied. The groups also discussed the sustainability of the various options, from environmental, social and economic perspectives. The comments provided by participants are summarised in Table 3.3. The results of this discussion have been considered in evaluating the full range of options for managing the coastline (PART D). PART D considers appropriate locations for applying various options; risk reduction benefits; policy, statutory and cost constraints; as well as the likelihood of community acceptance and support for the action as a way to reduce risks in the coastal context.

3.3.5 Other community meetings and briefings

During the preparation of the draft Plan, Council met with local community progress associations and precinct committees, providing each group with some background about the project, and how technical, policy and community input have been integrated to identify the management direction and priority actions set out in the draft WSCZMP. Community organisations were invited to provide feedback and a number of issues were raised, including the following:

- How Management Plans for the Tuggerah Lakes and the coastline are related.

  Information: WSC adopted an Estuary Management Plan for the Tuggerah Lakes about five years ago and has been implementing that Plan using special funding obtained from the Australian government. The Estuary Management Plan covers issues inside the entrance of Tuggerah Lakes.

  The Coastal Zone Management Plan, when adopted, will focus on issues caused by the interaction of coastal processes (ocean waves, tides and currents, water level) and coastal landforms and land uses. These processes apply outside the entrance to Tuggerah Lakes. The Coastal Zone Plan considers impacts on the Tuggerah Lakes system for those situations when coastal processes affect the form and health of the lake system, including dredging of The Entrance as a source of sand for beach nourishment.

  What do the sea level rise benchmarks adopted in the NSW Sea Level Rise Policy Statement mean for residents living around the lake shore and the ocean frontage?

  Information: For details about how the NSW Government Sea Level Rise Policy Statement affects the assessment of risks along the coast, see Section 15.3.2 in PART C of this report. For details about how the Sea Level Rise Policy Statement could affect people living around the shores of Tuggerah Lakes (i.e. properties that could be affected by higher lake levels), see the estuary management section of WSC's web site.

  How coastal hazard lines will change from what is currently available when the new coastal zone management plan is adopted.

Table 3.3 - Community responses for the sustainability of management options, March 2010

	Where could it be applied?	ENVIRONMENTAL SUSTAINABILITY	SOCIAL SUSTAINABILITY	ECONOMIC SUSTAINABILITY
Beach Nourishment Note: Should be done in conjunction with vegetation management	• Bateau Bay • Shelley Beach • The Entrance (including near the channel) • North Entrance (beach near Curtis Pde) • Cabbage Tree Harbour • Soldiers Beach • Lakes Beach (SLSC) • Blue Lagoon • Hargreaves Beach • Jenny Dixon Beach	STRENGTHS: • Generally replicates existing environment • Opportunities to refine, correct and adapt process WEAKNESSES: • Potential impact on beach ecology • Potential Acid Sulphate Soils • Potential impact on offshore ecology • Impacts on source/mining area's ecology	STRENGTHS: • Safety, i.e. covering exposed dangerous items • Delays impacts so other options can be considered • Maintains beach use amenity WEAKNESSES: • Dredging and nourishment can affect short term use • May not get community acceptance	STRENGTHS: • Minimise potential need for property acquisition • Retains beach amenity for local tourism economy etc • Mutual benefit in dredging sand from channel to reduce risk and increase amenity • Protects property and assets WEAKNESSES: • Only temporary, therefore ongoing expenditure • Not cost effective to use for most areas on Wyong's coastline • Costly (transport and extraction)
Coastal Vegetation Management	• North Entrance • Budgewoi • Tacoma • South Tacoma • Lake Foreshores (Lake Munmorah, Budgewoi) • River Banks • All river mouths (Wyong, Tumbi and Wallorah Creek) • Riparian Zones	STRENGTHS: • Protect property • Habitat for flora and fauna • Increased ecology • Protect biodiversity • Improved micro-climate WEAKNESSES: • Cost to homeowners • Loss of species • Pollution	STRENGTHS: • Improved aesthetics of vegetation WEAKNESSES: • Loss of access • Amenity loss • Could diminish way of life	STRENGTHS: • Preservation of species and biodiversity for future human needs WEAKNESSES: • Property loss to vegetation encroachment • Devalue property (loss of views etc.)

	Where could it be applied?	ENVIRONMENTAL SUSTAINABILITY	SOCIAL SUSTAINABILITY	ECONOMIC SUSTAINABILITY
Sea Walls and Other Structures	• South Entrance • North Entrance • Cabbage Tree Harbour	STRENGTHS: • Protect biodiversity behind wall • Training walls can help keep the lakes entrance open and flushed • Artificial reefs and headlands can encourage biodiversity WEAKNESSES: • Loss of beach due to erosion in front of wall • Change to natural sand movement • Environmental effects of structure falls apart or not properly maintained • Disruption to sand dunes and vegetation during construction phase • Increased erosion longshore or in other areas from seawalls	STRENGTHS: • Protect private property as well as council infrastructure and other assets • Protect highly developed areas • Artificial reefs can improve surfing breaks WEAKNESSES: • Loss of natural appeal • Loss of beach width	STRENGTHS: • Protect valuable assets • Job creation in construction and ongoing maintenance WEAKNESSES: • Very expensive • Liability issues if structure fails or causes damage somewhere else

	Where could it be applied?	ENVIRONMENTAL SUSTAINABILITY	SOCIAL SUSTAINABILITY	ECONOMIC SUSTAINABILITY
Planned retreat	• Anywhere under the 1/100 flood line that is depicted for 2100 using OEH benchmarks • Large new developments	STRENGTHS: WEAKNESSES: • Loss of amenity • 'Run out' of land	STRENGTHS: • Reduce risk of flooding • Stay in preferred location/lifestyle • Opportunity for landowners further back to become new waterfront property WEAKNESSES: • Loss of local communities • Loss of everything due to lack of insurance for landowners when a natural disaster occurs • Legal problems	STRENGTHS: • Potential cost of removing/relocating may be less than trying to "stop" the water and erosion WEAKNESSES: • Cost for future owners • Possible devaluing of land • Reduced number of land owners could reduce rates base thereby increasing rates for rest of community • Increased insurance costs • Legal mine field
Compulsory and Voluntary Acquisition	• Low Lying Areas • Cliff Faces • Chittaway Bay • Rocky Point • Hargreaves Beach • Jenny Dixon Beach • Cabbage Tree Harbour	STRENGTHS: • Land may be used for environmental protection • Increased biodiversity WEAKNESSES: • Reduced funding available for environmental initiatives	STRENGTHS: • Includes owners in decision making process (in voluntary acquisition), and other owners may follow suit. • Allows owners to move on • Reduces liability WEAKNESSES: • Loss of home • Social upheaval consequences (incl. stress and depression) • Litigation • People have sentimental value of home (which they may lose)	STRENGTHS: • Reduces ongoing liabilities • Could be more cost effective over a long period of time • Voluntary acquisition reduces litigation costs WEAKNESSES: • Could be very expensive • Reduced number of land owners could reduce rates base thereby increasing rates for rest of community

	Where could it be applied?	ENVIRONMENTAL SUSTAINABILITY	SOCIAL SUSTAINABILITY	ECONOMIC SUSTAINABILITY
Do Nothing	Everywhere	STRENGTHS: • Development tendencies would change because of risk so people would build on higher ground • It would avoid the impacts of 'coastal works' and continued maintenance WEAKNESSES: • Vulnerability • Loss of biodiversity • Lack of planning • Potential for catastrophic disasters • Neglecting responsibility	STRENGTHS: • Avoid conflict in the short term between government, landowners and other stakeholders WEAKNESSES: • Loss of beach amenity Liability (I.e. council not acting in good faith) • Increased threat to life and property	STRENGTHS: • Cheap in the short term WEAKNESSES: • Depleted land value • Loss of infrastructure • Loss of tourist income • Reduction in opportunities • Increased insurance or losing ability to insure • Mortgage impacts

Information: The coastal hazard lines adopted with the WSCZMP will reflect the most up to date information and assessment of oceanic water levels, storm waves and storm erosion, now and for 50 and 100 year planning horizons. The hazard lines could be amended in the future as new information becomes available.

- A number of questions about dredging the entrance to the Tuggerah Lakes.

  Information: Dredging within the Tuggerah Lakes for the purpose of maintaining tidal exchange is managed under the Estuary Management Plan. The WSCZMP recommends that dredging of the tidal delta just inside the entrance should continue, with the sand being placed on North Entrance or The Entrance Beaches, to help maintain beach volume. Over time, the dredging protocol will need to be reviewed, to maintain the best approach as sea level rises and entrance processes respond accordingly.

- Windblown sand from North Entrance Beach that ends up in Curtis Parade is currently classed as 'contaminated' and cannot be placed back on the beach. What volume of sand is being lost in this way?

  Information: Council will investigate the reasons for classifying this sand as contaminated and the volume of sand that may be involved.

- Will changes in State policy and legislation affect the validity of the Plan?

  Information: The WSCZMP is being prepared in consultation with the NSW Government – particularly OEH, DPI (relevant sections of former L&PMA) and DP&I. It reflects the most up to date State policy and legislation. As necessary, the adopted Plan can and will be updated if significant changes to the policy context occur over the next ten years.

- Safety issues at Cabbage Tree Harbour, concerning both the boat ramp, rubbish on the beach and signage about potential land slip.

  Information: WSC is continually reviewing its management of areas of Cabbage Tree Harbour that are affected by geotechnical hazards, in the light of expert advice. Options to improve the safety of the Cabbage Tree Harbour boat ramp, which is the only formed, open ocean access ramp in the Shire, are considered in Section 19.7 of PART D.

- There were also questions about the timing of construction of proposed toe protection works at Cabbage Tree Harbour.

  Information: Council will fund this construction 50/50 with the NSW Government. Council has submitted detailed plans and funding applications to the NSW Government. Construction will commence as soon as the necessary funding is approved. Details about the proposed structure and cost implications are in Section 19.0 of PART D.

- Stormwater erosion at Soldiers Beach

  Information: The WSCZMP considers the effects of storm water erosion on beaches, bluffs and rock platforms at several locations. However, stormwater erosion is a minor contribution to sand loss from open coast beaches during storms and in comparison to the predicted loss of beach volume due to sea level rise drive coastal recession.

15.2 Community stakeholders, management activities and issues

Section 15.2.1 introduces some of the key community stakeholder groups that currently contribute to the management of the Wyong coastline.

Council provides regular consultation opportunities for many of the community interest groups through the Tuggerah Lakes Estuary and Coastline Management Committee (Section 15.2.1.1). Sections 3.3.3, 3.3.4 and 3.3.5 in PART A outline the issues and options that have been raised by community stakeholders during the preparation of the WSCZMP.

15.2.1 Community stakeholder groups

15.2.1.1 Tuggerah Lakes Estuary and Coastline Management Committee

The Tuggerah Lakes Estuary, Coastline and Flood Risk Management Committee (TLEC&FMC) is a Committee of Council. The Committee meets monthly at Council and secretariat services for the Committee are provided by Council's Environment and Natural Resources Unit (see Section 15.3.2). The Committee provides a reference group for Council's management of the Tuggerah Lakes estuary and the Wyong coastline. Its agenda includes technical presentations on new coastal zone management tools relevant to the Wyong area and review and discussion of coastline and estuary planning documents prepared by Council or on behalf of Council.

The Committee membership includes:

- Councillors
- Council officers responsible for coast and estuary management
- State agency representatives, such as OEH, SES, DPI (relevant sections of the former L&PMA) and DTIRIS
- Representatives of community organisations with interest in the management of the coastal zone. This includes precinct committees from coastal residential areas, surf life saving clubs, volunteer coastal patrol and Landcare/Coastcare groups.

In relation to the preparation of the WSCZMP, the TLEC&FMC has considered project scope and costing issues, has received monthly updates on progress in preparing the hazard studies and management studies, has participated in open community meetings and has received briefings on key issues.

The TLEC&FMC has been briefed on and had an opportunity to review the draft of the coastal hazard studies (coastal erosion and geotechnical issues) and the draft WSCZMP, before they were formally presented to Council for approval to exhibit.

15.2.1.2 Landcare, Coastcare and the Central Coast Environment Network

There are 36 community groups under the Landcare/Bushcare/Coastcare umbrella across Wyong Shire. Six of these focus their activities on coastal areas, including those listed below, each listed with their stated key activities. Landcare and Coastcare groups are primarily interested in restoring natural dune vegetation, enhancing biodiversity and building the resilience of dune habitats.

- Bateau Bay Bushcare: bush regeneration and large scale tree planting. Central Coast Environment Network (CEN) has identified the Bateau Bay foreshore area and Flora Reserve as key components of ecological connectivity in their 'Stepping Stones' project. This project aims to improve connectivity between coastal and estuarine habitat areas, including the northern and southern sections of Wyrrabalong National Park, by enhancing linkages in reserves along the Long Jetty lake shore and at Bateau Bay.
- Birdie Beach Dunecare: Regeneration of sand dunes and littoral rainforest
- Budgewoi Dunecare: The group's objective is to encourage involvement of the community in the restoration of the natural environment. Its projects have included beach access construction, bitou control, construction of dune forming fences and planting. Budgewoi Dunecare has prepared a detailed Action Plan (2010) for its current operations. The Dunecare group has worked in the Budgewoi area since 1996 and Dunecare volunteers have invested 41000 hours of their time in vegetation restoration and habitat enhancement works since then. Other significant achievements over the last 15 years include installation of constructed access ways to separate beach users from regenerating areas, establishing a propagation facility (with OEH) which has produced 35,000 endemic tube stock, and stabilising mobile dunes. The group reports that once rapidly transgressing dunes (at around 1.5 metres per year) are now fully stable. Budgewoi Dunecare has been awarded local and regional awards for natural heritage management. The group's area at Lakes Beach was chosen by OEH for the launch of the NSW Dunecare Manual.
- Coastcare T.E.N (The Entrance North): bitou control, construction of dune forming fences, planting
- Hargraves Beach Dunecare: Bitou bush control, construction of dune fencing, planting dune species, regeneration of littoral rainforest.
- Norah Head Coastcare Inc (also a residents and ratepayers organisation): bush regeneration, weeding, planting, coastal walk maintenance.

CEN and Wycare Inc. have broader interests but also do work and support other groups along the coast, including providing training and coordination. Wycare and CEN, together with HCRCMA, Lake Macquarie City Council, Gosford City Council and Wyong Shire Council are joint sponsors of the Central Coast Annual Landcare Forum, which provides networking and training opportunities for Landcare members from the region.

Wycare, Budgewoi Dunecare and CEN have received grants to carry out a range of on the ground activities to stabilise coastal landforms, remove nuisance weeds and improve the condition of the coastal ecological communities. Examples include:

- Budgewoi Dunecare received a grant of $25,000 from the Australian Government Caring for our Country Program in the 2008 funding round for a dune rehabilitation project on a 13 hectare site at South Budgewoi. The dune had previously been degraded by rutile mining, sand extraction, weed invasion, and public access. Existing vegetation was predominantly Bitou Bush, with a small area of coastal sedge land. The funded works included weed control, minor dune reshaping and the growing and planting of 5000 endemic seedling plants. The project also involved fencing of car parks, construction of pathways and new signage for beach users

- In the same funding round, CEN received a grant of $37,000 for a broad coastal dune rehabilitation project, for multiple sites in Wyong and Gosford Council areas. The project included training/skill development for community volunteers, demonstration sites and on the ground works. It focused on enhancing the vegetation cover on coastal dunes to increase their resilience to a range of current and future threats, including recreation pressures and climate change.

15.2.1.3 Local Progress Associations, Precinct Committees and Ratepayers groups

Managing the interaction between coastal processes, private property, infrastructure and community services is a key interest of local community organisations, particularly as predicted long term coastal erosion is likely to impact on both the investments and lifestyles of coastal residents and ratepayers. Examples of impacts include loss of land and building assets, loss of insurance cover, loss of investment returns, and changes to access, views and amenity. Progress Associations and ratepayer groups are also interested in dune vegetation, management of beach access and recreation facilities along the coast.

Organisations with coastline interests include:

- Wyong Shire Residents and Ratepayers Association Inc.
- Budgewoi Precinct Committee
- Norah Head Residents and Ratepayers Organisation (and Coastcare)
- Lake Munmorah Progress Association
- The Entrance Community Precinct Committee

15.2.1.4 Surf Life Saving Clubs

There are six surf life saving clubs associated with patrolled beaches along the Wyong Council coastline:

- The Entrance
- North Entrance
- Toowoon Bay (established 1954)
- Lakes Beach (established 1953)
- Soldiers Beach (established 1953). Approximately 149,000 visitors now use Soldiers Beach each summer
- Shelly Beach

The locations of each of these beaches and clubs are shown in Figure 1.1.

Apart from providing lifeguard services at each of the six patrolled beaches on weekends and public holidays, the surf clubs contribute to environmental management on beaches and dunes and provide a venue for a wide range of community activities and values. These are discussed further in Section 17.2.8.

15.2.2 Previous community comments on coastal zone values, objectives and issues – related planning contexts

Several previous projects, conducted by State and local government, have engaged the community in discussion of issues in the coastal zone generally and specifically for Wyong Shire. Examples that are relevant to the WSC area include the NSW Government 'Who Cares about the Environment' surveys (see www.environment.nsw.gov.au) and Council's own wide ranging community engagement about the management of the Tuggerah Lakes. WSC has also consulted residents and visitors during the development of the planning strategy for The Entrance Peninsula area (2005-2009). Information about The Entrance Peninsula Strategy is included in Appendix 5.

Information about consultation during the preparation of the WSCZMP is in Section 3.3 of PART A. Details of community information provided during the project are in Appendix 1.

F.6 Description of Coastal Management Issues

The following reproduces (verbatim) the sections listed in Table F-7 from Umwelt's (2011b) *Coastal Zone Management Plan for the Wyong Coastline: Supporting Information Volume 1,* which refer to the Description of Management Issues associated with the Wyong coastal zone. References mentioned within the below reproduced text by Umwelt refer to Sections, Figures, Tables etc. presented in their 2011(b) document

Table F-7 Reference to Information in the WCZMP Supporting Information (Umwelt, 2011b)

Information	WCZMP Supporting Information (Umwelt, 2011b) Report Part/Section reference
Description of Coastal Management Issues, including: • Impact of coastal processes on valued coastal landscapes • Increasing population and demand for access to coastal 'services'	Part A Section 4.1 Section 4.2

BMT WBM highlights the below reproduced text has been copied verbatim from Umwelts' (2011b) 'Coastal Zone Management Plan for the Wyong Coastline: Supporting Information' and is included within this document on request by Council. Intellectual property rights of the below material remain with Umwelt Pty Ltd.

4.1 The impact of coastal processes on valued coastal landscapes

Coastal process impacts are related to beach and dune erosion by waves, inundation of low lying land by raised sea levels and landslips on cliffs and bluffs. Some of these processes are already having a significant impact on coastal values; others will increase or become more severe as climate changes and sea level rises over the next century. This time frame is within the expected life of existing buildings and infrastructure.

The intensity of coastal processes is naturally variable. In the medium to long term, predicted sea level rise and other aspects of climate change will affect the variability of coastal processes. For instance, sea level rise affects the frequency of events associated with extreme water levels, such as wave overtopping of the low sandy barrier, as well as driving coastal recession.

A broad range of impacts and issues is noted in this section to highlight the scope of concerns to be addressed in planning for a sustainable coastline. Details about coastal processes, predicted changes in their intensity and impact and an evaluation of the significance of associated risks are in Section 16.0 (PART C). Multiple possible options for reducing risks associated with these processes are evaluated in PART D.

Coastal erosion and inundation processes

Issues include the following:

- loss of structural integrity of existing residences which are located within the zone of wave impact, zone of slope adjustment or zone of reduced foundation capacity, either now or in the longer term;
- erosion of private land and loss of land value, often from current ‘prestige’ properties;
- reduced diversity of future land use opportunities on coastal dunes, time constraints for some land uses;
- loss of structural integrity of surf club buildings which are within coastal erosion zones;
- loss of serviceability of beach access ways after storm erosion events and increased ongoing maintenance costs (see Plate 4.1);
- reduced scenic amenity of the coastline, affecting residents and visitors;
- reduced beach amenity and safety for swimmers and walkers with loss of beach area, beach sand volume and high erosion scarps;
- reduced accommodation capacity of coastal caravan park sites (such as Blue Lagoon) as coastal recession proceeds;
- loss or degradation of coastal vegetation communities (on dunes);
- storm erosion and beach recession impacts on public infrastructure such as sewerage lines, pump stations and water pipes, roads and footpaths;
- loss of structural integrity of existing sea walls (such as at The Entrance), with raised sea levels and storm wave conditions;
- reduced area of land available for recreational facilities such as paths, picnic shelters etc. and increased maintenance costs;
- reduced tourism marketability through reduced image of safe and easily accessed beaches;

- changes to entrance processes for the Tuggerah Lakes and increases in entrance maintenance costs, with flow on effects for other aspects of lake management;
- inundation of properties at North Entrance and other locations during storms and in the longer term during high spring tides (see Plate 4.2);
- reduced drainage efficiency of the storm water system in low lying areas;
- degradation of the ecology of Budgewoi Lake (e.g. sea grass beds) with wave overtopping of the barrier in storm conditions – likely to be more frequent and persistent;
- damage to roads and loss of road access along the Budgewoi peninsula in storm conditions;
- reduced habitat for (migratory) shore birds, many of which are listed under international conservation agreements;
- undermining of heritage buildings/structures on the dunes or rock platform, mostly at The Entrance;
- capacity of NSW and local policy and planning frameworks to deal effectively with climate change impacts; and
- reduced perception of community well being.

Ongoing geotechnical instability of coastal bluffs and headlands.

Specific locations such as Cabbage Tree Harbour, Norah Head and Blue Bay are affected by landslip, slumping and rock fall. Aspects of this issue include:

- loss of structural integrity of existing houses or commercial buildings, decks and other domestic structures;
- reduced property area and loss of land value for affected properties;
- reduced safety of some existing public access facilities (viewing platforms, stairs and ramps) on steep slopes on cliffs and bluffs;
- significant changes required to existing stormwater drainage systems at high cost;
- threats to the integrity of public infrastructure such as roads, sewerage systems;
- uncertainty about interactions of geotechnical processes with local climate change impacts such as rainfall intensity and seasonality and high sea levels in extreme events; and
- risks to the safety of people using rock platforms below the unstable cliff or bluff.

Other climate change impacts

Predicted climate change impacts include increased extreme summer temperature events, changes to rainfall intensity and seasonality and increasing winter storm frequency associated with east coast low pressure systems. Regional scale research on these climate variables is discussed in Section 16.2.4 in PART C. Potential impacts on coastal processes and values include:

- insufficient storm water system capacity to prevent flooding during intense rainfall events;
- increased groundwater flows affecting landslip hazard and increased wave impact on differentially weathered cliffs and bluffs;
- increases risk of stormwater erosion across beaches and impacts on storm water systems on headlands;
- changes to the entrance processes for the Tuggerah Lakes associated with different balances between lake and ocean water levels;
- increased risk of heat impacts on the health of beach users;
- increased risk of storm erosion on beaches and dunes, associated with the southern tracking of tropical cyclones or more winter storms;
- changes to the distribution of coastal habitat, for instance loss of habitat for species at the northern limit of their range and extension southward of habitat for other species;
- potential increases in bushfire hazards for coastal properties; and
- reduced perception of community well being, associated with uncertainty and rates of change.

Climate change also has multiple implications for the Tuggerah Lakes system. These issues are addressed in the Tuggerah Lakes Estuary Management Plan (Wyong Shire Council 2006). Only those matters which are caused by coastal processes increasing their impact on the estuary are specifically addressed in the Coastal Zone Management Plan.

4.2 Increasing population and demand for access to coastal 'services'

The Central Coast, of which the Wyong coastline is a key landscape element is a recognised population growth area in NSW settlement planning. The Central Coast Regional Strategy (Department of Planning 2008) covers the Gosford and Wyong local government areas. It proposes a population increase of just under one per cent per year (or about 4000 people a year) over the next 25 years, so that by 2031, the population of the region will grow by 100,000 people to more than 400,000 people.

Over the last decade, the population of the Central Coast has grown by 2.5 per cent per year, or 7000 people a year, presenting major challenges for all aspects of community infrastructure and services. In addition, the Central Coast currently has a relatively high number of unoccupied dwellings (principally holiday homes), reflecting its history as a holiday centre of Sydney people. Occupancy rates are expected to increase as these holiday homes become the permanent homes of retirees.

The close proximity of the Central Coast to both the Sydney Metropolitan Area and the major urban centres of the lower Hunter means that the potential number of day recreation visitors and regional tourists is high. The Lower Hunter Regional Strategy has identified Morisset, in the southern part of Lake Macquarie LGA, as a major growth centre. The nearest access to the coastline for south Lake Macquarie residents is at Wyong beaches, so growth in the lower Hunter can be expected to increase recreation demand along the Wyong coastline.

The scope of issues associated with increased population growth and recreational demand is noted below. More detail about these issues and a discussion of significance is in PART C, Sections 17.2 and 18.0. Options for reducing risks associated with increasing community demands on coastal landscapes and resources are considered in PART D.

Issues include:

- increased requirements for the capacity of surf club facilities and for beach patrol, including extended season and hours;
- increased safety risks with more people potentially using unpatrolled sections of the coast;
- demand for increased range, capacity and sophistication of facilities in coastal reserves, including parking, kiosks, paths, picnic tables, seating, signage, lookouts, playgrounds, shade, signage etc. Issues include up front capital for construction of new facilities and ongoing high maintenance costs;
- need to improve links between beach front reserves and local commercial centres, for instance at The Entrance, Budgewoi, and Bateau Bay;
- increased demand for parking and beach access ways away from the main patrolled beaches;
- conflicts with residents about parking in residential streets near popular beaches;
- conflicts between users, such as people walking dogs, recreational anglers, bird watchers, off road vehicles surfers and swimmers;
- demand for off beach coastal recreation facilities such as along coast walking paths;
- impacts of large numbers of coast users on coastal habitats such as dune vegetation, vegetation in headland reserves, habitat for shore birds and harvesting of rock platform species;
- interactions of increased demand for facilities and increased risks of coastal erosion;
- increased demand for higher density or higher quality housing in coastal locations, on dunes, headlands and nearby locations with ocean views. This is already apparent at Noraville, The Entrance, North Entrance, Blue Bay and Toowoon Bay;
- interactions of development planning and climate change risks to coastal locations, affecting land prices, design standards and insurance risks; and
- increased demand on beach species such as pipi and rock platform species that are used for bait by recreational anglers.

F.7 Implementation Schedule

The WCZMP 2011 implementation schedule, documented in Umwelt's (2011a) *Coastal Zone Management Plan for the Wyong Coastline* has been reviewed in Appendix C of this current Wyong CZMP 2017. Details of Umwelt's (2011a) CZMP Actions are provided within that Appendix and are therefore not reproduced here. The WCZMP 2011 provided in Appendix G (Section G.1).

F.8 Management Action Plans

The following reproduces (verbatim) the Action Plan Tables listed in Umwelt's (2011b) *Coastal Zone Management Plan for the Wyong Coastline: Supporting Information Volume 1*. References mentioned within the below reproduced text by Umwelt refer to Sections, Figures, Tables etc. presented in their 2011(b) document.

Table F-8 Reference to Information in the WCZMP Supporting Information (Umwelt, 2011b)

Information	WCZMP Supporting Information (Umwelt, 2011b) Report Part/Section reference
Management Action Plans	Part B (Chapter 7.0 – 14.0)
• Coastal Knowledge Action Plan	Chapter 7.0 (Table 7.2)
• Coastal Emergency Response Management Plan, and the EASPs	Chapter 8.0 (Table 8.3), EASP in Appendix 2 of the WCZMP 2011
• Coastal Erosion and Recession Action Plan	Section 9.3 (Table 9.3, Table 9.4 – Potential Future Actions)
• Coastal Inundation Action Plan	Section 9.4 (Table 9.5)
• Lake and Sea Interactions Action Plan	Chapter 10.0 (Table 10.2)
• Geotechnical Hazards Action Plan	Chapter 11.0 (Table 11.2)
• Building Coastal Biodiversity Resilience Action Plan	Chapter 12.0 (Table 12.2)
• Recreation and Tourism Action Plan	Chapter 13.0 (Table 13.2)
• Cultural Landscapes Action Plan	Chapter 14.0 (Table 14.2)

BMT WBM highlights the below reproduced text has been copied verbatim from Umwelts' (2011b) 'Coastal Zone Management Plan for the Wyong Coastline: Supporting Information' and is included within this document on request by Council. Intellectual property rights of the below material remain with Umwelt Pty Ltd.

7.0 Coastal Knowledge Action Plan

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 rowspan="2">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</td><td rowspan="2">Whole of Wyong coastline, to 10 m above sea level</td><td rowspan="2">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>Review period: after two follow up LiDAR surveys</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 rowspan="2">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.</td><td rowspan="2">The role would guide implementation of the WSCZMP for the entire Wyong coastline.</td><td rowspan="2">Allow approximately $80,000 per year. The role would continue for 10 years.</td></tr>
<tr><td>The role would be reviewed within Council's existing performance review</td></tr>
</table>

	process. The coordinator would be involved in the review of implementation annually and after approximately five years.		
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 **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 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 Review period - 3 to 5 years, see Actions A13 and A14	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
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	Sandy beaches along the whole of coastline. Separate refinement of geotechnical models could also be achieved	Allow $5,000 per year. This work is primarily the responsibility of OEH and University researchers.

	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	by making better use of detailed geology, terrain data and slope mechanics equations.	
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

Table 8.3 - Managing Coastal Emergency Response

Step 2: Take action to reduce risk

A3: Integrate Coastal Emergency Response Management Plan with other elements of Council's DISPLAN

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.

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 (Council Services)	Within the first 2 years of the Plan Review period. After the Coastal Emergency Response Management Plan is adopted and integrated, review overall DISPLAN at intervals of not more than 5 years.	Applies to whole of coastline	WSC funds: within existing Council responsibilities

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

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.

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	**When - Priority**	**Where – locations for**	**Indicative cost and**

partners		**investment**	**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.

9.3 Coastal Erosion and Recession Action Plan

Table 9.3 - Strategies for managing coastal erosion risks

Step 2: Take action to reduce risks **A6**: Introduce clauses in the Wyong LEP and DCP to restrict new development in immediate hazard zones. Other than specified coastal protection works, no new development will be approved seaward of the immediate coastal erosion hazard line or seaward of the immediate geotechnical hazard line. All development in the 2050 risk area will require development consent.			
Intent and logic Provide a clear framework, with more certainty for landowners and reduce disputes in the Land and Environment Court. Control new development to reduce risks. Prohibiting new development in immediate coastal hazard zones (immediate coastal risk areas) other than very minor maintenance works, places a limit on the value of existing development and prevents major additional investment which would increase risk. Council will apply the same planning controls to its own activities as it would apply to private development. More details are in Section 9.3.1 and Section 9.3.2.			
Responsibility and key partners	**When - Priority**	**Where – locations for investment**	**Indicative cost and source of funding**
WSC Strategic Planning Support from DP&I and OEH	In new Wyong LEP (due 2010) Review period Review implementation issues within 5 years of	Applies to all land within immediate coastal erosion risk areas in the Shire	No additional budget necessary. Council is currently preparing a new LEP and DCP.

	gazettal of the new Wyong LEP and DCP.		
Step 2: Take action to reduce risk **A18**: Introduce clauses in the LEP and DCP to introduce timed consents for new development in 2050 coastal risk area. Before the expiry date of the timed consent, the land holder must apply and obtain an extension of time, or relocate the structure landward on the block (where this is feasible and approved) or remove the development. Council will review the LEP at intervals of approximately 5 years, using best available knowledge and a review of the costs and benefits of planning controls. Specific and/or local area details are in Sections 9.1.5, 9.1.6 and 9.1.7 of the WSCZMP **A19**: Use clauses in the LEP and DCP to identify appropriate development in coastal risk areas (such as relocatable structures) and to allow for mandatory demolition in certain circumstances. Council will review the LEP at intervals of approximately 5 years, using best available knowledge and a review of the costs and benefits of planning controls. Further details are in Sections 9.1.5, 9.1.6 and 9.1.7 of the WSCZMP. Details are in Section 9.3.1 and Section 9.3.2 These two actions jointly address DP&I requirements that new development respects coastal erosion and recession risks. As noted in A6, all development in the 2050 risk area will require development consent.			
Intent and logic The intent is to increase the resilience of coastal development (outside the immediate coastal risk area) to coastal hazards. The planning requirements will provide clear guidance to Council, land owners and land developers about the location and types of development that is acceptable in coastal risk areas. These clauses will not prohibit development but will guide appropriate development.			
Responsibility and key partners	**When - Priority**	**Where – locations for investment**	**Indicative cost and source of funding**
WSC Strategic Planning, implemented by Development Planning Support from DP&I and OEH	In new Wyong LEP (due 2011) Review period: Review impacts on development applications and land values after 3 to 5 years. Review to also consider ongoing evidence of sea level and other climate change factors.	Applies to all land within the 2050 and 2100 coastal erosion risk areas for the Shire	Within Council's existing responsibility to update its LEP and DCP. No additional budget necessary
Step 2 Take actions to reduce risk **A80**: Zone ocean frontage land that is within the immediate hazard zone for Open Space or Environment Protection **A84**: Introduce appropriate zoning and related clauses into the LEP to de-intensify development in the immediate coastal fringe, which is affected by coastal hazards.			
Intent and logic The intent is to encourage, over time, lower intensity and lower risk development in coastal risk areas. The zoning is consistent with Council's longer term planned retreat strategy. Lower intensity development is also more likely to allow for landward retreat of coastal ecological communities (see A20 and A32).			
Responsibility and key partners	**When - Priority**	**Where – locations for investment**	**Indicative cost and source of funding**
WSC Strategic Planning Directorate and DP&I	Introduce appropriate zoning in current update of the LEP. Where new zonings are not yet	Applies to all land within the immediate, and 2050 coastal risk areas	Within Council's existing responsibility to update its LEP and DCP. No additional budget

	practical, the LEP should sill flag the intent to reduce intensity of the development on the frontal dune system over time. Review period: Council will review the LEP zones at intervals of approximately 5 years, linked to updates of trends in the impact of climate change on the coastline (e.g. from IPCC, NSW Government and from LiDAR analysis at the local scale).		necessary
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. Associated elements of planning measures to reduce risk are in Actions A6 and A18. See Table 7.2 for details about this action.			
Step 2: Take action to reduce risk **A8**: Conduct dune stabilisation and revegetation works to encourage sand accretion and stabilisation of frontal dunes. These on-ground dune maintenance and stabilisation works will be conducted in accordance with Plans of Management for ocean frontage reserves managed by Council. This involves preparation and implementation of vegetation management plans for ocean frontage reserves, to ensure that effective stabilisation outcomes are achieved, without degrading important coastal outlooks. It also includes beach scraping and/or direct dune nourishment to shore up dunes or to move sand from the swash zone to the back of the beach.			
Intent and logic Research observations suggest that vegetation management on coastal dunes is an effective for building resilience because it traps additional wind-blown sand and helps build up dune height and volume, providing a better buffer to coastal erosion. Enhancing dune vegetation also has biodiversity benefits and potential recreational amenity benefits. It can be applied in urban and non urban areas. Dune stabilisation works are important for resilience in the short to medium term. Well established dune vegetation communities are less effective for managing long term recession, but vegetation management programs can be used to stabilise dune forms if they roll landward as sea level rises.			
Responsibility and key partners	**When - Priority**	**Where – locations for investment**	**Indicative cost and source of funding**
WSC Environment and Natural Resources Unit, with Coastcare/Dunecare groups (and CEN) Support from HCRCMA	Immediate and ongoing. Review period: Review success after no more than 5 years. The value of dune rehabilitation works will need to be reviewed as the impacts of sea level rise become more	Key locations are Budgewoi Beach Lakes Beach Soldiers Beach North Entrance Beach Hargraves Beach	Allow $50,000 per year for materials, plus $60,000 per year salary to continue the role of the Landcare coordinator (role covers other aspects of coastal vegetation management too) Funds from CMA coastal

	obvious – likely to be step changes after major storms in the 5 to 10 year planning horizon.		projects funding stream and from OEH programs
Step 2: Take action to reduce risk **A9**: Council will continue to dredge sand from the active tidal delta at The Entrance and place the sand on North Entrance Beach. Some sand may also be placed on The Entrance Beach to maintain beach amenity. This action combines with A28: Review of entrance management strategy as sea level rises.			
Intent and logic Manage sand volume on North Entrance and South Entrance beaches, using locally available sand from the active tidal delta. Council currently dredges sand from the entrance channel of Tuggerah Lake and places it on North Entrance Beach. This small scale maintenance dredging distributes sand that would otherwise be stored in the tidal delta for prolonged periods and would be scoured from the entrance channel to the nearshore area in occasional very large storms/floods. Dredging allows Council to manage sand delivery gradually, rather than in pulses. It also allows control of where sand is placed.			
Responsibility and key partners	**When - Priority**	**Where – locations for investment**	**Indicative cost and source of funding**
WSC asset manager, Environment and Natural Resources Unit, Shire Services Unit and Environmental Assessment unit. Council will work with advice from OEH and will consult with DPI (relevant sections of the former L&PMA) as the land owner.	Ongoing. Review period: Review outcomes at approximately 5 yearly intervals. In the longer term, sea level rise may affect the dynamics of the entrance channel and change the volume of sand available and/or pumping requirements.	Council already uses sand from the channel at The Entrance to nourish North Entrance Beach. Section 10.0 discusses use of dredged sand on both North Entrance and South Entrance beaches.	Allow $80,000 per year. From Council resources (this cost continues an allocation that Council already makes for placing dredged sand on North Entrance Beach)
Step 2: Take action to reduce risk **A10**: Council may build temporary structural protection such as geotextile bag structures to protect existing public assets in immediate hazard zones, as a short term action prior to relocation. In the longer term, this action is modified to A26 **A26**: Council may build and maintain sea walls to protect existing public assets that are vulnerable in the 2050 and 2100 planning horizons. This action would only be used for major assets with a long asset life, whose function will not be compromised by other aspects of climate change or changing community requirements.			
Intent and logic Council has a number of existing community assets, such as surf clubs, in the immediate (or short term) coastal risk area. The intent of this action is to provide protection from storm bite erosion, over the asset life of those assets or until the asset can be relocated landward. It is not intended that Council would use a sea wall to maintain a surf club in the immediate hazard zone in the long term. Proposed short to medium term geotextile bag structures are a pre-emptive component of managing coastal emergencies. Details about some benefits and concerns about the use of geotextile bag structures are in Section 8.3.3 In addition, for high usage recreational areas, a sea wall can provide a clear edge between pedestrian/picnic spaces and the active beach. The sea wall at The Entrance, is an example which Council will maintain. Where sand is available, sea walls or other structures can be combined with sand nourishment for aesthetic reasons and to enhance beach amenity.			

Responsibility and key partners	When - Priority	Where – locations for investment	Indicative cost and source of funding
WSC Asset Manager and Engineering Support from WSC Environment and Natural Resources Unit and OEH, also DP&I and DPI (relevant sections of former L&PMA).	A short term action for structures such as surf clubs and some access ways that may be vulnerable to erosion in the next ten years and where relocation is not immediately feasible. Review period: Review after no more than 5 years.	Short term protection: Surf Cub sites – protect with sand filled geotextile bags. Note that these protection structures must not reduce beach amenity or exacerbate erosion nearby. Longer term protection and maintenance: The Esplanade at The Entrance (protect promenade). The sea wall needs structural design suitable for 2050 and 2100 sea level and wave impacts.	Interim protection for surf clubs using sand filled geotextile bags will cost approximately $100,000 per site. Cost for maintaining rock walls at The Entrance is likely to be more than $1 million over the next 20 years
Step 2: Take action to reduce risk **A21**: Prepare a schedule with trigger points for action, for relocation of existing community infrastructure and public assets to outside coastal risk areas. (See also Sections 9.4 and 11.0 in relation to assets affected by inundation and coastal geotechnical hazards). See also Actions A22 and A23 for surf clubs.			
Intent and logic Proactive management of community assets to maintain their functions and services in the long term. Although there are significant cots with relocating infrastructure, planned relocation linked to risk profile and asset life is more cost effective than emergency action when infrastructure has been broken/undermined by wave action.			
Responsibility and key partners	**When - Priority**	**Where – locations for investment**	**Indicative cost and source of funding**
WSC Asset Manager (City Services) and Environment and Natural Resources Unit Partners will include Surf Life Saving clubs, OEH, RTA, NSW Maritime Authority, DPI (relevant sections for former L&PMA), Energy Australia and local community groups.	Prepare schedule within 12 months Review period The schedule will be reviewed and updated after approximately 5 years to ensure that priorities are informed by the best available information.	Applies to all assets within the immediate, 2050 and 2100 coastal erosion risk areas. In particular, consider surf clubs (see Actions A22 and A23), sewer infrastructure, water supply and electricity infrastructure, roads, pathways, parking areas, boat launching ramps, steps and ramps, viewing platforms. See Figure 9.21 for locations of affected infrastructure.	Within responsibilities of existing Council staff.
Step 2: Take action to reduce risk **A22**: Council will plan for the relocation of surf clubs out of coastal risk areas for appropriate planning horizons when major upgrades of facilities are due. Council will work with surf clubs to identify club services/facilities that must be in the immediate hazard zone.			

<table>
<tr><td colspan="4">See also A23, which can provide additional flexibility for the location of some surf club structures. A10 addresses interim protection measures.</td></tr>
<tr><td colspan="4">Intent and logic
Reduce risk to Council investment in surf club buildings and maximise the community value of surf club facilities. Council manages six surf club buildings and associated infrastructure, to meet both beach safety objectives and a range of other social objectives in the community. By locating new major surf club buildings outside the coastal risk areas for either 50 years or 100 years, Council will maximise the life of its investment in these buildings. Council acknowledges that some surf club infrastructure must be located very close to the beach, likely in the immediate coastal risk area, for safety reasons. Details of key services that could be located in or outside of short term coastal risk areas are in Section 19.4.2 of PART D.</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 asset management, development assessment and community planning.
Surf Clubs.
Consult L&PMA when facilities are on Crown land.</td><td>Surf clubs and related facilities should be relocated as necessary to minimise risk. Because some buildings are in higher hazard locations than others, they may need to be relocated sooner.</td><td rowspan="2">See Figures 9.1 to 9.14 for surf clubs at risk and the extent of retreat of club buildings, access and car parks necessary to reduce risk for the 2050 and 2100 coastal risk planning periods.</td><td rowspan="2">Allow up to $2.5 million for relocation of each surf club and access facilities.</td></tr>
<tr><td>Review period:
Review progress no later than 5 years and refocus if necessary</td></tr>
<tr><td colspan="4">Step 2: Take action to reduce risk
A23: Council will design some surf club buildings and other structures for retreat during erosion emergencies or in accordance with long term erosion triggers. Relocatable facilities are an option when the terrain and land tenure are suitable.
See Plate 9.2 for examples of designs suitable for retreat.</td></tr>
<tr><td colspan="4">Intent and logic
This action would allow some surf club infrastructure (but generally not main buildings) to be safely built close to the beach face, by focusing on flexible design. Similar management of relocatable structures could be used for some structures on private land (to be identified in Council's LEP and DCP – see Actions A18 and A19.</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 Asset managers, community planning, development assessment and Surf Club members.
L&PMA should also be consulted about structures on Crown land.</td><td>Include in any modifications and refurbishment over the next 2 years and up to 10 years. All major club infrastructure should be redesigned and/or relocated over ten years.</td><td rowspan="2">All surf clubs in Wyong shire (see Figures 9.1 to 9.14 for locations). May be used particularly for facilities/functions that must be located in the immediate back beach area.</td><td rowspan="2">Cost for major redesign included in $2.5 million for each surf club site, noted for Action A22.
Cost to redesign only the functions for immediate back beach areas (closest to the beach), allow $100,000 per site.
Funds may be available in special climate change adaptation grants from the</td></tr>
<tr><td>Review period: Report on progress and remaining exposure to risks after no more than 5 years.</td></tr>
</table>

<table>
<tr><td></td><td></td><td></td><td>Australian government.</td></tr>
<tr><td colspan="4">Step 2: Take action to reduce risk
A11: Council may grant development consent to private landholders to install temporary, short to medium term (maximum of ten years) structural protection such as sand filled geotextile bag structures, to protect existing private assets in immediate hazard zones. Requirements will be generally in accordance with Ministerial Guidelines and the Coastal Protection Act requirements for emergency protection works, but development consent will be required and conditions will be applied.
A27: Council may grant development consent to permit the construction and maintenance of sea walls to protect existing private assets affected by coastal recession (2050 coastal risk planning period), with specific conditions.</td></tr>
<tr><td colspan="4">Intent and logic
Council is considering the use of geotextile structures to protect public assets in immediate coastal erosion hazard areas, for periods of up to ten years. Council proposes to allow the use of similar structures to protect private assets for short to medium periods, up to 10 years. This would provide private landholders with time to consider and implement retreat options for existing development that is located in immediate hazard zones. Any structural protection installed by private land holders (other than very temporary emergency protection works) must be installed on private land. Public land (beach and dune) is not to be used for medium term or longer coastal protection measures for private property. Council is not currently in favour of rock wall protection for coastal property in immediate hazard zones, whether it is private or public property (see also Section 19.3.5 in PART D). See Section 8.3.3 for further information about geotextile structures.
Council will only consider approval of structures that do not increase coastal erosion risk elsewhere along the beach and dune system and which do not reduce the public accessibility and amenity of the beach. Landholders may prevent loss of beach amenity by committing to long term beach nourishment (where a suitable sand supply is available). See Action A29.</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">Private land holders in consultation with WSC, DP&I, OEH, and DPI (relevant sections of former L&PMA).</td><td>Property at North Entrance (Curtis Parade) is within the immediate coastal risk area and is threatened by storm bite erosion now. Applications to build structural protection are expected as soon as statutory context is clarified.</td><td rowspan="2">Could be considered for North Entrance (Curtis Parade and Hutton Road), Hargraves Beach and at Blue Bay.</td><td rowspan="2">Properly designed and engineered geotextile bag structures can cost up to $8,000/linear metre and are suitable for interim protection applications up to a life span of approximately 10 years.
These structures would be at landholder expense.
Landholders would also be required to meet the cost of any beach nourishment that may be required to offset the effects of the sea wall on beach amenity, in perpetuity.
Councils may do protection works on behalf on private landholders, on a cost recovery basis.</td></tr>
<tr><td>Review period:
If approved, structure integrity should be examined after not more than 5 years and development consent would generally expire after 10 years.
Overall success of the approach to be reviewed after 10 years.</td></tr>
</table>

Step 2: Take action to reduce risk or enhance opportunities

A29: Council will consider a Shire wide levy to provide funds for managing climate change impacts on community assets along the coast, such as sewerage systems, roads and public beach access ways.

This action supplements actions A26 (public assets) and A27 (private assets) and provides a mechanism for collecting funding contributions from private landholders who benefit from coastal protection works. A user (beneficiary) pays system, over and above normal rate charges, is proposed in amendments to the *Coastal Protection Act 1979*.

Council is also considering a broader rate levy to cover the costs to the community of climate change impacts on coastal assets.

Intent and logic

If sea walls are built to protect absolute ocean frontage private property from coastal erosion, impacts on beach amenity and access are likely over time as sand is lost from the beach in front of the wall. This action foreshadows that Council will levy an additional rate charge on benefitting land owners, to contribute to the cost of works such as beach nourishment to maintain the public values of the beach.

Responsibility and key partners	When - Priority	Where – locations for investment	Indicative cost and source of funding
Council would levy the additional rate in consultation with the Minister for Local Government, Minister for Planning and Minister for the Environment, and with affected landholders.	Discussion of levies will be concurrent with any discussion about construction of long term coastal protection works and would be subject to review.	Initial areas where this may apply are immediate coastal risk areas and/or coastal erosion Authorised Locations – such as North Entrance and Hargraves Beach. The broader levy for coastal protection works would apply to all ratepayers in the Shire.	Council will consider the cost effectiveness of administering a rate levy on specific properties.

Step 3: Enhance knowledge and monitor achievements

A61: Conduct research into specific coastal process issues: Council will work with the NSW Government to study the feasibility of off shore sand being used for beach nourishment purposes, for maintaining beach area, volume and amenity at key locations. This is not for immediate implementation, but is relevant in the context of likely increasing need after 2020.

Intent and logic

This action is one of several knowledge improvement tasks, required before decisions can be made about the scope and feasibility of another management response. In the medium to long term supplies of terrestrial sand and/or sand dredged from the entrance channel of the Tuggerah Lakes may not be sufficient to maintain dune height and volume as sea level rises and coastal recession continues or increases. One alternative source of sand is offshore sand from deep water on the continental shelf. For instance, one option to reduce the long term risk of a breach of the barrier at Budgewoi is beach nourishment to maintain dune height and volume. Research has commenced on the feasibility of accessing offshore sand supplies for beach nourishment in the Sydney metropolitan area, but not for the Central Coast. Offshore sand extraction for beach nourishment (or any other purpose) is not NSW government or Wyong Council policy at the moment. See Section 10.0 in PART B and Section 19.3.4 in PART D for more detail about sand sources and recent studies of offshore sand.

The NSW Minister for the Central Coast and Minister for Mineral Resources refused an application for an Exploration licence off the Central Coast in 2009, citing environmental concerns as the reason for the refusal.

Note that offshore sand supplies are a very high cost sand source and Council's decisions will be affected by decisions made for very high profile beaches in the Sydney metropolitan area, and the evolution of NSW Government policy over the next 5 to 10 years.

Responsibility and key	When - Priority	Where – locations for	Indicative cost and

partners		investment	source of funding
DTIRIS (Department of Resources and Energy) OEH Australian government Sydney Coastal Councils Group	Over the next 10 years – this type of beach nourishment is not necessary now and is contra to State and local policy and regulations.	May be feasible for Budgewoi and North Entrance in the future.	See Sydney Coastal Councils research 2009. Very high capital costs (in the order of hundreds of millions of dollars) and ongoing costs are involved.

Table 9.4 - Potential future actions

<table>
<tr><td colspan="4">Step 2: Take action to reduce risk
A7: Require removal of existing development within immediate coastal hazard zones, when the landward margin of the zone of wave impact is within 5 metres of the structure. Note that if structures collapse onto the beach during a coastal emergency, the landholder will be responsible for the cost of removing the rubble from the beach. As immediate coastal hazard zones migrate landward, this requirement would also apply to assets in the 2050 and 2100 coastal risk areas.</td></tr>
<tr><td colspan="4">Intent and logic
As the impacts of climate change and sea level rise begin to be revealed above the natural buffering capacity of coastal dunes, some coastal properties will be reduced in size and some residential and commercial buildings may not be viable, i.e. protection of some structures may not be feasible because of high costs or unacceptable impacts on other coastal values. This action places responsibility for the risk on the landholder. If implemented, it is likely that a version of Action A21 would also be required.</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">Council will consult and seek advice from landholders, insurance providers, OEH and DP&I prior to implementing this action</td><td>The need for this action will become more apparent over the next 10 years.</td><td rowspan="2">The action may be implemented at North Entrance or at Hargraves Beach in the first instance, but could also be relevant at some time in the future to Blue Bay and Toowoon Bay.
Council is also affected by the need to demolish and relocate surf club infrastructure.</td><td rowspan="2">Funding is partly dependent on the outcomes of policy decisions noted in relation to Action A21.</td></tr>
<tr><td>Council will review the situation as new IPCC reports or State or Australian government climate change impact analyses and coastal management policies for existing development are released.</td></tr>
<tr><td colspan="4">Step 2: Take action to reduce risk
A24: Council will consider options for government acquisition of private land affected by coastal hazards. Council will work with NSW and Australian governments to develop an appropriate strategy for high risk locations. Government acquisition of private land in coastal risk areas is not currently supported by any of these levels of government.
At this time, WSC undertakes only to monitor State and National policy development in relation to acquisition of hazard impacted coastal land.</td></tr>
<tr><td colspan="4">Intent and logic
There are several hundred properties in the immediate coastal risk area along the NSW coast and many hundreds more in longer term coastal risk areas. At current market value, purchase of affected properties by State or local government is not considered to be feasible. In the longer term, other options to manage coastal process impacts on these properties may not be cost effective and buy back may become a more</td></tr>
</table>

beneficial option.			
Responsibility and key partners	**When - Priority**	**Where – locations for investment**	**Indicative cost and source of funding**
Council and/or the NSW government, in negotiation with affected property owners.	Policy position to be reconsidered within the 10 year life of the coastline management plan.	Council and/or the state government would acquire private property within the immediate coastal risk area, or within a specified set back of an erosion scarp. Immediate coastal risks currently affect houses at North Entrance and Hargraves Beach in Wyong Shire.	Costs will depend on the value of coastal properties at the time of acquisition. Current market values of individual ocean frontage properties are often more than $1.5 million.

9.4 Coastal Inundation Action Plan

Table 9.5 - Strategies for managing coastal inundation risks

Step 2: Take action to reduce risk **A62**: Reference maps showing areas affected by coastal inundation in the Wyong LEP. Amend the Wyong LEP and DCP to require development applications in areas affected by coastal inundation to take the inundation hazard into account. Floor levels for new development in immediate inundation hazard areas must consider the 1% AEP storm wave run up for each beach.			
Intent and logic To ensure that coastal inundation hazards are taken into account when new development is proposed.			
Responsibility and key partners	**When - Priority**	**Where – locations for investment**	**Indicative cost and source of funding**
WSC – Strategic Planning and development assessment planners within the Planning Directorate	Include in the preparation of the new Wyong LEP, applying the standard State-wide template and draft clauses developed by DP&I for coastal risk areas	The maps referenced in the LEP will show areas affected by coastal inundation. Planning controls will apply to those areas. Other areas may be added later, after reviews of the hazard.	Within the roles of council's strategic planning team. No additional investment required.
	Review period Review impact on landowners and development no later than 5 years. This review will also consider the impacts of any inundation events, and any modifications to hazard areas.		
Step 2: Take action to reduce risk **A43**: Advise occupiers of property that is affected by coastal inundation risks by adding a notation on s149 certificates for the property and by direct communication, e.g. with rate notices, letters. Combine this with			

<table>
<tr><td colspan="4">information about emergency response procedures in the event of inundation
Emergency egress is important for occupiers of existing development where other risk reduction measures are not feasible. See also Section 8.0.
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.</td></tr>
<tr><td colspan="4">**Intent and logic**
To ensure that land owners and potential land owners are informed of the coastal inundation risk that affects the property and that quality, cost effective information is used to advise residents and plan for emergency events. See also **Section 8.0**.</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">Council Strategic planning and legal sections</td><td>This will be done when the LEP references the coastal inundation hazard areas.</td><td rowspan="2">As for OA1.</td><td rowspan="2">No additional budget required (other than small allowances for communication).</td></tr>
<tr><td>Review period
As for OA1. Review no later than 5 years.</td></tr>
<tr><td colspan="4">**Step 2: Take action to reduce risk**
A44: Use beach nourishment or beach scraping to reinforce dunes and to maintain dune crest height above 7 metres at affected locations (potentially 8 metres at North Entrance)
This includes beach scraping to reinforce dune volume, use of sand catch fencing, revegetation or vegetation enhancement, control of beach access ways and potentially use of temporary geotextile structures to help trap and retain sand.
This action complements Action A8 in **Table 9.2**</td></tr>
<tr><td colspan="4">**Intent and logic**
This action is designed to maximise the accretion potential of the frontal dune system, increasing its volume and height so that it provides an effective buffer to coastal erosion and wave overtopping in the short to medium term.
The action also has benefits for biodiversity connectivity and will work best with community involvement – e.g. Landcare/Coastcare in planting.
In the long term, actions such as A31 (research into identifying feasible offshore sand sources) would follow on from this action.</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 managers
OEH for technical advice
DPI (relevant sections of the former L&PMA) (land owner)</td><td>Council currently supports Landcare/Coastcare groups in dune protection works, in accordance with the NSW Coastal Dune Management Manual.</td><td rowspan="2">The action is relevant to all sandy beach and dune systems along the Wyong coastline, but is particularly important at North Entrance, Hargraves Beach and Lakes Beach/Budgewoi.</td><td rowspan="2">Allow $50,000 per year, above staff salaries.</td></tr>
<tr><td>Review period
Review dune profiles and volume at intervals of not more than 5 years.</td></tr>
</table>

Step 3: Enhance knowledge and monitor progress **A61**: Conduct research into specific coastal process issues: Council will work with the NSW Government to study the feasibility of off shore sand being used for beach nourishment purposes, for maintaining beach area, volume and amenity at key locations. This is not for immediate implementation, but is relevant in the context of likely increasing need after 2020. **Error! Not a valid link.**Long term sand sources are relevant to both beach recession and inundation issues. Information about this action is in **Table 9.3** and is not repeated here. Preliminary information about potential sand sources is in **PART C** and in **Section 10.0** of **PART B**.
Step 3: Enhance knowledge and monitor progress **A65**: Maintain a data base with information about coastal inundation episodes, including dates, context, photographs, impacts and response.
Intent and logic Maintain a clear record of individual events, which can be used to review hazards and the effectiveness of any management actions. This action is a companion to Actions A10 and A1 in **Section 7.0**.

Responsibility and key partners	**When - Priority**	**Where – locations for investment**	**Indicative cost and source of funding**
Council staff – Environment and Natural Resources Unit. Involve Council Services unit where infrastructure assets are involved. Potential for community involvement particularly in relation to local photos and stories.	To commence immediately (i.e. be ready for use at the next oceanic inundation event) Review period. Review record at intervals of 3 to 5 years.	Relates to all locations along the Wyong coast expected to be affected by wave overtopping of coastal dunes: Blue Bay, Shelly Beach, North Entrance, Hargraves Beach, Budgewoi sand spit	Within existing responsibilities of Council staff. Additional budget required for assessment and monitoring resources such as aerial photos (around $30,000 per run).

10.0 Lake and Sea Interactions Action Plan

Table 10.2 – Management actions at The Entrance

Step 2: Take action to reduce risk or to increase opportunities **A9**: Council will continue to dredge sand from the active tidal delta at The Entrance and place the sand on North Entrance Beach. Some sand may also be placed on The Entrance Beach to maintain beach amenity. **A28**: Review the entrance management strategy and dredging management plan for The Entrance channel to maximise sustainable beach nourishment now and as sea level rises. The first review will focus on maximising the benefits of sand placement for dune stability. After the research described in A13/A68 is conducted, Council will review and revise the dredging program over time, as necessary.
Intent and logic Although the purpose of entrance dredging is to maintain some tidal flushing of the lake entrance area, the placement of dredged sand is how Council currently manages the sediment balance between the tidal delta and the open ocean beaches. Dredging gradually moves sand from the tidal delta to the beach at times when it would normally accumulate in the estuary entrance. In the short term this provides a greater sand buffer on the beach and dunes of the open coast. The volume and rate of dredging is adapted to current sea level and rainfall/flood conditions See also **Table 9.1**.

Responsibility and key partners	**When - Priority**	**Where – locations for investment**	**Indicative cost and source of funding**
See **Table 9.2**	See **Table 9.2**	See **Table 9.2**	See **Table 9.2**

Step 2: Take action to reduce risk or increase opportunities

A66: Council will review the structural integrity of The Entrance sea wall and schedule structural upgrades as necessary to balance risk and cost.

There is already a sea wall on the southern side of The Entrance, which provides a formal promenade and separates the shoreline from road and other infrastructure. It is an important tourism asset. See also **Table 9.1**.

Council does not propose to construct a training wall on the northern side of The Entrance channel.

Intent and logic

This action relates only to the sea wall at The Entrance. The wall is part of a major tourism area and protects community infrastructure, including the road, car parking and pedestrian promenade. This action will ensure that the sea wall remains structurally sound in the long term.

Responsibility and key partners	When - Priority	Where – locations for investment	Indicative cost and source of funding
Council Asset Manager, with OEH and DPI (relevant sections of the former L&PMA).	Confirm structural integrity and design requirements for the sea wall within 2 years.	The Entrance sea wall	Allow $20,000 for assessment and design requirements. Any structural changes to the wall would be costed separately. Significant sea wall reconstruction could cost more than $1 million.

Step 2: Take action to reduce risks

A44: Use beach nourishment or beach scraping to reinforce dunes and to maintain dune crest height above 7 metres at affected locations (potentially 8 metres at North Entrance)

This applies to parts of North Entrance Beach (e.g. Curtis Parade area), and to the Hargraves and Lakes Beach area, where low barrier height increases the long term hazard of breaching from the coast through into Budgewoi Lake.

Intent and logic

Council currently uses bulldozers to shape parts of North Entrance Beach during sand nourishment activities. This action continues that process and also provides for beach scraping to move sand from the beach face onto the incipient dune and frontal dune area at other times.

This action will help to maintain the dune height at Lakes Beach/Budgewoi, to reduce the risk of oceanic inundation/wave overtopping of the barrier. Beach scraping is a short term option, which can be used as sand begins to move back onto the beach after major storms. Sand sources for beach nourishment are currently limited, and are discussed in **Section 10.0**.

Responsibility and key partners	When - Priority	Where – locations for investment	Indicative cost and source of funding
See **Table 9.1** and **Section 10.0**	See **Table 9.2** and **Section 10.0**	See **Table 9.2** and **Section 10.0**	See **Table 9.2** and **Section 10.0**

Step 3: Enhance knowledge and monitor achievements

A67: Establish a detailed monitoring program to clarify how sand placed on North Entrance Beach is redistributed and (sediment budget) and to support amendments that would provide more effective sand retention to buffer against major storm bite.

This action is part of a suite of monitoring and review tasks that are designed to refine understanding of the effectiveness of management actions and therefore to improve management of sediment budgets in changing conditions. See also A1, A73, A68.

Intent and logic

Council does not currently have detailed information about how and when sand moves on North Entrance Beach and how sand loss can be minimised. Long shore sediment transport can be modelled using wave data. Monitoring using a combination of remote sensing and ground survey will calibrate the models and help clarify opportunities for improved management. The results of this monitoring will also help landholders to understand how the sediment budget can be managed to provide the best possible protection to property.			
Responsibility and key partners	**When - Priority**	**Where – locations for investment**	**Indicative cost and source of funding**
WSC will lead this action, with assistance from OEH.	The monitoring program should be developed and implemented as soon as possible and should also revisit as necessary, information from beach nourishment and storms over the last several decades.	The focus is on North Entrance Beach from The Entrance spit, to north of Curtis Parade, a distance of some 2.5 km	Indicative cost is $10,000 per year. Options include council funds, landholder contributions (if approved through the amendments to the *Coastal Protection Act 1979*) and OEH programs.
Step 3: Enhance knowledge and monitor achievements **A68**: Council will commission further studies of sediment dynamics in The Entrance channel, with sea level rise. This is likely to include a hydrodynamic model to test sediment budget changes in the Entrance channel as sea level rises. Further research is also necessary to clarify the relationship between lake flood levels, coastal recession and oceanic inundation hazards at Lakes Beach area. The timing of trigger points for increased risk is important for this location. See also **Table 9.4**. **Appendix 7** provides information about some additional studies.			
Intent and logic Lake frontage properties and low lying coastal land in Wyong Shire have been identified as significant risk areas as sea level rises to 40 centimetres and 90 centimetres above 1990 levels over the next century. The extent to which lake processes and marine processes will interact and the cumulative effects of lake flooding, coastal recession and oceanic inundation are not well understood. These studies will help Council and land owners to better understand the extent of risks that need to be managed.			
Responsibility and key partners	**When - Priority**	**Where – locations for investment**	**Indicative cost and source of funding**
Council's Environment and Natural Resources Unit will work with OEH in relation to scoping and funding these studies	See **Tables 9.1** and **9.4**	Entrance of Tuggerah Lake, North Entrance peninsula (first priority) and Budgewoi/Lakes Beach area are key locations. Studies involve modelling sediment transport consequences of changes to hydrodynamics as sea level rises, and testing a range of management options using the model.	See **Table 9.1** and **9.4**. Allow up to $50,000 as Council's contribution (assuming 50% contribution from NSW Government).

11.0 Geotechnical Hazards Action Plan

Table 11.2 - Strategies for managing geotechnical hazards

<table>
<tr><td colspan="4">Step 2: Take action to reduce risk
A69: Council will introduce planning clauses in the LEP and DCP with consistent requirements for appropriate geotechnical assessments of proposed development within the zone bounded by the immediate hazard line and 2100 low geotechnical hazard line (assessments prepared by a properly qualified geotechnical practitioner). No new development will be approved within immediate geotechnical hazard areas.
The LEP/DCP will specify required qualifications based on advice from Australian Geomechanics Society.
A82: LEP zoning and DCP clauses will discourage land use intensification and reduce risk in areas with a high probability of geotechnical hazards.</td></tr>
<tr><td colspan="4">Intent and logic
Council's current planning instruments are out of date in relation to geotechnical hazards. The amended clauses of the LEP will provide clear guidance for landholders in affected locations about the nature of immediate and longer term geotechnical hazards and how they affect the development and use of their property.
Notation on s149 certificates will help to raise awareness of geotechnical hazards and their implications for land use planning and development assessment.
Proponents of development in areas where coastline recession due to geotechnical hazards is predicted in the 2050 and 2100 planning periods may be required to conduct further detailed studies, including site specific topography and geology and three dimensional studies of geotechnical hazards. Figure D3 and Section 8.3 of Appendix 4 provide an example of how this could be done. This information will contribute to Council's 3D model of geotechnical hazards (see Action 89).</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 strategic and development planners, in consultation with DP&I and DPI (relevant sections of the former L&PMA)</td><td>The new geotechnical hazard information should be included in the current revision of the LEP, as soon as possible.</td><td rowspan="2">This action applies urgently to cliffs and bluffs at Cabbage Tree Harbour and Noraville, but is also relevant to all cliffs and bluffs along the coast. In the longer term, further assessment of indurated sand stability at Toowoon Bay is necessary.</td><td rowspan="2">The amendments of the LEP and DCP are within the responsibilities of Council officers, but additional training may be required on hazard management.</td></tr>
<tr><td>Review: it is likely that understanding of geotechnical hazards for the longer planning periods will be enhanced as further climate change impact studies are completed and new reports are released by IPCC. The spatial application of planning controls should be reviewed every 5 years.</td></tr>
<tr><td colspan="4">Step 2: Take action to reduce risk
A70: Review stormwater drainage systems in the vicinity of geotechnical hazard areas to ensure that they do not discharge runoff into areas where it could trigger a landslide. This applies to both council stormwater systems and stormwater systems on private property.</td></tr>
<tr><td colspan="4">Intent and logic
Some geotechnical processes are exacerbated by inappropriate management of surface and groundwater flows.</td></tr>
<tr><td>Responsibility and key</td><td>When - Priority</td><td>Where – locations for</td><td>Indicative cost and</td></tr>
</table>

partners		investment	source of funding
WSC and landholders. Link to Water Sensitive Urban Design projects within Council	Within 5 years Review after approximately 5 years to accommodate any additional information on changes to rainfall and runoff associated with climate change.	This action is relevant to all cliffs and bluffs where there is urban development.	Allow approximately $100,000 per year for adjustments to stormwater drainage
Step 2: Take action to reduce risk **A71:** Review Plans of Management for coastal reserves in coastal hazard areas (geotechnical), both for Crown Reserves and for Council community land. Ensure that each Plan of Management takes geotechnical hazards and risks into account. For instance, Plans of Management should address surface and subsurface drainage in geotechnical hazard areas; they should address landslip and rockfall risks affecting lookouts and walking tracks. All structures (including access or other facilities) within geotechnical hazard areas should be designed by a properly qualified engineer. Examples of relevant requirements are in Gosford Council's DCP 163 and Pittwater Council's geotechnical risk management policy.			
Intent and logic Currently very few Plans of Management for coastal reserves on Crown land or on Council managed community land specifically deal with geotechnical hazards. Geotechnical hazard assessment at Norah Head/Mariners Memorial area in 2007 indicated risks associated with community infrastructure.			
Responsibility and key partners	**When - Priority**	**Where – locations for investment**	**Indicative cost and source of funding**
WSC, with DPI (relevant sections of the former L&PMA) and OEH (for National Parks)	At approximately 5 years	Key Plans of Management are for Norah Head and southern sections of Wyrrabalong National Park.	DPI (relevant sections of former L&PMA) and OEH
Step 2: Take action to reduce risks **A88**: Council will include information about geotechnical hazards affecting infrastructure in the coastal zone, such as stormwater drains, sewer reticulation and pumping systems, in its asset data base and will take geotechnical hazards into account when planning upgrades, relocation or other major system maintenance activities. Council will set out appropriate design requirements in the LEP, which will apply to Council activities, projects by other government agencies and private development.			
Intent and logic This action reflects the ways in which slope instability hazards in the coastal zone affect the asset life and maintenance costs of Council infrastructure. Proper planning of new or upgraded infrastructure to minimise the impacts of hazards will reduce costs and maintenance effort required to maintain effective functioning infrastructure. This action presents good value for money, as early investment in good planning and design will save significant maintenance expenditure.			
Responsibility and key partners	**When - Priority**	**Where – locations for investment**	**Indicative cost and source of funding**
WSC engineering services and asset managers, in consultation with Central Coast water and sewer	Planning and design that take geotechnical hazards into account should be part of all infrastructure projects,	All infrastructure projects on rock based terrain in the coastal zone should consider geotechnical issues.	Planning and design costs will be incorporated in the investigations for each infrastructure project.

provider.	now and ongoing.		
Step 2: Take action to reduce risks **A72**: Council will construct a toe drainage structure at Cabbage Tree Harbour that both improves groundwater drainage and protects the toe of the slope against erosion. This structure will be partly funded by OEH. Council and OEH will share the $1.9 million cost of this structure.			
Intent and logic Council has received geotechnical advice about how best to reduce geotechnical hazard risks at Cabbage Tree Harbour. Previously installed 'horizontal drainage' controls have failed. The toe of the landslip area at Cabbage Tree Harbour is undercut by storm waves, destabilising shallow landslip upslope. As a pocket beach with limited sand buffer, Cabbage Tree Harbour is likely to be affected (removed by) by beach recession due to sea level rise. The toe protection structure will help to decouple the geotechnical hazards from these beach recession hazards. Ongoing regular monitoring of slope condition and geomorphic character will alert Council and residents early to changes in the slope that may signal further geotechnical activity. See also A73 in relation to long term monitoring and scenario testing using high resolution LiDAR data.			
Responsibility and key partners	**When - Priority**	**Where – locations for investment**	**Indicative cost and source of funding**
WSC with OEH and DPI (relevant sections of former L&PMA), and affected landholders upslope.	Immediately Initially, the condition and effectiveness of the structure should be monitored and reviewed frequently, to ensure it is performing as intended. It should be monitored after storm events, and in the longer term, at intervals of not more than 5 years, in conjunction with reviews of the condition of the beach.	This action applies only to Cabbage Tree Harbour	Council has sought funding from the NSW Government. Council and NSW Government will share the $1.9 million cost of the structure.
Step 3: Enhance knowledge and monitor achievements **A73**: Repeat LiDAR surveys of the coast at approximately 5 year intervals. Analyse high resolution digital terrain data at 5 yearly intervals to identify any changes in the terrain of areas affected by geotechnical hazards.			
Intent and logic LiDAR provides high resolution remote sensed data about the ground surface. Analysis of digital terrain models prepared from sequences of LiDAR survey can provide accurate information about changes in the morphology of slopes, which will be important for assessing the success of management structures and also for observing when a slope is becoming oversteep. Note that some ground truthing of LiDAR analysis may be necessary in specific areas of steep slopes, to clarify vegetation and overhangs effects. See also **Action 89** which refers to development of a data base and 3D model, as per Figure D3 of **Appendix 4.**			
Responsibility and key partners	**When - Priority**	**Where – locations for investment**	**Indicative cost and source of funding**
NSW Government	The Central Coast	LiDAR data is relevant to	NSW Government.

	LiDAR was collected in 2007. New LiDAR data should be collected after approximately 5 years. However, much of the NSW coast has not been mapped using LiDAR at all yet.	tracking landform change along the entire Wyong coastline – both cliffs and bluffs and sandy shorelines.	Council may choose to invest in LiDAR data itself, to accelerate the process. Allow $60,000 per run for the local area.
Step 3: Enhance knowledge and monitor achievements **A74**: Make Australian GeoGuides, published by the Australian Geomechanics Society, available on Council's web site, as reference material on good practice for landowners and Council. See **Section 10.4.1** for current titles. See also TAB D in **Appendix 4**. Engineers Australia also prepares technical guidelines for coastal engineering issues and is currently updating their documents. Council should also provide/encourage access to these documents when updated versions are released			
Intent and logic These guides provide information about managing development on land affected by geotechnical hazards			
Responsibility and key partners	**When - Priority**	**Where – locations for investment**	**Indicative cost and source of funding**
WSC – in conjunction with Australian Geomechanics Society and Engineers Australia	As soon as possible Information should be updated as new guides or revised guides are released.	The guidelines are relevant to all landowners, architects and developers operating in the coastal zone.	No additional cost is involved.
Step 3: Enhance knowledge and monitor achievements **A89**: Develop and continue to refine a 3D geotechnical model for predicting geotechnical hazards (See Figure D3 in **Appendix 4**) and Section 8.1 in **Appendix 4**.			
Intent and logic The general geology of the Wyong coastline is well known but the details of stratigraphic and structural interactions and presence of dykes at an individual property scale are less well defined. Council proposes to progressively develop a three dimensional model of geotechnical processes and hazards along the coast. The model could incorporate a range of information such as high resolution terrain models (LiDAR), known geology, known geotechnical processes and engineering equations for stable slopes in various materials. Council will collect more information about these factors from development applications for properties within specified geotechnical hazard zones. By collating this information within a data base linked to the coastal recession model, Council will continuously improve its knowledge and capacity to predict slope instability hazards along the coast.			
Responsibility and key partners	**When - Priority**	**Where – locations for investment**	**Indicative cost and source of funding**
WSC, (Planning, natural resources and asset management sections) with information supplied from detailed studies submitted with development applications.	An indicative model is provided in **Appendix 4**. Council could establish the model and data management process within the first two years of implementing the Plan. The model and hazard lines should be reviewed	This action applies to all rock and indurated sand based sections of the coast. Cliffs and bluffs which have residential development within existing and predicted geotechnical recession areas are a priority.	Data base establishment would be a task for existing WSC staff. Council may seek further geotechnical advice and further expertise in the management of very large spatial data sets. This additional advice is likely to involve

	at regular intervals, likely to be 3 to 5 years.		consultants. Allow up to $50,000 over the first five years of the Plan.
Step 3: Enhance knowledge and monitor achievements **A90**: Further investigate the interaction of coastal erosion and geotechnical hazards in areas where both types of hazard (coastal erosion and geotechnical recession) may apply now or within the 2100 planning period.			
Intent and logic At several locations, rock based terrain is overlain by a shallow sand deposit, or is landward of sand based landforms which are expected to be eroded within the 2050 or 2100 planning horizons. The details and hazard implications of these stratigraphic relationships at these locations are not currently clear. Further investigation, either by Council or as part of studies required for new development proposals in these areas will clarify the hazard relationships and provide more certainty about how they should best be managed. New information would be entered in Council's coastal process data base.			
Responsibility and key partners	**When - Priority**	**Where – locations for investment**	**Indicative cost and source of funding**
WSC, with input from information provided by proponents.	This work is expected to commence within the first two years of the Plan and will be ongoing.	Examples of locations where sandy coast and rock coast processes interact are at Cabbage Tree Harbour, The Entrance, Blue Bay and Toowoon Bay.	Allow $10,000 for clarification at priority sites, but other information will come from private land developers.

12.0 Building Coastal Biodiversity Resilience Action Plan

Table 12.2 - Actions for enhancing the resilience of coastal ecological communities

Step 1: **A81**: Conduct a benchmark survey of the condition of coastal ecological communities, providing standardised information about a selection of representative sites along the coast. The assessment would be conducted in partnership with HCRCMA and local Landcare groups.			
Intent and logic The objective of management actions is to maintain or improve ecological resilience and condition, so it is important that Council and the community understand the existing condition of coastal ecological communities. Some survey work and mapping of condition already exists (for instance HCRCMA has assessed rock platform habitats). This action would seek to fill gaps and provide standardised assessment techniques that can potentially be implemented by community groups. Council would revisit the condition assessment every 2 to 3 years			
Responsibility and key partners	**When - Priority**	**Where – locations for investment**	**Indicative cost and source of funding**
WSC strategic planning and biodiversity teams, in conjunction with Landcare, HCRCMA, DPI (relevant sections of the former L&PMA) and OEH.	Within 12 months, with follow up condition assessment at intervals of 2 to 3 years (up to 5 years as a maximum).	Locations to be chosen in consultation with the partner organisations. The aim is to have a series of representative sites, sampling different habitat types along the coast.	Allow up to $50,000 for condition assessment, but costs may be less, depending on the quality and coverage of existing data. See also Action E01 regarding the use of

			remote sensing techniques (a combination of LiDAR, aerial photogrammetry and satellite imagery), which may allow some parameters of vegetation condition to be assessed without field work in the future. See also Action A14, which foreshadows community involvement in ecological condition monitoring.
Step 2: Take action to reduce risks **A20**: Use zoning and other planning measures to provide for retreat (landward migration) of important ecological communities, where possible.			
Intent and logic As sea level rises, coastal landforms and associated vegetation communities will roll landwards, provided there is sufficient sand supply and that land use and zoning creates spaces into which ecological communities can migrate. This action provides the planning context for coastal ecological communities on public land, to migrate landward. Information about the geomorphology of coastal dunes as sea level rises is in Section 17.0 of PART C. Actions affecting the sand supply for coastal dunes are in Section 9.0 and Section 10.0 of PART B.			
Responsibility and key partners	**When - Priority**	**Where – locations for investment**	**Indicative cost and source of funding**
WSC Strategic Planning and Environment and Natural Resources Unit. Consult L&PMA where ecological communities are on Crown land/Crown reserve. Consult HCRCMA with respect to regional biodiversity priorities.	Include in new Wyong LEP, due 2010. Review period Consider success of this measure in reviews of the condition of coastal ecological communities, conducted for councils State of the Environment Reports.	Use for SEPA26 littoral rainforest and for SEPA14 wetlands that are within coastal risk areas (Budgewoi). Where open coast dunes are on Crown land or council community land, zoning should also be used to facilitate roll back of landform and ecological communities.	No additional cost. These communities are either on Crown land or Council community land. Where facilitating landward migration of very high value ecological communities would involve private land, Council may consider acquisition of private property, in conjunction with OEH, HCRCMA and the landholder.
Step 2: Take action to reduce risks **A8**: Conduct dune stabilisation and revegetation works to encourage sand accretion and stabilisation of frontal dunes. These on-ground dune maintenance and stabilisation works will be conducted in accordance with Plans of Management for ocean frontage reserves managed by Council. This action is also in Table 9.1. See also A26, which provides a greater focus on the details of vegetation management (e.g. weed removal) and O13, which uses dune management techniques to reduce coastal inundation risks. A12 suggests involving the community in various condition monitoring programs for coastal ecological communities.			
Intent and logic Vegetation management on dunes helps to trap wind-blown sand and builds up dune height and volume, providing a better buffer to coastal erosion. Dune vegetation management can therefore deliver on multiple			

<table>
<tr><td colspan="4">objectives including biodiversity enhancement and protection of assets from storm erosion, at least in the short to medium term.</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>Council's Environment and Natural Resources Unit will prepare Plans of Management for foreshore reserves in Council's care and control.
Council will support local Landcare groups to implement on the ground works.
Council will liaise with L&PMA about consistent management of Crown Reserves managed by the Authority.
HCRCMA is also a key partner for this action.</td><td>Immediate and ongoing
Review period:
At approximately five year intervals, review the extent to which new or updated Plans of Management have been prepared. Also consider evidence for improvements in the condition of coastal ecological communities in the same time frame.</td><td>This action is relevant to beaches where property is at immediate threat (e.g. North Entrance, Hargraves Beach, Blue Bay and surf club sites at Soldiers Beach and Lakes Beach), but is also relevant to beach and dune systems which are managed as open space or for conservation (for instance the Budgewoi dune system and Tuggerah Beach).</td><td>Preparation and/or updating of Plans of Management for foreshore reserves is within the responsibility of Council planning and environment staff. Allow for ongoing support of a Landcare coordinator and ongoing costs for plants and materials for Landcare groups.
Funds may be sourced from HCRCMA programs.</td></tr>
<tr><td colspan="4">Step 2: Take action to reduce risks
A30: Strengthen vegetation communities on dunes by preparing, implementing (including monitoring effectiveness) vegetation management plans that include species selection, planting, weed removal, fencing etc.
This action expands on the vegetation management component of Action A8. It also provides more detail on how dune vegetation management will be carried out. Weed removal is a priority for much of the Wyong coastline, which is affected by Bitou bush and other species. The hummocky form and impact on species diversity associated with Bitou detracts from the stability of coastal dunes.
Both short term and longer term dune vegetation management actions require significant community involvement to be successful.</td></tr>
<tr><td colspan="4">Intent and logic
As for A8. The aim is to maintain ecological processes and ecosystem services on coastal dunes that are affected by coastal recession. The effectiveness of this action may be reduced by rapid sea level rise or by more frequent major storm events. However, maintaining healthy coastal vegetation is still beneficial in the long term because of habitat connectivity values. Ongoing dune vegetation management will also contribute to successful vegetation colonisation as frontal dune systems roll landward as sea level rises.</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>Council's Environment and Natural Resources Unit will be responsible for this action, in close partnership with community Landcare groups and L&PMA where Crown land is involved.
Council will also work closely with HCRCMA.</td><td>Immediate and ongoing
Review period
Align with reviews of the condition of coastal ecological communities conducted by HCRCMA, but generally at intervals of no more than 5 years.</td><td>As for A8 above. The action is also relevant to ongoing management of dune heights and volumes (see O 13).
Council would focus on locations where maintaining or enhancing biodiversity resilience is important because of the</td><td>Allow for ongoing employment of a Landcare coordinator and ongoing materials for use by Landcare groups.</td></tr>
</table>

Invasive species such as bitou bush are a priority in the HCRCMA CAP.		ecosystem services provided, including where well vegetated dunes provide a good buffer to coastal erosion (e.g. Budgewoi dunes and north Tuggerah Beach).	
Step 2: Take action to reduce risks **A32**: Where feasible, establish conservation agreements for high value ecological communities in reserve areas that are vulnerable to climate change and other medium to long term threats This action can be applied to terrestrial communities and to intertidal habitats such as rock platforms.			
Intent and logic By applying conservation oriented land management, the resilience of coastal ecological communities to aspects of climate change and to other threats is increased. Conservation oriented land management (e.g. private conservation agreements negotiated with HCRCMA or with OEH) focus on maintaining and restoring ecological processes and ecological connectivity. No such agreements are currently in place for coastal locations in Wyong Shire.			
Responsibility and key partners	**When - Priority**	**Where – locations for investment**	**Indicative cost and source of funding**
Council is a minor player in this action because it does not own major parcels of coastal land and conservation agreements would be negotiated with the State, rather than local government. Key stakeholders are HCRCMA, DPI (relevant sections of the former L&PMA) (tenure over all rock platforms, headland slopes and many coastal dune areas outside National Park)	Further develop options and appropriate conservation strategies over the next five years. Review period: 5 years	Not suitable for locations which are subject to coastal recession in the short to medium term.	Costs for Council are minor, commensurate with its minor, supporting role in the process.
Step 2: Take action to reduce risk **A51**: Council will continue to support Landcare groups to maintain and enhance the condition and function of native vegetation on coastal dunes, including weed removal and replanting.			
Intent and logic This action enhances community involvement in recreational activity but also has major benefits for the natural landscape. Community contributions to the protection of coastal ecological communities are a key component of sustainable coastline management. The action also underpins a solid partnership between Council and HCRCMA for coastal vegetation management. The action partners Actions A8,A30 and A32.			
Responsibility and key partners	**When - Priority**	**Where – locations for investment**	**Indicative cost and source of funding**
Council will investigate funding options to employ a Coastcare/Landcare	Current and ongoing Review period: Review role of	Applies to all coastal dunes in the Shire, with particular attention at North Entrance,	As per Action A8, allow approximately $60,000 for a coordinator, plus funds to provide training

coordinator for on-ground works in coastal locations. Members of Landcare groups and residents are key stakeholders. HCRCMA is a key stakeholder.	coordinator and focus of activities after 5 years, or in line with HCRCMA reviews.	Budgewoi to Hargraves Beach, Soldiers Beach and Blue Bay. The strategic benefits of Landcare activities at all locations would be determined in conjunction with HCRCMA.	and materials for Landcare volunteers (allow approximately $100,000 for each of the five groups working along the coast, over ten years). Council will investigate funding options, including potential funding under HCRCMA programs.
Step 2: select and implement actions to reduce risk **A75**: Council will continue to work with OEH and HCRCMA to protect nesting and roosting habitat for protected shorebirds such as Little Tern (examples include from disturbance from pedestrians, dogs and vehicles, possibly from short term wave overtopping). Council would cooperate with HCRCMA and OEH in implementing these programs.			
Intent and logic Several species of shore bird, including migratory species protected under international agreements and EPBC Act are known to forage and or nest along the Wyong coastline. This action is to reinforce Council's position as a committed, cooperative and consistent stakeholder in the management of protected fauna species. The presence of these species adds to the biodiversity of the coastline.			
Responsibility and key partners	**When - Priority**	**Where – locations for investment**	**Indicative cost and source of funding**
It is likely that the lead for this action will be taken by HCRCMA and/or OEH. Council has a supporting role. For instance, Council could participate in monitoring programs, and Council could ensure that new access tracks are sited away from sensitive areas. Important beach habitat would be considered in any plan to scrape beach sand up to reinforce frontal dune systems.	This is an ongoing activity over the life of the Plan. Review period: Council will review its role and level of involvement after 5 years.	Norah Head rock platform is a key site (see studies for HCRCMA, discussed in Section 17.0 of PART C)	Council has a minor role and only minor investment, principally within the responsibilities of existing Council staff, is expected.

13.0 Recreation and Tourism Action Plan

Table 13.2 - Actions for safe and sustainable recreational and tourism uses of the coastline

Step 2: Take action to reduce risk or enhance opportunities **A46**: Maintain a close working relationship with surf clubs and Surf Life Saving Australia in relation to beach patrols, beach safety information and beach environment information. Surf clubs also have a role in emergency response activities and their activities (such as major surf carnivals) also contribute to tourism income.**Error! Not a valid link.**

<table>
<tr><td colspan="4">Intent and logic
This action demonstrates the value that Council places on community resources which contribute to safe and enjoyable beach access. Council sees the Surf Life Saving community as a valuable partner in coastline management.</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>Council recreation and tourism development units.
Council will work closely with surf clubs and the peak surf life saving organisation.</td><td>Ongoing
Review period:
Review achievements and new challenges after approximately five years.</td><td>Applies to all patrolled beaches along the coast, as a minimum.</td><td>No additional costs involved.</td></tr>
<tr><td colspan="4">Step 2: Take actions to reduce risks or enhance opportunities\
A76: Prepare and/or review of Plans of Management and Master Planning for the main recreational beaches and coastal reserves of Wyong Shire. Upgrade shade and picnic facilities at high profile beaches, in accordance with these Plans of Management. Identify priority asset and infrastructure works for public reserves in accordance with these Plans of Management. Council will review the design and integrity of structures such as stairways and lookouts which are within immediate geotechnical hazard zones and relocate or modify as necessary. See also A52 , A50 and A54.</td></tr>
<tr><td colspan="4">Intent and logic
The aim of this action is to enhance opportunities for safe and enjoyable use of the main recreational beaches (i.e. those with surf club infrastructure and good access), consistent with long term coastal hazards. The action also addresses a range of management issues at other high profile recreational reserves along the coast, predominantly on headlands, but also at locations such as Mazlin Reserve, Jenny Dixon and Hargraves Beach. In addition to coastal hazard issues, the issues to be addressed include:
Storm water management
Weed Management (particularly Bitou, but also a range of other invasive species)
OH&S and other public safety issues, and
Geotechnical hazards management</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>Plans to be prepared by Open Space and Community Development teams.
Council will work closely with L&PMA.</td><td>Plans for beaches to be prepared in line with Council proposals to relocate/enhance surf club buildings in coastal risk areas. Expect that plan preparation will extend over five years and implementation over ten years.
Review period:
Review extent of implementation after approximately 5 years.</td><td>Applies to all of the main recreational beaches – Toowoon, Shelly, Soldiers, The Entrance, North Entrance, Lakes Beach.
This action also applies to coastal reserves such as the Mazlin Reserve at Cabbage Tree Harbour and to Council reserves (or Crown land managed by Council) on headlands and bluffs.</td><td>Plan preparation – allow $50,000 for each area. On ground upgrade works- allow up to $250,000 for each beach and each main foreshore reserve.
Funds from NSW and Australian government recreation programs, plus Council funds. These works are not suitable for funding under the NSW Coast and Estuary Program. If structural protection from coastal processes is agreed for these reserves, these works</td></tr>
</table>

			could be funded from the Coast and Estuary Program (50/50 with Council)

Step 2: Take action to reduce risk or enhance opportunities

A47: Work with community groups, OEH, DPI (relevant sections of former L&PMA) and DTIRIS to plan routes for a coastal walk extending the full length of Wyong Shire coastline, for local users and which can be promoted as a recreational attraction for the coastline. Council intends to construct the walk over ten years. A coastline walk and a 'mountains to the sea' walk are noted in WSC's Strategic Vision. The routes would complement the existing walking path/cycleway around the shore of Tuggerah Lake. A related action to A50.

Intent and logic

This action aims to promote the natural assets of the Shire's coastline and to encourage residents to participate in outdoor activity. The walks will diversify clearly marked opportunities for residents and visitors to enjoy the natural landscape of the Shire. The walks could become a valuable weekend tourism attractor, if linked to accommodation and restaurant services. The coastal walk could be structured to provide a recreational experience which could be enjoyed as short half day or day walks or which could be combined into a longer coast walking experience. Half day and day walks that link important features or transport access points are likely to appeal to many visitors and residents. The walk could connect into similar facilities and experiences in Gosford City Council and Lake Macquarie City Council areas to the south and north respectively.

Responsibility and key partners	**When - Priority**	**Where – locations for investment**	**Indicative cost and source of funding**
Council recreational planners and strategic land use planners would be involved. Asset managers will be involved if any additional pedestrian infrastructure is required – such as path surfaces, stiles, gates, bridges. Wyong Council will work with OEH (NPWS), DPI (relevant sections of the former L&PMA) and adjoining councils. Local precinct committees will be consulted.	Planning to proceed over the next five years. Some sections will not require major investment to make them accessible – although signposting will be necessary Review overall strategy and investment requirements after approximately five years.	Priority areas include Norah Head to Budgewoi, The Entrance and North Entrance area and extensions of existing walking paths in national parks.	Cost will vary from area to area and the extent of track creation and track surfacing that is required. NSW government grants and Australian government grants for community infrastructure.

Step 2: Take action to reduce risk or enhance opportunities

A48: Liaise with NSW Maritime Authority, NSW Marine Rescue and recreational and commercial fishers about the safety and suitability of ocean boat launching ramps and associated facilities (particularly the Cabbage Tree Harbour ramp) and identify any necessary upgrades to current facilities or need for additional safe facilities in the Shire.

The exposed open coast of Wyong Shire is not readily amenable to ocean going access infrastructure for small vessels.

Intent and logic

The aim of this action s to ensure that boat launching infrastructure remains safe and cost effective to maintain. Wyong Shire currently has only one major ocean access boat ramp, at Cabbage Tree Harbour. Some small boats are launched across the beach at Toowoon Bay. The structural integrity of the Cabbage

Tree Harbour Ramp should be reviewed in the context of sea level rise. Other issues at Cabbage Tree Harbour include parking for trailers, the capacity of the ramp in high usage periods and interactions between boat launching activities and other aquatic uses of the small embayment. These issues would be addressed in a new Plan of Management for the reserve (Action A76).			
Responsibility and key partners	**When - Priority**	**Where – locations for investment**	**Indicative cost and source of funding**
As noted above, NSW Maritime Authority and NSW Marine Rescue are key stakeholders, as are recreational boating users.	This action would be managed as a 'watching brief' over the first five years of the plan, and its priority would be reviewed at the first overall plan progress review.	Cabbage Tree Harbour.	New boating infrastructure is expensive. An upgrade of the ramp is likely to require investment of $500,000 or more. Funds may be sourced from L&PMA grants and direct investment from NSW Maritime Authority.
Step 2: Take action to reduce risks or increase opportunities **A50**: Develop a design theme for coastal information, interpretation and safety signage. This action supports Action A4, but extends to the broader interpretation of coastal landscapes. It is also linked to Action A47 (coastal walk) and to A76 in relation to Master Planning for high profile foreshore reserve areas.			
Intent and logic The principal aim of this action is to provide attractive presentation of clear information about the coast to beach users, supporting recreation, tourism and beach safety. When focused on beach safety (e.g. understanding rips), this action helps to reduce risks to the safety of beach users. Examples of existing themed signage can be seen at The Entrance.			
Responsibility and key partners	**When - Priority**	**Where – locations for investment**	**Indicative cost and source of funding**
Council's communication and tourism development teams would have a key role. Council would work closely with Surf Life Saving Australia, and with a variety of local groups, including historical society, precinct committees and Landcare. HCRCMA would also be involved.	Develop a consistent theme during the first five years of the Plan.	Focus on high profile or high usage sites first – such as Soldiers and Shelly Beach and Toowoon Bay (see existing signage at Toowoon Bay as an example).	Allow at least $50,000 for a package of signage at each location.
Step 2: Take action to reduce risk or enhance opportunities **A52**: Review access ways to and within high profile foreshore and headland reserves and provide disabled access. This would be included in reviews/preparation of plans of management			
Intent and logic The aim is to make the coastal experience at beaches and headlands accessible to all. The action will contribute to the review and update of Plans of Management for selected reserves.			
Responsibility and key partners	**When - Priority**	**Where – locations for investment**	**Indicative cost and source of funding**

The action will be managed by Council Open Space and Recreation and Community Development units. Consult with L&PMA, precinct committees and with local organisations representing the disabled and elderly.	Audit existing access opportunities within one year. Upgrade access at two sites within five years. Review period: Review extent of access provided and usage, after approximately five years.	Investigate opportunities for providing disabled access onto the beach at all surf clubs. Maintain existing access opportunities such as from the special school at North Entrance. Toowoon/Blue Bay beaches are a priority because they are flat and protected from high energy waves for much of the time. Exposed, open ocean beaches are a lower priority for access onto the beach, but there should still be access to a viewing point. Liaise with L&PMA about maintenance of pathways at Norah Head.	Initial audit has minimal cost. Provision of full disabled access – ramps of appropriate grades and materials, handrails, mats to facilitate access across the sand etc., can be a significant cost. Allow a minimum of $50,000 per site.
Step 3: Enhance knowledge and monitor achievements **A53**: Conduct regular (for instance, every three years) surveys of beach users in relation to satisfaction with facilities and services.			
Intent and logic Provide opportunities for community feedback about beach management and keep Council informed about community needs. The action could be integrated with existing surveys of customer satisfaction conducted by Council. This action will also provide information that contributes to the overall evaluation and improvement of coastline management. This action does not preclude other communication between Council and coastline residents and users, for instance, via precinct committees and the Tuggerah Lakes Estuary Management Committee, or direct submissions to council about specific issues.			
Responsibility and key partners	**When - Priority**	**Where – locations for investment**	**Indicative cost and source of funding**
Council Community Development section. Council would consult with precinct committees and/or the Coast and Estuary Management Committee as part of this process.	At intervals of approximately 3 years. Review period: This action provides information that will feed into the overall review of progress at 3 to 5 year intervals.	Applies to the entire coastline and potentially the sample would include people from across the shire and visitors.	Allow approximately $25,000 for each survey, if conducted by consultants – sample design, survey and analysis.
Step 3: Enhance knowledge and monitor achievements **A55**: Review off leash dog exercise areas in terms of compliance and feedback from users and make changes as necessary to minimise negative impacts on other users and values.			
Intent and logic Council has several off leash and on leash dog exercise areas along the coast (such as Lakes Beach north			

of the surf club and North Shelly Beach). Dog owners have responsibilities for the safety of other beach users in these areas. This action is intended to review the level of satisfaction with the operation of dog exercise areas, by all beach users, so that changes to access can be made if necessary.			
Responsibility and key partners	**When - Priority**	**Where – locations for investment**	**Indicative cost and source of funding**
Council Community Development section will manage the review process. Consultation with Precinct Committees and Coastcare (or CEN) groups about the interactions of domestic pets and wildlife.	Within the first five years of the Plan At approximately five year intervals.	At existing dog exercise areas along the coast.	Within Council's existing responsibilities and budget.

14.0 Cultural Landscapes Action Plan

Table 14.2 – Actions for Managing Social and Cultural Values

Step 1: Benchmark current condition **Step 2: Take action to reduce risks or enhance opportunities** **A77**: With the Darkinjung Local Aboriginal Land Council, Council will develop a project to document stories of Aboriginal community attachment to the Wyong coastline – spiritual, social and cultural. With the Land Council and other Aboriginal groups, identify information that could be used in interpretative material about the coastline and identify locations where this information would add to community appreciation of the values of the coastline			
Intent and logic The cultural value of the coast extends beyond physical evidence of the presence of traditional Aboriginal people. It includes stories about the origins of places, cultural knowledge about places, plants and animals as well as historical experiences of Aboriginal people on the Central Coast. This project is intended to respect the cultural attachment of Aboriginal people to the local landscape and to ensure that Council incorporates that respect in managing coastal places.			
Responsibility and key partners	**When - Priority**	**Where – locations for investment**	**Indicative cost and source of funding**
Council Environment and Natural Resources Unit and Community Development Unit Darkinjung Local Aboriginal Land Council and other Aboriginal groups in the Wyong community. OEH (Cultural Heritage Unit) DPI (relevant sections of the former L&PMA)	Data gathering and documentation component within 2 years. Development of interpretative material within five years. This will be linked to other coastal signage projects for instance, in association with the coastal walk.	Locations will be determined in consultation with the Aboriginal community groups.	Allow $25,000 for a consultation and documentation project. Allow up to $20,000 for signage.
Step 1: Benchmark current condition			

Step 2: Take action to reduce risks or enhance opportunities **A78**: Council will work with the Darkinjung Local Aboriginal Land Council and other Aboriginal community groups, to monitor the condition of known Aboriginal sites on land in its care and include proper protection measures in Plans of Management for coastal reserves in Council's management.			
Intent and logic A detailed assessment of Aboriginal sites on Council land has not been conducted as part of the coastline management study. Whilst much of the dune country along the Wyong coastline has been impacted by past mineral sand mining, some archaeological sites may remain. Such sites would have rarity value on the Wyong coastline. Some sites may also remain on headlands. This action is a partner to A77. It focuses on the physical evidence of Aboriginal cultural heritage, where A77 focuses on the more spiritual attachment to country.			
Responsibility and key partners	**When - Priority**	**Where – locations for investment**	**Indicative cost and source of funding**
Wyong Council Community Development Unit and Open Space and Recreation Unit. Darkinjung Local Aboriginal Land Council and other Aboriginal community groups OEH Cultural Heritage Unit	Audit and condition assessment of Aboriginal sites on council managed land within 1 year. Ensure Plans of Management for council coastal reserves reflect and protect Aboriginal cultural heritage values within 2 years.	Locations to be determined in consultation with Darkinjung Local Aboriginal Land Council and other local Aboriginal groups.	Allow $10,000 for review of the condition of coastal Aboriginal sites. Allow $30,000 for review of relevant Plans of Management to ensure they address the condition of cultural heritage evidence.
Step 1: Benchmark current condition **Step 2: Take action to reduce risks or enhance opportunities** **A79**: In conjunction with L&PMA, review Plans of Management for Crown coastal holiday parks (such as Toowoon Bay, Norah Head, and Crown leases at Sun Valley and Blue Lagoon) and Crown Reserves such as Norah Head, to ensure that climate change hazards are recognised and that the impact of climate change and sea level rise on the recreational, visual and social values of these reserves and leases is managed for the benefit of the community. See Section C, Part 16 for further information about coastal hazard impacts on Crown land.			
Intent and Logic Council and DPI (relevant sections of the former L&PMA) jointly are responsible for coastal reserves and built assets such as holiday parks which represent significant recreational, social and scenic assets for the Wyong community and for visitors. This action is designed to ensure that long term changes to coastal processes and the coastal landscape are taken into account in the management of these reserves and holiday parks. This action complements actions to manage coastal erosion and recession hazards in Table 9.2 and action to maintain and enhance the recreational and tourism values of the coastline, in Table 13.2.			
Responsibility and key partners	**When - Priority**	**Where – locations for investment**	**Indicative cost and source of funding**
Council Asset Manager, Open Space and Recreation Manager, in conjunction with L&PMA	Review Plans of Management within 5 years	Applies to all Crown Reserves and Council managed foreshore reserves along the coast	Initial review of extent to which Plans of Management address climate change and sea level rise issues is within existing Council staff responsibilities. Allow $20,000 for specialist advice on how reserve

			values can be managed and/or design of structures to protect assets.

F.9 Potential Funding Sources and Options

The following reproduces (verbatim) the sections listed in Table F-9 from Umwelt's (2011b) *Coastal Zone Management Plan for the Wyong Coastline: Supporting Information Volume 1,* which refer to the Potential Funding Sources and Options that were applicable in 2011. References mentioned within the below reproduced text by Umwelt refer to Sections, Figures, Tables etc. presented in their 2011(b) document.

Table F-9 Reference to Information in the WCZMP Supporting Information (Umwelt, 2011b)

Information	WCZMP Supporting Information (Umwelt, 2011b) Report Part/Section reference
Potential Funding Sources and Options	Part B Section 6.4.4-6.4.7

BMT WBM highlights the below reproduced text has been copied verbatim from Umwelts' (2011b) 'Coastal Zone Management Plan for the Wyong Coastline: Supporting Information' and is included within this document on request by Council. Intellectual property rights of the below material remain with Umwelt Pty Ltd.

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/Questions and Answers.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.

F.10 Summary of Condition and Status of Biodiversity, Settlement and Land Use

The following reproduces (verbatim) the sections listed in Table F-10 from Umwelt's (2011b) *Coastal Zone Management Plan for the Wyong Coastline: Supporting Information Volume 1,* which refer to the Biodiversity and Land Use within the Wyong coastal zone. References mentioned within the below reproduced text by Umwelt refer to Sections, Figures, Tables etc. presented in their 2011(b) document.

Table F-10 Reference to Information in the WCZMP Supporting Information (Umwelt, 2011b)

Information	WCZMP Supporting Information (Umwelt, 2011b) Report Part/Section reference
Summary of condition and status of **biodiversity, settlement and land use**	Part C Section 17.1 (Biodiversity Values) Section 17.2 (Land use and assets, including residential property value; and recreational activities and assets) Section 17.3 (Cultural and heritage values)

BMT WBM highlights the below reproduced text has been copied verbatim from Umwelts' (2011b) 'Coastal Zone Management Plan for the Wyong Coastline: Supporting Information' and is included within this document on request by Council. Intellectual property rights of the below material remain with Umwelt Pty Ltd.

17.1 Biodiversity values

Biodiversity resilience is a key objective for coastal zone management, with and without the impacts of climate change on coastal vegetation communities and habitats.

17.1.1 Vegetation communities

Coastal biodiversity includes individual plant and animal species, communities and habitats occupying other terrestrial and marine pars of the landscape, as well as the connections between these species, habitats and communities and the ecosystem services that they provide. Ecosystem services include ecological functions that benefit other aspects of the physical, social and economic environment. For instance, vegetation on coastal dunes provides services such as sand trapping, dune stabilisation, provision of shade for recreational users and visual amenity.

Budgewoi Beach Dunecare 2010 reports the presence of four threatened flora species within the area of the group's operations. These are Sand Spurge, Camfield's Stringybark, Magenta Lilypilly and Black-eyed Susan. Of these, only the Sand Spurge is likely to occur within the area of coastal hazard impact.

Figures 17.1 and 17.2 show the distribution of vegetation communities along the Wyong coastline, based on mapping by HCCREMS (Blackmore & Goodwin 2009), mapping of Endangered Ecological Communities by Hunter Councils (McCauley et al. 2006) and the NSW Government SEPA14 maps of coastal wetlands.

Much of the coastline is developed for residential land uses. Much of the northern part of the coast was mined for mineral sands some 50 years ago, and has been broadly rehabilitated.

Coastal vegetation on dunes is dominated by coastal sand scrub and beach spinifex communities. Only very small areas of Endangered Ecological Communities are located within the area affected by coastal processes or its immediate landscape context, except in Munmorah State Conservation Area.

EECs in or close to the core area of interest for the WSCMP include:

- A small area of Swamp Oak Rushland Forest and a small area of littoral rainforest on the landward side of the dunes at Lake Munmorah
- A small area of littoral rainforest between Norah Head and Cabbage Tree Harbour. This patch is not gazetted under SEPA26.
- A small area of Littoral Rainforest at Little Bay, south of Toowoon Point. This patch is not gazetted under SEPA26.

Other EECs and/or larger areas of EEC are located in the broader coastal zone. For instance, the Budgewoi Beach Dunecare Group (2010) identifies areas of Swamp Sclerophyll Forest on Coastal Floodplains; Swamp Oak Floodplain Forest; Littoral Rainforest in the South East Corner, Sydney Basin and NSW North Coast Bioregions; Littoral Rainforest and Coastal Vine Thickets in Eastern Australia; and Sydney Freshwater Wetlands within the area of its operations.

SEPP14 wetlands are generally restricted to lake shore locations. At Budgewoi, where the coastal dune barrier is narrow and low lying, the SEPP 14 wetland comes to within 200 metres of the coastline.

17.1.2 Coastal Fauna

Table 17.1 lists shorebirds and wader species that have been reported (i.e. sighted) along the Wyong coastline, and are listed under either the Threatened Species Conservation Act or the Environment Protection and Biodiversity Conservation Act (subject to JAMBA, CAMBA or ROCKAMBA). Additional species (such as the Glossy Black Cockatoo) are known to occur within the broader coastal zone and may forage within the coastal hazard areas.

Table 17.1 - Protected and threatened bird species, Wyong coastline

Scientific name	Common name	Conservation Status		Known records
		TSC Act	EPBC Act	
Thalassarche melanophris	Black browed albatross	V	MAR and MIG	Red Ochre Beach
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	V		Gravelly Beach Headland
Puffinus carneipes	Flesh footed shearwater	V	MAR & MIG JAMBA/ ROCKAMBA	Red Ochre Beach
Sterna albifrons	Little tern	E	MAR & MIG JAMBA/ CAMBA/ ROCKAMBA	Gravelly Beach Headland, Pelican Point, The Entrance North
Gygis alba	White tern	V	MAR	Norah Head
Puffinus assimilis	Little Shearwater	V	MAR	Birdie Lagoon/Birdie Beach Lookout
Pandion haliaetus	Osprey	V	MAR & MIG	Frazer Beach, Snapper Point road Lookout, inland from Coral Fern Beach
Haematopus longirostris	Pied oystercatcher	V		Birdie Lagoon, Ghosties Beach, Tuggerah Entrance, Norah Head, Soldiers Beach, Budgewoi
Pterodroma solandri	Providence Petrel	V	MAR & MIG JAMBA	Norah Head
Calidris alba	Sanderling	V	MAR &MIG JAMBA/ CAMBA/ ROCKAMBA	Norah Head
Haematopus fuliginosus	Sooty oystercatcher	V		Birdie Beach, Red Ochre Beach, Groper Hole, Flat Rocks Headland, Toowoon Point, Tuggerah Entrance, Soldiers Beach, Pelican Beach, Norah Head

Macronectes giganteus	Southern giant petrel	E	MAR & MIG	Groper Hole, Moonie Beach

Outside the Munmorah State Recreation Area, the most frequent sightings of these protected bird species have been on the sand flats at The Entrance and Toowoon Bay and at Norah Head.

Other threatened fauna which may be sighted along the Wyong coast from time to time include the New Zealand Fur Seal, Australo-African Fur Seal, Southern Right Whale, Humpback whale, Common Bentwing Bat and Squirrel Glider (Budgewoi Beach Dunecare, 2010).

17.1.3 Biodiversity assessment of rocky shores

In relation to its focus on the protection and enhancement of rocky shorelines, the HCRCMA has prepared a Central Coast Rocky Shore Biodiversity Assessment (Gladstone et al. 2007) and Discussion Paper: Management Planning for Coastal Rocky Shores (B-COS Consulting Services 2008).

The biodiversity assessment examined habitats at 26 rocky shore sites, including 11 in Wyong Shire (e.g. Blue Lagoon, Norah Head, Spoon Bay, The Entrance, Toowoon Point and Soldiers Reef). Results are summarised below.

Intertidal organisms

Species diversity: The smallest number of species (91) was recorded at Norah Head and Snapper Point.

Rare Species: the greatest number of rare species was recorded at Blue Lagoon (15 species, making it the most distinctive assemblage in the project area).

Conservation Value: The Entrance was rated as having the lowest conservation value

Birds

Species diversity: The largest number of species was recorded at Norah Head (10 species) and Blue Lagoon (7 species). Norah Head was regarded as a particularly important site for birds, being a high and low tide roost for gulls and terns, a significant low tide foraging site for migratory shore birds.

17.1.4 Ecosystem services

DECCW (2009), Eamus et al. (2005) and others identify a range of ecosystem services that are relevant to healthy, functioning coastal wetlands, dune and headland ecological communities along the coast. Examples of these include:

- Biological regulation – resisting or providing a buffer against invasive species; protection ecological functions of other communities.
- Erosion protection. Coastal dune communities provide some protection and buffering against storm bite erosion. Well established dune communities also help to maintain the sediment separation between beach and inland landforms. This ecosystem service is the rationale for investment in dune vegetation programs (such as by Landcare) which are included in Section 9.0.

- Hydrological regimes – vegetated landscapes moderate runoff during major rainfall events, by absorbing and detaining runoff; they also play a role in groundwater recharge and discharge and also have water filtering capabilities.
- Natural hazards. Well established headland vegetation can reduce the likelihood of mass movement events (land slip and creep) on terrain underlain by geotechnically unstable geology. Headland vegetation provides lesser services where the main geotechnical process is blockfall and can in fact exacerbate physical and chemical weathering along joint planes and other lines of weakness (see Section 16.8).
- Soil formation and nutrient recycling is dependent upon the functioning of ecosystems. In former mining sites along the Wyong coastline, soil formation on reconstructed dunes sis still limited.
- Recreation. The coastal landscapes of Wyong provide a major recreational asset for local communities and visitors. Valued activities that depend on functioning terrestrial and marine ecosystems at the local and regional scale include swimming and surfing, bird watching, walking, sight-seeing, photography and other art forms.
- Cultural services, including spiritual connectedness (Darkinjung traditional owners) and aesthetic appreciation. Apart from the spiritual attachment of local Aboriginal people to particular landscape features and species, intact and resilient landscapes also protect the physical evidence (archaeology) of past occupation of the coastal landscape by Aboriginal ancestors.
- Pollination and nectar supplies for species including commercial species or those used by humans.
- Genetic resources that can be drawn upon for commercialisation.
- Climate regulation and carbon sequestration. Carbon accumulation and storage in coastal ecosystems does occur and may be more efficient in relatively intact systems compared to disturbed systems.

Different assemblages of ecological communities on dune and headland terrain provide different combinations of these and other services. Consequently, threats which reduce the resilience of coastal ecological communities will have a differential impact on ecosystem services, depending on the spatial arrangement of impacted communities. The extent of loss of ecosystem services also varies with time frame. For instance, the effects of sea level rise have different impacts on ecosystem services over the 2050 and 2100 timeframes varies because a variety of thresholds for landform change will be passed at different times (see Section 9.0 and Section 16.6).

17.1.5 Threats to biodiversity values

Biodiversity values, and particularly the maintenance of sustainable populations of threatened or endangered species are threatened by a wide range of natural processes and human activities.

In the Wyong coastline area, the most important threats to biodiversity are:

- Expansion of the development footprint on the coastline. In general, this is a threat that has already run its course on the Wyong. Coastal sand mining (see Section 17.2.1.1) and construction sand quarrying and expansion of urban areas occurred in the 1960s and 1970s in particular. These activities removed coastal heath and coastal woodland communities, many of which would now be considered to be Endangered Ecological Communities. Remaining areas of relatively undisturbed native vegetation along

the Wyong coastline are now protected in conservation management, in National Park of State Conservation Area. Post mining dune vegetation rehabilitation has stabilised the dune surfaces, but has also resulted in lesser species diversity than the original vegetation (e.g. on the dunes at Budgewoi).

- Weed invasion. Lantana and Bitou are the most obvious species on coastal dunes and headlands, but other weeds are also present. Bitou is very widespread, as it was used as a coastal dune rehabilitation species at the time that the Wyong coastal dunes were mined for mineral sand.
- Urban edge effects. These impacts include predation by domestic animals, sources of weeds, additional clearing for views or fire control, clearing for tracks, introduction of pathogens and chemicals and increased nutrient levels in runoff.
- Heavy recreational usage of terrestrial habitats. Multiple, heavily used access ways reduce the ground cover of vegetation, encourage wind erosion and open opportunities for invasive species.
- On rock platforms and nearshore reef areas, heavy use by recreational anglers can impact on shellfish species and can also disturb migratory shorebirds.
- Climate change. For coastal dunes in coastal risk areas, climate change impacts over the next century are expected to include the erosion (recession) of the land surface occupied by remnant and restored dune vegetation. Whilst this will not necessarily reduce species diversity in the region, it does affect ecological connectivity (see Section 17.1.5) and loss of frontal dune vegetation communities will expose more landward communities to more aggressive coastal processes.

17.1.6 Trends in biodiversity resilience – what will climate change do?

Figures 17.1 and 17.2 show the locations of conservation reserves along the Wyong coastline and the locations of other patches of vegetation which provide connectivity between the principal vegetation reserves.

The lack of high conservation value ecological communities in the immediate coastal area means that coastline recession, by itself, is not a major threat to the biodiversity of the open sandy coast in Wyong. However, climate change has a number of other implications for biodiversity along the Wyong coastline, including the following:

- If coastal recession results in changes to the tidal processes in the Tuggerah Lakes, such as opening an entrance at Budgewoi, major biodiversity impacts would result
- Inundation of rock platform habitats so that they are permanently submerged rather than only at high tide. This will reduce the value of roosting habitat for a number of protected migratory species.
- Climate change (warmer and slightly wetter) may favour the expansion of some invasive plant species, particularly those whose range is currently restricted to further north than the central coast.
- Climate change driven coastal recession and dune mobilisation may further fragment coastal vegetation communities.
- The response of coastal dunes and associated vegetation to coastal recession clearly varies with the scale of the dune system and its landscape context (see Section 16.4.1). In general, pocket beaches (such as Cabbage Tree Harbour) are susceptible to coastal recession, because they have a limited buffer of sand, and landward translation of small dune forms is blocked by the break of slope to bedrock terrain.

17.2 Land use and assets

Other than the National Parks and State Conservation Areas in the far north and south of the coastline, the Wyong coastline is densely settled, particularly south of The Entrance.

This section provides background information about the population of the coastal area, trends in residential land values and the social values of the coastline, such as recreation, exercise, relaxation, views, meeting friends and family holidays.

Also in this section is information about the public built assets along the coastline. These include existing sea walls at The Entrance, surf club buildings, roads, pathways, sewerage and stormwater systems.

17.2.1 Evolution of settlement and coastal communities

The coastline of the Wyong Council area is the traditional home of the Awabakal and Darkinjung people. There is significant uncertainty about exact traditional tribal boundaries. Parts of the Central Coast were also occupied by the Guringgai people. It is believed that the name 'Wyong' derives from the traditional Aboriginal name for the area, meaning either 'running water' or 'place of yams'. More information about the Aboriginal heritage of the Wyong coastline is included in Section 17.3.1.

European settlement is believed to have commenced as early as 1796. Central Coast Tourism (Central Coast Tourism n.d.) reports:

In 1796, some shipwrecked fishermen landed on the coast at The Entrance, thus marking the beginning of recorded European interest in the area. These seamen were safely guided most of the way to Sydney by some of the local Aborigines and upon their return they reported the existence of a white woman living amongst the Aboriginal peoples.

Henry Holden became the first European to settle in the area at Picnic Point in 1828, then in the late 1820s, a group of Chinese fishermen set up a base at a place now known as Toowoon Bay.

In 1889, the rail link from Sydney to Newcastle was completed and the first tourists began to visit the area. In the early 1890s a holiday camp began operating at Toowoon Bay and in 1895, the first guesthouse opened at North Entrance.

Development of the area, however, was only gradual. A post office opened in 1911 under the name 'The Entrance' and thus the town's name was selected. It refers to the slender channel that connects Tuggerah Lake to the ocean.

Although there was some European settlement at several locations along the Wyong coastline from the 1830s onwards, increasing towards the end of the nineteenth century as the area became more accessible for tourism, significant expansion of the population of the Wyong Shire Council area did not occur until after the Second World War.

Up until the mid twentieth century, settlement of the coastal parts of the Wyong coastline was restricted to small fishing and holiday settlements, (e.g. see Scott 1998 or an oral history of the ecology of the Tuggerah Lakes). Holiday interest focused on the lakeside beaches (such as Canton Beach and Long Jetty) where there were popular camping grounds, and The Entrance and Toowoon Bay with both camping grounds and guest houses.

Rapid population growth occurred in the 1970s and 1980s, when Wyong Shire received a significant inflow of population from the Sydney Metropolitan Area. Much of the major growth in the 1970s and 1980s was concentrated in the eastern part of the Shire. More recent growth has focused on new estates west of the Pacific Highway. The pattern of settlement expansion in the coastal part of the Shire has resulted in areas that have transformed from small dune top or headland holiday cottages to major investment in residential property (see also Section 17.2.4 for information about the value of coastal property).

This history, a transition from small scale rural settlement (forestry, fishing and later tourism) to small urban centres with low cost housing to major urban expansion to redevelopment of prime coastal sites, has influenced the distribution of risk along the coast (see Section 18.0).

The National Sea Change Taskforce (Gurran & Squires 2006) identifies five broad types of coastal community. Wyong Shire's coastal settlements have the characteristics of three of these types: coastal commuters, coastal getaways and coastal cities, and can be seen to be in transition from the commuter to the coastal city type, which also attracts weekend getaway settlement because of its proximity to Sydney. These settlement and community characteristics present particular challenges for managing the values of Wyong's coastline. There is a large and growing population, holiday peaks in occupation, high access and amenity expectations, historical inheritance of land use and pressure for redevelopment of 'prime' coastal sites.

17.2.1.1 Impacts of previous land uses

Coastal dunes are a traditional source of a range of heavy minerals, including rutile, zircon and ilmenite. From the 1950s to the 1970s, coastal dunes in Wyong Shire were mined for these mineral resources. For instance, mineral sand mining leases covered all of the North Entrance peninsula, east of Wilfred Drive (CCCEN Centre for Sustainability 2004; O'Dell 1980; Thom 2004). Mineral sand mining also occurred along the Budgewoi peninsula. Thom (2004) notes that the community environment groups fought for the conservation of red gum (Angophora costata) forest on the North Entrance peninsula in the 1970s, leading eventually to the dedication of part of the area to what is now Wyrrabalong National Park.

Thom (2004) notes the general adverse affects of historical mineral sand mining on the coastal environment, including:

- Mining opened up relatively inaccessible coastal land which was subsequently used for residential development (e.g. parts of North Entrance and Norah Head)
- Mineral sand mining creates hazardous waste (such as monazite), which requires careful remediation
- Mining disturbed soil, groundwater and vegetation in coastal dunes (beach ridges and transgressive dunes, such as were located at North Entrance). Initial post mining rehabilitation was poor, leaving some permanently degraded landscapes.
- Mining rehabilitation was the principal source of the invasive species bitou bush (Chysanthemoides monifera), which is now a major national weed, and is a primary target of Coastcare/Dunecare groups. Bitou is a major weed in remnant woodland on the North Entrance peninsula.
- Disturbance of frontal dunes may have exacerbated shoreline erosion during the 1970s, when a series of major coastal storms coincided with mining activity (see also Section 16.0). However, in some locations,

the post mining dune profile moved dune sand seaward, increasing the sand buffer in frontal dune positions.

Part of the North Entrance peninsula, within the former mineral sand mining lease, was used as the Wyong shire landfill site prior to the mid 1990s. DCP 26 DCP 26 (Wyong Shire Council 1999) noted the potential for contaminated land to occur on the North Entrance Integrated Tourist Facility site, associated with past mineral sand mining and landfill activities. The DCP requires that no buildings are situated on land previously used for landfill.

Urban growth has occurred since mineral sand mining leases expired or were cancelled, as well as with the growing value of the central coast as a commuter residential area.

17.2.2 Coastal property values and ownership profile

The scenic and social amenity of ocean frontage or ocean view land has for decades provided premium pricing for these properties.

The Department of Lands (Office of NSW Valuer General) issued new land valuation notices for Wyong Shire in January 2009. The new valuations drew on an analysis of real estate sales during 2008. The NSW Valuer General (press release dated 12 January 2009) notes that the value of ocean waterfront land is significantly higher than all other property in the Shire. A waterfront residential property at Blue Bay, for instance, was valued at $1.8 million and property at Noraville and The Entrance North was also valued at around this amount.

The Commonwealth Bank publishes suburb by suburb information about demography, housing prices and recent sales (myrp.com.au n.d.). The reports use 2001 and 2006 census data and up to date information about median sale prices and trends. All suburbs which have some ocean frontage residential property are reported to have median sale prices well above the average for Wyong Shire. The median value in any suburb is greatly influenced by the size of the residential area and the relative portion of the residential area that has ocean frontage or ocean views as opposed to non waterfront (or waterfront reserve) land. Toowoon Bay, Norah Head and Blue Bay in particular have long term (over the last ten years) property values close to double the Shire average.

17.2.3 Population trends

How will trends in demography and socioeconomic indicators increase or reduce vulnerability to coastal processes and to climate change?

The estimated total population of Wyong Shire Council in 2007 (based on 2006 Census data) was 143,951. Population data for the period 1996 to 2007 shows a period of rapid growth from 1996 to 2001, with significant slowing in the growth rate since then. Current population growth rates for the Shire as a whole are less than one per cent per annum.

The narrow coastal strip of Wyong Shire Council includes six Census sub areas:

- Bateau Bay- Shelly Beach
- Long Jetty-Blue Bay-Toowoon Bay
- Noraville-Norah Head-Canton Beach

- The Entrance-North Entrance
- Budgewoi-Halekulani-Buff Point
- Lake Munmorah-Chain Valley Bay

Clearly the census data for these sub areas includes residents from streets outside the core area of interest for the WSCMP. However, a review of the demographic trends from these six areas reveals important population characteristics that Council has considered in its planning for coastal access and recreation facilities.

The total population of the six coastal sub areas remained quite stable between 2001 and 2006. The 2001 population was 42,849 and by 2006 the population had increased slightly to 42,923, a gain of less than 0.2 per cent.

The population of the Toowoon Bay-Blue Bay, Noraville and Budgewoi areas declined slightly between 2001 and 2006. Very small increases were experienced at The Entrance and Bateau Bay, with a slightly larger increase in the Lake Munmorah-Chain Bay area.

The three oldest settled coastal areas have a lower proportion of young people (population under 18 years) and a higher proportion of older adults than other parts of the coast and particularly than other parts of the Shire. However, all parts of the coast have more than 20 per cent of their population in the older age bracket (over 64 years).

17.2.4 Commercial uses of Wyong coastline beaches

Beaches in Wyong Shire are used for the following commercial purposes:

- Commercial fishing (beach hauling)
- Surfing schools and board hire - Toowoon Bay Beach, Lakes and Soldiers Beaches
- Fitness training - Soldiers Beach

Other commercial events are occasionally held on beaches; however these are usually one off bookings.

Several caravan parks (see Section 17.2.7) have ocean frontage locations, not extending onto the beach itself. Many other businesses, including accommodation and food businesses derive a significant portion of their income from visitors who come to the area because of its beaches and coastal recreation opportunities such as beach and rock platform fishing.

17.2.5 Recreation and tourism

Recreational uses of the Wyong coastline include:

- Recreational ocean fishing from beaches and rock platforms. Access is generally on foot, but four wheel drive vehicles use parts of Birdie Beach
- Ocean fishing from boats launched at Cabbage Tree Harbour or Toowoon Bay
- Swimming and general surfing
- Surf board riding – by locals and visitors

- Surf life saving and competitive surf life saving club activities such as surf boat rowing and surf ski paddling (see Section 17.2.6)
- Walking – see Section 17.2.7 for information about paths and other access ways for walkers and swimmers
- Other fitness activities such as cycling and running
- Bird watching
- Picnics – on beaches, headlands and in foreshore reserves
- General sightseeing
- Kite surfing
- Whale watching
- Environmental activities such as weeding and planting
- Car parking access is required for all of these activities

The tourism uses of the coast include:

- Bed and breakfast accommodation
- Caravan parks and camping areas. Table 17.4 indicates the locations of Caravan Parks in relation to the six patrolled beaches in the Shire.
- Restaurants and cafes
- Formal open spaces for large community events/festivals
- Surfing lessons
- General sightseeing
- All of the recreational uses noted above

Table 17.4 - Caravan Park Locations
(Data from L&PMA and SGL 2010)

Shelly Beach and Shelly Beach North	Sun Valley Tourist Park (Crown lease) Blue Lagoon Beach Resort (Crown lease) Toowoon Bay Tourist Park (walking distance to beach for young families)
Toowoon Bay	Toowoon Bay Van Park
Blue Bay	Blue Bay Camping and Caravan Tourist Park (walking distance to beach for young families)
North Entrance	Dunleith Caravan Park Two Shores Caravan Park
Soldiers Beach	Norah Head Tourist Park
Budgewoi Beach (Ocean Street)	Budgewoi Tourist Park (walking distance to beach for young families)

17.2.6 Patrolled beaches and Surf Club activities

There are six surf clubs along the Wyong coastline (see Section 15.2.1.4 of PART C).

Council provides lifeguards at six beaches for seven months of the year between the end of September and 25 April, excluding weekends and public holidays when the beaches are patrolled by Surf Life Saving volunteers.

Council also provides a contract service at Frazer Beach in Lake Munmorah State Recreation Area (Christmas, Easter and April School Holidays). Hours of patrol: are 8.30 am – 5.00 pm and 8.30 am – 6.00 pm (Christmas holidays)

17.2.6.1 Beach usage statistics

Lifeguards working at each of the six surf clubs in Wyong Shire have collected estimates of beach usage over the last twenty years (SGL Consulting Group 2010). Table 17.5 summarises beach usage data for the patrolled beaches for 2004/2005. There are obvious inaccuracies/rounding in this data, but despite this, it is likely that more than 1.1 million people visited the Shire's beaches over that period. This is part of a trend of overall increasing beach usage in the Shire. Table 17.5 also shows the number of rescue and first aid incidents at each of the beaches for 2004/2005.

Table 17.5 - Beach usage and incidents, 2004/2005 (data from SGL 2010)

Beach	Estimated attendance, weekdays	Estimated attendance weekends	Rescues/users per rescue	First aid
Soldiers	182,170	100,000	261 recues or 1081 users per rescue	138
Shelly	152,700	100,000	360 rescues or 702 users per rescue	258
Toowoon Bay	126,860	75,000	31 rescues or 6511 users per rescue	306
The Entrance	110,870	25,000	102 rescues or 1332 users per rescue	75
Lakes	92,450	25,000	28 rescues or 4194 users per rescue	135
North Entrance	90,030	25,000	14 rescues or 8216 users per rescue	185
Estimated total	755,080 (68%)	350,000 (32%)		

Soldiers, Shelly and Toowoon Bay beaches are the most popular, and slight declines in the usage of The Entrance, Lakes and North Entrance Beaches have been reported over the last decade. SGL (2010) do not provide information about the types of injuries treated at each of the beaches (e.g. stings, grazes on rocks, heat exhaustion are all likely reasons for first aid). However, it is apparent from this data that Soldiers and Shelly Beach require the highest resources for safe management of beach users. Both have high and increasing numbers of users, and high numbers of rescues/first aid incidents.

Based on these statistics, Shelly Beach has the lowest numbers of users per rescue incident – i.e. a higher likelihood of users requiring rescue than other beaches. Soldiers Beach has the next most frequent rescues relative to user numbers. In 2004/2005, North Entrance, Lakes Beach and Toowoon Bay had relatively low numbers of rescues relative to the estimated number of beach users.

17.2.6.2 Functions and services of surf club sites

Surf club buildings provide the following services and functions. Some of these services and functions require a location very close to the beach and with direct line of sight to areas used by people swimming or surfing (Beach Front BF). However, other activities/services are already delivered or could be delivered effectively from a building located further back from the beach (Near Beach NB, outside the immediate coastal risk area) and potentially outside the 2050 or 2100 coastal risk areas. See Section 16.6 for more information about coastal risk areas.

- Beach lookouts for lifeguards (with high beach visibility, shade and power for announcements) (BF)
- Focal point for safety issues for beach users (BF)
- Main beach access to patrolled swimming areas (BF)
- Source of information to beach users, including about beach safety, beach access and protecting coastal environments (BF and NB)
- Storage of surf life saving equipment such as surf boats, rubber duckies, surf skis, buggies for towing etc. Larger pieces of equipment need a direct ramp access onto the beach (BF)
- Meeting rooms for life saving club members (NB)
- Function rooms for club members and general community hire – social values (NB)
- Public amenities such as toilets, change rooms and showers (NB). Showers may also be provided at beach access points near the club (BF)
- Disabled access points onto beaches (BF)
- Focal point for coastcare activities on dunes (NB)
- Kiosks and cafes (NB)
- Car parking (NB)
- Starting point for coastal walking paths (NB)
- Picnic areas (NB)
- Venues for major events such a State and National Surf Life Saving Championships bringing significant tourist revenue to the area (BF and NB)
- Some club buildings (such as The Entrance) have heritage value.

17.2.6.3 Environmental works and community development at surf club sites

Toowoon Bay Beach was awarded the title ‘Australia’s cleanest beach’ by the Keep Australia Beautiful program in 2007. The beach also won the ‘friendliest beach’ award in that year.

Toowoon Bay Surf Club, in partnership with Wyong Council and other community members, has implemented a number of innovative environmental and social programs to enhance the quality of the beach experience for all users. These initiatives include:

- Regular maintenance by Council maintenance crews, Council lifeguards, Surf lifesaving Club members and the local community mean that the beach and reserve area is virtually litter free.
- A 'Talking sign' system, which provides visual and audio information about visitor safety issues in multiple languages. The sign is solar powered.
- A double filtration storm water tank at the surf club collects water for use in equipment wash down and toilet flushing. In extended dry periods, council diverts recycled water to top up supply.
- The club area is fully accessible to people with disabilities and the Club works with the Disabled Surfers Association to run a surfers day for disabled people.
- Extensive landscaping has been conducted around the club, using local species, which attract birds and other local wildlife. Landcare groups look after foreshore vegetation with some assistance from surf club nippers.
- The club runs an education program for its junior members on the natural values of rock platforms, beaches and dunes.
- Seaweed collected from the beach is used as mulch/fertiliser on council reserves.

These programs are also relevant to the other surf clubs along the Wyong coastline.

17.2.7 Other community infrastructure and built assets

WSC has constructed and/or is responsible for the maintenance of the following community infrastructure and assets along the coast:

- Stormwater drainage systems and discharge points – onto beaches and headlands
- Water collection for desalination
- Water distribution (drinking water supply)
- Sewerage lines and sewerage pumping stations
- Sea walls at The Entrance
- Surf clubs (see Section 17.2.6 for details).
- Boat ramp and fish cleaning facilities, such as at Cabbage Tree Harbour
- Beach access ways, including steps, ramps and viewing platforms
- Picnic facilities in foreshore reserves
- Pathways and cycleways

Council lists 156 parks developed for public recreation in Wyong Shire. Many parks contain recreation facilities such as picnic tables, seats, playground equipment, toilets, and community information about

ecological or heritage values. A few parks are designated off lead dog exercise areas (see Section 17.2.7.1). Some parks and reserves provide valuable connecting coastal habitat as well as community recreation facilities. Coastal parks and facilities are listed below. The ecological values of coastal parks and reserves is considered in Section 17.1.

- Munmorah State Conservation Area (OEH), with facilities at:
  - Moonee Beach
  - Coral Fern Beach (road loop to informal look out),
  - Frazer Blowhole (road access to car park),
  - Frazer Park Beach (picnic area, camping area, parking and toilets)
  - Red Ochre Beach (picnic area, road access and toilets)
  - Podgewoy Reserve, Budgewoi Beach (walking tracks)
  - Other dune and beach access tracks along Budgewoi Beach and Lakes Beach
  - Lakes Beach Surf Life Saving Club (parking, toilets and beach access)
- Jenny Dixon Reserve at Noraville (parking, picnic area, playground equipment, beach access and toilets)
- Lions Park at Noraville (playground equipment)
- Cliff Street Reserve at Norah Head (picnic table)
- Mazlin Reserve at Cabbage Tree Harbour (Norah Head Search and Rescue area, boat launching ramp to ocean, picnic tables and playground equipment)
- Rossett Lookout and Bush Street Reserve (parking, toilets, playground equipment, picnic tables, lookout)
- Norah Head Lighthouse Reserve (Department of Lands)
- Pebbly Beach Reserve at Soldiers Point (parking area, picnic tables, surf life saving club, beach access, toilets)
- Wyrrabalong National Park North (DECC) (daytime beach access roads and parking area)
- Beach access to Tuggerah Beach fro Wilfred Barrett Drive
- Tuggerah Beach Recreation area (off lead dog exercise area)
- Matron Simpson Reserve, North Entrance (beach access, walking path, surf life saving club)
- North Entrance Foreshore Reserve (sensory garden), (disabled toilets)
- Karragi Point Reserve, North Entrance (sand spit) (beach access, parking, walking track, toilets, picnic tables, playground, links to caravan park)
- Memorial Park, The Entrance (on southern side of entrance channel) icon park with major tourist attractions and facilities, used for events and festivals.
- Shore Park (surf life saving club, lookout, ocean baths, walking tracks)
- Blue Bay foreshore reserve (beach access, toilets)

- Toowoon Beach Reserve and Swadling Reserve (boat launching ramp to ocean, surf life saving club, toilets, parking, lookout, picnic tables, playground equipment)
- Shelly Beach surf Club (parking, toilets, beach access)
- Naomi Honey Reserve (picnic tables)
- Bruce Burgis Park (playground equipment, picnic tables, community hall)
- Wyrrabalong National Park (South) (OEH), Bateau Bay (walking track to Crackneck Point, playground equipment, picnic tables, lookout, parking, toilets, access to Bateau Bay Beach)

17.2.7.1 Dog exercise areas

Dogs are not permitted on some beaches and foreshore reserves. Council has approved a number of on and off leash dog exercise areas. These are:

- Lakes Beach from 500 metres north of the Surf Club to Ocean Street
- North Shelly Beach from the northern beach access walkway off Shelly Beach Road (adjacent to the Golf Course) to the beach access stairs opposite Swadling Reserve
- North Entrance Beach from Wyuna Avenue to Stewart Street
- Bateau Bay Reserve, bounded by Avignon Avenue, Sabrina Avenue and Fishermans Bend

Unleashed dogs must not cause a nuisance to people on these beaches and owners remain responsible for the safety of other users (from dog attacks) and for cleaning up dog waste.

17.3 Cultural and heritage values

17.3.1 Indigenous places and values

Approximately 2700 Aboriginal people live in Wyong Shire. The Wyong coastline is part of the traditional country of the Darkinjung people and the coastal strip was occupied by the Kuringai clan (Wyong Shire Council 2005a). The Darkinjung Local Aboriginal Land Council is the representative body for Aboriginal people living in the Wyong area, some of whom are Darkinjung people, others people from other Aboriginal nations across NSW. The traditional Darkinjung country extends from the Hawkesbury River to Lake Macquarie and west through the Wollombi and Mount Yengo area, including the Wollombi, Colo and Macdonald Rivers. The whale is one of the totems of the Darkinjung people.

The Darkinjung Local Aboriginal Land Council (DLALC) is negotiating a Memorandum of Understanding with Wyong and Gosford Councils in relation to respecting cultural values.

As a Local Aboriginal Land Council, Darkinjung makes land claims under the Aboriginal Land Rights Act. Some 461 land claims across Darkinjung country are pending. In 2009, the DLALC completed a land assessment for land it has acquired under the Act, considering cultural significance, biodiversity significance and development significance. The DLALC also works with the HCRCMA and NSW Environmental Trust on land management projects to protect the natural and cultural values of its lands.

More than 270 Aboriginal sites (places with physical archaeological evidence of past occupation), listed in the OEH AHIMS register, are formally recorded in the Shire, but many more sites are undoubtedly present

across the coastal landscape. Known (recorded and registered) sites are protected by the National Parks and Wildlife Act 1974, as are Aboriginal Places which have been gazetted by the Minister for the Environment.

The value of the landscape to the Darkinjung people and other Aboriginal people who have now made the Shire their home is much more than archaeological sites. The coastal landscape provided people with stone for tools, with a multitude of plants that could be used for food, medicines and fibres (e.g. for weaving), and with fish and shellfish as well as terrestrial animals. Coastal places are associated with traditional Darkinjung stories and with the totems of Darkinjung people. Some places are also important because they are associated with the early interactions between the Darkinjung owners and European settlers moving into the district. Rock art and engravings provide an important record of the association between Darkinjung people and their country. These sites are concentrated in the sandstone lands in the western part of Darkinjung country and in the Gosford council area, rather than along the Wyong coastline.

17.3.2 Heritage listings

A number of places and buildings along the Wyong coastline are identified in local, state and National heritage lists. Table 17.6 lists heritage items listed in Schedule 1 of the Wyong LEP (1997).

Table 17.6 - Coastal historic heritage items, Wyong Shire

Location	Item	Why significant?	Significance
Bush Street **Norah Head**	Light house and building	The last NSW lighthouse to be built in the classical style of James Barnet, the lighthouse was established in 1903. The lighthouse is built of precast concrete blocks rather than stone. There are outstanding views from the top of the lighthouse (now accessible in tours). The complex also includes three keepers cottages.	Regional
Elizabeth Drive **Noraville**	Dwelling (Hargraves House)		State
Corner Wilfred Barrett Drive and Oleander Street **Noraville**	Noraville cemetery and Hargraves Grave		Regional
Marine Parade, **The Entrance**	Surf Club building	Interwar architectural style, like other buildings along the sea front/lake front of the Entrance. Built in the early twentieth century, The Surf Club represents the beginning of The Entrance's heyday as a tourist destination and it has social significance to 'generations of early to mid twentieth century holiday makers and locals'.	Regional
Marine Parade, **The Entrance**	World War 1 Memorial	Situated in the waterfront reserve at the entrance to Tuggerah Lakes, the original memorial was dedicated in 1926 (this memorial has now been	Local

		replaced). The site records the scale of participation of local people in World War 1.	
The Entrance	The Entrance Ocean Baths	A complex of three outdoor ocean baths in the rock platform between The Entrance Beach and Blue Bay. Like the Surf Club building, the baths are linked to the importance of the Entrance as a holiday destination in mid twentieth century (from post WA1 to the 1960s). The local Swimming Club celebrated its Golden Jubilee in 2003.	State. Reported to have been listed in 2003.

17.3.3 Cultural landscapes – integrating physical, visual and social values

Culture incorporates many different aspects of human activity. This section considers only how human activities and values have interacted with the natural coastal landforms and processes, resulting in four main types of landscape along the Wyong coast.

17.3.3.1 Indigenous cultural landscape

The Indigenous cultural landscape reflects the attachment of the Darkinjung people to the coast, for spiritual reasons and associated ceremonies and obligations, as a reliable and abundant source of food medicines and other resources. The Darkinjung people would have experienced considerable change in the shape of the coastline, particularly the coastal dunes and lake entrance areas, over many generations. Naturalness is an important part of the Indigenous cultural landscape, because natural areas conserve the landscape features of cultural value.

17.3.3.2 Historic to modern recreation and tourism

Recreation/tourism and fishing were the key drivers of European settlement along the Wyong coast. The key precincts which reflect a transition from long standing recreation and holiday making to modern versions of these uses are The Entrance ocean channel (north and south shorelines), The Entrance Beach, Norah Head/Noraville and Toowoon Bay. Parts of Budgewoi illustrate a more recent transition from small holiday cottages to more permanent residences.

The Entrance Beach and lake entrance area is a heritage coastal recreation area, long recognised as a place for an escape to the seaside. Holiday camping was an established practice from 1901. The Entrance had only about 50 permanent residents, but there were 400 to 500 tents on Mr Taylors property at the Entrance (and on Rabbit Island) in the holiday season. The Entrance rock pool dates to 1919, with the 50 metre pool constructed in 1938 (NSW Ocean Baths n.d.).

In the 1920s the Entrance was a popular holiday place with 15 guest houses and hordes of campers, including many rail and tramway men and their families. The holiday makers caught boats across the Tuggerah Lakes after travelling on the Sydney to Newcastle railway to Tuggerah or Wyong. Use of the ferry services started to decline after 1923, when the first bus services to the Entrance from Wyong and Gosford began.

Kims Resort on the beachfront at Toowoon Bay, which commenced as a campsite in the late nineteenth century, also grew to become a popular guesthouse from the 1920s, continuing to the present day.

The Entrance Surf Club is linked to an inter-war consolidation of the area as a significant tourist destination.

As a tourism and recreation destination, The Entrance includes not just the ocean beach and rock pools, but the recreational connection between the lake and ocean, extending as far into the Tuggerah Lakes as the Entrance Bridge and the nearby islands.

The Entrance foreshore has been developed as a premier tourist site for Wyong Council, designed to attract and cater for large numbers of visitors. A promenade and boardwalk extends along the estuary foreshore to The Entrance beach and the foreshore is backed by recent redevelopment to medium density residential/tourism accommodation.

The Entrance Peninsula Planning Strategy (2009) identifies some key elements of this landscape and how they will be taken forward in concepts for the future development of the area.

The Entrance Peninsula Vision is based on a clear and unique identity:

- Unique ocean channel with naturally forming mini beaches, shallow and deeper water providing for swimming, paddling, fishing and other water based activities
- Ocean beaches, providing for swimming, surfing, fishing, kite surfing, other water and beach based activities
- Islands providing scenic value, boating refuges, fishing and wildlife refuges (these islands are inside The Entrance Bridge)
- Shopping, including boutique style, restaurants, coffee shops, local convenience stores. Entertainment events.
- Heritage buildings and other places of historic value
- Biodiversity including various threatened species and environments

17.3.3.3 Expansive ocean beach and dunes

The Wyong coastline is dominated by two long classic ‘zeta curve’ beaches, which form the coastal barrier enclosing the Tuggerah Lakes. These are Tuggerah Beach (extending north from The Entrance) and Birdie Beach, extending north from the Hargreaves Beach/Lakes Beach area. Although both dune systems have been mined for sand in the past, there is residential development at North Entrance, and a coastal resort part way along Tuggerah Beach, these two long beach and dune systems present an open and almost remote feeling landscape for beach users.

For the expansive coastal dune areas, a further important cultural value is the commitment to and involvement of local residents in restoring and enhancing the natural environment. The work of the Budgewoi Dunecare group along Budgewoi Beach and dunes, since 1996, is an example of this community cultural value in action.

The cliffs and smaller beaches of the Wallarah Peninsula and the National Park at Crackneck are also part of this open, relatively natural landscape, used primarily for low key activities such as fishing and walking.

17.3.3.4 The residential coast

There is considerable overlap between the recreational and tourist landscapes of the Wyong coast and the residential coastline, as many of the residential areas also serve as tourist accommodation and attractions. The residential coast landscape is characterised by family homes set in a coastal landscape – and designed for enjoyment of the coastal lifestyle. As noted in Section 17.2.2, land values in these residential areas are significantly higher than in other parts of Wyong Shire. Permanent occupancy rates are also lower than many residential areas, because of the overlap with tourism uses and the historical inheritance of holiday homes.

The residential coast landscape includes:

- North Entrance: dune landscape, formerly with low key fishing and holiday houses – now significant residential redevelopment
- Noraville to Lakes Beach
- Shelly Beach, Toowoon Bay and Bateau Bay

In these areas, a narrow foreshore reserve provides for habitat protection, or recreation (including along shore public access) or a visual buffer.

F.11 Risk Assessment

The following reproduces (verbatim) the sections listed in Table F-12 from Umwelt's (2011b) *Coastal Zone Management Plan for the Wyong Coastline: Supporting Information Volume 1,* which refer to the Evaluation of Management Options undertaken for the WCZMP 2011. References mentioned within the below reproduced text by Umwelt refer to Sections, Figures, Tables etc. presented in their 2011(b) document.

Table F-11 Reference to Information in the WCZMP Supporting Information (Umwelt, 2011b)

Information	WCZMP Supporting Information (Umwelt, 2011b) Report Part/Section reference
Evaluation of Management Options, including evaluation of:	Part D (Chapter 19.0)
• Options for immediate erosion and inundation risks	Section 19.3 (summary in Table 19.2)
• Options for future recession and inundation Risks	Section 19.4 (summary in Table 19.3)
• Options for managing lake and sea interactions	Section 19.5 (summary in Table 19.5)
• Options for managing current and future geotechnical hazards	Section 19.6 (summary in Table 19.6)
• Options for enhancing the resilience of coastal biodiversity	Section 19.7 (summary in Table 19.7)
• Options for managing risks associated with community use of the coast	Section 19.8 (summary in Table 19.8)
• Options for managing heritage and cultural values of the coast	Section 19.9 (summary in Table 19.9)

BMT WBM highlights the below reproduced text has been copied verbatim from Umwelts' (2011b) 'Coastal Zone Management Plan for the Wyong Coastline: Supporting Information' and is included within this document on request by Council. Intellectual property rights of the below material remain with Umwelt Pty Ltd.

18.0 Key Risks for the Wyong Coastline

18.1 Assessing risk

Detailed assessments of coastal process hazards are reported in Section 16.0, and full hazard reports are in Appendix 3 and Appendix 4. Risk assessment considers the assets and values that will be impacted by the coastal hazards the consequences of those hazards.

DECCW (2009) has defined 'coastal risk area' as areas that are affected by any coastal hazard within a specified time frame (by 2050 or 2100). Whilst many of the risks are associated with impacts on structures (such as sea walls), infrastructure (such as roads, sewerage systems) and private property (such as residences and businesses), risks can also derive from impacts on valuable natural assets such as Endangered Ecological Communities or on social or cultural values. For instance, the impact of a coastal erosion hazard on a surf club building includes both the value of the structure and the social values that the structure provides, such as a meeting place a place for community functions, or a place associated with long term recreation values. These non structural risks are more difficult to quantify, but should still be taken into account when identifying priorities for risk reduction and when assessing potential risk reduction options.

DCCEE (2009a) discusses the value of risk based planning for making sound decisions about land use in coastal landscapes that are, or are likely to be affected by erosion or inundation. DCCEE (2009a) provides qualitative descriptions of different risk levels, drawing particularly on the likelihood of an event occurring, and planning for new development. The four main risk classes used in the DCCEE (2009a) classification are shown in Table 18.1.

For the Wyong coastline, the coastal planning issues relate to both new development and extensive existing development. This means that risk needs to be considered not only in terms of decisions about where new development should be located, but also in terms of decisions about the extent of protection of other management measures that should be considered or provided for existing development.

Table 18.1 - Land use planning for new development, based on a hierarchy of risks (Source DCCEE 2009, p142)

Risk category	Application and planning response
Low risk areas	Defined by areas where there is little or no risk of erosion, flooding or long term inundation at less than 1 in 1,000 year return periods, under worse case climate change scenarios to 2100. **Planning response**: no constraint on land use planning because of physical climate processes
Medium risk areas	Defined as shorelines, tidal watercourses and low lying lands subject to erosion, inundation and flooding at 1 in 500 to 1 in 1,000 year return period. **Planning response**: no new construction of essential and critical infrastructure and public utilities unless designed to remain operational during extreme climate events (suitable for most other development)
High risk areas	Defines as coastal areas likely to be affected by erosion, inundation and flooding at a return interval of between 1 in 500 and 1 in 100 years. **Planning response**: approval only for development that can be relocated or designed to withstand the impacts of extreme events or flooding without causing adverse consequences for adjoining coastal areas.

Very high risk areas	Defined as areas subject to erosion, inundation and flooding at a return interval of greater than 1 in 100 years under worst case climate change scenarios. **Planning response**: approval only for developments that are compatible with a high degree of land surface disturbance. Existing high value assets in such areas should be subject to restrictions on new development and on the management of potential adverse consequences for adjoin areas, in the light of the ability of the community to protect these assets and support their relocation over time.

Note: current planning is generally based on assessing risks from a 1 in 100 year event. Events less frequent than this, i.e. a 1 in 1,000 year event, are significantly larger in magnitude.

18.1.1 Risk assessment protocols for geotechnical hazards

Much of the focus of recent policy and planning initiatives has been on addressing potential increases in risks associated with coastal erosion, exacerbated by climate change and sea level rise. The multiple policies, guidelines and codes of practice recently released by the NSW Government and discussed in Section 15.0, all relate to coastal erosion and recession.

Geotechnical hazards are driven by quite different processes and the consequences are also different. The Australian Geomechanics Society (2007) has prepared protocols for assessing risks associated with geotechnical hazards. These protocols consider potential damage to property, but also potential injury and loss of life associated with landslip and rock fall events. Full details of the assessment process for the Wyong coastline are in Section 16.0 and Appendix 4.

Risks associated with geotechnical hazards are not further evaluated in this section. However, it should be noted that the geotechnical hazard assessment found some extreme risks associated with landslip risk in public reserves, and also in relation to some private property.

18.1.2 Standard risk assessment protocols – likelihood and consequence

Tables 18.2, 18.3 and 18.4 outline how likelihood and consequence are incorporated into risk and how different levels of risk are described. Figure 18.1 is a risk matrix which shows how the likelihood and consequence scores contribute to the risk description. This qualitative risk matrix is consistent with the Australian Standard and the DCCEE 2009 framework.

Sea level rise predictions are not certain, but the sea level rise planning benchmarks set for the NSW coast (DECCW 2009) are considered likely to occur within the various time frames (immediate, 2050 and 2100). Because coastal erosion/recession hazards are considered likely to affect all development and sandy landforms within the hazard zone for a given time frame, all hazard impacts in the following tables are accorded the same probability. The probability of 'likely to occur' means that all assets within the hazard zone are likely to be affected at least once. Some assets may be affected many times. The time linked width of the hazard zones also means that the seaward parts of the zone will be impacted by erosion hazards sooner and more frequently than the landward margins of the hazard zone.

By applying the same probability of hazards occurring to the entire hazard zone, the risk score actually varies with the value of the asset that will be affected by erosion or coastal recession within that time period. The high likelihood of hazard impacts occurring within the hazard zone for each time period also means that even low consequence scores will lead to a moderate to high risk in the relevant time period. This is in fact the basis of the NSW Government planning response for coastal risk areas that are based on time frames.

Table 18.2 - Qualitative Measures of Likelihood

Level	Descriptor	Description
A	Almost certain	Is expected to occur as a result of the hazard under most circumstances.
B	Likely	Will probably occur as a result of the hazard in most circumstances.
C	Possible	Could occur and has occurred in similar circumstances.
D	Unlikely	Could occur as a result of the hazard but is not expected.
E	Rare	Could occur only in exceptional circumstances.

Table 18.3 - Qualitative Measures of Consequence

Level	Descriptor	Description
1	Catastrophic	Irreparable damage to highly valued structures/items or places with the coastline. This would include removal of entire landforms and associated ecological functions. It would also include destruction of major community infrastructure, such as highways, water and sewer links serving large populations, hospitals etc. Culturally, loss of paces of national heritage significance would be considered a catastrophic loss.
2	Major	Significant damage to structures/items or places or values associated with the coastline.
3	Moderate	Moderate repairable damage to structures/items or places or values associated with the coastline.
4	Minor	Minor repairable damage to structures/items or places or values associated with the coastline, or values are not considered important.
5	Insignificant	No impact to structures/items or places or values associated with the coastline, or the values impacted are very minor.
P	Positive	A benefit or enhancement to coastline places or values.

Table 18.4 - Risk Descriptions

Level	Risk	Description
E	Extreme	Risk is intolerable and cannot be justified under any circumstances. Measures to reduce risk to a lower level are required.
H	High	Risk is significant and requires cost effective measures for risk reduction.
M	Moderate	Routine and cost effective measures required to reduce risk.
L	Low	Risk can be managed by routine procedures and no further measures to manage risk are required.
P	Positive	Positive impact expected. No management required – except perhaps communication. May provide offset benefits for other losses?

Likelihood	Consequences				
	Insignificant	Minor	Moderate	Major	Severe
Almost certain	M	H	H	E	E
Likely	M	M	H	H	E
Possible	L	M	M	H	E
Unlikely	L	M	M	M	H
Rare	L	L	M	M	H

Figure 18.1 - Qualitative risk matrix, combining likelihood and consequence.

18.2 Immediate coastal erosion and inundation risks

Immediate risks are assessed in Table 18.5. The table considers assets located within the immediate hazard lines (wave impact and slope adjustment) to understand the consequences of storm erosion and wave runup.

Table 18.5 – Qualitative assessment of immediate coastal risks

Hazard	Impacts on	Likelihood	Consequence	Assessed risk
Immediate Coastal Risk Area, **North Entrance** (includes Curtis Parade and Hutton Road)	Dune vegetation	Likely to occur and could occur at any time.	Insignificant	Moderate
	Beach access ways (steps and ramps)		Minor	Moderate
	Surf Club buildings		Moderate	Moderate to High
	Residential buildings		Moderate to Major	High
	Residential landscaping		Minor	Moderate
	Infrastructure		Minor	Moderate
Immediate Coastal Risk Area, **Lakes Beach**	Dune vegetation	Likely to occur and could occur at any time	Insignificant	Moderate
	Beach access ways (steps and ramps)		Minor	Moderate
	Surf Club buildings		Minor	Moderate
	Beach access ways (steps and ramps)		Insignificant to Minor	Low to Moderate
	Surf Club buildings		Minor	Moderate
Immediate Coastal	Dune vegetation	Likely to occur and	Insignificant to	Low to Moderate

Risk Area, **Hargraves Beach**		could occur at any time	Minor	
	Residential property		Moderate	High
	Beach access ways		Minor	High
	Picnic areas		Minor	High
	Caravan park sites			
Immediate Coastal Risk Area, **Shelly Beach**	Dune vegetation	Likely to occur and could occur at any time	Insignificant	Low
	Beach access ways		Minor	Moderate
	Picnic areas		Insignificant	Low
	Surf club buildings		Minor	Moderate
	Parking area		Insignificant	Low
	Beach access ways		Minor	High
Immediate Coastal Risk Area, **Soldiers Beach**	Coastal dune vegetation	Likely to occur and could occur at any time	Minor, potential to destabilise dune field?	Moderate
	Beach access ways		Insignificant to Minor	Low to Moderate
	Surf club buildings		Moderate	Moderate
Immediate wave runup (for a 1 in 100 year return interval storm), **North Entrance** (Curtis Pde)* and **South Entrance**	Houses along Curtis Pde South entrance surf club, boat shed and swimming pool	Possible	Minor	Moderate
Immediate wave runup (for a 1 in 100 year return interval storm), **Lakes Beach** (north)*		Possible	Insignificant to Minor	Low to moderate
Immediate wave runup (for a 1 in 100 year return interval storm), **Hargraves Beach***	Most houses along the frontal dune system	Possible	Minor	Moderate
Immediate wave runup (for a 1 in 100 year return interval storm), **Blue Bay***	Caravan Park at Toowoon Bay Caravan Park south of Shelly Beach Low lying houses (southern half of Blue Bay)	Possible	Minor	Moderate

*these beaches were considered to be most at risk for wave runup inundation

18.3 Coastal erosion risks for the 2050 and 2100 planning periods

Table 18.6 provides a qualitative assessment of coastal erosion risks for the planning period to 2050. Table 18.7 provides a qualitative risk assessment for the 2100 planning period.

Table 18.6 – Coastal erosion risks, for 2050

Hazard	Erosion impacts on assets	Likelihood (for this planning period, based on current predictions)	Consequence	Assessed Risk
2050 Coastal Risk Area, **North Entrance** Hutton Road and Curtis Parade	Dune terrain and vegetation	Likely to occur by 2050	Moderate – shoreline moves landward to crest of current dune form	High
	Beach access ways		Minor to Moderate	Low
	Surf club buildings		Major– surf club land will be in the sea	High
	Car parking and road access		Moderate – some parking remains landward of old dune form	High
	Sewer and water infrastructure within coastal hazard area		Major disruption for infrastructure along Curtis Parade	High
	Private property (land and outdoor structures)		Minor	Moderate
	Private property, houses		Major (multiple houses affected)	High to Extreme
	Land tenure definition		Minor – moving boundary of crown and private land	Moderate
2050 Coastal Risk Area, **Hargraves Beach**	Residences	Likely to occur by 2050	Major	High to Extreme
	Infrastructure		Moderate	High
	Dune form and vegetation		Moderate	High
	Infrastructure		Major	High

Hazard	Erosion impacts on assets	Likelihood (for this planning period, based on current predictions)	Consequence	Assessed Risk
2050 Coastal Risk Area, **Lakes Beach**	Dune form and vegetation	Likely to occur by 2050	Major – frontal dune system removed	High
	Beach access ways		Minor	Moderate
	Surf club buildings		Major	High
	Car parking		Minor to Moderate	Moderate
	Sewer and water infrastructure		Minor	Moderate
	Central Coast Highway		Major	High
2050 Coastal Risk Area, **Shelly Beach**	Dune vegetation	Likely to occur by 2050	Minor (dune form will be removed)	High
	Beach access ways		Insignificant to Minor	Moderate
	Picnic facilities		Insignificant to Minor	Moderate
	Beach safety (including life saver station)		Insignificant to Minor	High
	Car parking		Moderate	High
	Road access		Moderate (road impacted both sides of surf club)	High
2050 Coastal Risk Area, **Blue Bay and Toowoon Bay**	Residences and commercial development	Likely to occur by 2050	Major	High
	Infrastructure		Moderate	Moderate to High
	Beach access and amenity		Major (these pocket beaches likely to disappear)	High
2050 Coastal Risk Area, **Soldiers Beach**	Dune vegetation and landform	Likely to occur by 2050	Moderate – likely to destabilise dune	High
	Beach access ways		Minor	Moderate
	Surf Club buildings		Major	High
	Car park		Moderate	Moderate to High
	Infrastructure such as Soldiers Point Drive and sewer and water lines		Moderate	High

18.3.1 Coastal Hazard Assessment for Surf Clubs

Table 18.8 summarises the findings of the coastal hazard assessment for six surf club buildings along the Wyong coastline. The assessment uses the OEH 40/90 centimetre sea level rise benchmarks.

It is apparent that all of the surf clubs built on sand are on the boundary or partly within the immediate coastal risk area, as defined by the landward boundary of the zone of reduced foundation capacity. At 2050, all existing surf clubs on sand are partly or fully seaward of the zone of reduced foundation capacity and other than Shelly Beach, are inside the zone of wave impact and slope adjustment where severe erosion impacts can be anticipated. All surf clubs on sand are within the 2100 coastal risk area. North Entrance Surf Club is the most severely affected, but by 2100, surf clubs, car parks and access roads are affected at all sand based sites.

Table 18.8 - Coastal hazards at surf clubs

	Lakes Beach	North Entrance	Shelly Beach	Soldiers Beach	South Entrance boatshed	South Entrance surf club
Within zone of immediate wave impact or slope adjustment	Not affected	Not affected	Not affected	Passes across the seaward face of the surf club	On rock	On rock
Within immediate zone of reduced foundation capacity	Passes through the surf club	Crosses the front of the existing building	Passes across the seaward face of the surf club	Between surf club and car park	On rock	On rock
Within 2050 zone of wave impact and slope adjustment	Landward of the surf club, affects seaward part of car park	Landward of surf club	Just seaward of the surf club	Between surf club and car park	On rock	On rock
Within 2050 zone of reduced foundation capacity	Landward of the surf club, affects seaward part of car park	Landward of the surf club, at base of dune	Passes through surf club and Shelly Beach Drive	Landward of surf club, passes through car park	On rock	On rock
Within 2100 zone of wave impact or slope adjustment	Landward of the surf club and almost entire car park also affected, plus part of Central Coast Highway	Landward of surf club and of houses in Hutton Road	Passes through surf club and Shelly Beach Drive	Landward of surf club, passes through car park	On rock	On rock

	Lakes Beach	North Entrance	Shelly Beach	Soldiers Beach	South Entrance boatshed	South Entrance surf club
Within 2100 zone of reduced foundation capacity	Landward of the surf club and almost entire car park also affected, plus part of Central Coast Highway	Landward of surf club, along alignment of Hutton Road	Landward of Surf Club and lower section of Shelly Beach Drive	Landward of car park and access road	On rock	On rock
Within area of wave runup (using current sea level)	Seaward of surf club	Seaward of surf club	Seaward of surf club	Seaward of surf club	Landward of boat shed	Passes across seaward face of surf club

18.4 Other risks to coastline values

18.4.1 Inadequate or poorly maintained or managed recreational access

Poorly designed or maintained recreational access ways to beaches and along the coast could drive a number of potential consequences, including:

- Safety risks (injuries) to people visiting the coast (path ways, steps, ramps and viewing platforms, open stormwater drains). See also Section 16.8 regarding geotechnical hazards at some viewing platforms.
- Reduced attraction for tourists – lack of features for marketing the coastline to visitors
- Reduced beach amenity – inappropriate or inadequate facilities at surf clubs or in foreshore reserves; insufficient parking at beaches.
- Reduced public access to beaches (see also Section 9.0 and Section 16.6, public access may be compromised by coastal recession associated with sea level rise).
- Recreational access at popular locations reduces the resilience of coastal dune vegetation communities and habitat for threatened or protected species.
- Recreational access and usage affects the resilience of rock platform ecological communities, such as shellfish habitat and habitat used by shore birds (in addition to the impacts of sea level rise on these communities – see Section 17.1).

All of these risks, as stand-alone issues, are currently considered to be moderate. The threat/hazard of poorly located, designed or maintained beach access ways is considered to be possible. The likelihood of poor design or maintenance occurring is largely dependent on Council's available budget and competing priorities, but other social drivers such as vandalism and physical process drivers such as a higher storm frequency or intensity will also affect Council's capacity to provide sound design, location and maintenance. The consequences noted above vary in their importance, as summarised in Table 18.9.

Table 18.9 - Summary of risks associated with high community recreational pressure on coastal landscapes.

Hazard	Likelihood	Consequence	Assessed Risk
Poorly designed or maintained recreational access ways	Possible for all timeframes	Generally minor, but could (rarely) impact on human life. Affects the safety of beach users (trips, falls etc)	Generally low. High risks are possible where recreational users could be affected (injured) by collapse of structures, even though the probability of this occurring is lower than other scenarios.
Poorly managed beach access infrastructure	Possible for all timeframes	Reduces beach amenity and tourism attraction and economic viability. Generally minor.	Moderate Does not consider variance associated with existing conditions
High recreational usage	Possible for all time frames	Impacts on the stability of dune vegetation communities. Generally minor (dune communities are not EECs or threatened vegetation communities	Moderate
High recreational usage	Possible for all timeframes	Impacts on the ecological viability of rock platform habitats. Minor	Moderate

18.5 Which risks require urgent attention?

The risk assessment highlights that not all assets and values within the coastal risk area are equally vulnerable to the effects of sea level rise and climate change, or to other stresses.

Based on the risk assessment, the following risks are in the 'extreme' class or 'high' class, requiring urgent risk reduction measures. Diverse options which could be used to reduce high and extreme risks are evaluated in PART D and effective options are set out in PART B. Some of these options should be implemented now to reduce immediate high risks and to provide a risk aware framework for future development. Other measures can be delayed until the 2050 or 2010 planning periods, to provide the most cost effective risk reduction strategy.

Table 18.10 - Risks assessed as high or extreme, by timeframe and locality

Immediate planning period		**Can this risk be reduced?**
High risks	In the immediate period, coastal erosion risks at North Entrance Beach (particularly at Hutton Road and Curtis Parade) and at Hargraves Beach, can be considered to be considered as High. These locations are affected by coastal erosion recognised by OEH to make them 'Authorised Locations' for emergency coastal protection works. Geotechnical hazards at Cabbage Tree Harbour also affect private property and public access at a level that makes them High risks.	Risk reduction measures for existing development at these locations are discussed in Sections 8.0, 9.0 10.0 and 11.0 of PART B. These sections also present planning controls to reduce risks associated with potential new development
Moderate risks	Storm wave erosion of beach access infrastructure at all beaches Reduced foundation capacity of North Entrance Surf Club, Lakes Beach Surf Club and Soldiers Beach Surf Club	See Section 9.0 in PART B for a range of potential risk reduction actions, including planning controls, design of access infrastructure and public assets such as surf clubs, structural protection and vegetation management
2050 planning period		**Can this risk be reduced?**
High risks	Loss (erosion) of existing surf club infrastructure at North Entrance, Lakes Beach, and Soldiers Beach Ongoing erosion and loss of structural beach access ways across dunes Erosion and inundation (not from wave runup) impacts on Central Coast Highway Major impacts on residential development at North Entrance, Hargraves Beach, Blue Bay and Toowoon Bay due to coastal recession. Impacts on private property at Cabbage Tree Harbour and Noraville from landslip.	See Section 9.0 in PART B for a range of risk reduction options, including retreat and redevelopment of surf club infrastructure, asset registers and maintenance of access ways. Section 9.0 of PART B also deals with planning controls for new development in coastal risk areas. Section 11.0 in PART B addresses geotechnical hazard control measures.
Moderate risks	Erosion of car parking areas at North Entrance, Lakes Beach, Soldiers Beach Erosion of existing foreshore reserve facilities at Shelly Beach Impacts on sewerage infrastructure at all beaches (some only re connections to surf clubs) Erosion of caravan park sites such as Shelly Beach Loss of beach access and amenity at all beaches, with likely removal of pocket beaches and reduction of beach volume and width at other beaches.	See Section 9.0 in PART B for a range of potential risk reduction measures such as planning controls for new development and modifications to existing development, retreat of mobile structures during storm events, planned relocation of major infrastructure, coastal protection works, community education about emergency procedures. Sections 9.0 and 10.0 also address potential beach and dune nourishment options

2100 planning period		Can this risk be reduced?
Extreme risks	Loss of dune landforms and coastal vegetation, particularly where this exposes hind dune areas such as the lake system, major infrastructure or important ecological communities to significant impacts and changes. Changes to morphology and processes at the entrance to Tuggerah Lakes; potential breakthrough at Budgewoi, across Central Coast highway. Loss of public land along coastline, with roll back of shoreline into private property Erosion of houses and other private property structures at North Entrance, Hargraves Beach, Blue Bay and Toowoon Bay	Planning controls are a key tool for the longer term risks. See Section 9.0 of PART B. Also Sections 10.0 and 12.0. Geotechnical hazard management measures are in Section 11.0 of PART B.
High risks	Loss of existing surf club buildings and car parks, plus access roads at all beaches Erosion of sewer infrastructure at all beaches Geotechnical hazards at Cabbage Tree Harbour and Noraville Ongoing issues about safe beach access on public land	Erosion hazard lines are landward of all surf clubs and foreshore reserve areas by 2100. See Sections 9.0, 11.0 and 12.0 for a range of options to reduce risk

F.12 Evaluation of Management Options

The following reproduces (verbatim) the sections listed in Table F-12 from Umwelt's (2011b) *Coastal Zone Management Plan for the Wyong Coastline: Supporting Information Volume 1,* which refer to the Evaluation of Management Options. Sections, Figures, Tables and Plates mentioned in the below text by Umwelt refer to those presented in their 2011(b) document.

Table F-12 Reference to Information in the WCZMP Supporting Information (Umwelt, 2011b)

Information	WCZMP Supporting Information Report Part/Section reference
Evaluation of Management Options, including evaluation of:	Part D (Chapter 19.0)
• options for immediate erosion and inundation risks	Section 19.3 (summary in Table 19.2)
• options for future recession and inundation Risks	Section 19.4 (summary in Table 19.3)
• options for managing lake and sea interactions	Section 19.5 (summary in Table 19.5)
• options for managing current and future geotechnical hazards	Section 19.6 (summary in Table 19.6)
• options for enhancing the resilience of coastal biodiversity	Section 19.7 (summary in Table 19.7)
• options for managing risks associated with community use of the coast	Section 19.8 (summary in Table 19.8)
• options for managing heritage and cultural values of the coast	Section 19.9 (summary in Table 19.9)

BMT WBM notes the below text has been copied verbatim from Umwelt (2011b) and is included within this document on request by Council. Intellectual property of the below text remain with Umwelt Pty Ltd.

19.3 Potential responses for managing immediate coastal erosion and inundation risks

Table 19.2 - Summary evaluation of options to address immediate coastal erosion and inundation risks

Step 1: Benchmark existing condition	
ACTION	**Risk reduction benefits and logic**
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. Council has quality baseline data from 2007. **INTENT** Provide baseline data for assessing ongoing trends in beach and dune sand volumes and stability, and success of other management actions. See Principle 1 and Objectives 1, 2 and 11	Provides terrain data at a resolution suitable for monitoring change associated with sea level rise and storms. Reduces field survey requirements. Provides data to streamline ongoing modelling and evaluation.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	Indicative cost for Wyong coastline LiDAR collection and processing is $50,000 per event. Wyong coastline likely to be flown at same time as other parts of Central Coast and lower Hunter. May be provided by Australian Government or State programs in the future
	Constraints to implementation: policy or statutory
	No policy or statutory constraints
	Community acceptance?
	Expect to be supported by community
	Where would it be applied
	Whole of coast.
Sustainability score:	**4**
ACTION	**Risk reduction benefits and logic**
A2: Establish an asset register for community assets in coastal risk areas, which will eventually include maintenance schedules, systems for ongoing monitoring of implementation and outcomes. The asset register will include access infrastructure and major assets such as stormwater systems and pump stations. It could eventually be linked to other regional natural resource management and asset management systems. See also A12 and A45 in PART D **INTENT** Creates management mechanisms to focus on how management actions achieve intended outcomes, and to update actions as necessary for ongoing effectiveness	A core part of adaptive management and relevant to all issues affecting the Wyong coastline. These data management systems are designed to track action, expected outcome and actual outcome.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	Complements existing Council spatial and qualitative data bases. Consistent with OEH recommendations for natural resource management in coastal contexts and with the approach of HCRCMA, as well as Council's own business management.
	Constraints to implementation: policy or statutory
	No policy or statutory constraints. Facilitates ongoing review of risk reduction achievements.
	Community acceptance?
	High level of acceptance likely. This action drives the availability of information to the community about what council's investment in coastline management has achieved.
	Where would it be applied
	Applies to all actions in the WSCZMP
Sustainability score:	**5**

Step 2: Select and Implement Actions to Reduce Risk	
ACTION	**Risk reduction benefits and logic**
A3: Integrate Coastal Emergency Response Management Plan with other elements of Council's DISPLAN **INTENT** Provide clear guidance to Council staff and to community on emergency response issues, enhancing preparedness and safety and efficiency of actions in emergency events. See Principles 2, 6 and 12 and Objectives 5, 7 and 10	Ensures necessary agreements and approvals are in place for rapid mobilisation of emergency actions. Allows for some pre-emptive emergency measures. Increases community preparedness e.g. re egress routes. Specifically addresses the Ministers Requirements and *Coastal Protection Act 1979* (amended 2100
	Constraints to implementation: up-front cost and ongoing maintenance costs
	State direction for preparation of emergency plans for coastal erosion hotspots (Authorised Locations) in current proposed amendments to the Coastal Protection Act. Council already has DISPLAN requirements. This provides more detail and readiness measures
	Constraints to implementation: policy or statutory
	Required by NSW government, with North Entrance Beach and Hargraves Beach as State coastal erosion hotspots (Authorised Locations).
	Community acceptance?
	Supported by community
	Where would it be applied
	Whole of coast, with priority to North Entrance and Hargraves Beach in terms of approvals.
Sustainability score:	**4**
ACTION	**Risk reduction benefits and logic**
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** Support an informed and consistent approach to coastal erosion issues across all sections of Council. See Principles 1 and 8 and Objectives 1 and 8	Will improve Council efficiency and effectiveness. Builds on existing Council programs. Will enable Council to properly implement the proposed requirements of amendments to the Coastal Protection Act in relation to emergency protection of private property.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	Low costs for ongoing training, with significant benefits
	Constraints to implementation: policy or statutory
	No policy or statutory constraints. Important part of Council preparedness for coastline management in a changing environment.
	Community acceptance?
	Supported by community
	Where would it be applied
	Relevant to all Council staff, with various levels of training to target those with significant responsibility.
Sustainability score:	**4**

ACTION	Risk reduction benefits and logic
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. Use information sheets, historical aerial photos and news coverage, information boards at beach access ways. Could also include information on rate notices of affected properties (DP&I suggestion). **INTENT** Enhances community capacity to make informed decisions about land use and property management, to act appropriately during erosion emergencies and to provide feedback to council on coastal management options. See Principle 2 and Objective 7.	Climate change, sea level rise and coastal recession are very high profile issues for the Wyong community. This action will help to ensure that the community understands risk management principles and accepts planning responses that impact on the use and value of coastal land. Facilitates appropriate community responses in coastal emergencies, which do not create more issues.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	Low to moderate cost – indicative $50,000/year for the first three years.
	Constraints to implementation: policy or statutory
	Strongly recommended in State government package of climate change adaptation actions (November 2009). Strongly supports Council's climate change policy and draft sustainability principles and strategic vision.
	Community acceptance?
	Expected to be strongly supported by community.
	Where would it be applied
	Whole of coastline, with particular focus on coastal erosion hot spots/Authorised Locations.
Sustainability score:	**5**
ACTION	**Risk reduction benefits and logic**
A6: Introduce clauses in the Wyong LEP and DCP to restrict new development in immediate hazard zones. Other than specified coastal protection works, no new development will be approved seaward of the immediate coastal erosion hazard line or seaward of the immediate geotechnical hazard line. All development in the 2050 risk area will require development consent. **INTENT** Provide a clear framework, with more certainty for land owners. Reduce disputes in Land and Environment Court. Control new development to reduce future risk. Council proposes to apply the same planning controls to its own activities as it would apply to private development. See Principles 2, 3, 4 and 6 and Objectives1, 7 and 9.	Provides non ambiguous guidance on how Council proposes to reduce risks. Prohibiting new development (other than very minor maintenance works) in immediate coastal hazard zones, places a limit on the value of existing development and prevents major additional investment which would increase risk.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	Costs are in terms of loss of property value for private landholders.
	Constraints to implementation: policy or statutory
	Complying development SEPP will not apply. Special consideration will be needed for development like surf life saving stations for public safety. New LEP and DCP provisions to make prohibited development explicit (as per the DP&I Planning Guidelines). Needs special consideration for development that is for coastal protection such as sea walls.
	Community acceptance?
	Community concern about the impact of planning restrictions on land owner ability to maintain existing investment.
	Where would it be applied
	All immediate hazard areas along the coastline, including private land and community or Crown land.
Sustainability score:	**5**

ACTION	Risk reduction benefits and logic
A7: Require removal of existing development within immediate coastal hazard zones, when the landward margin of the zone of wave impact is within 5 metres of the structure. Note that if structures collapse onto the beach during a coastal emergency, the landholder will be responsible for the cost of removing the rubble from the beach. As immediate coastal hazard zones migrate landward, this requirement would also apply to assets in the 2050 and 2100 coastal risk areas (see Sections 8.4 and 10.3.3) (see Sections 8.4 and 10.3.3) **INTENT** Reduce risk of erosion impacts on development that would require protection during coastal emergencies or add to clean up costs. See Principles 3, 4, 5, 6 and 13 and Objectives 2, 7, 8 and 9.	Reduces the potential for housing or other development to collapse onto the beach as a result of storm bite and post storm slumping.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	The amount of development affected will increase over time. Long term costs attached, particularly for landholders. Waste management issues for demolition materials. Who would pay for demolition and removal?
	Constraints to implementation: policy or statutory
	No current policy about removal of development in hazard zones along the coast. Voluntary purchase of affected properties by the NSW Government is currently unlikely. NSW Government coastal planning discussion paper includes consideration of whether new development should be prohibited seaward of the immediate coastal erosion hazard line, but removing existing development is a further level of constraint on existing land holders.
	Community acceptance?
	Possible if requirements are staged? Likely to cause distress to landholders with longstanding association with the coast, or those with recent large investments.
	Where would it be applied
	Possible option for North Entrance peninsula (e.g. Curtis Parade area). In the short term, the affected 'development' is primarily decks, fences and garden structures. In the longer term, more of this type of development would be affected, plus houses and other more permanent buildings.
Sustainability score:	**2**
ACTION	**Risk reduction benefits and logic**
A8: Conduct dune stabilisation and revegetation works to encourage sand accretion and stabilisation of frontal dunes. These on-ground dune maintenance and stabilisation works will be conducted in accordance with Plans of Management for ocean frontage reserves managed by Council. Beach scraping to shore up dunes or to move sand from the swash zone to the back of the beach may be part of this process. Prepare vegetation management plans for ocean frontage reserves. **INTENT** Enhance the resilience of the coastal dunes to storm wave erosion. Enhance ecological connectivity and diversity along the coast. See Principles 7, 8 and 9 and Objectives 3, 8 and 9.	Linked to objectives for biodiversity protection and the amenity of coastal reserves for activities such as picnics. Research observations suggest vegetation management is effective because it traps additional wind-blown sand and builds up dune height and volumes, providing a better buffer to coastal erosion. Improving the health and biodiversity of coastal dune vegetation in old mining areas is an added benefit. Particularly valuable for long open barrier beaches, with limited development.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	Low cost option, often implemented by Coastcare/Landcare volunteers. Ongoing maintenance is required post storm and to minimise weed invasion.
	Constraints to implementation: policy or statutory
	Supported by NSW Government policy as a key strategy for enhancing dune stability and habitat connectivity.
	Community acceptance?
	Generally highly valued by community, provided there are no conflicts between dune stability benefits and views or recreational use.
	Where would it be applied
	Ocean frontage reserves at Budgewoi, North Entrance (Tuggerah Beach), others
Sustainability score:	**5**

ACTION	Risk reduction benefits and logic
A9: Council will continue to dredge sand from the active tidal delta at The Entrance and place the sand on North Entrance Beach. Some sand may also be placed on The Entrance Beach to maintain beach amenity. **INTENT** Maximises sand availability to the beach and frontal dune system	Council currently dredges sand from the entrance channel of Tuggerah Lake and places the dredged material on North Entrance Beach. It has done this for about 20 years, with a total of approximately 500,000 m^3 placed on North Entrance beach (on average, about 30,000 to 80,000 m^3/year). This small scale maintenance dredging distributes sand that would otherwise be scoured from the channel and into the near shore during occasional very large flood flows out of the estuary. Risk reduction benefits are in terms of timing of sand delivery (gradual rather than in occasional pulses), rather than the total volume. Dredging also allows WSC to control where the sand is delivered
	Constraints to implementation: up-front cost and ongoing maintenance costs
	Delivery of sand to The Entrance Beach may require booster pumps and additional pipe to transfer sand. This is a long term process and requires a budget allocation indefinitely. Sea level rise may affect the dynamics of The Entrance channel and could change the volume of sand or pumping requirements. Is there sufficient sand to make a difference to both beaches? Further studies are needed on long term changes to the sediment dynamics in the entrance channel.
	Constraints to implementation: policy or statutory
	Maintenance dredging of the Entrance channel is currently approved by NSW Government as part of the Tuggerah Lake Estuary Management Plan, to maintain some tidal exchange into the lakes.
	Community acceptance?
	Dredging of the entrance channel and reuse of sand for beach nourishment is generally supported by the local community. There are occasionally issues re sand quality (e.g. elevated organic content from buried kelp) and odour.
	Where would it be applied
	Relevant to North Entrance and The Entrance beaches
Sustainability score:	**4**

ACTION	Risk reduction benefits and logic
A10: Council may build temporary structural protection such as geotextile bag structures to protect existing public assets in immediate hazard zones, as a short term action prior to relocation. In the longer term, this action is modified to A26 **INTENT** Provide emergency protection from erosion for ocean frontage public reserves and council infrastructure within immediate hazard zones. The intent of this strategy is to protect existing significant investment in buildings or community infrastructure from intermittent storm bite erosion. See A26 for rationale for longer term structural protection. This is a defence strategy for long term climate change (sea level rise) impacts on the coastline. Examples include surf club buildings, other community and sporting clubs, major roads and sewerage infrastructure. Structural solutions may also be appropriate in some locations to prevent creek entrances migrating and lowering the height of the frontal dune crest. Where sand is available, sea walls or other structures can be combined with sand nourishment, for aesthetic reasons or to improve recreational amenity. See Principles 6, 11 and 13 and Objectives 4 and 8.	Temporary structural protection is limited to geotextile bag structures, which can be installed with varying levels of engineering security. The NSW Government has released draft Ministerial Requirements and code of practice for the construction of temporary erosion protection works. See also A11 for private landholders. Temporary protection measures are permitted for twelve months, but could be extended to allow Councils to prepare for relocation of some assets. In the longer term, a well designed, constructed and maintained sea wall can protect assets and provide a clear edge for high usage public recreation spaces. A sea wall is already in place at The Entrance Beach On a retreating coast, such as one affected by sea level rise, the sea wall will also, over time, lead to a reduction of sand volume on the beach and increases in sand volume offshore as the profile adjusts to loss of sand supply.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	Indicative costs for structures built from geotextile bags are $4000 to as much as $8000/linear metre up front. Structures using these bags are easy to place but require ongoing maintenance. Cost benefit depends on the asset being protected and what alternatives may be available. Rock sea walls are unlikely to be viable for protection of surf clubs in the immediate hazard zone, because of ongoing increases in risk associated with sea level rise and coastal recession.
	Constraints to implementation: policy or statutory
	DECCW 2009 states that the Government will give priority to funding applications to assist Councils to build structures to protect publicly owned assets. Note that although it may provide funds to reduce the impacts of coastal hazards, it does not assume any responsibility for coastal hazards.
	Community acceptance?
	Generally supported by the community
	Where would it be applied
	A rock seawall protects the public promenade at The Entrance. Geotextile bag structures could be used to protect or reinforce beach access infrastructure such as steps, ramps and viewing platforms. An alternative for some structures is deep piled foundations.
Sustainability score:	**4**

ACTION	Risk reduction benefits and logic
A11: Council may grant development consent to private landholders to install temporary, short to medium term (maximum of ten years) structural protection such as sand filled geotextile bag structures, to protect existing private assets in immediate hazard zones. Requirements will be generally in accordance with Ministerial Guidelines and the Coastal Protection Act requirements for emergency protection works, but development consent will be required and conditions will be applied. **INTENT** Provide short term protection from erosion for ocean frontage private property. See Principles 3, 4 5, 6 and 13 and Objective 9. Currently only intended for Authorised Locations, but Council is considering use of short term protection for several other sites where private property is within the immediate coastal erosion hazard zone.	Temporary structural erosion protection is limited to geotextile bag structures, erected in accordance with Ministerial Guidelines (for up to 12 months). These structures are not intended to protect private property from long term recession, but may provide sufficient protection to allow landowners to develop other solutions to coastal erosion hazard. On a retreating coast, such as one affected by sea level rise, any sea wall will also lead to a reduction of sand volume on the beach and increases in sand volume offshore as the profile adjusts to loss of sand supply.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	Indicative costs for robust structures built from geotextile bags are $4000 to $8000/linear metre up front. Structures using these bags are relatively easy to place but require ongoing maintenance. Ongoing costs for landholders in terms of beach nourishment to maintain beach amenity and public beach access (Amendments to the Coastal Protection Act allow Councils to levy certain landholders for a contribution to the maintenance of beach amenity). Expect that over time, the cost of maintaining amenity will increase.
	Constraints to implementation: policy or statutory
	Where private landholders propose to construct a temporary geotextile wall to protect their property from coastal erosion, approval (a certificate) is required from WSC. See the Ministerial Guidelines. Current OEH advice is that if landholders propose a more permanent structure, applicants must demonstrate that the structure will not increase the risk of coastal erosion on other properties and will not detrimentally impact on beach amenity.
	Community acceptance?
	The community has promoted the use of geotextile bags as a relatively cheap and easy to install option for private property (and public assets such as beach access ways). Landholders may favour the option to use geotextile bags as a short term protection for development within the zone of slope adjustment. Note that the Ministerial Guidelines place significant restrictions on how and where geotextile structures can be erected.
	Where would it be applied
	In the short term the properties most affected by coastal erosion are at North Entrance.
Sustainability score:	**3**

ACTION	Risk reduction benefits and logic
A12: Establish an asset register and maintenance program for major Council infrastructure such as stormwater systems and sewage pumping stations. See Also A45. **INTENT** Streamline future infrastructure management. See Principle 1 and Objectives 1, 8, 9 and 10.	Part of Council's ongoing asset management program. Manages data on asset location and condition, maintains records of impacts of storm events on infrastructure at various locations.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	Low cost – within Council's existing asset management program. Link into Council's GIS. Will require regular condition assessment of assets – at specified intervals and/or after each major storm.
	Constraints to implementation: policy or statutory
	No policy constraints. Consistent with Council's Asset Management Strategy. Council may choose not to maintain some assets (e.g. some beach access ways) and to focus investment in assets that are critical to community well being or which are heavily used.
	Community acceptance?
	The community expects Council to demonstrate efficient and effective management of assets.
	Where would it be applied
	Applies to the whole Wyong coastline.
Sustainability score:	**4**
ACTION	**Risk reduction benefits and logic**
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** To provide sufficient supplies of sand which are ready for immediate application to beach erosion sites in the lead up to major storms an which can be used to enhance the broader resilience of frontal dune systems to coastal erosion and recession.	Suitable quality sand may be used directly to protect assets during storms and is also needed to fill large geotextile bags. In the long term, nourishment with suitable sand is a key part of maintaining beach profile and amenity, and protecting assets. There are limited sources of suitable sand in WSC.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	Potential sources of sand include old transgressive dunes on coastal barriers (now mostly in National Park and protected from extraction), relic and active tidal delta sediments, off shore sand deposits, and possibly some fluvial/terrestrial sands. Confirmation of the suitability of any of these sources requires detailed investigation and will also involve new approvals. If offshore sand supplies were to be used for coastline protection works in the future, there are very significant costs involved, including specialist dredge equipment. See Sydney Coastal Councils report (released December 2010).
	Constraints to implementation: policy or statutory
	Most possible sand supplies are currently constrained by either environmental issues or NSW legislation and policy. For instance, there is currently no State level support for accessing offshore sand supplies for construction or for beach protection works.
	Community acceptance?
	Although the community accepts the importance of beach nourishment as part of the future management of coastal amenity, there is limited support for access to most potential sand supplies, because of perceived environmental constraints.
	Where would it be applied?
	Sand is already needed to maintain beach profile, volume and amenity at North Entrance. Requirements for sand supply are likely to increase in the future as sea level rises and other beaches pass trigger points for recession.
Sustainability score:	**4**

ACTION	Risk reduction benefits and logic
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** There is some evidence of past Tsunami impacts on the NSW coast. Notification procedures are now in place and will continue to be refined.	Historical evidence of tsunami on the NSW coast has been limited to relatively minor damage to moored vessels (see Bureau of Meteorology web site and information in **PART C**), but there is some stratigraphic evidence of major tsunami events over periods of hundreds to thousands of years. With existing development on and behind low level coastal barrier systems, Council will benefit from measures to enhance understanding of risks and more effective responses.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	Council's role is minor and costs will be low.
	Constraints to implementation: policy or statutory
	No policy or statutory restrictions.
	Community acceptance?
	Community support for improved risk assessment and notification s expected.
	Where would it be applied
	Applies particularly to the Tuggerah Beach barrier and Birdie Beach/Lakes Beach barrier systems, but also to low lying coastal development, such as at blue Bay and Toowoon Bay.
Sustainability score:	**4**
ACTION	**Risk reduction benefits and logic**
A82: LEP zoning and DCP clauses will discourage land use intensification and reduce risk in areas with a high probability of geotechnical hazards. **INTENT** To reduce future risks associated with slope instability hazards.	This is precautionary management, to prevent or restrict further development of land on unstable coastal cliffs and bluffs where landslip could occur at any time. It will ensure that landholders are aware of the risks involved.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	There are limited up front or maintenance costs for Council. For landholders, the planning controls should mean that future assets are not damaged by landslip processes.
	Constraints to implementation: policy or statutory
	No policy constraints.
	Community acceptance?
	There may be concerns from landholders whose property is primarily in the immediate geotechnical hazard area.
	Where would it be applied
	Would apply to any part of the coast where there are immediate slope instability (landslip and rockfall) hazards.
Sustainability Score:	**#**

ACTION	Risk reduction benefits and logic
A83: Secure funding for and maintain a coastal zone management coordinator position, to facilitate streamlined implementation of key strategies in the WSCZMP **INTENT** This action is intended to provide a central contact person for implementing the WSCZMP. Many of the actions in the CZMP will require coordination across multiple sections of council, preparation of applications for funding, budget and performance tracking, briefings to Councillors and clear community information.	Implementation of the WSCZMP will require good coordination within Council and between Council and government stakeholder, and Council and the community. Council's experience from implementing the Tuggerah Lakes Estuary management plan is that a coordinator role streamlines this interaction and facilitates streamlined action, monitoring and reporting.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	The role will add up to $100,000 per year to Council's budget, depending on the experience of the person and the salary package.
	Constraints to implementation: policy or statutory
	There are no policy or statutory constraints
	Community acceptance?
	Council's structure has included this role for the last two years, with demonstrated benefits in terms of communication and coordination of activities.
	Where would it be applied
	The role would have responsibility for coordinating the implementation of the CZMP for all parts of the coastline that are within council's control.
Sustainability Score:	**5**
ACTION	**Risk reduction benefits and logic**
A84: Introduce appropriate zoning and related clauses into the LEP to de-intensify development in the immediate coastal fringe, which is affected by coastal hazards **INTENT** The intent is to send a clear signal that Council aims to reduce future risks along the coastline. Within the immediate coastal risk area, there is near certainty that development will be impacted by coastal erosion hazards during large coastal storms.	By reducing the intensity of development in the immediate coastal risk area, Council will reduce the amount of development that is exposed to coastal process hazards. This means that less emergency protection works will be required in the future and requirements for structural protection of assets will also decline over time.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	There are only limited cost implications for Council in this action. The LEP and DCP will set out appropriate development for coastal risk areas.
	Constraints to implementation: policy or statutory
	This action is in accordance with the guidelines for coastal development, prepared by DP&I
	Community acceptance?
	Some community concern may be anticipated during the period of adjustment of development style and also until monitoring shows clear impacts of sea level rise on coastal recession.
	Where would it be applied
	Applies to all property within the immediate coastal risk area.
Sustainability Score:	**4**

ACTION	Risk reduction benefits and logic
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** The 2010 amendments to the *Coastal Protection Act* were intended to provide greater certainty about protection options for landholders whose residence is in an immediate coastal risk area.	At Authorised Locations, there are multiple residences within the immediate coastal risk area. The NSW Government has amended the *Coastal Protection Act* to allow landholders in these locations to construct short term emergency protection works, intended to provide some protection during major coastal storms.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	OEH Authorised Officers will be required to review applications for installation of emergency protection works. There may be some costs associated with enforcement of the conditions for emergency protection works.
	Constraints to implementation: policy or statutory
	These works are specifically identified in the 2010 amendments to the *Coastal Protection Act*, as a measure to deal with substantial existing development in immediate coastal risk areas.
	Community acceptance?
	Residents may welcome an opportunity to protect private property, but there are numerous limitations to the work that may be carried out at Authorised Locations.
	Where would it be applied
	Applies only to North Entrance, Hargraves Beach and Cabbage Tree Harbour.
Sustainability Score:	**5**
ACTION	**Risk reduction benefits and logic**
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. **INTENT** This action is intended to give ocean frontage residents more time to adjust to significant changes in the risk profile of their property. It extends the period during which interim protection structures may be installed to ten years. During this time, evidence of coastal recession associated with sea level rise is expected to become more explicit.	WSC recognises that there are properties along the Wyong coastline where existing development is within the immediate coastal risk area. Emergency protection works (one off) do not provide sufficient adjustment time for owners of these properties. Council proposes to allow (with consent, and conditions) landholders to erect medium term coastal protection works, on their own property with the intent of providing a longer adjustment period. Council does not favour rock structures, but will consider properly engineered structures built from large and robust geotextile bags.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	There are some costs for Council in regulating the consent process for these interim structures. There are significant costs for affected landholders in immediate coastal risk areas. Residents must construct the protection on their own property and at their own cost. They may be required to contribute to the coast of maintaining beach amenity, if structures affect beach access or sand volume.
	Constraints to implementation: policy or statutory
	This action would need to be included in the LEP and DCP, with clear guidelines about the standard of construction required and how consent applications will be assessed and reviewed.
	Community acceptance?
	This action is an option for a limited number of ocean frontage residents.
	Where would it be applied
	Applies only to properties which are within the immediate coastal risk area.
Sustainability Score:	**4**

ACTION	Risk reduction benefits and logic
A87: Confirm the boundaries of areas where this is interaction of coastal erosion and geotechnical processes and refine hazard assessments **INTENT** Where rock underlies dune and beach sand at shallow depths, the coastal erosion and recession hazards are modified and some slope stability hazards may come into play as the sand cover is eroded. The intent is to reduce uncertainty about these interactions.	The action reduces two types of risk: firstly it clarifies the actual risks and the expected timing of changes from erosion to slope stability hazards; secondly it reduces the risk that Council will set unnecessary (or insufficient) planning controls for some locations, affecting the ways in which land owners can use their property.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	Allow $20,000 for further coastal erosion and geotechnical analysis, within the first two years of the Plan.
	Constraints to implementation: policy or statutory
	There are no policy or statutory constraints. The information will enable Council to refine its planning controls.
	Community acceptance?
	Improved accuracy is expected to be supported by landholders. Note that Council intends to review coastal hazard and risk assessment on a regular basis.
	Where would it be applied
	Applies to specific locations where shallow sand overlies rock, such as Toowoon Bay, the southern corner of Hargraves Beach and the area south of the boat ramp at Cabbage Tree Harbour.
Sustainability Score:	**4**

<table>
<tr><th colspan="2">Step 3: Enhance knowledge and monitor achievements</th></tr>
<tr><th>ACTION</th><th>Risk reduction benefits and logic</th></tr>
<tr><td rowspan="11">A13: Conduct research into specific coastal process issues.
INTENT
Refine understanding of how coastal processes will impact on coastal values in the future, so management actions are properly targeted. See Principles 1 and 8 and Objectives 1, 2 and 11. Research questions include the response of the entrance to Tuggerah Lakes to a rising sea level in terms of sediment dynamics; higher resolution models of coastal processes and alternative sources of sand for beach nourishment. Also adaptive processes for measuring and monitoring geotechnical change (see also Action A35)</td><td>Targeted research to fill important gaps in knowledge of how coastal processes interact with climate change variables and with different elements of the coastal landscape.
Council will need additional information to make sound decisions about the management of The Entrance channel as sea level rises. Entrance channel processes have the potential to reduce sand supply at The Entrance and North Entrance beaches, exacerbating coastal retreat. Research has commenced on the feasibility of accessing offshore sand supplies for beach nourishment (see Sydney Coastal Councils Group, December 2010), but not in the Central Coast area.</td></tr>
<tr><td>Constraints to implementation: up-front cost and ongoing maintenance costs</td></tr>
<tr><td>All research projects require funding, from both Council and partners such as OEH, HCRCMA, Hunter Councils and the university sector. Council has limited funds available for research into coastal processes or their impacts.
The research on channel sediment processes will require the services of a coastal engineering and environmental economics expert. Both research costs and sand extraction and transport costs for offshore sand are very high (see Sydney Coastal Councils 2009) and are unlikely to be warranted for the Wyong coastline in the medium term.</td></tr>
<tr><td>Constraints to implementation: policy or statutory</td></tr>
<tr><td>No policy constraints. The results of this research may lead to management solutions that would require a change to government policy (for instance in relation to access of offshore sand sources – see PART B for more information about the current status of offshore sand sources for beach nourishment).
If the additional information results in changes to the management protocols for the Entrance channel (such as dredge area, volumes and frequency), then changes to Council's existing entrance management policy and plan (see Tuggerah Lakes Estuary Management Plan) are likely to be required. Changes may also require approval from L&PMA and I&I. Offshore sand extraction is not NSW or Wyong council policy at the moment.</td></tr>
<tr><td>Community acceptance?</td></tr>
<tr><td>Community support is anticipated provided other partners are seen to be contributing appropriately and investment in research projects is not detracting resources from actions to address immediate high risks.
Some of the proposed research may lead to changes to the dredging process at The Entrance. A portion of the community has long regarded additional dredging at The Entrance as a useful management strategy for the health of the Tuggerah Lakes system. They may also support changes to the current dredging protocols. However, it is important that there is general understanding about the purpose of any additional dredging (widening, deepening or lengthening the channel) in relation to sediment budget and lake level issues.</td></tr>
<tr><td>Where would it be applied</td></tr>
<tr><td>Modelling applies to whole coastline, sand nourishment applies to whole coastline, entrance dynamics only to The Entrance area; geotechnical hazard modelling and monitoring to all cliffs and bluffs along the Wyong coastline.
Offshore sand deposits are on the continental shelf. If the additional research led to recommendations for off shore sand extraction, there are a number of spatial issues to be resolved. Currently the only development potentially approaching a value that would offset the cost of offshore sand extraction for beach nourishment is at North Entrance/Blue Bay, but this is minor development compared to the major waterfront assets at some Sydney beaches</td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td>Sustainability score:</td><td>4</td></tr>
</table>

ACTION	Risk reduction benefits and logic
A14: Involve community in data collection and record keeping through community NRM monitoring programs **INTENT** Improve understanding of the effectiveness of actions and also improve community involvement in coastline management. See Principle 2 and Objectives 7, 9 and 11.	Involving the community in monitoring has significant benefits in terms of community awareness and ownership, as well as providing data that is not cost effective to be collected by professional staff. Community monitoring must also be managed in a way that does not over extend community capacity.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	Confirm with OEH that parameters that can be monitored by community groups provide meaningful data on coastline condition and demand community resources that can be maintained. Minor costs in providing support to community groups – training, data management, presentation and equipment.
	Constraints to implementation: policy or statutory
	This action is consistent with Council's vision and sustainability strategy, and with the approach of regional NRM programs. Similar programs are being implemented in adjoining councils and there may be benefits in sharing parameters and data.
	Community acceptance?
	Strong community support for direct involvement in NRM programs, providing Council establishes a supportive framework in which community volunteers can work – training, equipment etc.
	Where would it be applied
	Selected representative coastal sites – identified in consultation with community and OEH.
Sustainability score:	**4**
ACTION	**Risk reduction benefits and logic**
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. **INTENT** This is a specific piece of research and development that is as relevant to flood management as to coastal management. Flooding at north Entrance is more likely to result from elevated lake levels than wave overtopping. The modelling could be used to predict more accurately the future extent and probability of flooding and how evacuations would take place if needed.	The outcomes of this research are principally in relation to SES responsibilities for emergency evacuation during coastal flooding events.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	Council has LiDAR data and a digital terrain model for North Entrance and other parts of the coastline. The cost of egress management planning would be included in updates of the Tuggerah Lakes Flood risk management program.
	Constraints to implementation: policy or statutory
	There are no policies or statutory constraints to Council enhancing flood warnings and evacuation procedures.
	Community acceptance?
	Residents would welcome effective communication of flood risk and egress issues during major storms and flooding events.
	Where would it be applied
	Relevant to low lying land around Tuggerah Lakes, not just to the immediate coastal strip.
Sustainability score:	**3**

ACTION	Risk reduction benefits and logic
A59: Liaise with SES and OEH about shared training and coordinated management of coastal emergencies **INTENT** To maximise the efficiency of training and the coordination of emergency response during coastal emergencies.	This training and planning is to ensure the key local players in emergency management have a clear understanding of the essential outcomes and how each organisation contributes to those outcomes for the community. Excellent coordination will include good communication, clear definition of access, control and other matters, so that both human safety and protection of property can be achieved efficiently.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	Training costs are a minor component of overall emergency management.
	Constraints to implementation: policy or statutory
	There are no policy constraints preventing effective liaison and coordination of emergency management at the local scale.
	Community acceptance?
	The community expects that council, SES and OEH will work together during coastal emergencies.
	Where would it be applied
	Coordinated coastal emergency management is more likely to be applied at North Entrance, Cabbage Tree Harbour and Hargraves Beach, but may also be required at all beaches along the Wyong coast.
Sustainability score:	**4**
ACTION	**Risk reduction benefits and logic**
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** To provide a continuing forum for direct communication between Council managers and coastal communities, to inform residents of new policy, regulation or science relevant to the coast.	This action does not directly affect coastal process risks, but it does reduce communication risks, by maintaining a well established link between Council and coastal communities. It is not and should not be the only communication mechanism.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	Continues current minor costs – part of existing staff responsibility to act as secretariat for the Committee.
	Constraints to implementation: policy or statutory
	No policy or statutory constraints. However, the most recent draft Coastline Management Plan guideline from DECC 2010 removes the requirement that Council must have a Committee. It is identified as a communication/consultation option.
	Community acceptance?
	The existing Committee is well supported by the community and continuing support is expected, provided Council ensures that the Committee is well informed and has clear opportunities to provide feedback (see A60).
	Where would it be applied
	The current committee covers a range of natural resource management priorities for Council and this would continue.
Sustainability score:	**4**

ACTION	Risk reduction benefits and logic
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** This action assumes that Action A56 will also be implemented. To enhance integrated management of all coastal hazards which may cause emergencies along the Wyong coastline and to facilitate transfer of information about Council's responses to the community.	This action reduces risk by contributing to the dissemination of information and involving community representatives in review of the interaction of different types of hazards.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	There are no additional costs involved in this reporting process.
	Constraints to implementation: policy or statutory
	There are no statutory or policy constraints.
	Community acceptance?
	The community is expected to support an ongoing role for the Tuggerah Lakes Estuary, Coastline and Floodplain Management Committee as a forum for discussion about the implementation of related hazard management plans.
	Where would it be applied
	Information provided to the Committee could relate to all parts of the coastline affected by coastal hazards and coastal emergencies.
Sustainability score:	**4**

Step 4: Status review and progress evaluation	
ACTION	**Risk reduction benefits and logic**
A15: Conduct a regular technical review of the validity and effectiveness of management actions **INTENT** To ensure that actions that are proposed to be implemented or are being implemented are informed by the best available science and are considered to be a best practice response. See Principle 1 and Objectives 1 and 11.	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 are consistent with the most up to date research recommendations and the current best practice solutions. A review of whether actions are achieving intended outcomes is also part of the technical assessment, and is a key part of adaptive management.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	A technical review of the actions that have been implemented requires data about whether the work has achieved the predicted effect, so must be built into the design of projects and programs. Costs for scientific monitoring may be relatively high. Community monitoring (see E 14) may provide relevant data at lower cost. Council will also draw on the results of scientific work conducted by others.
	Constraints to implementation: policy or statutory
	No constraints. Council's existing strategic planning framework and CMA CAP both require regular review and evaluation of implementation (see also A16). Adaptive management requires review of the technical validity of management actions.
	Community acceptance?
	Community expects Council to maintain efficient and effective investment that is properly targeted.
	Where would it be applied
	Applies to the entire coastline
Sustainability score:	**3**

ACTION	Risk reduction benefits and logic
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**Error! Not a valid link.INTENT** Provides reflection and evaluation needed with key stakeholders for effective adaptive management. A status review considers the extent to which proposed work has been completed, and what it has achieved. See Principle 1 and Objectives 1, 10 and 11.	A regular review of the overall management program reduces the risk of poorly targeted Council investment and allows for community feedback on appropriate priorities.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	Requires budget set aside for a review process every three to five years. Cost will vary depending on whether the status review considers only implementation progress, or also reviews changes to coastline condition and a more detailed cost benefit review. Initial scope may be restricted to implementation progress, as condition data may not be available. However, if Council also invests in regular LiDAR data updates, a wide range of other condition assessment become more cost effective.
	Constraints to implementation: policy or statutory
	No policy constraints. This review is consistent with the adaptive management processes used elsewhere in Council's business plans and in regional NRM planning.
	Community acceptance?
	Community acceptance and support is likely – this action shows the community whether Council's investment has been well spent.
	Where would it be applied
	Applies to actions for the entire coastline
Sustainability score:	**4**
ACTION	**Risk reduction benefits and logic**
A17: Council will report the outcomes of its management decisions and investment in coastal management to the community on a regular basis. **INTENT** To inform the community about progress in the management of the coastline and of the reasons for any proposed changes to management approach and actions. See Principles 1, 2 and 7 and Objectives 7 and 9.	Reduces risk of Council continuing an action that has significant community disapproval. Raises community awareness of the issues and why some actions are more effective than others.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	Will require regular minor investment in developing community reports and presentation material. A range of formats are available to Council including information in its State of the Environment Report, reporting to the Coast, Estuary and Floodplain Management Committee, community meetings/briefings, and media features.
	Constraints to implementation: policy or statutory
	No policy constraints. Council has a stated commitment to transparent and effective governance
	Community acceptance?
	Supported by the community. Make information available in several formats to meet diverse community literacy and technology skills.
	Where would it be applied
	Applies to the whole coastline.
Sustainability score:	**5**

19.4 Potential responses for adapting to coastal recession, including erosion associated with sea level rise and climate change – extreme and high risks

Table 19.3 - Summary of evaluation of potential responses to medium to long term coastal recession, including recession driven by climate change and sea level rise.

(See Table 19.2 for actions that are part of Step 1 and Step 4)

Step 2: Select and Implement Actions to Reduce Risk	
ACTION	**Risk reduction benefits and logic**
A18: Introduce clauses in the LEP and DCP to introduce timed consents for new development in 2050 coastal risk area. Before the expiry date of the timed consent, the land holder must apply and obtain an extension of time, or relocate the structure landward on the block (where this is feasible and approved) or remove the development. Council will review the LEP at intervals of approximately 5 years, using best available knowledge and a review of the costs and benefits of planning controls. Specific and/or local area details are in Sections 9.1.5, 9.1.6 and 9.1.7 of the WSCZMP See Sections 9.1.3, 9.3.1 and 9.3.2 in PART B. This includes requirements such as deep piled footings, lightweight/removable structures, set-backs out of coastal risk areas. **INTENT** To increase the resilience of coastal development to coastal erosion hazards. See Principles 3, 4, 5 and 6 and Objective Objectives 2, 7, 8 and 9.	Provides clear guidance to council, land owners and land developers about the type and location of development that will contribute to reduced risk. By requiring flexible and relocatable designs, Council will provide for some forms of continuing use on coastal dunes, consistent with coastal hazards, but also consistent with the high community value of this landscape. **Constraints to implementation: up-front cost and ongoing maintenance costs** Low cost for Council, provided LEP and DCP are clear and supported by State government. Costs increase if Council faces frequent challenges in Land and Environment Court. **Constraints to implementation: policy or statutory** Planning controls are a key element of the NSW government policy approach to 'appropriate development' in coastal risk areas. See the DoP(I) Planning Guidelines for Coastal Risk Areas (2010), in Section 15.0 of PART C. **Community acceptance?** Community concerns about potential sterilisation of high value coastal real estate. See Section 9.0 in PART B and Section 16.0 in PART C for information about planning responses to accommodate sea level rise and coastal recession for development with different asset life. See also Action A19 re possible tenure arrangements and limited time consents. **Where would it be applied** Whole of coast, as affected by coastal recession.
Sustainability score:	**5**

ACTION	Risk reduction benefits and logic
A19: Use clauses in the LEP and DCP to identify appropriate development in coastal risk areas (such as relocatable structures) and to allow for mandatory demolition in certain circumstances. Council will review the LEP at intervals of approximately 5 years, using best available knowledge and a review of the costs and benefits of planning controls. Further details are in Sections 9.1.5, 9.1.6 and 9.1.7 of the WSCZMP **INTENT** To make coastal risks clear to landholders and to ensure that risks are with private landholders, not Council. See Principles 3, 4, 5 and 6 and Objectives 2, 7 and 9.	This action makes it very clear to property owners that coastal erosion risks must be taken into account in their new development proposals. Property owners would have clear up front direction in their development consent that coastal risk issues may require them to abandon the property and demolish any buildings when coastal recession impinges on the stability of the development.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	Limited cost for Council. Potentially significant costs in terms of reduced property value for land owners. NSW Government policy is that no compensation will be paid to private landholders affected by coastal erosion, so loss of property value cannot be recouped in this way.
	Constraints to implementation: policy or statutory
	Technically feasible with existing legislation, but there are few (if any) precedents of both timed consent and demolition orders being used in combination in this way. See also Action A33 re s149 notation to inform landholders of coastal risks.
	Community acceptance?
	Coastal erosion risk management as part of the cost benefit analysis for development decisions may not be familiar to many landholders. High levels of community concern likely from landholders who have invested 'life savings' in beach front properties.
	Where would it be applied
	All coastal risk areas to the 2100 planning horizon and beyond.
Sustainability score:	**5**
ACTION	**Risk reduction benefits and logic**
A21: Prepare a schedule with trigger points for action, for relocation of existing community infrastructure and public assets to outside coastal risk areas. This action includes relocation of sewer lines and pumping stations, water lines, power supply and potentially roads. **INTENT** Proactive management of community assets to protect their functions in the long term. See Principles 3, 4, 5 and 6 and Objectives 4, 5, 8 and 9.	Reduces risk to community assets and facilitates effective investment by matching redevelopment and relocation to coastal risk profiles. See also Action A22 in relation to surf club assets.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	There are significant costs (in $millions) associated with relocating infrastructure. This action links the timing of infrastructure relocation to asset life and asset upgrade schedules, to minimise additional costs associated with climate change impacts on coastal recession. It minimises the risk that infrastructure relocation works will need to be carried out in emergency situations when assets are impacted by coastal recession and storm bite. The schedule would open opportunities to relocate infrastructure at time when upgrades would be necessary for other reasons.
	Constraints to implementation: policy or statutory
	No statutory constraints, other than requirements for assessment or approval (Part 4 and Part 5) of the EP&A Act) prior to the commencement of the work.
	Community acceptance?
	Community will favour effective management and continuation of services. Adaptive management will be critical, so that infrastructure is moved at the most cost effective time.
	Where would it be applied
	Key localities where the schedule would be important include The Entrance, North Entrance, Central Coast Highway at Lakes Beach, all surf club sites, Cabbage Tree Harbour.
Sustainability score:	**5**

ACTION	Risk reduction benefits and logic
A22: Council will plan for the relocation of surf clubs out of coastal risk areas for appropriate planning horizons when major upgrades of facilities are due. Council will work with surf clubs to identify club services/facilities that must be in the immediate hazard zone. **INTENT** Reduce risk to Council investment and maximise the community value of surf club facilities. Surf club buildings would be relocated as necessary to minimise risk. See Principles 3, 4, 5, 6 and 12 and Objectives 4, 5, 8 and 9.	Council manages six surf club buildings and associated infrastructure which meet both beach safety objectives and a range of other social objectives in the community. By locating major surf club infrastructure outside the coastal risk area, Council will maximise the life of its investment in these community facilities. Note that some surf club facilities must be located close to the beach, so careful planning is necessary. See Section 19.4.2 for more information about surf club functions and how they can be managed.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	Information about proposed Council investment in surf club upgrades is in Section 19.4.3. By locating major built assets outside coastal risk areas, Council will reduce investment for capital works and maintenance.
	Constraints to implementation: policy or statutory
	No policy constraint. New surf club buildings will need approval under Part 4 of the EP&A Act.
	Community acceptance?
	Council will consult further with the community about the potential split of locations of surf club functions to minimise coastal erosion risks to assets, but maintain beach amenity and safety.
	Where would it be applied
	All surf club sites in Wyong Shire.
Sustainability score:	**4**
ACTION	**Risk reduction benefits and logic**
A23: Council will design some surf club buildings and other structures for retreat during erosion emergencies or in accordance with long term erosion triggers. Relocatable facilities are an option when the terrain and land tenure are suitable. **INTENT** This action would allow some surf club infrastructure to be built closer to the beach face. The action could apply to both public structures and to private dwellings or other structures such as decks (see also Action A18). See Principles 4, 5 and 8 and Objectives 3, 4, 5, 6, 9 and 12.	This action reduces risk by increasing flexibility of design, so that surf club infrastructure can be moved landward as the coast recedes.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	Good design is unlikely to have a significant impact on the cost of surf club facilities for the safety and amenity of beach users. Use of relocatable designs for major surf club buildings may add to the upfront cost, but is likely to be cost effective in the medium to longer term. For private development, there may be additional compliance costs for Council, to ensure that only approved relocatable structures are built seaward of set coastal risk areas. See Section 19.4.3.
	Constraints to implementation: policy or statutory
	At this stage, construction of surf club facilities that are designed to be rapidly relocated in coastal erosion emergencies would be consistent with NSW Government planning guidelines.
	Community acceptance?
	As for major surf club infrastructure, Council will consult further with beach users and surf club members before implementing this action, to ensure that amenity and safety objectives are met.
	Where would it be applied
	None of the surf club buildings along the Wyong coastline currently have designs suitable for mobility. This requires pier foundations and 'skid' type bearers and/or a modular light weight structure.
Sustainability score:	**4**

ACTION	Risk reduction benefits and logic
A24: Council will consider options for government acquisition of private land affected by coastal hazards. Council will work with NSW and Australian governments to develop an appropriate strategy for high risk locations. Government acquisition of private land in coastal risk areas is not currently supported by any of these levels of government. **INTENT** Compensate private landholders for losses in the value of coastal property due to coastal erosion. See Principles 4 and 5 and Objectives 6, 8 and 10.	This action transfers risk from private land owners to the Crown.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	There are more than 1000 private properties along the NSW coast that are predicted to be affected by erosion associated with sea level rise in the 50 year and 100 year planning horizon. Many of these are very large and high value residential assets. At current market value, all levels of government have indicated that they do not consider buying these properties is a sustainable investment. Market value of vulnerable coastal property is expected to decline over time.
	Constraints to implementation: policy or statutory
	NSW Sea Level Rise Policy Statement (2009): Risk to properties from coastal processes rests with the property owners whether public or private. NSW government does not have, nor does it accept specific future obligations to reduce impacts of coastal hazards and flooding caused by sea level rise on private property.
	Community acceptance?
	Acquisition of private coastal land in immediate hazard zones may be supported by affected land owners. Investment may not be supported by non coastal residents. Council has limited information about community attitudes to this specific issue.
	Where would it be applied
	Council has not yet decided a policy in this regard. A limit for buy back could be set at property which is now within the immediate hazard zone, or the 2050 coastal risk area and would not apply to land between 2050 and 2100 coastal risk lines.
Sustainability score:	**2**
ACTION	**Risk reduction benefits and logic**
A25: Update emergency response procedures and post storm refurbishment for longer term coastal recession risks **INTENT** This action is a modification of Action A2. The same Principle and objectives are relevant.	Ensures that Council's emergency response plan is consistent with the most up to date information about coastal hazards (sea level rise, storminess and tsunami)
	Constraints to implementation: up-front cost and ongoing maintenance costs
	Minor ongoing costs for updating the inputs to the Plan and checking the effectiveness of management actions.
	Constraints to implementation: policy or statutory
	No policy constraints.
	Community acceptance?
	Community expects that Council will be fully informed of the most up to date information on potential drivers of coastal emergencies.
	Where would it be applied
	Applies to the entire Wyong coastline.
Sustainability score:	**4**

ACTION	Risk reduction benefits and logic
A26: Council may build and maintain sea walls to protect existing public assets that are vulnerable in the 2050 and 2100 planning horizons. This action would only be used for major assets with a long asset life, whose function will not be compromised by other aspects of climate change or changing community requirements. **INTENT** Avoid relocation expenses and inconvenience, particularly were retreat of major infrastructure creates practical difficulties. Provide a robust structural boundary for recreation assets (boardwalks and promenades)	This action would protect high value assets from coastal recession. See Section 19.3 for information about unintended consequences of sea wall construction. Potential trade-offs between protecting private assets and loss of public amenity on sandy beaches. Extent of amenity loss varies from beach to beach – site specific assessment needed.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	Rock walls on open ocean frontage cost in the vicinity of $8000/linear metre, with significant maintenance costs, related to the intended life of the structure and sea level rise. Costs for walls in other materials: Geotextile $4000/linear metre. Although some geotextile structures have been in place for up to a decade, there is a general view amongst coastal engineers and in the NSW government that they are not appropriate for long term protection of significant assets. State government funding is available for specific sea walls protecting public investment. However, high costs mean that even when a sea wall is the preferred option, the relevant combination of State, Local and Australian Government funding may take years to organise (e.g. Wamberal)
	Constraints to implementation: policy or statutory
	Major works will require preparation of an EIS, with detailed cost benefit assessment of potential side effects, as well as benefits. Structures must be located, designed and maintained so as not to compromise the stability of adjoining land or structures.
	Community acceptance?
	Acceptance will depend on the context. Sydney Coastal Councils report significant disruption of beach access associated with the construction period and potentially permanently. However, sea walls with public promenades are highly valued by residents and visitors (e.g. at The Entrance).
	Where would it be applied
	Seawalls may be acceptable for protecting high value public infrastructure or shorelines with high recreational or tourism value. WSC has sought funds to construct a toe protection sea wall structure at Cabbage Tree Harbour and there is already a wall at The Entrance along the main ocean front promenade (see Section 9.0 re design specifications and upgrades).
Sustainability score:	**4**

ACTION	Risk reduction benefits and logic
A27: Council may grant development consent to permit the construction and maintenance of sea walls to protect existing private assets affected by coastal recession (2050 coastal risk planning period), with specific conditions. **INTENT** This action would 'draw a line in the sand' and use a permanent structure to protect existing private investment in residences or commercial buildings with coastal risk areas.	A well designed and constructed sea wall can provide robust and long term protection for public and private assets. However, it may also increase risks to other values, particularly beach amenity, unless accompanied by a beach nourishment program.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	As for sea walls to protect property in the immediate coastal risk area, there are significant construction and maintenance costs (for both rock walls and geotextile bags). Detailed designs and justification will be required to demonstrate that a sea wall does not exacerbate erosion on adjacent public or private land. The current NSW government policy is that private landholders who are given approval to build a sea wall may be required to maintain the structure and to contribute to beach nourishment to maintain beach amenity, in perpetuity. Councils would be able to levy ocean frontage landholders for their contribution to these maintenance costs (see Action A29). Long term costs are therefore likely to be significant, as accessible sand sources diminish.
	Constraints to implementation: policy or statutory
	NSW State policy (November 2009) suggests sea walls may be considered to protect private property at coastal erosion hotspots, provided they are built on private land at private expense, have no significant detrimental impacts on the risks affecting adjoining areas (along beach or seaward) and do not have a significant detrimental impact on beach amenity. In perpetuity beach nourishment may be an accompanying action.
	Community acceptance?
	There is strong community support for an action that allows residents to defend their property against coastal recession is expected.
	Where would it be applied
	Where existing private assets are within the 2050 and 2100 coastal risk areas (such as North Entrance, Blue Bay). There would be time limits on when these protection structures could be built, to help manage amenity impacts. Not proposed as an option for new development, which must be built outside the coastal risk areas.
Sustainability score:	**3**

ACTION	Risk reduction benefits and logic
A28: Review the entrance management strategy and dredging management plan for The Entrance channel to maximise sustainable beach nourishment now and as sea level rises. The first review will focus on maximising the benefits of sand placement for dune stability. After the research described in A13/A68 is conducted, Council will review and revise the dredging program over time, as necessary. **INTENT** This action will provide information about managing the sediment budget of The Entrance and adjacent ocean beaches, so that important ecological values of Tuggerah Lakes are protected as much as possible, whilst making sand available for some beach nourishment work.	Sea level rise is likely to increase the amount of sand moving into the entrance channel of Tuggerah Lakes on inflowing tides, contributing to shoaling of the entrance channel. This will increase the rate of sand loss from North Entrance and The Entrance Beaches. By reviewing the sediment dynamics model and actual behaviour of the entrance channel, council can adapt the current dredging regime to continue to return some sand to the adjacent ocean beaches, without compromising the recreational amenity and ecological values of the entrance channel.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	Dredging is an ongoing maintenance activity for the entrance channel of Tuggerah Lake (with an average of 30,000 to 80,000 m^3 of sand dredged from the outer channel per year). The Entrance is dredged primarily to maintain some tidal exchange, but there are associated benefits for recreational amenity, flood risk mitigation and beach nourishment. This action foreshadows a review of the sediment budget aspects of dredging and sand placement. Future dredging costs are likely to be slightly higher than current costs. Council may review the purpose of dredging if sediment budget studies show there is sound justification. It is also possible that over time, Council's position on the form of the lake entrance may change. For instance, a recent (Aecom 2010) report for Narrabeen Lagoon in northern Sydney recommends dredging to widen the lake entrance. This would lower lake levels and reduce lake flooding in the 2050 timeframe (there are many properties affected by flooding in this time frame). There are insufficient benefits to offset high costs in the immediate time frame.
	Constraints to implementation: policy or statutory
	The current dredging program is approved by the NSW Government under the Tuggerah Lakes Estuary Management Plan. Future changes to dredging regime would also need approval. If substantial changes are proposed to sand dredging processes and locations, then environmental assessment (probably an REF, but potentially and EIS) would be required.
	Community acceptance?
	There is general acceptance of the current dredging program. Ensure that the community is clear about the purpose of any ongoing dredging in the entrance channel. The purpose of dredging is not to improve lake water quality or to facilitate navigation in the Entrance area.
	Where would it be applied
	Sand dredged from the tidal delta of Tuggerah Lake would be used on North Entrance and/or The Entrance beaches as part of a nourishment program.
Sustainability score:	**4**

ACTION	Risk reduction benefits and logic
A29: Council will consider a Shire wide levy to provide funds for managing climate change impacts on community assets along the coast, such as sewerage systems, roads and public beach access ways. **INTENT** This action would provide an ongoing income stream for Councils to manage beach nourishment and the maintenance of coastal protection structures. See Principles 2, 7 and 13 and Objectives 4, 7, 8, and 9.	If sea walls are built to protect absolute ocean frontage private property from coastal erosion, there is an associated impact on beach accessibility, visual amenity and recreational amenity, as beach area is lost over time. This action requires that benefitting landholders contribute to the cost of on ground works to offset these impacts.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	Costs will vary with the extent of sand loss and the potential sources of sand for ongoing beach nourishment. Terrestrial sand sources are limited and if offshore sand use is permitted, costs will be very high. Beach nourishment would be required in perpetuity, while ever the protection structures are in place and impacting on public beach values.
	Constraints to implementation: policy or statutory
	The NSW Government has recently passed amendments to the Coastal Protection Act which allow Councils to differentially rate or levy beach front land owners who have contributed to the cost of sea wall construction to protect their property to also contribute to the cost of on ground coastal protection works and beach amenity works.
	Community acceptance?
	Details of the NSW government policy are not yet finalised, so community reaction is hard to gauge. Acceptance of this responsibility will vary from one area to another, depending on the assets at risk, age of landowners, and resolution of land tenure issues for the retreating coastline.
	Where would it be applied
	Likely to be relevant to North Entrance Beach, Hargraves Beach, Blue Bay and other beaches where property will be directly impacted by coastal erosion in the 2050 planning period and beyond.
Sustainability score:	**3**
ACTION	**Risk reduction benefits and logic**
A30: Strengthen vegetation communities on dunes by preparing, implementing (including monitoring effectiveness) vegetation management plans that include species selection, planting, weed removal, fencing etc. **INTENT** To maintain, where feasible, ecological processes on coastal dunes that are affected by coastal recession.	Healthy coastal ecological communities will continue to function and provide ecosystem services as coastal recession and other aspects of climate change progress. Well vegetated coastal dunes contribute to resilience to coastal erosion by trapping windblown sand and building up sand volumes. The effectiveness of dune vegetation as an aid to buffering capacity may reduce if sea level rises rapidly, accompanied by more frequent storms. However, maintaining healthy coastal vegetation is still beneficial in the long term because of habitat connectivity values. Management of dune vegetation can also help to prepare back barrier vegetation communities for change.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	Vegetation management on coastal dunes is a low cost management option, particularly when the on ground work is primarily achieved through community projects. However, costs may increase if sand supply declines or if dunes roll rapidly landwards (overstepping existing vegetation) and plantings are unable to survive.
	Constraints to implementation: policy or statutory
	Currently supported strongly by the NSW coastal dune management manual.
	Community acceptance?
	Community acceptance and support is likely for relatively natural/undeveloped beaches and dunes where high value investment in housing or commercial property is not threatened by coastal erosion.
	Where would it be applied
	Ocean frontage reserves such as Budgewoi and parts of Tuggerah Beach
Sustainability score:	**4**

ACTION	Risk reduction benefits and logic
A31: Implement a system of tradable or transferable development rights for coastal land **INTENT** This action could work in two ways. Firstly, it could provide opportunities to coastal land owners and developers to offset impacts on the coastal environment by investing in conservation of other land on the coast or nearby hinterland. If land tenure issues can be resolved, transferrable development rights could also be used to encourage certain types of development to be maintained in the coastal risk area in the short to medium term, (benefiting the community), by providing a roll back option for the development to continue elsewhere (outside coastal risk areas) in the future.	There are a number of environmental offsetting and trading schemes operating in NSW, with the intent of maintaining or enhancing long term environmental condition (e.g. Biobanking, Salinity Trading).
	Constraints to implementation: up-front cost and ongoing maintenance costs
	Land acquisition costs. Land management and maintenance costs. Costs of managing a series of one off agreements, or managing a regional scale scheme. Likely to be complex to administer
	Constraints to implementation: policy or statutory
	Direct offsetting of ecological impacts of coastal development through conservation agreements over land that is less vulnerable to coastal processes (see A30) can be appropriate for individual development proposals. Note that a conflict of interest has been recognised in recent court cases about offsets negotiated as part of regional and local planning. Requires agreement from L&PMA – no current precedent.
	Community acceptance?
	No information –assume only relevant to a small number of stakeholders, for whom it could provide beneficial flexibility.
	Where would it be applied
	Could apply to any part of the coast where new development is proposed and where there are other specific values which warrant protection. Parts of the Tuggerah Beach dune field may be examples.
Sustainability score:	**2**

ACTION	Risk reduction benefits and logic
A32: Where feasible, establish conservation agreements for high value ecological communities in reserve areas that are vulnerable to climate change and other medium to long term threats **INTENT** By applying conservation oriented land management, the resilience of these communities to aspects of climate change and other threats is increased.	Rock platforms in Wyong Shire are important habitat for a range of birds, shellfish and other species. Some rock platform habitats are heavily affected by recreational users. Rock platform communities are vulnerable to sea level rise over periods of decades. Littoral rainforest is the only terrestrial community with high conservation status within the core area of the coastline management plan. Other protected coastal vegetation communities (such as estuarine wetlands) are addressed in the Tuggerah Lakes Estuary Management Plan. For some relatively undeveloped open coast beaches that are backed by dunes on public land, this action could be used in conjunction with zoning to facilitate roll back of coastal dune vegetation communities.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	Potential loss of recreational opportunities and minor amendments to management plans for Crown reserves, such as relocating walking/bicycle paths. However, note that significant areas of the Wyong coastline are already in conservation management, in Wyrrabalong National Park and Munmorah State Conservation Area.
	Constraints to implementation: policy or statutory
	To extend conservation management to rock platforms, such as Norah Head, which are outside current National parks or conservation area holdings, would require agreement with L&PMA, as rock platforms are in Crown land, as are the remaining patches of Littoral Rainforest.
	Community acceptance?
	About 35% of the Wyong coastline is in National Park or State Conservation Area. Some community members may wish to minimise constraints to community access and use of other rock platforms,
	Where would it be applied
	Less useful for sites where there is immediate to 20 year coastal erosion hazard or significant terrestrial inundation hazard. Conservation management can also be applied to adjoining buffer land, which will allow for roll back of coastal vegetation communities where the terrain and soils are appropriate. Could be used for key rock platforms, such as Norah Head, provided a management plan can be developed which addresses both conservation and access for community recreation needs.
Sustainability score:	**3**

ACTION	Risk reduction benefits and logic
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. **INTENT** To ensure landholders have information about the level of coastal process risk affecting their property in various planning timeframes, so they can make informed decisions about investment risk.	The coastal erosion hazard study identifies land affected by waves and by slope adjustment for immediate, 2050 and 2100 planning horizons. The nature and value of existing development within these zones is quite variable, but there has been an overall trend towards increasing investment in ocean frontage and ocean view properties. By making coastal risks clear on the s149 certificates for all properties within the 2100 and 2050 coastal risk areas (amongst other notification measures), Council has demonstrated its duty of care, has provided the best available informant to landholders and helps landholders to manage their risk.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	There may be upfront costs in resolving exact wording and any legal implications. Expect some State assistance with this, through planning guidelines and/or amendments to legislation. Council will need to budget for ongoing updates to s149 certificates, as new sea level rise information becomes available. Allows landholders to invest in development of their property in a way that minimise future losses.
	Constraints to implementation: policy or statutory
	No policy constraint to using s149 certificates to provide advice about issues affecting a property, but will need to be linked to a planning layer in the LEP. Also requires a system to alert landholders to new notifications, as they may not otherwise be aware until the property is to be sold.
	Community acceptance?
	The community is likely to see this as an important step towards transparent communication of risk information.
	Where would it be applied
	Applies to all properties within the immediate, 2050 and 2100 coastal risk areas, although the wording about risk may vary from one hazard period to another. May be extended at a later date to include property affected by risks beyond 2100. For instance, Council is considering reviewing zoning at 5 year intervals, and would also review s149 notation.
Sustainability score:	**5**

ACTION	Risk reduction benefits and logic
A62: Reference maps showing areas affected by coastal inundation in the Wyong LEP. Amend the Wyong LEP and DCP to require development applications in areas affected by coastal inundation to take the inundation hazard into account. Floor levels for new development in immediate inundation hazard areas must consider the 1% AEP storm wave run up for each beach. **INTENT** To control new development in areas affected by coastal inundation, so that new development is consistent with the capability of the land.	The LEP/DCP clauses would require development in affected areas to take the inundation hazard into account, for instance in terms of set-backs, design, floor levels, site water management or other measures. The intent is to reduce the impacts of occasional (and potentially more frequent) inundation events, as sea level rises, and other climate change parameters take effect.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	Limited cost for Council in preparing relevant planning clauses. LEP and DCP requirements would be reviewed as new sea level and climate change information becomes available. May affect development and insurance costs for affected property owners.
	Constraints to implementation: policy or statutory
	The Standard Instrument for LEP preparation in NSW anticipates that a planning control of this type will be in place for new development in areas affected by coastal inundation, just as it is required for land affected by river flooding or lake flooding.
	Community acceptance?
	The controls will affect a relatively low number of properties (less than 100) (compared to properties affected by lake shore inundation – several thousand). Expect community acceptance of requirements for coastal inundation.
	Where would it be applied
	Anywhere along the coast mapped as affected by coastal inundation (wave run-up and dune overtopping).
Sustainability score:	**5**

ACTION	Risk reduction benefits and logic
A43: Advise occupiers of property affected by coastal inundation risks by adding a notation on s149 certificates for the property and by direct communication, e.g. with rate notices, letters. Combine this with information about emergency response procedures in the event of inundation **INTENT** To ensure that affected property owners are aware of the hazard, how it affects their property and measures to reduce risk.	As for coastal erosion, the notation provides the landowner with advice about hazards affecting their property, which must be taken into account when any new development is planned. In this context, the notation assists property owners to manage their risk.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	Low up front and maintenance costs.
	Constraints to implementation: policy or statutory
	No expected policy or statutory constraints. The notation is consistent with the approach for other natural hazards affecting private property.
	Community acceptance?
	Expect a high level of community acceptance, as a tool for providing information to land holders.
	Where would it be applied
	Applied to any property affected by coastal inundation up to the 2100 planning horizon.
Sustainability score:	**5**
ACTION	**Risk reduction benefits and logic**
A44: Use beach nourishment or beach scraping to reinforce dunes and to maintain dune crest height above 7 metres at affected locations (potentially 8 metres at North Entrance) **INTENT** To accelerate the rate of sand transfer from the beach face to the frontal dune system. If sand is available for beach nourishment, this action would also increase the buffering capacity of frontal dunes to storm bite and recession.	Beach nourishment increases the volume of sand in the frontal dune system, and delays the time where trigger points for recession will be reached. Beach scraping does not increase the overall volume of sand, but moves sand more quickly from the beach face to the frontal dune system than would occur with natural wind processes. It reduces risk by shoring up the frontal dune system and slightly shifting the balance of sand distribution from beach to dune. Beach scraping is more a short term response after storms, whereas beach and dune nourishment is a larger scale and long term strategy.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	As noted for other action, major beach nourishment is a high cost option, because of competition for suitable sand, w availability for suitable sand and the extremely high coast of accessing sand from the continental shelf (if this were to be permitted). Beach scraping is a relatively low cost option, which can be used in association with dune vegetation and beach access management programs.
	Constraints to implementation: policy or statutory
	There is some evidence that frequent beach scraping (and beach cleaning) affect the beach fauna, although few studies in NSW have addressed this risk. Beach scraping should be included in a Plan of Management for the beach and potential impacts assessed beside dune stabilisation benefits. Major sand nourishment projects would require full environmental assessment. Offshore sand extraction (and, for the Central Coast, exploration) is not permitted in NSW. Sydney Coastal Councils Group has prepared a preliminary business case for off shore dredging to provide sand for beach nourishment in the metropolitan area.
	Community acceptance?
	Likely acceptance, if managed within a program of associated actions and in the context of a Plan of Management for the beach and dune system.
	Where would it be applied
	Beach scraping can be used anywhere that is accessible for the relevant machinery, post storm, and at times when there is abundant sand on the beach face/swash zone. Most likely to be used near surf clubs, but also where there is an erosion scarp in front of private property..
Sustainability score:	**4**

Step 3: Enhance knowledge and monitor achievements	
ACTION	**Risk reduction benefits and logic**
A34: Train Council staff about long term coastal recession risks and Council's approved strategy for managing these risks. **INTENT** This action continues and expands A4 to address longer term issues. Updates to Council training are required regularly to ensure current understanding of risk and best practice. This action is recommended as part of Council maintaining its skills and knowledge of effective responses to coastal emergencies in future climate contexts.	Enhances efficiency of Council communication about climate change risks along the coast and decision making for coastal lands.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	Costs in terms of time spent by council staff in training and commissioning training courses. However these are likely to be offset by greater efficiency in decision making.
	Constraints to implementation: policy or statutory
	No policy or statutory constraints
	Community acceptance?
	The community expects Council officers to be well informed about climate change science, policy and planning and to be able to explain related issues and decisions clearly.
	Where would it be applied
	This action is relevant to all staff involved in managing coastal lands, including planners, asset managers and engineers, community development staff, cultural heritage staff, and environmental managers.
Sustainability score:	**4**
ACTION	**Risk reduction benefits and logic**
A68: Council will commission further studies of sediment dynamics in The Entrance channel, with sea level rise. This is likely to include a hydrodynamic model to test sediment budget changes in the Entrance channel as sea level rises. Further research is also necessary to clarify the relationship between lake flood levels, coastal recession and oceanic inundation hazards at Lakes Beach area. **INTENT** Investigate future sediment dynamics at The Entrance under the influence of sea level rise and/or changes to wave energy and angle of approach. Investigate off shore sand supplies for beach nourishment (quality, quantity, cost, policy issues)	Council will need this information to make sound decisions about the management of The Entrance channel as sea level rises. Entrance channel processes have the potential to reduce sand supply at The Entrance and North Entrance beaches, exacerbating coastal retreat. Research has commenced on the feasibility of accessing offshore sand supplies for beach nourishment, but not in the Central Coast area.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	The research on channel sediment processes will require the services of a coastal engineering and environmental economic expert. Hydrodynamic modelling for the entrance area is expected to cost $80,000 or more.
	Constraints to implementation: policy or statutory
	No constraints to further research and investigations. However, if the studies result in recommendations for changes to the management protocols for the Entrance channel (such as dredge area, volumes and frequency), then modifications to Council's existing entrance management policy and plan (see Tuggerah Lakes Estuary Management Plan) will be required. Changes may also require approval from L&PMA, I&I. Offshore sand extraction is not NSW or WSC policy at the moment.
	Community acceptance?
	A portion of the community has long regarded additional dredging at The Entrance as a useful management strategy for the health of the Tuggerah Lakes system. They may also support changes to the current dredging protocols which adapt management of The Entrance to new climate and sea level conditions. However, it is important that there is clear understanding about the purpose of any additional dredging (widening, deepening or lengthening the channel) in relation to sediment budget and lake level issues.
	Where would it be applied
	These studies focus on the management of The Entrance channel of Tuggerah Lake.
Sustainability score:	**4**

ACTION	Risk reduction benefits and logic
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** Council does not intend to directly fund local scale research on coastal process modelling. However, Council would consider being a party to a broader research project which would deliver higher resolution coastal erosion models, allowing council to make better informed decisions	More reliable models provide better predictions of the actual behaviour of beaches and dunes in storm conditions, and within the 'normal' variability of coastal processes, as supplemented by climate change.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	This research is expensive and is more suitable for DECCW, universities or CSIRO. However, Council may make a contribution to a research budget if it addresses specific needs of the local area.
	Constraints to implementation: policy or statutory
	There are no policies or statutory constraints, provided that OEH accepts the technical validity of the research and modelling.
	Community acceptance?
	Community would not support major Council investment in model development, but would support Council gaining benefits from a partnership arrangement with university or OEH team.
	Where would it be applied
	Relevant to North Entrance Beach, Hargraves Beach, Blue Bay, Toowoon Bay, and other parts of the Wyong coastline.
Sustainability score:	**4**
ACTION	**Risk reduction benefits and logic**
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** This action extends Action A1 and action A37 (as new modelling techniques become available). The intent is to improve the resolution and accuracy of coastal recession estimates, assisting ocean frontage landowners with greater certainty about the extent of land loss over time.	Consistent with the principle of using best available science and information about coastal processes and their impacts on the coastline. New modelling techniques, using high resolution data (such as LiDAR and LADS) will enable Council to predict more accurately and then track how the coast is responding to sea level rise.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	See Action A1 re the expected cost of regular collection of LiDAR data, which is critical to high resolution measurement of coastal change. Council may choose to contribute to model development or may commission a modelling expert to use the best available modelling techniques. If LiDAR data is collected at approximately 5 year intervals, the additional cost of re running models would average out at approximately $10,000 per year (shared across all beaches in the Shire).
	Constraints to implementation: policy or statutory
	No policy constraints. Australian government and state government both support the use of LiDAR data to help assess and monitor coastal hazard impacts.
	Community acceptance?
	Expect that community will support efficient review of coastal hazards and risks, which this action offers.
	Where would it be applied
	All beaches in the shire where coastal erosion and recession impacts on development or important biodiversity or cultural values. Give priority to the highest risk areas.
Sustainability score:	**5**

ACTION	Risk reduction benefits and logic
A61: Conduct research into specific coastal process issues: Council will work with the NSW Government to study the feasibility of off shore sand being used for beach nourishment purposes, for maintaining beach area, volume and amenity at key locations. This is not for immediate implementation, but is relevant in the context of likely increasing need after 2020. **INTENT** To develop a clear understanding of the process constraints (physical and ecological), as well as cost issues associated with accessing offshore sand along the Wyong coastline, so the merit of this potential measure to protect coastal development can be properly assessed.	The extent of deposits and constraints affecting access to offshore sand supplies along the Central Coast are not currently well understood.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	Investigation costs are high and access costs are likely to be extremely high. See the work by Sydney Coastal Councils on offshore sand deposits for beach nourishment at high profile Sydney beaches.
	Constraints to implementation: policy or statutory
	Mining or extraction of offshore sand bodies for construction or other purposes is not currently permitted in NSW. This is likely only to be an option for planning periods beyond 2050.
	Community acceptance?
	Currently expected to be low. Community approval for such a strategy may increase over coming decades as the evidence of costal recession impacts becomes clearer.
	Where would it be applied
	Offshore sand occurs in deep water (around 100m depth) on the continental shelf. The deposits are former frontal dune systems and beach ridges, drowned by rising sea levels in the early Holocene. If access to this sand is approved at some time in the future, with appropriate controls, it could be used to protect high risk shorelines such as North Entrance from recession.
Sustainability score:	**3 (2?)**
ACTION	**Risk reduction benefits and logic**
A65: Maintain a data base with information about coastal inundation episodes, including dates, context, photographs, impacts and response. **INTENT** To provide comprehensive records of how coastal hazards affect community assets, so that risk assessment and management can be refined.	Good data about actual impacts is essential to test the accuracy of models. This action provides detailed information about particular coastal risks. The same approach can be used for all coastal erosion events.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	Minor costs for Council staff to set up and maintain records. Can be run through a GIS based and web interface system, so that tracking information for specific locations is easy. Such a system can also make records available to residents, if Council wishes to do so.
	Constraints to implementation: policy or statutory
	No policy or statutory constraints
	Community acceptance?
	The community expects Council to keep good records of actual impacts on coastal assets, and to refine modelled predictions accordingly.
	Where would it be applied
	Relevant to all locations affected by oceanic inundation (or coastal erosion events)
Sustainability score:	**4**

Step 4: Status review and progress evaluation	
ACTION	**Risk reduction benefits and logic**
A17: Council will report the outcomes of its management decisions and investment in coastal management to the community on a regular basis **INTENT** To inform the community about progress in the management of the coastline and of the reasons for any proposed changes to management approach and actions. See Principles 1, 2 and 7 and Objectives 7 and 9.	Reduces risk of council continuing an action that has significant community disapproval. Raises community awareness of the issues and why some actions are more effective than others.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	Will require regular minor investment in developing community reports and presentation material. A range of formats are available to Council including information in its State of the Environment Report, reporting to the Coast and Estuary management Committee, Community meetings/briefings, and media features.
	Constraints to implementation: policy or statutory
	No policy constraints. Council has a stated commitment to transparent and effective governance
	Community acceptance?
	Supported by the community. Make information available in several formats to meet diverse community literacy and technology skills.
	Where would it be applied
	Applies to the whole coastline.
Sustainability score:	**5**

19.5 Potential responses for managing lake and sea interactions

Table 19.5 - Potential actions for managing the interaction of Tuggerah Lake and the ocean beaches

Step 2: Select and Implement Actions to Reduce Risk	
ACTION	**Risk reduction benefits and logic**
A9: Council will continue to dredge sand from the active tidal delta at The Entrance and place the sand on North Entrance Beach. Some sand may also be placed on The Entrance Beach to maintain beach amenity. **INTENT** Maximises sand availability to the beach and frontal dune system	Council currently dredges sand from the entrance channel of Tuggerah Lake and places the dredged material on North Entrance Beach. It has done this for about 20 years, with a total of approximately 500,000 m3 placed on North Entrance beach (about 30,000 to 80,000m3/year) placed on North Entrance beach. This small scale maintenance dredging distributes sand that would otherwise be scoured from the channel and into the near shore during occasional very large flood flows out of the estuary. Risk reduction benefits are in terms of timing of sand delivery (gradual rather than in occasional pulses), rather than the total volume. Dredging also allows WSC to control where the sand is delivered
	Constraints to implementation: up-front cost and ongoing maintenance costs
	Delivery of sand to The Entrance Beach may require booster pumps and additional pipe to transfer sand. This is a long term process and requires a budget allocation indefinitely. Sea level rise may affect the dynamics of the Entrance channel and could change the volume of sand or pumping requirements. Is there sufficient sand to make a difference to both beaches?
	Constraints to implementation: policy or statutory
	Maintenance dredging of the Entrance channel is currently approved by NSW Government as part of the Tuggerah Lake Estuary Management Plan.
	Community acceptance?
	Dredging of the entrance channel and reuse of sand for beach nourishment is generally supported by the local community. There are occasionally issues re sand quality (e.g. elevated organic content from buried kelp) and odour
	Where would it be applied
	Relevant to North Entrance and The Entrance beaches
Sustainability score:	**4**

ACTION	Risk reduction benefits and logic
A28: Review the entrance management strategy and dredging management plan for The Entrance channel to maximise sustainable beach nourishment now and as sea level rises. The first review will focus on maximising the benefits of sand placement for dune stability. After the research described in A13/A68 is conducted, Council will review and revise the dredging program over time, as necessary **INTENT** See also A68. To provide sound science on which to base assessments of the best balance between sand storage in the tidal delta and sand availability on North Entrance Beach.	Sea level rise is likely to increase the amount of sand moving into the entrance channel of Tuggerah Lakes on inflowing tides, contributing to shoaling of the entrance channel. This may increase the rate of sand loss from North Entrance and The Entrance Beaches. By reviewing the sediment dynamics model and actual behaviour of the entrance channel, Council can adapt the current dredging regime to continue to return some sand to the adjacent ocean beaches, without compromising the recreational amenity and ecological values of the entrance channel.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	Dredging is an ongoing maintenance activity for the entrance channel of Tuggerah Lake. Future costs are likely to be slightly larger than current costs. It is also possible that over time, council's position on the form of the lake entrance may change. For instance, a recent (Aecom 2010) report for Narrabeen Lagoon in northern Sydney recommends dredging to widen the lake entrance to lower lake levels and reduce lake flooding in the 2050 timeframe. There are insufficient benefits to offset high costs in the immediate time frame. This type of strategy may also be relevant to Tuggerah Lake in the medium to long term.
	Constraints to implementation: policy or statutory
	The current dredging program is approved by the NSW Government under the Tuggerah Lakes Estuary Management Plan. Future changes to dredging regime would also need approval. If substantial changes are proposed to sand dredging processes and locations, then environmental assessment (probably an REF, but potentially and EIS) would be required.
	Community acceptance?
	Ensure that community is clear about the purpose of any ongoing dredging in the entrance channel. It is for managing sediment budget and water levels on the coast, not water quality or navigation in Tuggerah Lakes.
	Where would it be applied
	Sand dredged from the tidal delta of Tuggerah Lake would be used on North Entrance and/or The Entrance beaches.
Sustainability score:	**4**

ACTION	Risk reduction benefits and logic
A66: Council will review the structural integrity of The Entrance sea wall and schedule structural upgrades as necessary to balance risk and cost. **INTENT** To protect valuable community assets – the promenade area has social, cultural/historic, recreation and economic value as a key piece of tourism infrastructure.	The promenade at The Entrance is a valuable community asset which adds to the attractiveness of the area for local recreation and for tourism. The promenade is largely constructed on rock, but the sea wall protects the interface between the land and entrance channel/ocean, to provide a safe and visually attractive walk and lookout points. Further investment in the sea wall structure will ensure that the recreation and tourism values are maintained in the medium to long term.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	Maintenance of the sea wall will require engineering advice on the design of the structure, particularly footings and rock size to withstand storm waves set on a higher sea level. Costs include engineering consultancy, materials and labour. Sea walls cost around $8000/linear metre for construction, more when a high finish is required. Council would seek joint funding from State and/or Australian government, for any major reconstruction.
	Constraints to implementation: policy or statutory
	There are no policies or statutory constraints to maintaining this sea wall. Works may require Part 5 planning approval and other approvals from state agencies.
	Community acceptance?
	This promenade and associated sea wall is a valued community asset. Expect strong community support for maintaining the promenade in safe and attractive condition.
	Where would it be applied
	This action applies only to the sea wall on the southern shore of The Entrance. At this stage, Council is not considering any sea wall construction on the northern side of The Entrance channel.
Sustainability score:	**5**

Step 3: Enhance knowledge and monitor achievements	
ACTION	**Risk reduction benefits and logic**
A67: Establish a detailed monitoring program to clarify how sand placed on North Entrance Beach is redistributed and (sediment budget) and to support amendments that would provide more effective sand retention to buffer against major storm bite. **INTENT** To provide improved information for detailed management of limited sand reserves.	Council maintains general records of the amount of sand dredged from the Entrance. All this sand is discharged at one location on North Entrance Beach and then the beach and dune area are shaped with the increased sand volume. By keeping detailed volume and survey records, Council can track how the added sand affects the dune profile and resilience over time. This information, together with research described in A68, will facilitate decisions about the most effective location to place sand and how best to shape the beach profile.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	This is a maintenance cost for dredging and enhances work that is already done. The beach profile should be resurveyed quarterly. There is potential for this work to be done by university students, or by contractors. Longer term monitoring can be done with LiDAR and LADS data, if it is available.
	Constraints to implementation: policy or statutory
	There are no statutory or policy constraints to monitoring beach profiles.
	Community acceptance?
	Monitoring which provides data which clearly adds value to entrance and beach management in a high risk location would be supported by the community.
	Where would it be applied
	The detailed monitoring action relates to north Entrance Beach. Broader monitoring of beach and dune form along the coast using LiDAR and LADS data would apply to all beaches and headlands.
Sustainability score:	**4**
ACTION	**Risk reduction benefits and logic**
A68: Council will commission further studies of sediment dynamics in The Entrance channel, with sea level rise. This is likely to include a hydrodynamic model to test sediment budget changes in the Entrance channel as sea level rises. Further research is also necessary to clarify the relationship between lake flood levels, coastal recession and oceanic inundation hazards at Lakes Beach area. **INTENT** See also A28 To provide sound science on which to base decisions about managing The Entrance as sea level rises. The Entrance and North Entrance barrier area are the highest risk locations for the whole of the Wyong coastline.	This action will inform adaptive management of The Entrance area as sea level rises and other climate change parameters take effect. Detailed review of the variability of sediment distribution is underway. Once there is a clear understanding of the empirical data, and the sequencing of responses to rainfall, tidal and wave energy drivers, modelling of entrance processes under future climate scenarios would be possible. This modelling and testing of actual change in key localities is a critical part of adaptive management of the coastline.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	Analysis of empirical data about channel change and sediment distribution in the entrance and adjacent beach areas is expected to cost around $70,000. Future scenario modelling will cost about the same amount.
	Constraints to implementation: policy or statutory
	There are no policies or statutory constraints to further empirical and modelling analysis of processes in The Entrance area.
	Community acceptance?
	The community will expect that Council makes decisions about the management of this key area for the lake and coast based on the best available information and rigorous science.
	Where would it be applied
	Initial investigations are focused on The Entrance and adjacent North Entrance Beach. Council may also conduct research at Lakes Beach in the future, if sea level rise tracks in a way that would threaten the integrity of the barrier at that location.
Sustainability score:	**5**

19.6 Potential responses for managing immediate and longer term geotechnical hazards

Table 19.6 - Summary evaluation of potential actions to address geotechnical hazards

Step 2: Select and Implement Actions to Reduce Risk	
ACTION	**Risk reduction benefits and logic**
A69: Council will introduce planning clauses in the LEP and DCP with consistent requirements for appropriate geotechnical assessments of proposed development within the zone bounded by the immediate hazard line and 2100 low geotechnical hazard line (assessments prepared by a properly qualified geotechnical practitioner). No new development will be approved within immediate geotechnical hazard areas. A82: LEP zoning and DCP clauses will discourage land use intensification and reduce risk in areas with a high probability of geotechnical hazards **INTENT** To align development with land capability and constraints in areas affected by geotechnical hazards.	Current planning controls in Wyong Shire are based on out of date information about geotechnical processes and hazards along the coast. This action links the planning system to the best available information about geotechnical processes and requires detailed consideration of geotechnical processes for affected land. Council is also considering further enhancement of the geotechnical hazard assessment process to enable rapid updates of risk as new information becomes available.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	Low costs to Council are associated with updates of the planning system. Council has already obtained detailed geotechnical advice for some public reserve areas, to ensure that lookouts and pathways are properly located and designed. New requirements for detailed geotechnical assessments for new development may add to costs for land owners/developers. However, properly designed structures which take geotechnical hazards into account have significant benefits for property owners and for Council.
	Constraints to implementation: policy or statutory
	The Wyong LEP must be consistent with the Statewide template and Standard Instrument. Council does not expect that this will be an issue.
	Community acceptance?
	Expect strong community support for clear and up to date definition of geotechnical hazard areas, with clear links to the planning system.
	Where would it be applied
	Applies to all parts of the Wyong coastline that are affected by geotechnical hazards.
Sustainability score:	**5**

ACTION	Risk reduction benefits and logic
A70: Review stormwater drainage systems in the vicinity of geotechnical hazard areas to ensure that they do not discharge runoff into areas where it could trigger a landslide. This applies to both council stormwater systems and stormwater systems on private property **INTENT** To control drivers of instability on coastal headlands and bluffs	Some geotechnical hazards are exacerbated by changes to surface and groundwater flows that are associated with urban development. This action draws on detailed local geotechnical advice to ensure that urban water design takes geotechnical hazards into account. Council has already invested in modifications to the surface and groundwater drainage system at Cabbage Tree Harbour to reduce landslip risk.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	Redesigning and/or redirecting surface water and groundwater flows is expensive, but costs clearly vary with the scale of retrofit that is required. Drainage is a key factor in landslip hazard at only a few locations. Expect at least $500,000 for changes to street drainage.
	Constraints to implementation: policy or statutory
	Community acceptance?
	Local communities expect that Council will manage urban stormwater in an environmentally sensitive manner. It is also important that individual landholders manage site drainage in a way that does not exacerbate landslip hazard.
	Where would it be applied
	Cabbage Tree Harbour is the most important location. Minor drainage issues are involved at The Entrance and other bluffs.
Sustainability score:	**4**
ACTION A71: Review Plans of Management for coastal reserves in coastal hazard areas (geotechnical), both for Crown Reserves and for Council community land. Ensure that each Plan of Management takes geotechnical hazards and risks into account **INTENT** To update Plans of Management so that they reflect the best available information about hazards in the coastal zone.	**Risk reduction benefits and logic**
	For Crown reserves and council owned/ managed land this action will ensure that recreational infrastructure is located and designed to take geotechnical hazards into account. For instance, geotechnical hazards affect the location of lookouts, pathways, stairways, and cabins in caravan parks on Crown reserves.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	All Plans of Management should be revised and updated from time to time, so incorporating management measures to reduce geotechnical hazards and risks is not necessarily a significant additional cost. There may be additional costs if further detailed geotechnical advice is required in order to design new pathways or stairways on slopes affected by geotechnical hazards. Norah Head is an example.
	Constraints to implementation: policy or statutory
	There are no policies or statutory constraints to updating Plans of Management. The Crown Lands Act and Local Government Act generally require that such plans are regularly reviewed within an adaptive framework.
	Community acceptance?
	High community expectations that access infrastructure in coastal reserves will be safe and properly designed for the specific terrain conditions.
	Where would it be applied
	Consider geotechnical hazard issues for all public reserves where there is access infrastructure. Norah Head is the best example.
Sustainability score:	**4**

ACTION	Risk reduction benefits and logic
A72: Council will construct a toe drainage structure at Cabbage Tree Harbour that both improves groundwater drainage and protects the toe of the slope against erosion. This structure will be partly funded by OEH	Coastal erosion and geotechnical instability are interacting at Cabbage Tree Harbour and slope processes are active. These processes threaten residential development and infrastructure as well as (at times) creating a safety issue for people using the beach. The proposed structure is intended and designed to protect the toe of the indurated sand slope from wave action and to improve drainage, thus reducing the activity of slope processes.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	High up-front cost (current estimate is $1.9 million). Maintenance is likely to be required to remediate any damage to the structure after major storms. The structure should also be monitored to identify any issues with its integrity and performance. Council will share capital cost with the NSW government.
	Constraints to implementation: policy or statutory
	The structure requires approval by Council and the NSW government.
	Community acceptance?
	Geotechnical hazards at cabbage Tree Harbour have been a source of significant community concern for years. Council has consulted residents about options and the proposed structure has general support.
	Where would it be applied
	A specific response for the situation at Cabbage Tree Harbour.
Sustainability score:	**5**
ACTION A88: Council will include information about geotechnical hazards affecting infrastructure in the coastal zone, such as stormwater drains, sewer reticulation and pumping systems, in its asset data base and will take geotechnical hazards into account when planning upgrades, relocation or other major system maintenance activities. Council will set out appropriate design requirements in the LEP, which will apply to Council activities, projects by other government agencies and private development.	**Risk reduction benefits and logic**
	Poorly recognised and managed geotechnical hazards can significantly reduce the performance of Council infrastructure and increase the maintenance costs necessary to maintain effective function. By including geotechnical information in the asset data base, Council will have information to better manage the hazard when planning and maintaining infrastructure. This should be very cost effective.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	This action may have little effect on capital costs (except where a more expensive design is necessary to accommodate geotechnical processes); over time, the action should significantly reduce maintenance costs as geotechnical factors are taken into account in infrastructure upgrades.
	Constraints to implementation: policy or statutory
	No policy or statutory constraints. Cost effective management of assets is expected of Councils through the Local Government Act.
	Community acceptance?
	The community will support cost effective measures to maintain asset function and service quality. Proper design and maintenance will also reduce the risk of environmental incidents through failure of pipes etc.
	Where would it be applied
	The action is relevant to all areas affected by geotechnical hazards. In this instance, the location is the coastline, but a similar action would be relevant to other parts of the council area.
Sustainability score:	**4-5**

Step 3: Enhance knowledge and monitor achievements	
ACTION	**Risk reduction benefits and logic**
A73: Repeat LiDAR surveys of the coast at approximately 5 year intervals. Analyse high resolution digital terrain data at 5 yearly intervals to identify any changes in the terrain of areas affected by geotechnical hazards. **INTENT** To provide accurate, high resolution and up to date data on actual changes to terrain morphology, so geotechnical and other erosion processes can be tracked.	LiDAR data is an excellent tool for tracking small changes to terrain. It is relevant to both beach and dune systems and to cliffs and bluffs. For geotechnical hazards, review of morphological change at five year intervals is sufficient to monitor how both terrestrial and marine processes are affecting cliffs and bluffs. When this type of information is available, it is possible to refine predictions about how cliffs and bluffs will respond to aspects of climate change.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	Collection and analysis of LiDAR data for the Wyong coastline is expected to cost up to $50,000 per run (i.e. at five year intervals). Council is investigating options for partnerships with State and Australian government for acquiring LiDAR data. Currently there is no LiDAR data for much if the NSW coastline, so funding for repeat surveys of the Central Coast may be some time off.
	Constraints to implementation: policy or statutory
	There are no policies or statutory constraints to collecting and analysing new LiDAR data, other than a funding policy that would give higher priority to locations which have no LiDAR coverage.
	Community acceptance?
	Expect community support for monitoring that enables tracking of actual changes to the coast so that risks can be adaptively managed.
	Where would it be applied
	Whole of coast
Sustainability score:	**4**
ACTION A89: Develop and continue to refine a 3D geotechnical model for predicting geotechnical hazards **Error! Not a valid link.**	**Risk reduction benefits and logic**
	Over time, this action will provide Council and the community with an effective tool for predicting geotechnical hazard. A basic model is included in the WSCZMP, but the model will be refined over time as new geological information and new climate change and process response information are added. Good information about hazards will reduce planning costs and increase certainty for all stakeholders.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	A basic model already exists. Ongoing costs for maintaining the data base will be shared by Council and by proponents of development in geotechnical hazard areas. Proponents will be required to provide specified geological and geotechnical data to Council.
	Constraints to implementation: policy or statutory
	Community acceptance?
	In general, the community supports actions that improve clarity about appropriate land use and risk management along the coast.
	Where would it be applied
	The model is relevant to all cliffs and bluffs along the Wyong coastline.
Sustainability score:	**4**

ACTION A90: Further investigate the interaction of coastal erosion and geotechnical hazards in areas where both types of hazard (coastal erosion and geotechnical recession) may apply now or within the 2100 planning period.	**Risk reduction benefits and logic**
	As for A89, this action is about improving clarity and certainty. This action focuses on localities where there are complex relationships between coastal erosion hazards (erosion of beach and dune sand) and geotechnical hazards (erosion of cliffs and bluffs), for instance, where beach sand mantles a weathering bedrock slope, or where recession of beach sand will expose a weathering rock slope to new processes.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	Refining understanding of the process relationships will require further studies of local stratigraphy and soil processes. Council may fund some of these studies, but others will be funded by proponents, to provide information required with a development application.
	Constraints to implementation: policy or statutory
	There are no policies or statutory constraints.
	Community acceptance?
	Improved understanding of hazards at these complex locations may allow some hazard affected land to be used, by clarifying the necessary designs and foundations to deal with a mix of processes over time.
	Where would it be applied
	There are multiple locations where coastal erosion/recession processes and geotechnical processes interact or will interact in the future. Examples are Cabbage Tree Harbour, Toowoon Bay, Noraville and Blue Lagoon.
Sustainability score:	**4**
ACTION	**Risk reduction benefits and logic**
A74: Make Australian GeoGuides, published by the Australian Geomechanics Society, available on Council's web site, as reference material on good practice for landowners and Council **INTENT** To provide residents and landholders with sound technical advice on good practice for managing geotechnical hazards. This advice is not intended to replace site specific assessment, but does assist with contextual information and general best practice approaches.	Reduces risks by providing land holders with technically sound information about geotechnical processes and their management.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	Low cost action, which makes sound information readily available.
	Constraints to implementation: policy or statutory
	No policy or statutory constraints are associated with this action.
	Community acceptance?
	Expect a high level of community acceptance of easy access to clear advice on best practice approaches to geotechnical hazards.
	Where would it be applied
	Relevant to the whole Wyong coastline.
Sustainability score:	**5**

19.7 Potential responses for enhancing the resilience of coastal biodiversity

Table 19.7 - Summary evaluation of options to enhance the resilience of coastal biodiversity

Step 2: Select and Implement Actions to Reduce Risk	
ACTION	**Risk reduction benefits and logic**
A20: Use zoning and other planning measures to provide for retreat (landward migration) of important ecological communities, where possible. **INTENT** To maintain biodiversity through reducing risks to roll back of communities and habitats and maintaining connectivity. See Principles 9 and 11 and Objectives 3 and 9	High ecological value communities and habitats and an appropriate buffer would be zoned for environmental protection or environmental management in the Wyong LEP. Recent research has addressed principally the impacts of climate change on estuarine habitats such as saltmarsh and mangrove. Rock platform habitats are not able to migrate landward because of the slow rate of geomorphic adjustment. In Wyong Shire, this action relates principally to small areas of littoral rainforest (see Section 17.0 in PART C). On long coastal barrier systems that are not in National Park, zoning of the back barrier area should also allow for roll back of frontal dunes and re-establishment of frontal dune ecological communities. These communities are not listed as ecologically significant but are important for ecological connectivity and for the visual amenity and ground surface stabilisation services that they provide.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	Successful roll back of ecological communities is likely to require more than space for them to move into; for instance, measures such as planting, weeding, fencing, monitoring, etc. may be necessary. Some of these additional costs could be reduced by the involvement of community volunteers.
	Constraints to implementation: policy or statutory
	Constraints associated with land tenure (e.g. private land) and potential back zoning of buffer land currently zoned for development. Not feasible in areas with existing high levels of urban development.
	Community acceptance?
	Community support expected, particularly if the affected land is within existing reserves and can be incorporated into the management plans for those areas.
	Where would it be applied
	SEPP 26 littoral rainforest in or adjacent to the immediate coastal risk area; other EECs in the coastal risk area – at present none are known. Coastal dune systems on long sandy coastal barriers such as Tuggerah Beach and Lakes/Birdie Beach.
Sustainability score:	**5**

ACTION	Risk reduction benefits and logic
A8: Conduct dune stabilisation and revegetation works to encourage sand accretion and stabilisation of frontal dunes. These on-ground dune maintenance and stabilisation works will be conducted in accordance with Plans of Management for ocean frontage reserves managed by Council. **INTENT** Enhance the resilience of the coastal dunes to storm wave erosion. Enhance ecological connectivity and diversity along the coast. See Principles 7, 8 and 9 and Objectives 3, 8 and 9.	Research observations suggest vegetation management is effective because it traps additional wind-blown sand and builds up dune height and volumes, providing a better buffer to coastal erosion. If buffers can be maintained for longer, there is greater opportunity for back barrier/hind dune communities to adjust to climate change variables.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	Low cost option, often implemented by Coastcare/Landcare volunteers. Ongoing maintenance required post storm and to minimise weed invasion.
	Constraints to implementation: policy or statutory
	Supported by NSW Government policy as a key strategy for enhancing dune stability and habitat connectivity.
	Community acceptance?
	Generally highly valued by community, provided there are no conflicts between dune stability benefits and views.
	Where would it be applied
	Ocean frontage reserves at Budgewoi, North Entrance, others. Will be less effective on low remnant dunes at pocket beaches.
Sustainability score:	**5**
ACTION	**Risk reduction benefits and logic**
A30: Strengthen vegetation communities on dunes by preparing, implementing (including monitoring effectiveness) vegetation management plans that include species selection, planting, weed removal, fencing etc. **INTENT** To maintain, where feasible, ecological processes on coastal dunes that are affected by coastal recession.	As noted for A8, well vegetated coastal dunes contribute to resilience to coastal erosion by trapping windblown sand and building up sand volumes. The effectiveness of this action may be reduced if sea level rises rapidly, accompanied by more frequent storms. This will eliminate or drive coastal dunes landward rapidly. However, maintaining healthy coastal vegetation is still beneficial in the long term because of habitat connectivity values.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	Vegetation management on coastal dunes is a low cost management option, particularly when the on ground work is primarily achieved through community projects. However, costs may increase if sand supply declines and plantings are unable to survive.
	Constraints to implementation: policy or statutory
	Currently supported strongly by the NSW coastal dune management manual.
	Community acceptance?
	Community acceptance and support is likely for beaches and dunes where high value investment in housing or commercial property is not threatened by coastal erosion.
	Where would it be applied
	Ocean frontage reserves such as Budgewoi and parts of Tuggerah Beach. Dune vegetation works are generally less suitable for developed sections of North Entrance beach, where houses are already directly threatened by storm bite.
Sustainability score:	**4**

ACTION	Risk reduction benefits and logic
A32: Where feasible, establish conservation agreements for high value ecological communities in reserve areas that are vulnerable to climate change and other medium to long term threats **INTENT** By applying conservation oriented land management, the resilience of these communities to aspects of climate change and other threats is increased.	Rock platforms in Wyong Shire are important habitat for a range of birds, shellfish and other species. Littoral rainforest is the only important terrestrial community within the core area of the coastline management plan. Other protected coastal vegetation communities (such as estuarine wetlands) are addressed in the Tuggerah Lakes Estuary Management Plan. Could be used in conjunction with zoning to facilitate roll back of coastal dune vegetation communities. Link this action to review and updating of Plans of management for coastal Crown Reserves and Council Reserves.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	Potential loss of recreational opportunities and minor amendments to management plans for Crown reserves, such as relocating walking/bicycle paths.
	Constraints to implementation: policy or statutory
	Requires agreement with L&PMA, as rock platforms are in Crown land, as are the remaining patches of Littoral Rainforest.
	Community acceptance?
	About 35% of the Wyong coastline is in National Park or State Conservation Area. Some community members may wish to minimise constraints to community access and use of other rock platforms,
	Where would it be applied
	Identify specific locations where this would be useful. Not useful for sites where the main process threat is inundation or where there is immediate to 20 year coastal erosion hazard. Conservation management can also be applied to adjoining buffer land, which will allow for roll back of coastal vegetation communities where the terrain and soils are appropriate.
Sustainability score:	**4**
ACTION	**Risk reduction benefits and logic**
A51: Council will continue to support Landcare groups to maintain and enhance the condition and function of native vegetation on coastal dunes, including weed removal and replanting. This action enhances community involvement in a recreational activity that contributes to social cohesion, but also has benefits for the natural landscape. It also helps to enhance Council's partnership with HCRCMA. **INTENT** Support opportunities for community involvement in enhancing biodiversity values and resilience along the coast. Continue and enhance existing positive relationships.	Well vegetated coastal dunes contribute to resilience to coastal erosion and also enhance biodiversity connectivity. Community involvement brings awareness, ownership and cost benefits. This action reinforces the role of local communities which is alluded to in all biodiversity options.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	Costs are associated with ongoing training for volunteers, materials for plant propagation and planting, protection of young plants from disturbance and wildlife. Council already invests in this assistance for community groups. Add costs for monitoring and reporting of success and review of high priority locations (this is also covered in a separate action for community involvement in biodiversity monitoring).
	Constraints to implementation: policy or statutory
	Consistent with NSW government approach to managing dunes affected by immediate coastal erosion (cyclical storm bite and later redeposition); for increasing resilience of dunes likely to be subject to storm bite in the future, and for maintaining dune height. Consistent with HCRCMA priorities.
	Community acceptance?
	Strong community involvement in Landcare/Coastcare activities.
	Where would it be applied
	Potentially to all coastal dunes in the Shire.
Sustainability score:	**5**

ACTION A75: Council will continue to work with OEH to protect nesting and roosting habitat for protected shorebirds such as Little Tern (examples include from disturbance from pedestrians, dogs and vehicles, possibly from short term wave overtopping). **INTENT** To encourage breeding success of protected bird species, and to contribute to meeting Australia's obligations under international bird conservation conventions (where relevant).	**Risk reduction benefits and logic**
	Migratory shorebirds are an important part of local biodiversity and are protected under international conservation agreements. Council will contribute to programs managed by OEH to reduce threats to breeding and roosting sites for migratory shore birds. This could involve seasonal exclusions of vehicles from some beaches, fencing of nesting sites etc.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	On ground actions are low cost, but enforcement can be difficult and expensive if the actions require exclusion of users. May require a high level of community cooperation.
	Constraints to implementation: policy or statutory
	For species that are covered by international conservation agreements, Council is obliged to manage threats to habitat.
	Community acceptance?
	Expect broad community acceptance that protecting habitat for migratory shore birds is a valuable activity. Also expect some resistance if this involves significant changes to the behaviour of some user groups (e.g. 4WD access to remote parts of the beach for fishing). Exclusion of people from some rock platform sites would also be difficult.
	Where would it be applied
	The action is relevant to areas used by migratory shore bird species. Confirm locations annually with OEH and bird conservation groups.
Sustainability score:	**4**
ACTION	**Risk reduction benefits and logic**
A81: Conduct a benchmark survey of the condition of coastal ecological communities, providing standardised information about a selection of representative sites along the coast. The assessment would be conducted in partnership with HCRCMA and local Landcare groups. **INTENT** To understand both how climate change/sea level rise is affecting coastal ecological communities and how activities by Council, HCRCMA and Landcare groups are affecting the condition of coastal ecological communities, a sound baseline survey of the distribution and condition of ecological communities and systems along the coast is an essential reference point.	The main risk reduction benefit is that Council and its partners will be able to evaluate the effects of drivers of change and of their investment in coastal ecological projects (coastal ecological resilience). This is fundamental to good adaptive management. Good information about the effectiveness of investment will allow Council to review its approach as necessary to deliver the best outcomes.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	A benchmark survey of coastal ecological communities will require around $50,000 investment. There are potential alternatives to entirely field based survey and assessment, using high resolution DTM, satellite imagery and aerial photogrammetry.
	Constraints to implementation: policy or statutory
	Sound baseline information about coastal ecological condition and/or resilience is consistent with the NSW Standard for Quality NRM.
	Community acceptance?
	Council expects that this baseline work would be supported by community Landcare groups.
	Where would it be applied
	The baseline information would be collected for all Council reserves along the coast. Council would work with DPI (relevant sections of former L&PMA) and OEH to achieve coordinated and consistent baseline information for reserves managed by those organisations.
Sustainability score:	**4**

19.8 Potential responses for managing risks associated with community use and enjoyment of the coast

Table 19.8 - Options for safe and equitable beach access and for managing recreation impacts on coastal systems

Step 1: Benchmark existing condition	
ACTION	**Risk reduction benefits and logic**
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** Prepare for planned installation, maintenance and redevelopment or replacement of coastal access assets. Principles 3, 4, 5 and 6 and Objectives 4, 5, 8 and 9 are relevant.	See also Section 19.3. Apart from routine asset valuation, management and redundancy, the data base will keep records of storm events and damage and what rectification works were carried out at each site. In the longer term, this will contribute to an understanding on how climate change and storm cycles contribute to costs of maintaining community amenity along the coast.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	A relatively low cost option, but one that requires a clear allocation of responsibility within Council, to ensure that records are properly maintained.
	Constraints to implementation: policy or statutory
	There are no policies or statutory constraints affecting this response.
	Community acceptance?
	Expect that the community will support regular monitoring of the condition of beach access ways, linked to ongoing maintenance.
	Where would it be applied
	Applies to the entire coastline.
Sustainability score:	**5**

Step 2: Select and Implement Actions to Reduce Risk	
ACTION	**Risk reduction benefits and logic**
A46: Maintain a close working relationship with surf clubs and Surf Life Saving Australia in relation to beach patrols, beach safety information and beach environment information. Surf clubs also have a role in emergency response activities and their activities (such as major surf carnivals) also contribute to tourism income. Members of Surf Life Saving Australia provide valuable services to residents and visitors, helping to make the coast safe and attractive. Surf carnivals also attract many visitors to the area, adding to the local economy. **INTENT** To value community resources which contribute to safe and enjoyable beach access.	The involvement of surf club members in beach activities and beach patrol helps to reduce risks to the safety of beach users.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	No significant costs associated with ongoing liaison. However, maintenance and upgrade of surf club facilities involves costs of more than $6.5 million, averaged over the 30 or more years life of major infrastructure. Council is seeking grant funds to cover some of these infrastructure costs.
	Constraints to implementation: policy or statutory
	No policy or statutory constraints to the relationship. There are planning controls affecting the location of surf club facilities in the future. See Section 15.0 of PART C.
	Community acceptance?
	Likely to be strongly supported by the community
	Where would it be applied
	All patrolled beaches in the Shire (six sites)
Sustainability score:	**5**
ACTION	**Risk reduction benefits and logic**
A47: Work with community groups, OEH, DPI (relevant sections of former L&PMA) and DTIRIS to plan routes for a coastal walk extending the full length of Wyong Shire coastline, for local users and which can be promoted as a recreational attraction for the coastline. Council intends to construct the walk over ten years. Both of these walks are noted in WSC's Strategic Vision. The walks would complement the existing walk/cycleway around the shore of Tuggerah Lake This is a valuable project for the coastline and hinterland. Investment likely to be implemented in stages, as part of recreation and community programs. **INTENT** Promote the natural assets of the shire coastline and escarpment; encourage tourism and encourage residents to enjoy outdoor activity.	These proposals are less about risk reduction, and more about promoting the coastal and escarpment landscapes of the Wyong area to visitors
	Constraints to implementation: up-front cost and ongoing maintenance costs
	Costs are associated with both construction of new sections of pathway, new facilities and with signposting and interpretation materials. Full cost for the coastal walk expected to be more than $500,000 (much more if paved surface pathways need to be constructed).
	Constraints to implementation: policy or statutory
	Potential issues around land tenure and coordination of safe access for walkers across multiple land tenures
	Community acceptance?
	Likely to be supported by the community. Concepts have already been approved in council's strategic vision
	Where would it be applied
	Coastal walk would link existing pathways, use some sandy beaches and in some places, follow existing roads. Details of both walks are yet to be determined. Options for staging – which sections would be priority for construction and signposting, are still to be determined.
Sustainability score:	**4**

ACTION	Risk reduction benefits and logic
A48: Liaise with NSW Maritime Authority, NSW Marine Rescue and recreational and commercial fishers about the safety and suitability of ocean boat launching ramps and associated facilities (particularly the Cabbage Tree Harbour ramp) and identify any necessary upgrades to current facilities or need for additional safe facilities in the Shire. **INTENT** Provide for continuing safe access to the ocean for recreational boating, taking into account sea level rise impacts on structures, and the growth in demand for facilities in the region. There is currently only one significant ocean access boat ramp in Wyong Shire, at Cabbage Tree Harbour. There are safety issues and user interaction issues at this ramp. Some small boats are launched across the beach at Toowoon Bay.	This action foreshadows further risk assessment and planning to ensure that boat launching infrastructure remains safe and cost effective to maintain.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	Very low cost in ongoing liaison and risk review. Upgrade of Cabbage Tree Harbour ramp, or construction of other ramps would cost more than $500,000. Any work at Cabbage Tree Harbour must take into account other sea wall construction and drainage works to reduce landslip risks to public infrastructure and private property.
	Constraints to implementation: policy or statutory
	No policy or statutory constraints associated with ongoing liaison and risk review. If further on ground works are necessary, environmental assessment (most likely under Part 5 of the EP&A Act) and consultation will be required.
	Community acceptance?
	Likely to be a positive community response to maintenance of ocean access. Any proposals for changes to existing arrangements will require detailed community consultation.
	Where would it be applied
	Initially to Cabbage Tree Harbour; would only extend elsewhere if demand is demonstrated. Basic site suitability and feasibility assessment would be required for any other potential sites.
Sustainability score:	**4**
ACTION	**Risk reduction benefits and logic**
A50: Develop a design theme for coastal information, interpretation and safety signage. Introduce new signage linked to the coastal walk and at high profile locations, to enhance community awareness of coastal landscape features, processes and coastal risks. This action complements action A5 (community awareness of coastal process hazards). Signage design would also be linked to the landscaping themes of high profile recreation reserves/locations, such as at The Entrance, where Council already has signage programs in place. Beach safety signage would be developed in consultation with Surf Life Saving people. **INTENT** Attractive presentation of clear information about the coast to beach users, supports tourism and beach safety	When focused on beach safety (e.g. understanding rips) this action helps to reduce risks to the safety of beach users. Other types of signage are directed more at enhancing the coastal experience for beach users than at reducing specific hazard risks.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	Investment required in the design and installation stages and then ongoing maintenance. Consultation is required with local communities. Allow approximately $80,000 for a package of signage for any one beach/reserve.
	Constraints to implementation: policy or statutory
	There is strong policy support for clear, informative safety signage. No policy or statutory constraints to interpretative signage, provided appropriate development approvals are in place. Signage needs to be consistent and integrated with other information products – on web and in hard copy.
	Community acceptance?
	Likely to be strong support for well designed and located signage, which presents information clearly and constructively.
	Where would it be applied
	Focus on high profile/high usage sites in the first instance. For instance, there is high beach usage at Soldiers, Shelly and Toowoon Bay Beaches, so these would be a priority.
Sustainability score:	**4**

ACTION	Risk reduction benefits and logic
A51: Council will continue to support Landcare groups to maintain and enhance the condition and function of native vegetation on coastal dunes, including weed removal and replanting. This action enhances community involvement in a recreational activity, but also has benefits for the natural landscape, by strengthening the resilience of coastal ecology and improving ecological connectivity. It also helps to enhance Council's partnership with HCRCMA. **INTENT** Support opportunities for community involvement in enhancing biodiversity values and resilience along the coast. Continue and enhance existing positive relationships.	As noted above, well vegetated coastal dunes contribute to resilience to coastal erosion and also enhance biodiversity connectivity. Community involvement brings awareness, ownership and cost benefits.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	Costs are associated with ongoing training for volunteers, materials for plant propagation and planting, protection of young plants from disturbance and wildlife. Council already invests in this assistance for community groups. Add costs for monitoring and reporting of success an review of high priority locations.
	Constraints to implementation: policy or statutory
	Consistent with NSW government approach to managing dunes affected by immediate coastal erosion (cyclical storm bite and later redeposition); for increasing resilience of dunes likely to be subject to storm bite in the future, and for maintaining dune height. Consistent with HCRCMA priorities.
	Community acceptance?
	Strong community involvement in Landcare/Coastcare activities.
	Where would it be applied
	Potentially to all coastal dunes in the Shire.
Sustainability score:	**5**
ACTION	**Risk reduction benefits and logic**
A52: Review access ways to and within high profile foreshore and headland reserves and provide disabled access. This would be included in reviews/ preparation of plans of management. This access will also enhance recreational access and safety for elderly and disabled residents. INTENT Make beaches and headlands accessible to all.	This action is designed to enhance access to and enjoyment of the coastal landscape. Careful design and placement of facilities is necessary to ensure they meet community needs and are cost effective. New disabled access would be located where it can reasonably be protected from coastal erosion hazards.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	Initial audit of existing disabled access is a low cost action. Provision of full disabled access (ramps of appropriate grades and materials, handrails, mats to facilitate access across the sand etc) can be a significant cost. Allow approximately $50,000 per site, although some will require more investment than this.
	Constraints to implementation: policy or statutory
	No policy constraints. Gives effect to NSW Coastal Policy. Development applications will be needed for any new access structures to be built inside immediate coastal hazard zones.
	Community acceptance?
	The Central Coast has a significant ageing/elderly population. This action is intended to make coastal reserves accessible to the frail aged and to disabled people. Strong community support expected. Council will consult about specific locations and needs.
	Where would it be applied
	Confirm safe disabled access at Norah Head, The Entrance, Toowoon Bay and potentially Lakes Beach and Soldiers Beach in the first instance. Note that there is already some disabled access to North Entrance Beach (near the surf club) from the Special School behind the dunes. Dune management activities in the short to medium team should maintain this access.
Sustainability score:	**4**

ACTION	Risk reduction benefits and logic
A53: Conduct regular (for instance, every three years) surveys of beach users in relation to satisfaction with facilities and services. **INTENT** Provide opportunities for community feedback about beach management and keep Council informed of community needs. Contributes to ongoing evaluation and improvement of coastline management. Council could also use this survey process to track community understanding of coastal erosion and recession issues and how these matters are being managed.	This action is part of the adaptive management framework for the coastline. It reduces risks by ensuring that Council's approach to managing coastal access continues to meet community needs and is targeting the most important priorities.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	Council is likely to need to commission consultants to perform this action – to design and implement surveys and to analyse the responses. Indicatively, allow up to $40,000 every three to five years. Costs could be less if the coastal uses survey is incorporated into other Council community survey/feedback projects that are included in Council's city strategic plan. Costs can also be reduced by making the survey an online process, although there may be issues about sampling bias.
	Constraints to implementation: policy or statutory
	No policy constraints.
	Community acceptance?
	Likely to be supported by community, provided the costs can be managed and the outcomes of surveys are demonstrably included in reviews of management priorities.
	Where would it be applied
	Applies to public using the coast or living adjacent to the coast and along the entire coastline
Sustainability score:	**4**
ACTION	**Risk reduction benefits and logic**
A54: Upgrade shade and picnic facilities at high profile beaches, consistent with a Master Plan for each site. This would require construction of covered picnic shelters or pavilions in foreshore reserves at selected beaches. The action is part of general landscaping design of foreshore reserves, as well as complementing provision of other facilities, disabled access and enhanced signposting/interpretative information about coastal processes and values. **INTENT** To enhance opportunities for safe and enjoyable use of the beaches, by diverse users.	The action reduces risks to beach users and increases the attractiveness of the foreshore to diverse users (for instance, young families and the elderly)
	Constraints to implementation: up-front cost and ongoing maintenance costs
	Design and construction of beach reserve infrastructure is a significant cost for Council. Priority would be given to high profile locations such as The Entrance (already subject to a Master Plan), Shelly Beach, Toowoon Bay, Bateau Bay and Soldiers Beach. Preparation of a new Master Plan is likely to cost around $50,000 per location. Implementation, with installation of new structures, furniture, amenities and playgrounds, is expected to cost up to $1 million per site, depending on the complexity of the Master Plan and the profile of the beach reserves (many will be less costly than this).
	Constraints to implementation: policy or statutory
	New facilities should be located to minimise risks associated with coastal process hazards. For instance, see the discussion about surf club facilities in Section 19.4.
	Community acceptance?
	Likely to be strongly positive. Consult local communities about specific proposals.
	Where would it be applied
	All foreshore reserves whose primary role is recreation (rather than biodiversity protection or enhancement) could be included in a Master Plan program, but high usage beaches are the highest priority.
Sustainability score:	**4**

Step 3: Enhance knowledge and monitor achievements	
ACTION	**Risk reduction benefits and logic**
A55: Review off leash dog exercise areas in terms of compliance and feedback from users and make changes as necessary to minimise negative impacts on other users and value. **INTENT** To ensure that on and off leash dog exercise areas along the coast are located and used appropriately.	This action is about adaptive management of a particular user group, so that their needs continue to be met over time, as coastal reserves are affected by other recreational preferences and coastal change.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	Feedback about off leash usage areas could be included in the community survey referred to in Action A53. Evaluation of beach usage by all groups is an ongoing review process, so costs will be repeated well into the future. There are potential additional costs associated with consultation about proposed changes to off leash exercise areas. However, overall, the costs of this action are low.
	Constraints to implementation: policy or statutory
	Council supports the benefits of companion animals, but is also required to ensure that dogs in beach front reserves or on beaches are managed in a way that does not endanger or inconvenience other users.
	Community acceptance?
	Expect support for a process of review and evaluation. Council will consult about proposed changes so that people are aware of the reasons and timing. For instance Council may choose to close some beach areas to all dogs during breeding season for migratory shorebirds. Council may only offer off leash exercise areas that are well away from the high usage sections of beaches associated with surf clubs.
	Where would it be applied
	Council will consider feedback about any area that is currently open for dog exercising – whether on leash or off leash.
Sustainability score:	**3**

19.9 Potential responses for managing heritage and cultural values of the coastline

Table 19.9 - Summary evaluation of potential management responses for cultural and heritage values of the Wyong coast

Step 1: Benchmark Existing Condition	
ACTION	**Risk reduction benefits and logic**
A78: Council will work with the Darkinjung Local Aboriginal Land Council and other Aboriginal community groups, to monitor the condition of known Aboriginal sites on land in its care and include proper protection measures in Plans of Management for coastal reserves in Council's management. **INTENT** To provide information that guides the development of Plans of Management for coastal reserves in Council's care and control.	If Council has access to good information from the Aboriginal community about important sites and places, including sites in the AHIMS data base and other sites that may be known to local people, then Plans of management and Master Plans for coastal reserves can be prepared to reflect and protect important cultural values. For instance, Council would not locate a high profile picnic area on or near a midden site or a place of spiritual significance to Darkinjung people.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	Basic site records are held in AHIMS, but this action requires ground truthing of the current condition of known sites. This could be done by Aboriginal community representatives with or without archaeological consultants. Allow at least $10,000 for review of site condition. Allow further budget (up to $30,000 in the first instance), to modify Plans of Management as necessary.
	Constraints to implementation: policy or statutory
	Consult with OEH to ensure that any recording, consultation and investigation procedures are consistent with recent reforms to cultural heritage management legislation and guidelines for NSW.
	Community acceptance?
	Consult with the Aboriginal community about appropriate controls on access to sensitive cultural information and how cultural heritage information should be used in Plans of management and Master plans. Expect support for the concept of protecting sites that remain in coastal reserves – noting that many have been destroyed by previous land use.
	Where would it be applied
	To all coastal reserves managed by Council.
Sustainability score:	**4**

Step 2: Select and Implement Actions to Reduce Risk	
ACTION	**Risk reduction benefits and logic**
A77: With the Darkinjung Local Aboriginal Land Council, Council will develop a project to document stories of Aboriginal community attachment to the Wyong coastline – spiritual, social and cultural. With the Land Council and other Aboriginal groups, identify information that could be used in interpretative material about the coastline and identify locations where this information would add to community appreciation of the values of the coastline. **INTENT** To create a written record of the values and experience of Aboriginal people along the Wyong coast.	This action is about recording stories that are important to local Aboriginal people. The stories may be about traditional times, cultural knowledge and totems, but they may also be about the ongoing experience of coastal attachment for local Aboriginal people since Europeans arrived in the area. These stories contribute to the identity of local Aboriginal people and to reconciliation. Council is keen to support local Aboriginal people to record stories so that they are not lost and can be passed on to future generations by the rightful owners of the information.
	Constraints to implementation: up-front cost and ongoing maintenance costs
	There is a low to moderate cost involved in consultation and in recording oral histories. Further costs are associated with consultation about design and wording of any Aboriginal cultural material that may be used in signage or other community information. Allow approximately $30,000 for this project in the first instance.
	Constraints to implementation: policy or statutory
	Any work related to this action must be carried out in close consultation with elders and other leaders of the local Aboriginal community to ensure cultural values are properly respected and protected. Council must also consult with OEH about appropriate consultation and publishing processes.
	Community acceptance?
	This project will help the Aboriginal community pass cultural knowledge to new generations.
	Where would it be applied
	To locations chosen in consultation with the Aboriginal community, particularly the Darkinjung Local Aboriginal Land Council.
Sustainability score:	**4**

ACTION	Risk reduction benefits and logic
A79: In conjunction with L&PMA, review Plans of Management for Crown coastal holiday parks (such as Toowoon Bay, Norah Head, and Crown leases at Sun Valley and Blue Lagoon) and Crown Reserves such as Norah Head, to ensure that climate change hazards are recognised and that the impact of climate change and sea level rise on the recreational, visual and social values of these reserves and leases is managed for the benefit of the community. INTENT To plan for a smooth transition of holiday park accommodation and facilities in other Crown Reserves as sea level rise and other aspects of climate change take effect.	As noted in PARTS B and C, parts of some holiday parks are expected to be affected by coastal recession in the 2050 and 2100 planning horizons. This action will support planning of development in these holiday parks so that exposure to coastal hazards is reduced – by relocating cabins, redesigning cabins or other measures to be determined by L&PMA and park users. Similarly, where access routes in Crown Reserves may be affected by long term recession, this response will guide staged actions to minimise risk (to structures and in relation to injuries).
	Constraints to implementation: up-front cost and ongoing maintenance costs
	Review and updating of Plans is a relatively low cost option, which has strong benefits over the medium and long term. The extent of investment in on ground works such as new cabins, new look out infrastructure or access infrastructure, will depend on the situation in each reserve, and the unfolding of sea level impacts on the coast. See also Section 19.6 and consider also geotechnical hazards when reviewing Plans of Management. The lead time is such that most new on-ground investment can be timed to fit with the asset life of existing infrastructure or buildings.
	Constraints to implementation: policy or statutory
	There are no constraints to reviewing and updating Plans of management. This is a requirement of adaptive and efficient management of community assets.
	Community acceptance?
	Expect a high level of community acceptance with this long term planning.
	Where would it be applied
	Applies to holiday parks on Crown land and to Crown Reserves such as Norah Head.
Sustainability score:	**4**

BMT WBM Bangalow
6/20 Byron Street, Bangalow 2479
Tel +61 2 6687 0466 Fax +61 2 66870422
Email bmtwbm@bmtwbm.com.au
Web www.bmtwbm.com.au

BMT WBM Brisbane
Level 8, 200 Creek Street, Brisbane 4000
PO Box 203, Spring Hill QLD 4004
Tel +61 7 3831 6744 Fax +61 7 3832 3627
Email bmtwbm@bmtwbm.com.au
Web www.bmtwbm.com.au

BMT WBM Denver
8200 S. Akron Street, #B120
Centennial, Denver Colorado 80112 USA
Tel +1 303 792 9814 Fax +1 303 792 9742
Email denver@bmtwbm.com
Web www.bmtwbm.com

BMT WBM London
International House, 1st Floor
St Katharine's Way, London E1W 1AY
Email london@bmtwbm.co.uk
Web www.bmtwbm.com

BMT WBM Mackay
PO Box 4447, Mackay QLD 4740
Tel +61 7 4953 5144 Fax +61 7 4953 5132
Email mackay@bmtwbm.com.au
Web www.bmtwbm.com.au

BMT WBM Melbourne
Level 5, 99 King Street, Melbourne 3000
PO Box 604, Collins Street West VIC 8007
Tel +61 3 8620 6100 Fax +61 3 8620 6105
Email melbourne@bmtwbm.com.au
Web www.bmtwbm.com.au

BMT WBM Newcastle
126 Belford Street, Broadmeadow 2292
PO Box 266, Broadmeadow NSW 2292
Tel +61 2 4940 8882 Fax +61 2 4940 8887
Email newcastle@bmtwbm.com.au
Web www.bmtwbm.com.au

BMT WBM Perth
Level 3, 20 Parkland Road, Osborne, WA 6017
PO Box 1027, Innaloo WA 6918
Tel +61 8 9328 2029 Fax +61 8 9486 7588
Email perth@bmtwbm.com.au
Web www.bmtwbm.com.au

BMT WBM Sydney
Suite G2, 13-15 Smail Street, Ultimo, Sydney 2007
Tel +61 2 8960 7755 Fax +61 2 8960 7745
Email sydney@bmtwbm.com.au
Web www.bmtwbm.com.au

BMT WBM Vancouver
Suite 401, 611 Alexander Street
Vancouver British Columbia V6A 1E1 Canada
Tel +1 604 683 5777 Fax +1 604 608 3232
Email vancouver@bmtwbm.com
Web www.bmtwbm.com