



# **DRAFT WOOLI BEACH COASTAL ZONE MANAGEMENT PLAN**

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Drafted by H Nelson  
Checked by G Blumberg  
Date/initials check 27/04/15  
Approved by G Blumberg  
Date/initials approval 11/05/2015

## **SUMMARY**

Wooli Beach has a long history of coastal recession and as a consequence the village of Wooli is currently at significant risk from coastal erosion and longer term recession. The Wooli community highly value the beach amenity and there is a strong preference for management responses that offer resilience for the beach and village while retaining beach amenity.

The significance of the risks from coastal hazards at Wooli has been recognised by the NSW Government classifying part of Wooli Beach as a coastal erosion ‘hotspot’. The significance of the issue demands that management solutions from both within and outside of the village and beyond the existing legislative and policy framework are considered.

This Coastal Zone Management Plan (CZMP) proposes to reduce, but not eliminate risk, by implementing a beach nourishment scheme for the southern part of Wooli Village where private land and assets are at greatest current threat from coastal erosion. This action is not a long term protective measure, however it will add resilience to the beach and village.

A coordinated monitoring program is proposed to enable the success of the scheme to be determined and provide data to indicate when modifications to the scheme may be required through an adaptive management approach. Implementation of this strategy is acknowledged to have environmental consequences however, in the circumstances it is considered to be the most sustainable and reasonable solution.

A range of complementary management actions are also proposed to reduce the current level of risk, whilst having an eye to the future so that current management does not threaten the viability of future management responses nor increase the risk to human life, and public and private assets.

These additional management measures include an emergency action plan, development controls, dune and beach access management, conservation of Aboriginal heritage, services contingency strategy and investigation of a land swap scheme as a lower priority. Importantly, development controls will enable continued use of private land where development is compatible with the coastal hazard.

Following is a summary of the CZMP actions in relation to how they address the 10 Coastal Management Principles contained in the *Guidelines for Preparing Coastal Zone Management Plans* (OEH 2013).

Guideline Principles		Coastal Zone Management Plan Actions
1. Consider the objectives of the Coastal Protection Act 1979 and the goals, objectives and principles of the NSW Coastal Policy 1997	2. <i>Optimise links between plans relating to the management of the coastal zone.</i>	<ul style="list-style-type: none"> <li>* Amend Coastal Risk Map in <i>CV LEP</i></li> <li>* Update DCP provisions</li> <li>* Continue to implement Yuraygir Nat Park (YNP) &amp; Solitary Islands Marine Park (SIMP) plans</li> <li>* Conserve Aboriginal heritage values</li> </ul>
	3. <i>Involve the community in decision-making and make coastal information publicly available.</i>	<ul style="list-style-type: none"> <li>* Consult community in LEP/ DCP reviews</li> <li>* Section 149 advice – current/ future risk</li> <li>* Community/ Coastal Communities Protection Alliance (CCPA) continue beach monitoring</li> <li>* Review CZMP in 10 years</li> </ul>
	4. <i>Base decisions on the best available information and reasonable practice; acknowledge the interrelationship between catchment, estuarine and coastal processes; adopt a continuous improvement management approach.</i>	<ul style="list-style-type: none"> <li>* Update LEP/ DCP provisions</li> <li>* Review Sea Level Rise (SLR) Policy</li> <li>* Town Services Contingency Strategy</li> <li>* Direct persons to public beach access</li> <li>* Review CZMP in 10 years</li> </ul>
	5. <i>The priority for public expenditure is public benefit; public expenditure should cost-effectively achieve the best practical long-term outcomes.</i>	<ul style="list-style-type: none"> <li>* Private and public funding of Beach Nourishment Scheme (BNS) proposed</li> <li>* Determine equitable apportionment private/ public funding for BNS</li> <li>* CCPA contribution to beach monitoring</li> </ul>
	6. <i>Adopt a risk management approach to managing risks to public safety and assets; adopt a risk management hierarchy involving avoiding risks where feasible and mitigation where risks cannot be reasonably avoided; adopt interim actions to manage high risks while long-term options are implemented.</i>	<ul style="list-style-type: none"> <li>* Implement Emergency Action Sub-Plan</li> <li>* Update LEP/ DCP provisions</li> <li>* BNS to manage highest risk to assets</li> <li>* Alternative actions if sand volume from BNS falls below trigger value (additional nourishment, groynes and/ or land swap etc)</li> <li>* Beach access repairs - public safety</li> </ul>
	7. <i>Adopt an adaptive risk management approach if risks are expected to increase over time, or to accommodate uncertainty in risk predictions.</i>	<ul style="list-style-type: none"> <li>* Update LEP /DCP provisions</li> <li>* Review SLR Policy</li> <li>* Section 149 advice – current/ future risk</li> <li>* Town Services Contingency Strategy</li> <li>* Opportunistic use of sand from river</li> <li>* Beach/ nearshore monitoring program</li> <li>* Alternatives if BNS target not met</li> <li>* Investigate land swap scheme</li> <li>* Review CZMP in 10 years</li> </ul>
	8. <i>Maintain the condition of high value coastal ecosystems; rehabilitate priority degraded coastal ecosystems.</i>	<ul style="list-style-type: none"> <li>* Dune management activities continued</li> <li>* Implement YNP and SIMP plans</li> </ul>
	9. <i>Maintain and improve safe public access to beaches and headlands consistent with the goals of the NSW Coastal Policy.</i>	<ul style="list-style-type: none"> <li>* Beach access repairs - public safety</li> <li>* Maintain pedestrian and 4WD accesses</li> <li>* Access for temporary coastal protection works via designated access (see EASP)</li> </ul>
	10. <i>Support recreational activities consistent with the goals of the NSW Coastal Policy.</i>	<ul style="list-style-type: none"> <li>* Beach access repairs - public safety</li> <li>* Maintain pedestrian and 4WD accesses</li> <li>* Implement YNP and SIMP plans</li> </ul>

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## 1 INTRODUCTION

### 1.1 Background

The beach fronting the original Woolli Village is one of two coastal erosion ‘hotspots’ within the Clarence Valley Local Government Area (LGA) and one of 15 hotspots along the NSW coast, as identified by the Office of Environment and Heritage (OEH 2015). The original Village is located on a narrow spit between the ocean and the Woolli Woolli River, with a newer subdivision located to the north.

Since the mid-1990s several investigations have been carried out and reported by Clarence Valley Council (CVC) for the Woolli coastal zone. These investigations have generally been made as incremental steps towards completion of a Coastal Zone Management Plan (CZMP or equivalent) for either the Woolli Woolli River or Woolli Beach. A Coastline Management Plan (CMP) was adopted for Woolli in 1998 (PBP 1997b). This was subsequently reviewed and a new *Draft Woolli Village Coastline Management Plan*, including a Draft Emergency Action Sub-Plan (EASP) was completed in 2010 (WP 2010c).

Following exhibition of the 2010 CMP, Council adopted a revised EASP in February 2012 and in July 2012 resolved to revise the 2010 Draft CMP. This CZMP has been prepared in accordance with the OEH (2013) *Guidelines for Preparing Coastal Zone Management Plans* (referred to hereafter as the *Guidelines*). A revised Draft EASP, consistent with this CZMP, has also been prepared (see Appendix A).

### 1.2 Area Covered by Coastal Zone Management Plan

The area covered by this CZMP is the beach between Jones Point in the south and Wilsons Headland in the north, see Figure 1. This area includes the following public lands:

- Yuraygir National Park (NP), north and south of the Woolli Village.
- Solitary Islands Marine Park (SIMP) which extends from MHWL seaward, and includes the Woolli Woolli River up to the tidal limit.
- Crown reserves that form part of the Clarence Coast Reserve and unreserved Crown land.

### 1.3 Scope, Life and Reporting for Coastal Zone Management Plan

This CZMP relates to management of coastal issues and hazards affecting Woolli Beach. The CZMP analyses hazards over planning periods up to the year 2100, based on the *Woolli Beach/ Village Review of Coastal Hazards* (WP 2010a) and the understanding of natural processes and coastline responses likely to apply during the planning periods. However this CZMP will have a maximum life of 10 years before it is reviewed and updated.

Implementation of the CZMP will be supervised by a sub-committee of the CVC Coast and Estuary Management Committee. Progress reporting on the implementation of the CZMP will be through existing annual statutory reporting requirements such as CVC’s Operational Plan or the annual report of the Clarence Coast Reserve Trust (CCRT).





**Figure 1 Area Covered by CZMP, Land Tenure and Management**

## 1.4 Purpose of Coastal Zone Management Plan

The purpose of this CZMP is to:

- Describe proposed actions to be implemented by CVC, other public authorities, and the Woolli community to address the priority management issues of:
  - risk to public safety and built assets from coastal hazards
  - pressures on coastal ecosystems
  - impacts associated with community use of the coastal zone.
- Provide a mechanism for implementing actions, developed by CVC through the CZMP planning processes that support the *NSW Coastal Policy 1997* and satisfy the requirements of Part 4A of the *Coastal Protection Act 1979* (refer to Appendix B for management principles, goals and objectives under the *Coastal Policy, Act and Guidelines*).
- Assist and guide CVC, and other public authorities, in implementing their related planning actions by establishing clear links between the CZMP and other planning instruments, strategic plans and management programs.

## 1.5 Supporting Information

### 1.5.1 Background Reports

The background reports referred to in Section 1.1 are available on CVC's website or by contacting CVC. They are summarised in Appendix C and listed below:

- *Woolli Beach Coastline Study—Stage 1 and 2 Hazard Definition* (PBP 1997a)
- *Woolli Beach Coastline Management Plan* (PBP 1997b)
- *Woolli River Floodplain Management Plan* (PBP 1999)
- *Woolli Woolli River Estuary Management Plan* (WBM 2009)
- *Woolli Beach/ Village Review of Coastal Hazards* (WP 2010a)
- *Woolli Village Coastline Management Strategy Update and Options Review* (WP 2010b)
- *Woolli Village Draft Coastline Management Plan* (WP 2010c)
- *Woolli Beach Nourishment and Sand Sourcing Investigation* (RHDHV 2015).

### 1.5.2 Consultation Activities

Community and stakeholder consultation on coastal zone management issues and options has been ongoing since the mid-1990s and is summarised below. Further information can be found in Appendix D.

- 1997 Coastline Management Plan: public meetings, focus group meetings and questionnaire surveys.
- 2010 Draft Coastline Management Plan: community 'drop in day', mail-out to property owners, Birrigan-Gargle Local Aboriginal Land Council (LALC) and relevant NSW agencies as part of public exhibition.



- Consultation post 2010 to date: coastal zone management information in community newsletter, formation of Coastal Communities Protection Alliance (CCPA) Inc.–Wooli and working partnership with CVC including joint meetings and teleconferences, ongoing involvement of OEH coastal technical officers, and discussions with the NSW Coastal Panel.

### 1.5.3 Other Supporting Information

The main CZMP report (this report) provides an overview of the important aspects of the CZMP development and intended actions. As required by the *Guidelines*, information supporting the CZMP can be found in the appendices as follows.

Emergency Action Sub-Plan (EASP)	Appendix A
Coastal Zone Management Principles, Goals and Objectives	Appendix B
Summary of Background Reports	Appendix C
Community and Stakeholder Consultation	Appendix D
Coastal Environment and Community Uses	Appendix E
Coastal Hazards and Risks Assessment	Appendix F
Evaluation of Management Options	Appendix G
Description of 2015 CZMP Actions	Appendix H
Benefit-Cost Analysis and CZMP Funding	Appendix I
Agency Agreement to CZMP Actions	Appendix J

## 1.6 Wooli Beach Coastal Zone Management Plan Objectives

The Wooli Beach CZMP objectives are to:

- Reduce the current (present day) level of erosion risk to properties along Wooli Beach from minor and moderate storm events.
- Prepare for emergency coastal erosion situations resulting from severe storm events.
- Increase community knowledge of coastal processes, coastal hazards and associated risks.
- Increase the understanding of the mechanisms affecting beach condition (e.g. effectiveness of management interventions in maintaining a sufficient volume of sand, where required, to reduce the level of risk to properties from minor to moderate storm events).
- Maintain and enhance beach and foreshore amenity and provide appropriate beach access for both recreational activities and maintenance/ management activities.
- Develop a strategy to mitigate projected future risks by ensuring that new development and infrastructure are either located outside the area at risk or are designed and managed to be compatible with the coastal hazard risk.

## 2 COASTAL VALUES AND ISSUES

### 2.1 Beach Amenity, Community Uses and Public Access

Wooli Beach extends from Wilson Headland for 6.6 km to the trained entrance of the Wooli Wooli River. Jones Beach is located south of the river entrance and is 750 m long. Wooli Beach is well exposed to waves, while Jones Beach is in the lee of a rocky reef that extends off Jones Point. The dune system fronting the original Wooli Village is narrow but north of Wooli increases in width to Wilsons Headland. Beach amenity is highly valued by the Wooli community.

Issues affecting beach amenity include coastal erosion, with severe erosion having occurred in 1954, 1974, 1996 and 2009. Refer to Section 3 for details on risks to built assets from coastal hazards. Wooli is also impacted by flooding from the Wooli Wooli River and indirectly by flooding in the Coldstream River catchment (WP 2010b).

The Wooli coast provides opportunities for swimming, surfing, snorkelling (Jones Beach), fishing, walking (beach and foreshore reserves), 4WDing on the beach and nature appreciation. There are 13 formal public access points to Wooli Beach including three for 4WD vehicles, see Figure 2. Refer to Appendix E for more information on community uses. Issues associated with community uses and public access include:

- design, safety and maintenance of formal beach access points
- public safety during/ following erosion events (i.e. collapse of dune escarpment)
- informal pedestrian access from individual properties or by beach goers through the frontal dune and associated erosion and potential for dune blow-outs
- damage to the incipient dune from 4WDs (WP 2010b).

### 2.2 Coastal Ecosystems

The natural values of the marine and estuarine ecosystems in the vicinity of Wooli have been recognised by their inclusion in the Solitary Islands Marine Park. The significance of the coast and lands surrounding Wooli has been recognised by inclusion in Yuraygir National Park. Remnant coastal vegetation at Wooli includes banksia forest which in some places supports littoral rainforest species (Peter Parker 1997). Mangrove communities along the Wooli Wooli River grade to saltmarsh, with swamp forest further inland, with these communities classified as *State Environmental Planning Policy (SEPP) No. 14 Coastal Wetlands*. Six Endangered Ecological Communities (EECs) are considered to occur at Wooli:

- Lowland Rainforest on Floodplain
- Littoral Rainforest
- Coastal Saltmarsh
- Swamp Oak Floodplain Forest
- Swamp Sclerophyll Forest on Coastal Floodplains
- Freshwater Wetlands on Coastal Floodplains (CVC 2006).

See Appendix E for more information on ecological systems.



**Figure 2 Community and Other Uses**

Issues affecting coastal ecosystems at Woolli include:

- vegetation damage (informal access/ 4WDs) and clearing (unauthorised clearing of reserves for views and grassed/ mown areas, reducing the extent of stabilising dune vegetation)
- weeds (garden 'escapees' and species previously used for dune stabilisation, e.g. the noxious weed Bitou Bush)
- bushfires (damage to dune vegetation along South Terrace) WP (2010b).

### **2.3 Cultural Heritage**

Byrne (1985) identified the coast and coastal wetlands as zones of high Aboriginal archaeological sensitivity. This includes:

- foredunes/ backdunes especially near swamps/ lagoons and estuaries; and
- high ground near swamps/ estuaries in the coastal floodplain. Refer to Appendix E for more information.

Issues affecting Aboriginal cultural heritage include potential damage to recorded and unrecorded Aboriginal sites from coastal erosion, informal access, and new development or redevelopment, especially any activities involving earthworks.

There are no heritage items or heritage conservation areas identified for the Woolli Village in the *Clarence Valley Local Environmental Plan 2011 (CV LEP 2011)* or items listed on the State Heritage Register under the *Heritage Act 1977*.



### 3 COASTAL HAZARDS AND RISKS

#### 3.1 Coastal Hazards

Wooli is subject to the following coastal hazards.

- **Coastal erosion:** up to 15 m of beach eroded during individual major storm events in 1994, 1995 and 1996 based on aerial photography (PBP 1997a).
- **Shoreline recession:** median recession rate between 1942 and 2006 of 0.3 to 0.4 m/yr for the majority of Wooli Beach, with a higher rate of 0.5 m/yr fronting the Wooli Spit as determined from photogrammetry (WP 2010a).
- **Coastal entrance instability:** The narrow sand spit which separates the Wooli Wooli River from the sea is vulnerable to the erosive forces of floodwaters and potential break-through of a new entrance (WP 2010a).

The impacts of climate change, and in particular projected Sea Level Rise (SLR), need to be taken into account in defining future hazards as they have the potential to exacerbate the coastal hazards described above. CVC has adopted SLR planning benchmarks for 2050 and 2100, of 40 cm and 90 cm respectively (increase above 1990 mean sea levels). Appendix F provides more detail on coastal hazards.

#### 3.2 Hazard Mapping

Figure 3 shows hazard mapping for the original Wooli Village. Hazard mapping for the entire Wooli Beach embayment is included in Appendix F. This shows the estimated location of the back beach escarpment following erosion during a 100 year Average Recurrence Interval (ARI) storm event.

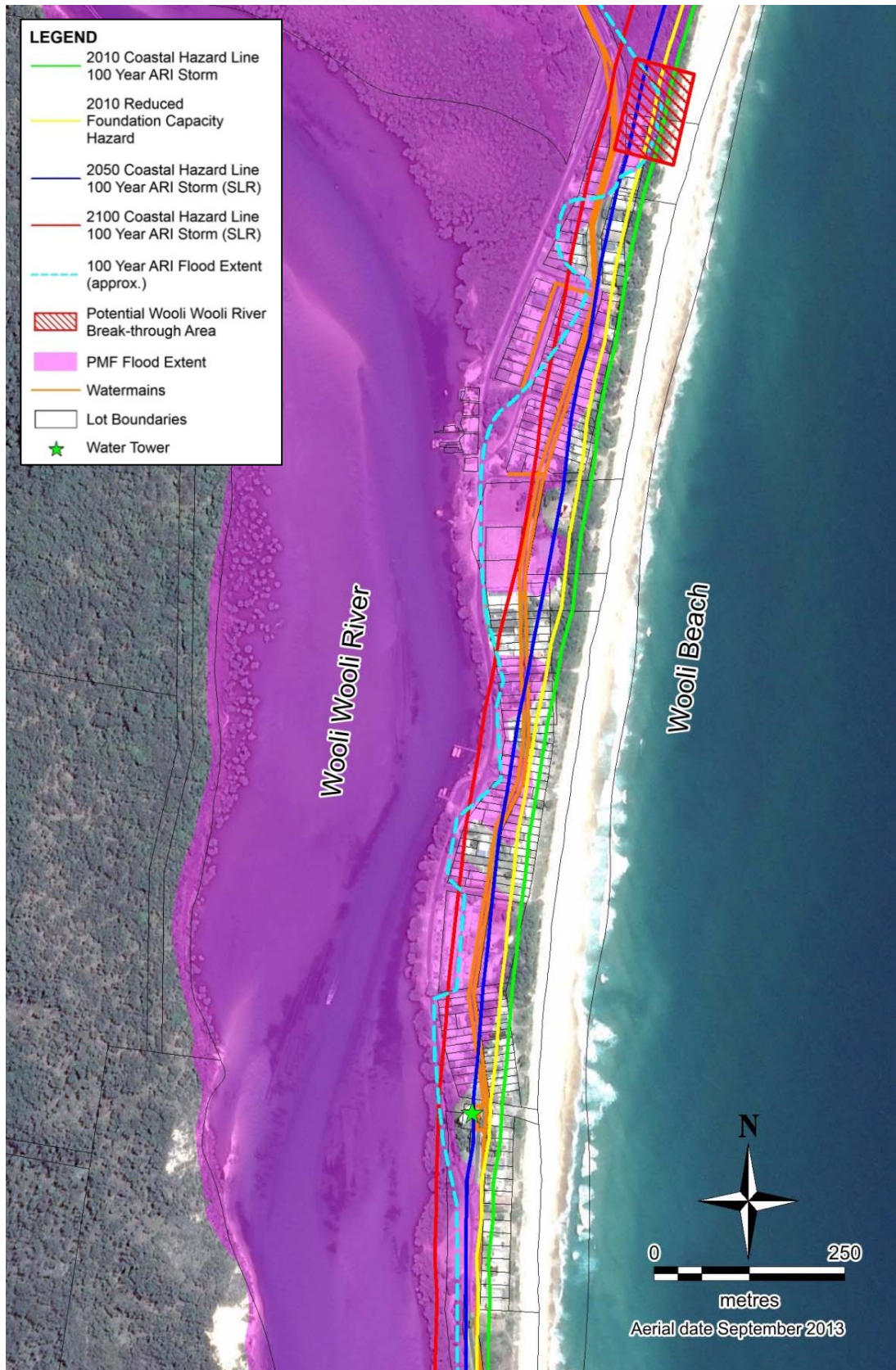
#### 3.3 Assets at Risk

Based on the hazard mapping (WP 2010a), the following assets are at risk over the specified timeframes, assuming historical shoreline recession continues and sea level rises in line with the benchmarks adopted by CVC.

- **Immediate risk:** 44 dwellings, one business, four foreshore reserve areas.
- **2050:** 94 dwellings, two businesses, six foreshore reserve areas, public buildings, and infrastructure including the Wooli water tower, Wooli Public School, South Terrace roadway and the Marine Rescue building.
- **2100:** 159 (out of 183 in the original Wooli Village), six businesses, public buildings, and nearly all roads, public reserves and services.

Note that with the exception of the Marine Rescue building, all built assets at immediate and future risk are located within the original Wooli Village, along with foreshore reserves in this location. In addition to this, the hazard mapping shows that the section of dune to the north and fronting the newer Wooli subdivision and southern half of Yuraygir National Park would be at risk by 2100.





**Figure 3 Original Woolli Village Hazard Mapping**

### **3.4 Risk Levels**

By 2100, in the absence of protection works, the hazard mapping indicates that the shoreline of the original Woolli Village would essentially erode back to the eastern bank of the Woolli Woolli River in a 100 year ARI event. No structures or rock protection works are proposed to reduce coastal hazards as they are not consistent with the beach amenity and character of Woolli Village, and community feedback (see Appendix D) has identified a preference for actions that provide additional resilience to the Village against the current storm erosion hazard while maintaining beach amenity.

Based on the probability of major storm events occurring over the next 50 years and the likely consequences of a range of ARI events (5, 10, 20, 50 and 100 yr ARI events), risks levels associated with coastal assets were assessed as follows:

- low for the vegetated dune
- medium for beach accessways
- high for foreshore reserves
- high for dwellings currently at most risk (located at or less than 17.5 m from the dune crest)
- medium for the remainder of foreshore dwellings at risk.

Appendix F provides details on coastal hazards and associated risks.

## **4 MANAGEMENT OPTIONS**

### **4.1 Options Investigated**

Since 1997, the following management options have been considered:

- Property relocation, voluntary purchase or acquisition
- Public assets/ services relocation/ modification
- Land swap
- Planning and development controls
- Beach monitoring to gain a better understanding of coastal hazards
- Seawall (full length)
- Seawall (partial)
- Groyne field and nourishment
- Massive beach nourishment (sand sourced outside Wooli area)
- Beach nourishment (sand from Wooli Wooli River and dune fields)
- Beach sand back-passing (moving sand from northern to southern part of beach)
- Beach scraping (moving sand across the beach from the swash zone to the dune)
- Dune management

### **4.2 Option Identification and Evaluation**

The management options listed in Section 4.1 were identified through the coastal zone management process for the 1997 and 2010 CMPs and the recent sand sources study. They were evaluated in terms of whether they were considered feasible, reasonable and whether it was likely implementation could be funded. A summary is provided below.

- Generally all options were considered feasible (technically and physically possible to safely implement and maintain).
- Built structures were not considered reasonable based on cost and environmental and beach amenity impacts. Massive beach nourishment was discounted primarily on cost.
- Options involving residents moving were generally not considered reasonable due to social impacts, however there has been some cautious support for a future public/ private land swap to allow people to stay within the Wooli community, should other options only manage hazards over the short term and on the basis that any land swap was implemented as a lower priority.
- Public assets and services modification and/ or relocation was considered reasonable and likely to be funded.
- Beach nourishment, sand back-passing, beach scraping and dune management were considered reasonable and affordable. The Wooli Dune Care group has been very active since 2012 in dune rehabilitation and revegetation.

- Beach monitoring was also considered reasonable and affordable with CVC and the CCPA already proactive in this area and undertaking various beach survey and monitoring activities.
- Planning and development controls have been applied since the 1990s and reviewed in response to coastal study report findings. Further refinement of LEP mapping and development controls is proposed.

Refer to Appendix G for more information on options identification and evaluation.

### **4.3 Woolli Beach Priority Management Action**

A Beach Nourishment Scheme (BNS) was identified as the priority management action in this CZMP to mitigate current risks to public safety and built assets.

#### **4.3.1 Description of Beach Nourishment Scheme**

The BNS is described below, with further details provided in Appendix H. Additional actions implemented through other plans and programs would also support coastal zone management at Woolli. The BNS approach is to “hold the line” against sediment budget recession and protect the Village from a 50 year ARI storm event. Whilst it is recognised that this will not protect all land and assets from a larger storm event, having this ‘50 year ARI’ buffer in place will make Woolli more resilient to, and reduce the impact of larger events. The BNS does not consider SLR projections directly but focuses on the current risk and will be implemented as follows.

1. Commence “well structured” and “targeted” beach monitoring.
2. Design the BNS, undertake environmental assessment, seek necessary legislative amendment/s, and obtain approvals etc.
3. Undertake Nourishment Campaign 1 involving the placement of 60,000 m<sup>3</sup> of sand on the beach within three years (2018) to account for sediment budget recession over the subsequent five years. This will ensure the average volume of sand in front of the southern 800 m of the original Village is 195 m<sup>3</sup>/m, which is the estimated 50 year ARI storm demand (Gordon, 1987).
4. Continue to monitor the beach profile and undertake sediment tracing.
5. Undertake Nourishment Campaign 2, five years after Nourishment Campaign 1. This will involve placement of 60,000 m<sup>3</sup> of sand ± surplus/ deficit from the previous campaign to ensure an average sand volume of 195 m<sup>3</sup>/m in front of the southern part of the Village.
6. Continue monitoring and nourishment campaigns at five year intervals with nourishment expected to extend into the northern half of the original Village in approximately 20 years, depending on shoreline recession.

7. Implement a Trigger Action Plan if the five year period moving average of the total volume of sand in front of the southern 800 m of the Village is less than 155,000 m<sup>3</sup> (total volume of sand in this location required to meet 50 year ARI storm demand). The Trigger Action Plan may involve one or more of the following:
- increased beach nourishment
  - inclusion of trial geotextile container groyne(s)
  - initiation of land swap scheme
  - other actions determined at the time.

#### 4.3.2 Benefit-Cost of Beach Nourishment Scheme

The cost of the BNS is estimated at \$2.1 million per nourishment campaign. Monitoring in the first three years after sand placement is estimated at \$350,000 (i.e. approximately \$116,700 per year). It is assumed that existing monitoring and data collection will be ongoing under current funding arrangements (i.e. has not been accounted for in the BNS costs).

Table 1 provides a summary of the dollar costs and benefits of the BNS over the next 50 years. Note that this does not take into account inflation, fluctuations in property values and changes to beach visitation levels. Refer to Appendix I for more information, including a discussion on intangible benefits and costs.

**Table 1 Summary of Benefits and Costs over 50 Years**

<b>Assets at Risk</b>	<b>\$ Benefits Maintained</b>	<b>Notes</b>
2013 land value of private property (at immediate risk and at risk by 2050)	27,404,000	Improvements: dwellings, landscaping etc would increase value substantially.
2013 land value of public reserves (at immediate risk and at risk by 2050)	1,176,800	Improvements: accessways, park furniture and structures would increase value.
Value of beach (based on recreation and tourism value, Raybould <i>et al</i> 2013)	442,324	'Intrinsic', scenic and ecological values would increase this value which is based on the value of visitation by residents and tourists.
<b>Risk Management</b>	<b>\$ Cost over 50 yrs</b>	
Beach Nourishment Scheme	19,250,000	Does not include ongoing monitoring and data collection under current funding arrangements. Does not include cost of other beach management activities, e.g. dune rehabilitation.



## 5 COASTAL ZONE MANAGEMENT PLAN ACTIONS

Management Actions are summarised in Table 2. Further information and a description of each action can be found in Appendix H.

Table 2 indicates how each action will be implemented, many of which will be under existing plans or programs. Where actions are implemented under this CZMP, costs and funding arrangements are included. Where an equal cost is indicated for CVC and OEH, it is assumed this action will be implemented under the NSW Government's Coastal Management (CM) Program.

Funding for the BNS will be apportioned in consideration of the benefits it provides to both private and public lands. A special levy or charge applied under the *Local Government Act 1993* to benefiting landowners is one method to assist in funding implementation of the Scheme. Other funding and financing are currently being investigated by the NSW Government as part of the Stage 2 Coastal Reforms and hence, additional or alternative funding options may be available to implement this CZMP, including the BNS.

CVC is responsible for implementing actions under this CZMP and will consult with relevant stakeholders. These may include:

- Birrigan-Gargle Local Aboriginal Land Council (LALC)/ Aboriginal elders
- Clarence Coast Reserve Trust (CCRT)
- Coastal Communities Protection Alliance Inc – Wooli (CCPA)
- Department of Education & Communities (Dept. Education)
- Department of Primary Industries (DPI), Fisheries Division (Fisheries)
- DPI – Marine Parks/ Marine Estate Management Authority (MEMA)
- Land & Property Information (LPI)
- Local Land Services North Coast (LLS)
- Manly Hydraulics Laboratory (MHL)
- National Parks and Wildlife Service (NPWS)
- Office of Environment and Heritage (OEH)
- Private landowners (mainly in terms of the EASP)
- State Emergency Services (SES)
- Telstra, Essential Energy and other service providers
- Trade & Investment, Crown Lands Division (Crown Lands)
- Wooli Dune Care

In principle agreement to the actions in the CZMP by other agencies will be sought as part of the exhibition of the Draft CZMP, with correspondence to be included in Appendix J.

**Table 2 CZMP Implementation Schedule**

<b>Management Strategy</b>	<b>Action</b>	<b>Implementation through other plan/ program/ legislation or funding arrangements under CZMP</b>	<b>Priority</b>	<b>Timeframe/ Frequency</b>
Beach Nourishment Scheme (BNS) Pre-implementation	Detailed design	\$20,000 CVC/ \$20,000 OEH application submitted to OEH	High	2015-2016
	Environmental impact assessment	\$40,000 CVC/ \$40,000 OEH application submitted to OEH	High	2016
	Approvals documentation	CVC staff time not costed	High	2017
	Detailed funding plan over likely life of BNS	CVC staff time not costed	High	2016-2017
BNS Implementation	Supervision by sub-committee of CVC Coast and Estuary Management Committee	staff/ agency/ volunteer time not costed	High	After certification of CZMP
	Beach nourishment campaigns	CVC/ OEH/ benefiting landowners	High	2018 and every 5 years thereafter
BNS Monitoring	Nearshore wave and current monitoring	\$25,000 CVC/ \$25,000 OEH	High	2018-2020 (continuous)
	Sand tracing	\$150,000 CVC/ \$150,000 OEH	High	2018-2020 (2-3 campaigns/yr)

<b>Management Strategy</b>	<b>Action</b>	<b>Implementation through other plan/ program/ legislation or funding arrangements under CZMP</b>	<b>Priority</b>	<b>Timeframe/ Frequency</b>
Routine Beach Monitoring	Beach camera monitoring	current activity by CCPA	High	Ongoing - to be reviewed post beach nourishment
	Beach surveys (including beach pole monitoring)	current activity (quarterly) by CCPA	High	Ongoing post storm with current frequency to be reviewed post beach nourishment
	Photogrammetry	OEH through CM Program	High	2018 and every 1-2 years thereafter
	Offshore wave data collection	OEH/ MHL through CM Program	High	Ongoing
	LiDAR (alternative to photogrammetry)	LPI through current program	Low	2018 and 1-2 years thereafter (if photogrammetry unavailable)
Emergency Management	Implement EASP and review periodically (e.g. post storm event)	Clarence Valley DISPLAN	High	Review when hazard lines and risk assessments are updated and in accordance with process in EASP
Community Education	Update community on CZMP implementation	Local community newsletter and CCPA	High	Ongoing
	Encourage landowners to manage their assets to reduce, where practical, the risk from current and future coastal hazards	EASP and local community newsletter	Medium	Ongoing

Management Strategy	Action	Implementation through other plan/ program/ legislation or funding arrangements under CZMP	Priority	Timeframe/ Frequency
Planning and Development Controls	Amend coastal risk planning map to be consistent with 2100 hazard line in WP (2010a).	<i>Clarence Valley (CV) LEP 2011</i>	High	2015
	Update information on Section 149 Certificates	<i>Environmental Planning and Assessment (EP&amp;A) Act 1979 and Regulation 2000</i>	High	2015
	Include provisions that no new subdivisions or LEP amendments will be permitted that increase intensity of development seaward of 2100 hazard line	<i>CV LEP 2011 and Development Control Plan (DCP) 2011</i>	High	2015
	Prepare and implement revised development control provisions for Woolli to more effectively implement Clause 7.5 of the <i>CV LEP 2011</i> .	<i>Clarence Valley DCP 2011 and EP&amp;A Act 1979</i> for new development proposals/ Development Applications (DAs)	High	2015
	Review Sea Level Rise Policy	CVC Policy Register	Medium	When new data is available, when State Gov. policy changes and/ or as specified in the Policy
Town Services Contingency Strategy	Plan for relocation/ modification/ redesign of utilities etc potentially at risk	not costed, requires input of Telstra, Essential Energy & other service providers	Medium	2020
Beach and Dune Management	Suitable sand from Woolli Woolli River to be placed on Woolli Beach	CVC/ NSW Government Rescuing our Waterways Program (or equivalent)	Low	If/ when dredging required for safe navigation
	Beach and dune rehabilitation, revegetation and weed control	Dune Care, Yuraygir NP and SIMP management programs	High	Ongoing (note plans/ programs may need review following implementation of BNS)

Management Strategy	Action	Implementation through other plan/ program/ legislation or funding arrangements under CZMP	Priority	Timeframe/ Frequency
Beach Access Management	Minor and localised beach scraping at formal beach accessways	EASP (and CZMP)	High	Ongoing (when public safety is unacceptable and sufficient sand is on the beach)
	Install fencing to direct pedestrians to formal accessways and rehabilitate informal 'private' tracks	Dune Care Program	Medium	2017
	Manage vehicle access	Beach Access or Vehicles on Beaches Policy (or similar)	High	Ongoing
Conservation of Aboriginal sites	Protect/ conserve known and unknown middens etc	<i>EP&amp;A Act 1979 and Regulation 2000 and National Parks and Wildlife Act 1974</i>	High	Ongoing
CZMP Review	Revise/ update CZMP	CVC/ OEH through CM Program	Low	Once actions are implemented, if significant issues arise or within 10 years (whichever occurs first)
Trigger Actions	Geotextile groynes and/ or additional beach nourishment, or other actions	cost dependent on design CVC/ OEH/ benefiting landowners	Low	If trigger point reached (i.e. less than 155,000 m <sup>3</sup> of sand in front of southern part of original Village)
Investigate Land Swap Scheme	Public land suitability study for residential use	staff time not costed, requires input from Crown Lands & Dept. Education	Low	2020 (investigation only) Implementation of scheme if trigger point reached and other actions unsuccessful



**REFERENCES AND BIBLIOGRAPHY**

BMT WBM (2009), *Wooli Wooli River Estuary Management Plan*.

Byrne D (1985), *Aboriginal Sites in Ulmarra Shire of Maclean. A Background for Site Management*. Report to National Parks and Wildlife Service. For Ulmarra Shire Council.

Clarence Valley Council (CVC 2015), *Delivery Program 2013-2015 and Operational Plan 2014-2015*.

CVC (2012) Report and Resolution, Ordinary Meeting 17 July 2012 Environment, Economic & Community Committee, Item: 12.103/12 Draft Wooli Coastal Zone Management Plan Update.

CVC (2011). *Development Control Plan: Development in Environmental Protection, Recreational and Special Use Zones*. In force from 23 December 2011

CVC (2006), *Draft Plan of Management Wooli Coastal Reserve*.

CVC and Coast Care (2005), *Wooli Beach Rehabilitation Plan*.

Department of Environment and Climate Change (DECC 2007), *Yuraygir National Park Contextual History: A report for the Cultural Landscapes: Connecting History, Heritage and Reserve Management Research Project*.

Department of Land and Water Conservation (DLWC 2001), *Coastal Dune Management. A Manual of Coastal Dune Management and Rehabilitation Techniques*.

Geomarine (1989), *Wooli Coastal Process Investigation Report*.

Gordon AD (1987), "Beach Fluctuations and Shoreline Change", *8th Australasian Conference on Coastal and Ocean Engineering*, Launceston, November 1987.

Intergovernmental Panel on Climate Change (IPCC 2010), *Guidance Note for Lead Authors of the IPCC Fifth Assessment Report on Consistent Treatment of Uncertainties*. IPCC Cross-Working Group Meeting on Consistent Treatment of Uncertainties Jasper Ridge, CA, USA 6-7 July 2010.

Land and Marine Management Strategies P/L (LAMMS 2005), *Wooli Peninsula Reserve No. 41752 & 97501 Flora and Fauna Survey Report*.

LAMMS (2002), *Wooli Centenary of Federation Reserve, Fauna and Flora Report*.

National Parks and Wildlife Service (NPWS 2003), *Yuraygir National Park and Yuraygir State Conservation Area Plan of Management*.

Nielsen AF, Lord DB, and Poulos HG (1992), "Dune Stability Considerations for Building Foundation", *Australian Civil Engineering Transactions*. The Institution of Engineers, Australia, Vol.CE34 No.2, p.167-174.

Office of Environment and Heritage (OEH 2015), *Coastal and Estuary Management Programs Guidelines for Applicants*.

- OEH (2013) *Guidelines for Preparing Coastal Zone Management Plans*.
- Patterson Britton and Partners (PBP 1999), *Wooli Wooli River Floodplain Management Plan*.
- PBP (1997a), *Wooli Beach Coastline Study, Stages 1 and 2 Coastline Hazard Definition*.
- PBP (1997b), *Wooli Beach Coastline Management Plan*.
- PBP (1997c), *Wooli Wooli River Floodplain Management Study*.
- Peter Parker Environmental Consultants (1997), *An Environmental Assessment of the Wooli Coastline*. Prepared for PBP.
- Raybould M, Anning D, Ware D, Lazarow N (2013), *Beach and Surf Tourism and Recreation in Australia: Vulnerability and Adaptation*. Bond University, Griffith University, National Climate Change Adaption Research Facility, Australian Government Department of Climate Change and Energy Efficiency, Fisheries Research and Development Corporation (FRDC 2010/536).
- Rollason V, Fisk G, Haines P (2010) "Applying the ISO 31000 Risk Assessment Framework to Coastal Zone Management". *NSW Coastal Conference*, Batemans Bay.
- Rooke A (undated), *Wooli Frontal Dune and Vegetation Management Plan*. Wooli Dune Care Group.
- Royal HaskoningDHV (RHDHV 2015), *Investigation of Feasibility of Utilising Sand Sources for Beach Nourishment in Vicinity of Wooli, NSW*.
- Short A (2006), *Beaches of the New South Wales Coast: a guide to their nature, characteristics, surf and safety*. Sydney University Press, 2007.
- US Army Corps of Engineers (USACE 2002), *Coastal Engineering Manual 1110-2-1100*, Washington DC.
- WorleyParsons (WP 2010a), *Wooli Beach/ Village Review of Coastal Hazards*.
- WP (2010b), *Wooli Village Coastal Management Strategy Update and Options Review*.
- WP (2010c), *Draft Wooli Village Coastline Management Plan*.