

Clarence Valley Coastline and Estuaries

Coastal Management Program

Stage 1: Scoping Study



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Acknowledgement of Country:

Clarence Valley Council and Hydrosphere Consulting acknowledge the Yaegl peoples, Traditional Custodians of the lands discussed in this Scoping Study and pay tribute and respect to the Elders both past and present and emerging of the Yaegl nations.

Cover photos: Yamba coastline, Sandon River entrance, Woody Head sea wall, Woolli beach nourishment scheme

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**JOB 20:038 CLARENCE VALLEY COASTLINE AND ESTUARIES COASTAL MANAGEMENT
PROGRAM: SCOPING STUDY**

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EXECUTIVE SUMMARY

Clarence Valley Council (CVC) will prepare a Coastal Management Program (CMP) for the Clarence Valley coastline and estuaries to provide a long-term coordinated strategy for managing the coastal zone. This CMP Scoping Study provides a review of progress of actions in the existing management plans for the coastal areas and identifies the focus of the new CMP.

The study area for this Scoping Study includes the open beaches, foreshores and coastal waters of the Clarence Valley Local Government Area (including Woody Head, Iluka, Yamba, Angourie, Brooms Head, Sandon, Minnie Water, Diggers Camp and Woolli). The study area also includes the estuaries and lagoons of Wooloweyah Lagoon, Lake Cakora, Lake Arragan, Sandon River, Woolli Woolli River and the freshwater lakes of Minnie Water and Lake Hiawatha. The CMP for the Clarence Valley coastline and estuaries will be developed for the three currently mapped coastal management areas defined in the *Coastal Management Act 2016* (Coastal Use Area, Coastal Environment Area and Coastal Wetlands and Littoral Rainforest Area) within the study area shown in Figure 1. Council has undertaken hazard assessments for some coastline areas however the assessments are outdated and are therefore insufficient to map the Coastal Vulnerability Area in accordance with the requirements of the *State Environmental Planning Policy (Coastal Management)*. Detailed coastal hazard studies are recommended as part of Stage 2 of the CMP development. The freshwater lakes (Minnie Water and Lake Hiawatha) and their catchments will be managed by CVC for town water supply. Although Wooloweyah Lagoon has been addressed in this Scoping Study, the Clarence River estuary including Wooloweyah Lagoon will be the subject of a separate CMP for the Clarence River estuary.

The Yaegl people have occupied the Clarence Valley coastal strip for thousands of years and have a strong connection to and relationship to the coastal landscape. The Yaegl people's ongoing use and relationship to country is recognised with their successful Native Title determinations over lands and coastal waters along the coastline. The natural beauty of the Clarence Valley coastline is highlighted in the large areas of National Parks and Nature Reserves and the Solitary Islands Marine Park. The coastline and estuaries are dynamic and diverse, encompassing a broad range of natural features including sandy beaches, coastal dunes, rocky headlands, marine areas, lakes, estuary entrances, littoral rainforest, wetlands/heathlands and estuarine environments. Locals and visitors place a high value on the abundance of natural resources, uncrowded areas for nature-based recreation and stunning scenic amenity. Beaches, headlands and waterways provide a place for recreation and social interaction and results of the community consultation undertaken during this Scoping Study indicate that for many community members, interaction with the coast and estuaries is a valued part of life. The values of the coastline and estuaries of the study area are threatened by increasing pressure from coastal hazards, climate change, sea level rise, tourism growth and coastal development.

The study area is currently managed in accordance with various regional and local level planning instruments, strategies and management plans implemented by Council and other stakeholders. The following plans have been certified by the NSW Government:

- *Coastal Zone Management Plan for Wooloweyah Lagoon* (White, 2009).
- *Woolli Beach Coastal Zone Management Plan* (Royal HaskoningDHV, 2018a).
- *Brooms Head Beach and Lake Cakora Coastal Zone Management Plan* (CVC, 2017b).

These current coastal zone management plans and other coastline and estuary management plans for the Clarence Valley coastline will be updated and incorporated into the CMP in accordance with the NSW Coastal Management Framework.

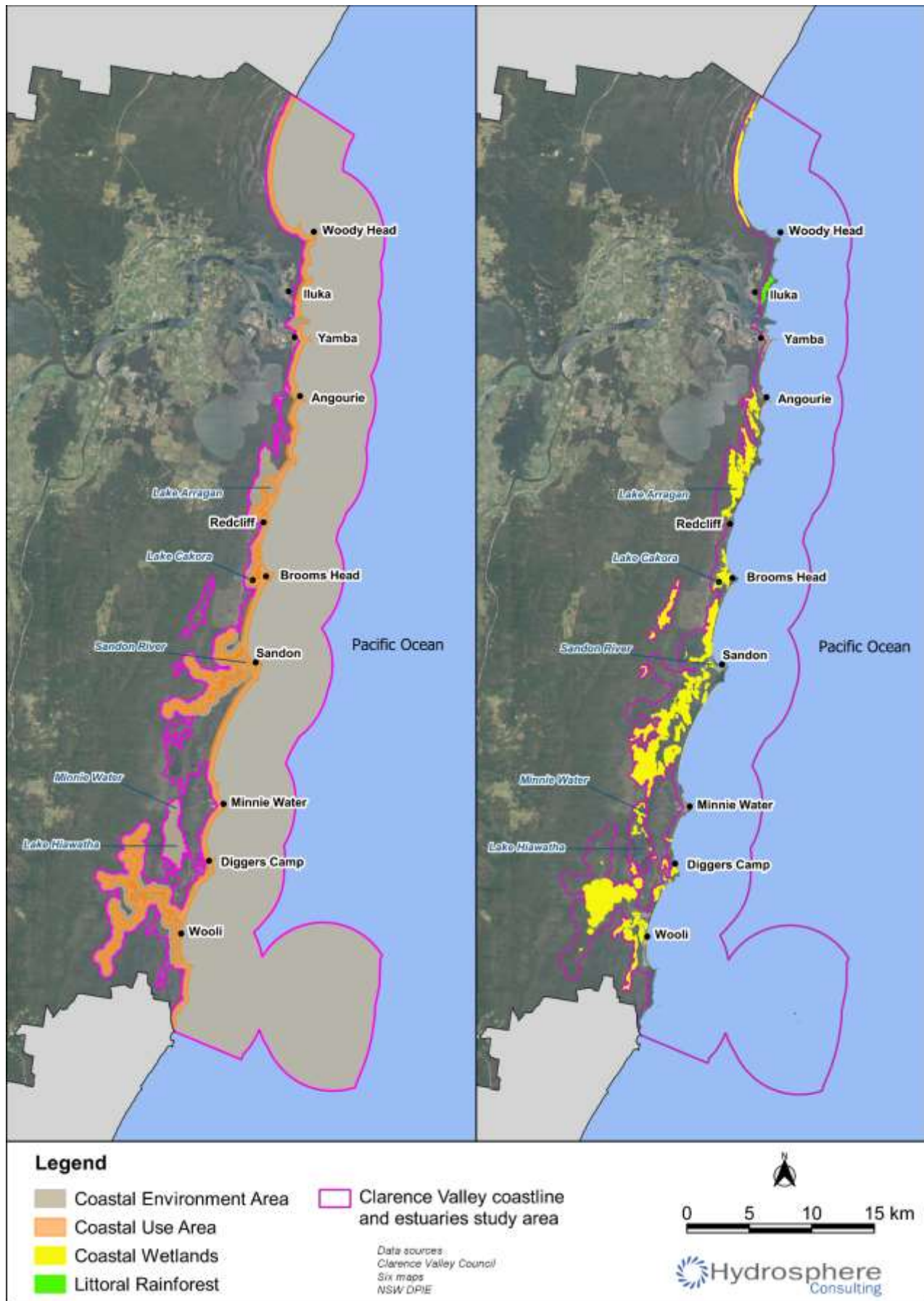


Figure 1: Coastal management areas to be addressed in the CMP for the Clarence Valley coastline and estuaries

A first pass (or preliminary) risk assessment and gap analysis was completed to prioritise risks and identify those that should be further investigated in subsequent stages of the CMP. Due to the large geographical area, environmental and social values of the study area, there are several key management threats to be considered in the CMP. Based on the existing information, the threats with a moderate or high risk in the current timeframe are listed Table 1.

Table 1: Key management issues within current timeframe

Category	Key threats	Locations
Coastal hazards	Beach erosion	Shark Bay, Woody Bay, Whiting Beach, Yamba Main Beach, Brooms Head Beach, Lake Cakora – entrance and Ocean Road properties, Brooms Head foreshore reserve, The Sandon, Sandon River campground and village, Wooli Beach and village, Jones Beach
	Shoreline recession	Shark Bay including Iluka Road, Woody Bay, Whiting Beach, Lake Cakora – entrance and Ocean Road properties, Brooms Head foreshore reserve, Sandon River campground and village, Illaroo campground, Wooli Beach and village, Jones Beach
	Coastal inundation	Shark Bay, Woody Bay, Whiting Beach, Yamba Main Beach, Lake Cakora Ocean Road properties, Sandon River campground and village, Illaroo campground, Wooli Beach and village
	Slope instability/ landslide	Pilot Hill, Yamba Point, Pippi Beach, Cakora Point
	Tidal inundation	Wooloweyah Lagoon and channels, Wooli village and Wooli Wooli River and all other low-lying areas
	Inadequate/ damaged coastal protection infrastructure	Woody Bay, Lake Cakora Ocean Road properties, Brooms Head foreshore reserve, Sandon village
	Estuarine bank erosion	Wooloweyah Lagoon and channels, Lake Cakora bridge footings, Wooli Wooli River
Threats to biodiversity	Historic clearing of riparian vegetation and adjacent habitat	Wooli Wooli River, Wooloweyah Lagoon and channels
	Foreshore development and land clearing for agriculture or urban development	Wooloweyah Lagoon catchment, Yamba-Angourie coast
	Bushfire	All areas
	Invasive weeds	Whole coastline, Wooloweyah Lagoon and channels, Wooli Wooli River estuary
	Uncontrolled stock access to and grazing within the riparian zone	Wooli Wooli River estuary, Wooloweyah Lagoon and channels
	Grazing of wetlands, saltmarsh and mangroves	Wooloweyah Lagoon and channels
	Seagrass decline	Wooloweyah Lagoon and channels, Sandon River, Wooli Wooli River

Category	Key threats	Locations
	Uncontrolled dog access	All areas
	4WD/motorbikes on beaches (Brooms Head, Shark Bay)	Brooms Head Beach, Shark Bay
	Predation and invasion by introduced animals	All areas
Water quality	Urban stormwater pollution	Wooloweyah Lagoon and channels, Lake Cakora, Sandon River, Wooli Wooli River
	On-site wastewater management	Wooloweyah lagoon and channels, Lake Cakora, Wooli village Sandon village and campground
	Poor flushing of ICOLLs	Lake Cakora, Lake Arragan
	Modified environmental flows (floodplain drainage) and catchment runoff	Wooloweyah Lagoon and channels
	Agricultural diffuse source runoff	Wooloweyah Lagoon and channels
	Future development, urban growth	Wooloweyah Lagoon catchment, Yamba
	Long fetch and strong winds increasing turbidity	Wooloweyah Lagoon
Shoaling and estuary hydraulics	Shoaling and sediment movement within estuaries (reducing flushing)	Wooli Wooli River
	Erosion and sedimentation affecting navigation	Clarence River entrance
	Estuary entrance modifications	Clarence River entrance
Use and access	Limited and/or informal pedestrian access to waterways	Wooli Beach
	Bushfire damage to access and infrastructure	National Park areas
	Limited boating access (upper estuaries)	Wooli Wooli River
	Unauthorised access points (boat launching)	Wooli Wooli River
	Damage to beach access points from erosion and coastal storms	All beaches

Category	Key threats	Locations
	Reduced accessible beach at high tide due to rock walls	Brooms Head, Woody Bay
	4WD/motorbikes on beaches	Shark Bay, Barri Point, Brooms Head, Wooli Beach
Governance	Inadequate action on coastal protection (due to difficulties gaining community consensus, high cost of implementation and stringent approval requirements)	All areas
	Inadequate land use planning and development controls	All areas
	Lack of funding for coastal management	All areas
Heritage	Inadequate consultation with Aboriginal land managers	All areas
	Erosion of cultural heritage sites (e.g. middens)	Angourie, Sandon campground
Amenity	Vehicles on beaches (causing safety and noise issues)	Broom Head
	Fallen/ dangerous trees on eroded beaches	Woody Bay
	Litter (terrestrial and marine)	All areas

In terms of local issues, the highest risk threats (current timeframe) are:

- Woody Bay and Wooli Beach – beach erosion, shoreline recession.
- Lake Cakora (Ocean Road properties) – beach erosion, shoreline recession, coastal inundation.
- Pilot Hill, Yamba Point – slope instability/ landslip.
- Wooloweyah Lagoon and channels – agricultural diffuse source runoff, modified environmental flows (floodplain drainage) and catchment runoff and historic clearing of riparian vegetation and adjacent habitat.
- All areas – bushfire.

These threats are likely to be exacerbated by sea level rise, increased storminess and increased fire risk with future climate change. Emerging high risk threats (next 20 years) are:

- Beach erosion – Shark Bay, Whiting Beach, Lake Cakora entrance, Wooli.
- Shoreline recession – Iluka Road, Shark Bay, Lake Cakora entrance, Wooli.
- Coastal inundation – Yamba Main Beach.
- Tidal inundation – Wooloweyah Lagoon and channels.

- Inappropriate/ damaged coastal protection infrastructure – Woody Bay, Ocean Road, Brooms Head foreshore, Sandon village.
- Damage to beach access points from erosion and coastal storms – all areas.

Accurate and detailed information about risk and consequence is necessary to assist decision makers generate effective management strategies which identify and prioritise future actions and investment. Coarse level coastal hazard assessments using regional-scale parameters have been undertaken for beach erosion and tidal inundation for much of the coastline. Detailed assessments have been undertaken for some beaches, but these should be updated to enable robust decision-making with regard to development of management options, planning controls and long-term management.

Detailed studies are required in Stage 2 of the CMP development as follows:

- Coastal hazard assessment:
 - Beach erosion, shoreline recession and coastal inundation (LGA-wide with focus on known hot-spots and areas not yet assessed).
 - Review of existing slope instability assessments and monitoring data.
- Assessment of assets/infrastructure at risk:
 - Asset register including location, use, construction date, condition, coastal hazard risks and timing, level of service (shire-wide).

The risks identified in this Scoping Study are based on the current information and will be updated once the above assessments have been completed.

The CMP will set the long-term strategy for the coordinated management of the coastline and relevant estuaries and ensure that the values and benefits of the study area are enhanced and maintained for future generations. CVC will lead the development of the CMP for the Clarence Valley coastline and estuaries and will collaborate with land managers, state government agencies, industry and community representatives to provide effective coastal management outcomes. The CMP development will continue over the next two years following Council adoption of this Scoping Study with the estimated costs and timing to deliver stages 2 to 4 of the CMP development as follows:

- Stage 2: between \$210,000 and \$330,000 (11 months: October 2021 – August 2022).
- Stage 3: between \$30,000 and \$150,000 (4 months: September 2022 – December 2022 plus an additional 3 months if a cost-benefit analysis is required).
- Stage 4: between \$45,000 and \$65,000 (5 months: Jan 2023 – May 2023).

CVC will seek funding from the NSW Department of Planning, Industry and Environment (DPIE) Coastal and Estuaries Grants Program to ensure affordability of the CMP development. Ongoing stakeholder liaison will be a key component of the CMP development.

There is an opportunity for National Parks and Wildlife Service (NPWS) to collaborate with Council on CMP development relevant to NPWS land management responsibilities. Concurrent to the preparation of the CMP, NPWS will continue to develop coastal management strategies for the National Parks and Nature Reserves within the study area.

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1. INTRODUCTION

Clarence Valley Council (CVC) will prepare a Coastal Management Program (CMP) for the Clarence Valley coastal zone. The current coastal zone management plans and estuary management plans for the Clarence Valley coastline will be updated and incorporated into the CMP in accordance with the NSW Coastal Management Framework. Stage 1 (this document) is a Scoping Study which sets the scene for the remainder of the coastal planning process for the Clarence coastline and estuaries. This Scoping Study has been prepared by CVC in association with National Parks and Wildlife Service (NPWS) with assistance from the NSW Department of Planning, Industry and Environment (DPIE).

The study area for this Scoping Study includes the open beaches, foreshores and coastal waters of the Clarence Valley Local Government Area (LGA, including Woody Head, Iluka, Yamba, Angourie, Brooms Head, Sandon, Minnie Water, Diggers Camp and Wooli). The study area also includes the estuaries and lagoons of Wooloweyah Lagoon, Lake Cakora, Lake Arragan, Sandon River and Wooli Wooli River and freshwater lakes of Minnie Water and Lake Hiawatha. The study area excludes the catchment of the Clarence River estuary but includes Wooloweyah Lagoon and the Clarence River estuary entrance and Whiting Beach. As the Clarence Valley coastline contains significant areas of National Parks and Reserves, NPWS has played a key role in the development of this Scoping Study.

The Scoping Study:

- Sets out the strategic, environmental, social, cultural and management context for the CMP.
- Identifies issues and opportunities affecting the study area now, and those that are considered likely in the future.
- Includes review of existing plans and documents to identify actions and strategies which have been completed, and outstanding actions that will be considered for inclusion in the CMP.
- Assesses the adequacy of existing management arrangements including current and planned actions.
- Includes a first-pass risk assessment and an analysis of knowledge gaps to inform decisions specified in a preliminary business case about the need for and scope of detailed studies to be undertaken.
- Includes a forward program for subsequent stages of the CMP.

This Scoping Study has been compiled from existing studies and data sets, stakeholder consultation activities and site inspections including reports/studies and spatial data sets (Appendix A).

1.1 The Coastal Management Framework in NSW

The *Coastal Management Act 2016* establishes the framework and overarching objects for coastal management in NSW and supports the aims of the *Marine Estate Management Act 2014* to provide for strategic and integrated management of the whole marine estate – marine waters, coasts and estuaries. The *Coastal Management Act 2016* communicates the NSW Government's vision for coastal management and reflects the vital natural, social, cultural and economic values of our coastal areas and promotes the principles of ecologically sustainable development in managing these values. The legislative and policy framework introduced by recent coastal reforms recognises natural coastal processes and the local and regional dynamic character of the coast and promotes land use planning decisions that accommodate them. The reforms ensure coordinated planning and management of the coast and support public participation in these activities (Figure 2). Further detail on the NSW Coastal Management Framework is provided in Appendix B.

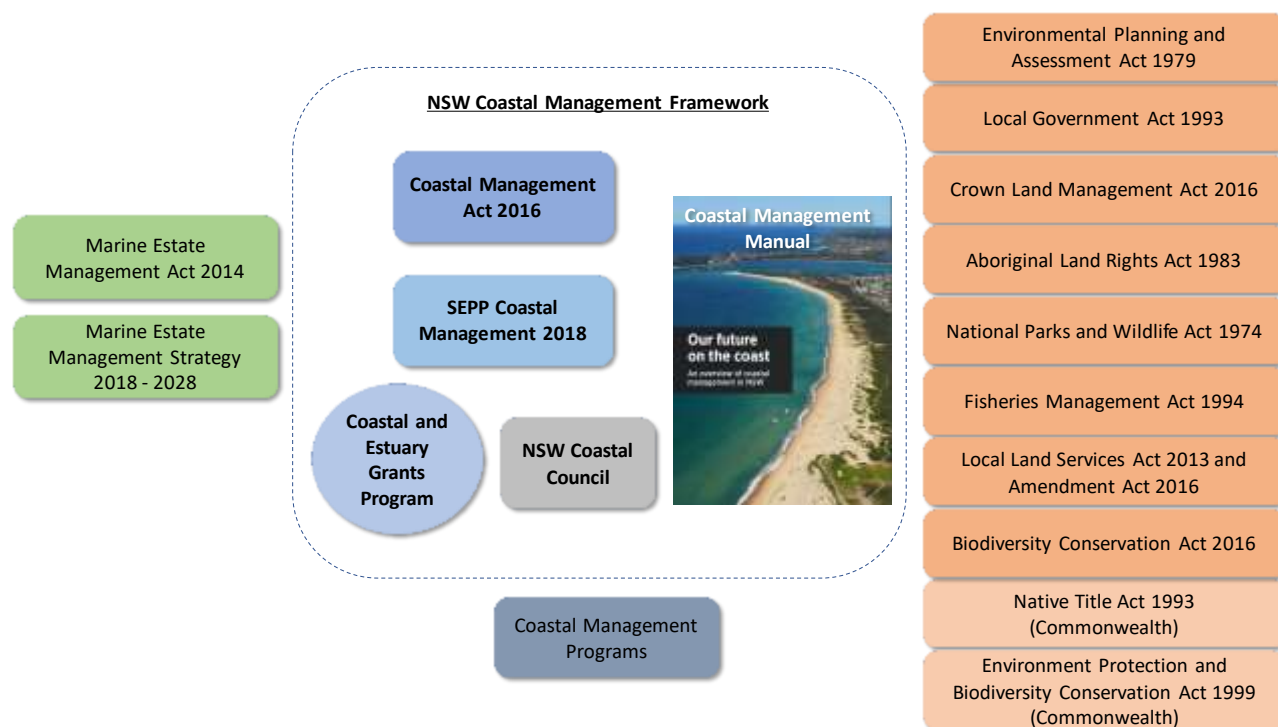


Figure 2: Coastal management framework

The *NSW Coastal Management Manual* (OEH, 2018, the Manual) provides guidance for developing a CMP and assists councils in addressing the requirements of the *Coastal Management Act, 2016*. The manual outlines the mandatory requirements and provides guidance on the preparation, development, adoption and content of a CMP. It includes a process for councils to follow when identifying and assessing the vulnerability of coastal environmental, social and economic values and evaluating management actions. It also contains guidance on the integration of a CMP into Council's Integrated Planning and Reporting (IP&R) framework and land use planning. The manual outlines a five-stage process for developing and implementing a CMP (Figure 3). This report addresses Stage 1 of the CMP process for the Clarence Valley coastline.

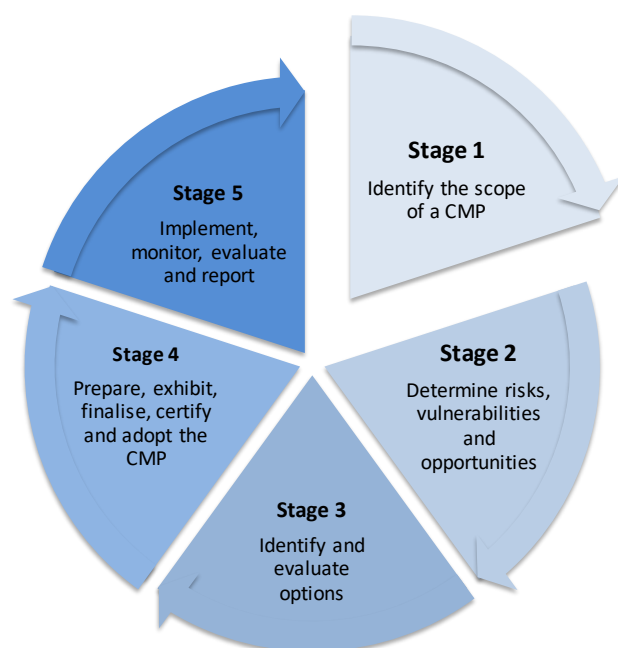


Figure 3: The five-stage process for developing a coastal management program

Source: Adapted from OEH (2018)

The key components of a Scoping Study (as required by the Manual) are shown in Figure 4 with the relevant section of this document that addresses each component.

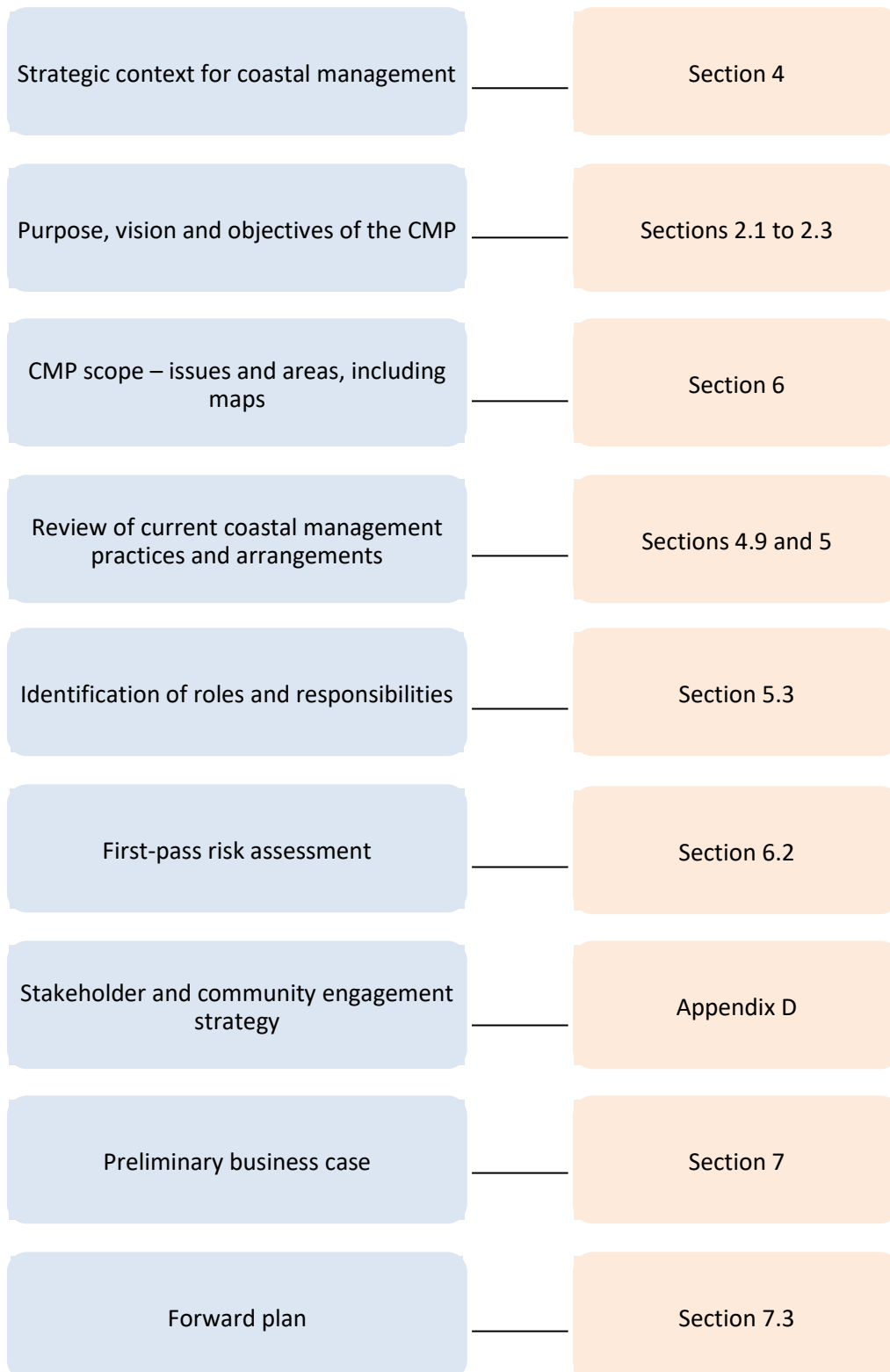


Figure 4: Components of the CMP Scoping Study for Clarence Valley coastline

1.2 Clarence Valley Local Government Area Coastal Management Strategy

The coastal zone of the Clarence Valley LGA includes the open coastline extending from Ten Mile Beach in the north to Jones Beach in the south and includes the major estuary of the Clarence River as well as many smaller estuaries, lagoons and freshwater bodies. Due to the large geographical extent of the coastal zone (approximately 86 km of coastline), CVC, with advice from DPIE, has determined to separate the coastline from the Clarence River estuary (with the exception of Wooloweyah Lagoon and Whiting Beach) for the purposes of this initial CMP Scoping Study. The coastal management strategy for the LGA includes the development of the following CMPs (refer Figure 5):

- CMP for the coastline and smaller estuaries including the Solitary Islands Marine Park (study area addressed in this Scoping Study).
- CMP for the Clarence River estuary (including Wooloweyah Lagoon which has been covered in this Scoping Study) to be commenced in 2021.
- The National Parks and Nature Reserves within the coastal zone will be addressed in separate coastal management planning documents to be prepared by NPWS (although there may be opportunities to collaborate with Council on some components of CMP development). The coastline and small estuaries in the National Parks and Nature Reserves are addressed in this Scoping Study.

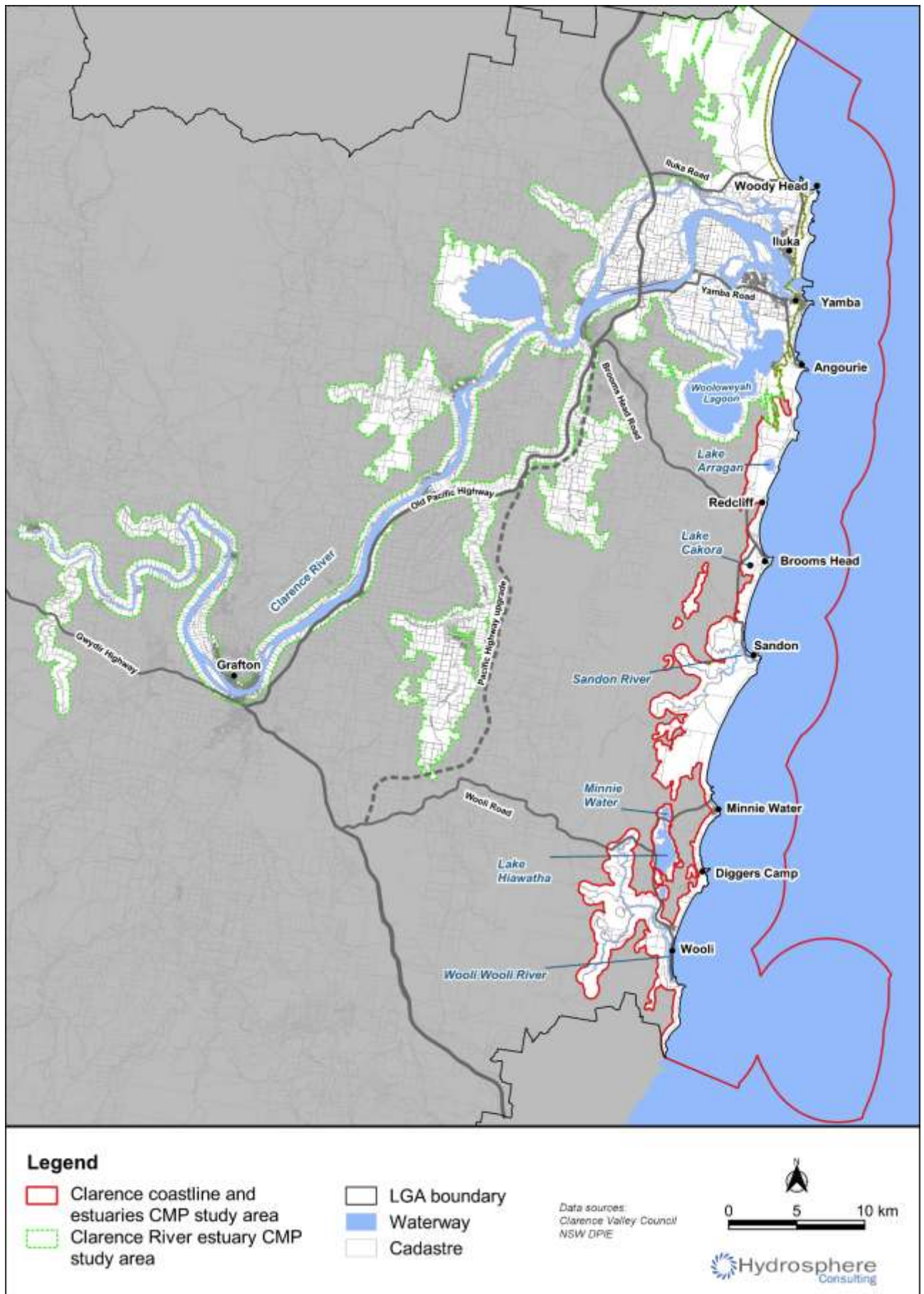


Figure 5: Coastal management strategy for the Clarence Valley LGA

1.3 Study Area for the Coastline and Estuaries CMP Scoping Study

The three coastal management areas that make up the coastal zone as defined by the *Coastal Management Act 2016* and the *Coastal Management State Environmental Planning Policy (SEPP)* are included in the study area for the Clarence Valley coastline and estuaries Scoping Study (Figure 6). Maps of the study area including the Coastal Wetland and Littoral Rainforest Area (CWLRA), Coastal Environment Area (CEA) and Coastal Use Area (CUA) are provided in Figure 7 to Figure 9. Although the Coastal Vulnerability Area (CVA) is not mapped in the SEPP, the coastline is subject to coastal hazards and these have also been addressed in this Scoping Study.

The study area for this CMP Scoping Study includes the open beaches, foreshores, coastal waters, estuaries and lagoons of the Clarence Valley Local Government Area excluding the Clarence River estuary but including Wooloweyah Lagoon.



Plate 1: Yamba and Clarence River entrance aerial view

Source: CVC (2020a)



Plate 2: Wooli Wooli River aerial view

Source: <https://www.wooli-minniewater.com.au/>

The boundaries of the coastal and estuarine study area do not preclude consideration of known issues and threats from the upper catchments that have the potential to impact on downstream values (e.g. bank erosion and diffuse source agricultural runoff in the upper catchments affecting estuary health).



Figure 6: Study area for the Clarence Valley Coastline CMP Scoping Study

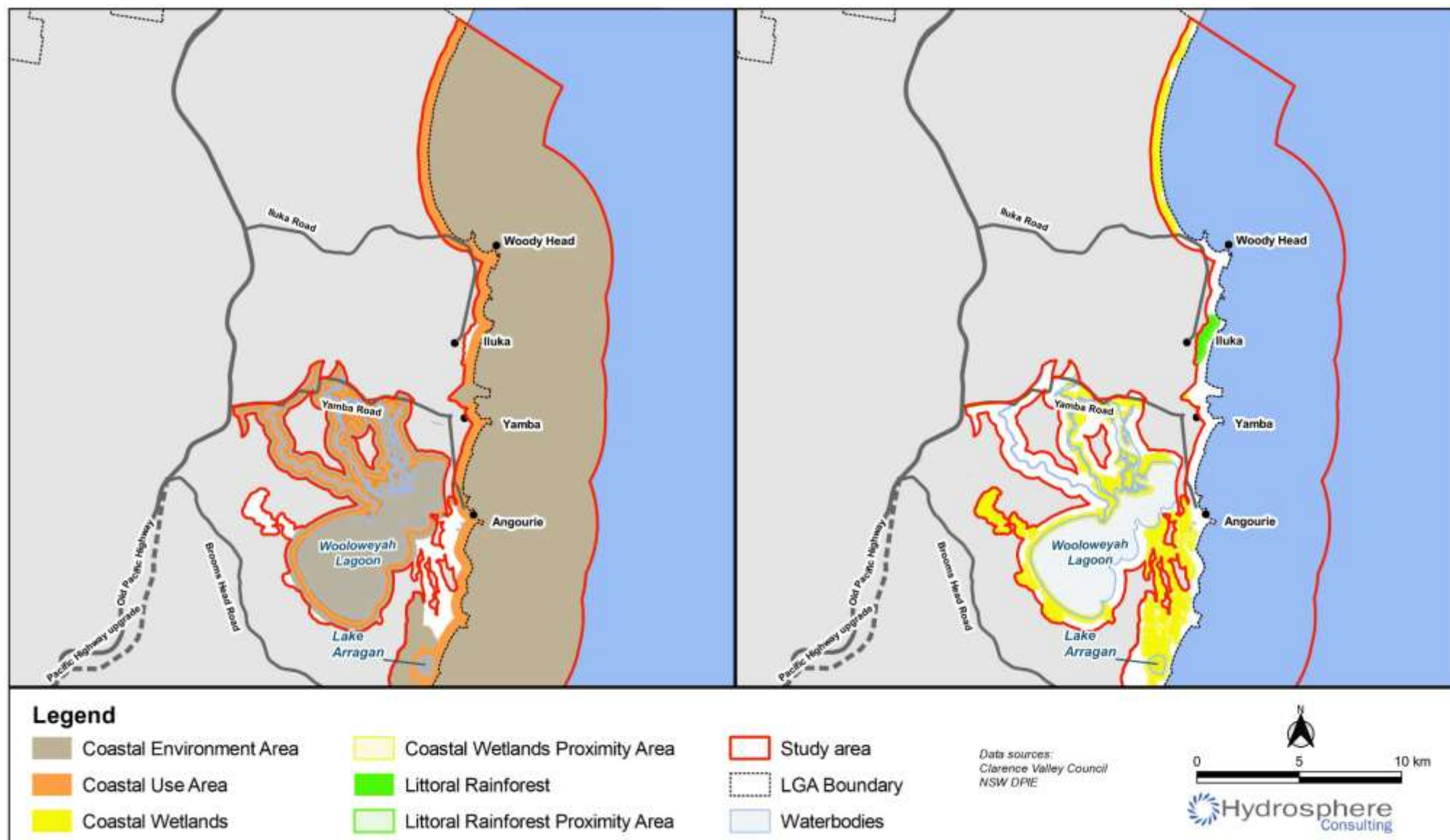


Figure 7: Coastal management areas: Yamba, Angourie and Wooloweyah Lagoon

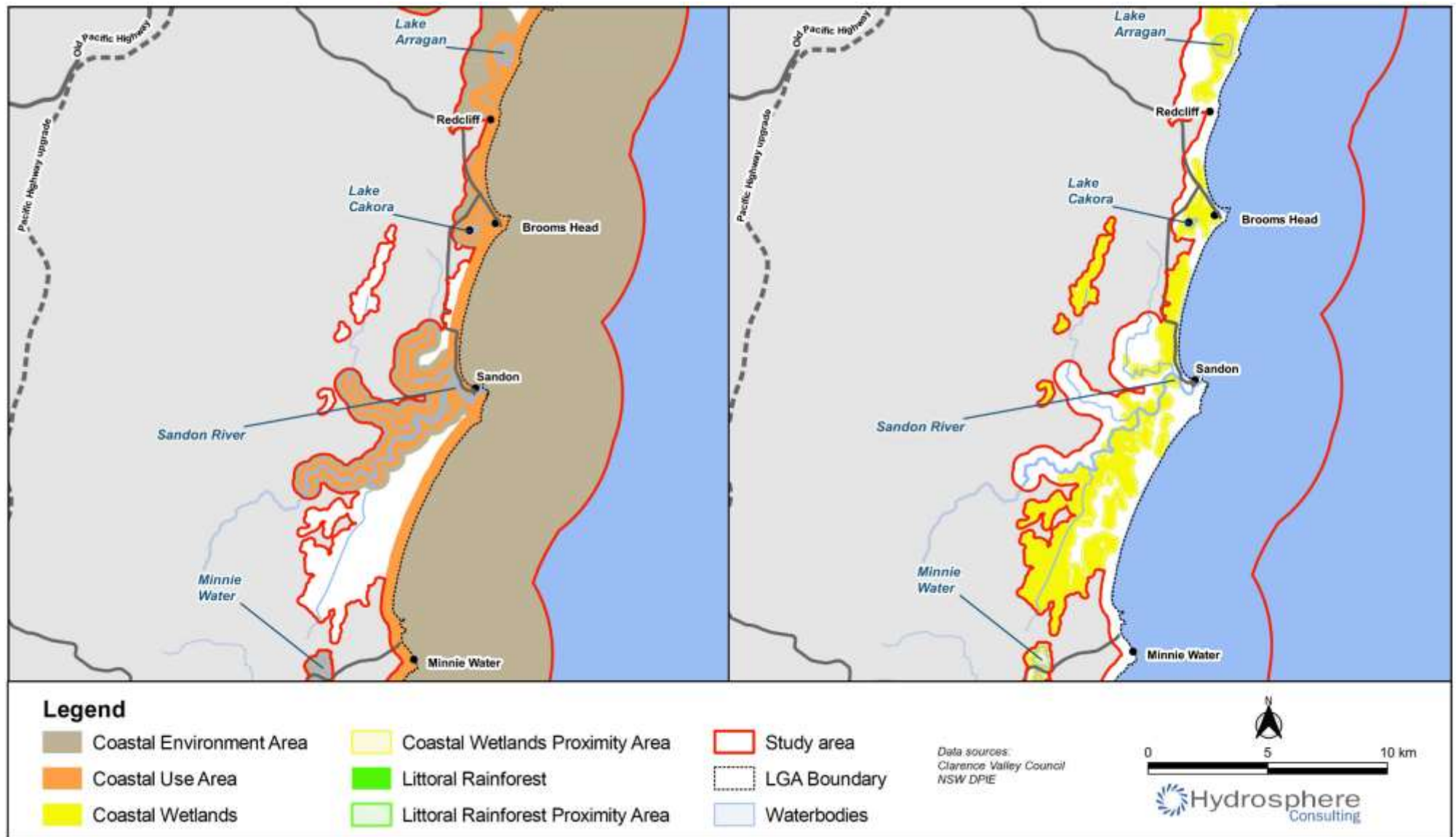


Figure 8: Coastal management areas: Minnie Water, Lake Hiawatha, Wooli and Wooli Wooli River

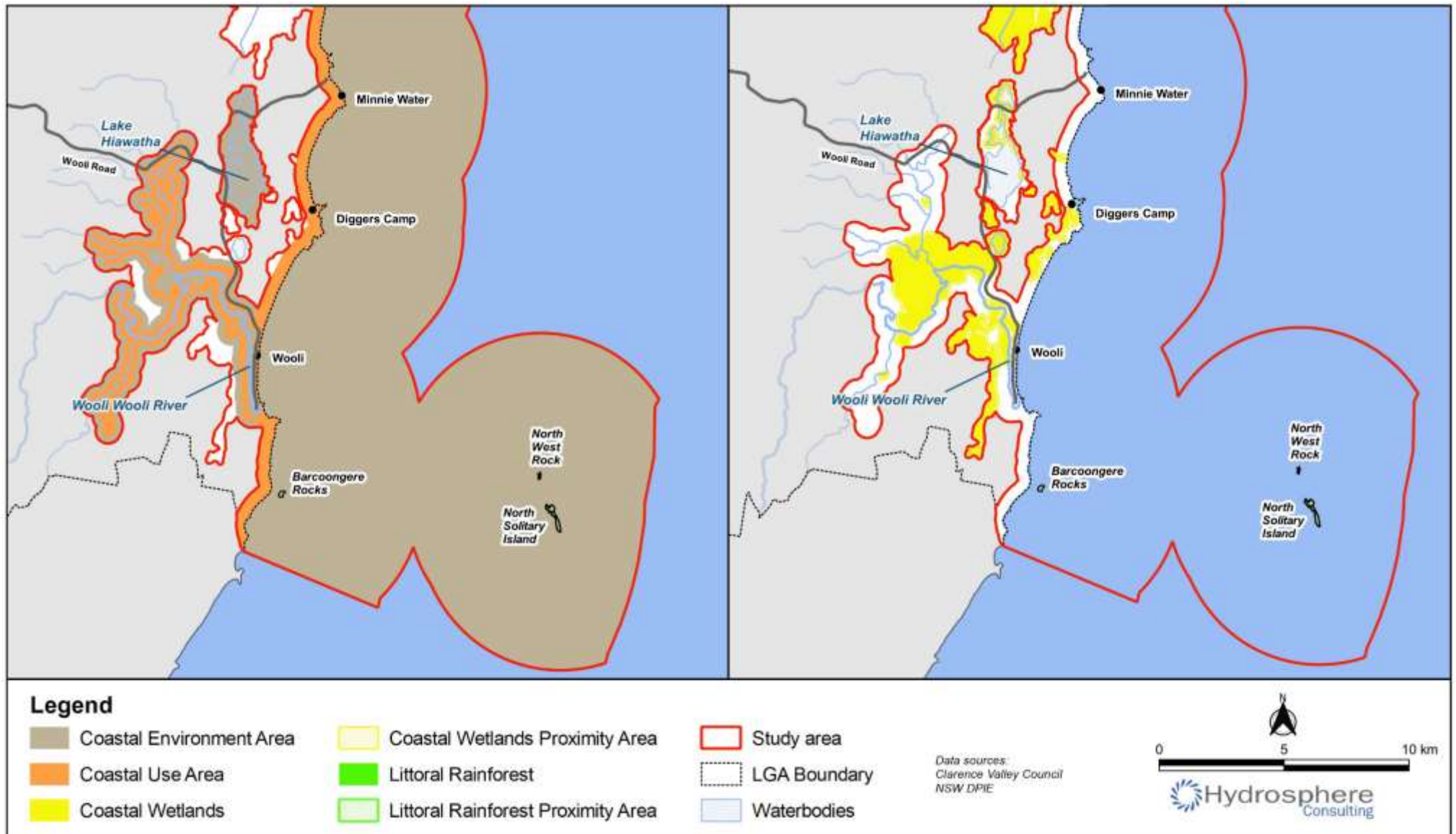


Figure 9: Coastal management areas: Brooms Head and Sandon River estuary

2. CMP PURPOSE, VISION AND OBJECTIVES

2.1 Purpose

The CMP will provide the long-term coordinated strategy for managing the Clarence coastal zone. An integrated whole-of-government and community approach is required to implement the strategy, with CVC, NPWS, DPIE and other state government agencies, stakeholders and local communities working together to achieve the CMP objectives.

The primary purposes of this Scoping Study are to:

- Review progress made in managing issues in coastal areas.
- Develop a shared understanding of the current situation.
- Identify the focus of the new CMP.

This Scoping Study also assists Council to:

- Identify the community and stakeholders and prepare an engagement strategy.
- Determine the strategic context of coastal management.
- Establish the purpose, vision and objectives
- Determine the key coastal management issues and the spatial extent of management areas.
- Review current coastal management arrangements.
- Establish roles, responsibilities and governance.
- Determine where action is required through a first-pass risk assessment.
- Identify knowledge gaps and information needs.
- Prepare a preliminary business case.
- Determine whether a planning proposal will be prepared to amend coastal management area maps and the Local Environmental Plan.
- Develop a forward program for subsequent stages of the coastal management program.

The CMP will incorporate management actions and strategies to address key threats and support a diversity of natural values and human uses into the future. The CMP will consider the range of timeframes (immediate, 20 years, 50 years, 100 years) where appropriate as required by the *Coastal Management Act 2016*. This Scoping Study presents the scope of the CMP and the forward program and costs to implement Stages 2 to 4 of the CMP. Recommended management actions will be developed in the CMP to balance and manage uses so that they are compatible with the environmental, social and economic values of the study area and to ensure short term actions are compatible with issues and threats in the longer term. The actions will be developed with reference to a ten-year management timeframe reflecting the implementation phase of the CMP. Longer-term pressures such as climate change and sea level rise will be considered in the formulation of management actions to ensure resilience against future threats and the conservation of the values for future generations.

2.2 Vision Statement

The CMP vision statement has been developed from community feedback and is consistent with the objects of the *Coastal Management Act 2016*, the management objectives for the coastal management areas and Council's vision and objectives as identified in its Community Strategic Plan.

“The natural values of the Clarence Valley coastline and estuaries will be conserved and enhanced. Sustainable management of the coastline will include adequate resourcing and funding to preserve the environmental, cultural, recreational, amenity, local and tourism values with consideration of existing and emerging threats to improve resilience to current and future pressures.”

A summary of feedback from the community to inform the Scoping Study is shown in Figure 10.



Figure 10: Word cloud generated from the survey respondents' vision of the Clarence Valley's coastline and estuaries in 10 years

2.3 Objectives

Section 12 of the *Coastal Management Act 2016* states that: “The purpose of a coastal management program is to set the long-term strategy for the coordinated management of land within the coastal zone with a focus on achieving the objects of this Act.”

The objects of the *Coastal Management Act 2016* (Section 3) are to manage the coastal environment of NSW in a manner consistent with the principles of ecologically sustainable development for the social, cultural and economic well-being of the people of the State, and in particular:

- (a) to protect and enhance natural coastal processes and coastal environmental values including natural character, scenic value, biological diversity and ecosystem integrity and resilience, and
- (b) to support the social and cultural values of the coastal zone and maintain public access, amenity, use and safety, and
- (c) to acknowledge Aboriginal peoples' spiritual, social, customary and economic use of the coastal zone, and
- (d) to recognise the coastal zone as a vital economic zone and to support sustainable coastal economies, and

- (e) to facilitate ecologically sustainable development in the coastal zone and promote sustainable land use planning decision-making, and*
- (f) to mitigate current and future risks from coastal hazards, taking into account the effects of climate change, and*
- (g) to recognise that the local and regional scale effects of coastal processes, and the inherently ambulatory and dynamic nature of the shoreline, may result in the loss of coastal land to the sea (including estuaries and other arms of the sea), and to manage coastal use and development accordingly, and*
- (h) to promote integrated and co-ordinated coastal planning, management and reporting, and*
- (i) to encourage and promote plans and strategies to improve the resilience of coastal assets to the impacts of an uncertain climate future including impacts of extreme storm events, and*
- (j) to ensure co-ordination of the policies and activities of government and public authorities relating to the coastal zone and to facilitate the proper integration of their management activities, and*
- (k) to support public participation in coastal management and planning and greater public awareness, education and understanding of coastal processes and management actions, and*
- (l) to facilitate the identification of land in the coastal zone for acquisition by public or local authorities in order to promote the protection, enhancement, maintenance and restoration of the environment of the coastal zone, and*
- (m) to support the objects of the Marine Estate Management Act 2014.*

The CMP will also ensure that the objectives for the four coastal management areas (CWLRA, CEA, CUA and CVA) as described in Appendix B are achieved.

The CMP objectives may be refined as the CMP is developed to reflect local issues and values and remain consistent with state government objectives. The CMP will include the development of performance indicators where relevant, for inclusion in the CMP Monitoring, Evaluation and Reporting (MER) framework.

3. STAKEHOLDER AND COMMUNITY ENGAGEMENT

Stakeholder engagement is a critical component which spans all stages in the production of a CMP.

3.1 Previous Stakeholder Engagement Activities

As part of the development and implementation of previous coastal and estuary management planning documents, Council has engaged with stakeholders and the community. Previous engagement activities have included:

- Community surveys – e.g. Yamba (2002), Sandon River (2011), Lake Cakora (2009) and Wooli (1997). Further detail is provided in Appendix D.
- Coast and Estuary Management Committee (CEMC) meetings
- Information in community newsletters – e.g. Wooli-Minnie Water-Sandon River, Diggers Camp.
- Direct engagement with community groups – Wooli Coastal Communities Protection Alliance, Brooms Head Landcare.
- Public exhibition of plans – e.g. Sandon River, Wooli, Brooms Head, Yamba, Whiting Beach.
- Public meetings and drop-in sessions – e.g. Wooli, Brooms Head, Yamba.
- Agency meetings.
- Site meetings – e.g. Brooms Head Landcare, OEH (now DPIE-EES), NSW Coastal Panel, Wooli Dunecare.
- Information on Council's website.

Prior to this Scoping Study, limited consultation had been undertaken for Yamba and Wooloweyah Lagoon areas. Activities had also not been specifically targeted to Aboriginal groups. Apart from the activities undertaken for Wooli and Brooms Head, most of these activities were undertaken 5-25 years prior to this Scoping Study development. Consultation activities had also focussed on localised issues and targeted in local areas. While these outcomes provide useful background to community values, fresh engagement activities were undertaken for this Scoping Study and are planned for the remaining CMP stages (refer Appendix D).

3.2 Scoping Study Consultation Activities

Development of this Scoping Study included stakeholder engagement activities undertaken in accordance with the *Quality Assurance Standard for Community and Stakeholder Engagement* (IAP2, 2015), *CVC Community Engagement Policy* (CVC, 2018a) the *Guidelines for Community and Stakeholder Engagement in Coastal Management* and *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (OEH, 2010).

The aims of the engagement activities were to inform and involve stakeholders by bringing all interested parties on board early to share information and ideas, identify stakeholders and prepare a stakeholder profile. Feedback from the community and other stakeholders has been used to identify values and coastal management issues. Engagement activities are detailed in Appendix C and included:

- Meetings with the CEMC.
- An online community survey with paper-based copies available at key locations.
- Submissions were invited from government agencies, community groups and the Aboriginal community.

- The Clarence Conversations website included project information, a link to the community survey, useful links, downloads, a discussion forum, questions page and pin map.

4. STRATEGIC CONTEXT

4.1 Statutory and Planning Context

4.1.1 Legislation and policy

The legislation and policy governing management of the coastal zone is detailed in Appendix B. The *Coastal Management Act 2016* establishes the framework and overarching objectives for coastal management in NSW which focus on strategic, integrated and ecologically sustainable management of the NSW coastal zone (refer Section 1.1).

Council is not aware of any legal challenges relating to coastal management in the study area

4.1.2 Regional and local plans

The study area is currently managed in accordance with various regional and local level planning instruments, strategies and management plans implemented by Council and other stakeholders. The key regional plans and local plans relevant to coastal management are shown on Figure 11. Other relevant management plans include Crown reserve plans of management and floodplain risk management plans. The following plans have been certified under the *Coastal Protection Act 1979*:

- *Coastal Zone Management Plan for Wooloweyah Lagoon* (White, 2009).
- *Wooli Beach Coastal Zone Management Plan* (Royal HaskoningDHV, 2018).
- *Brooms Head Beach and Lake Cakora Coastal Zone Management Plan* (CVC, 2017).

A summary of all coast and estuary management plans (both certified and uncertified), National Parks plans of management and Crown Reserves plans of management is provided in Appendix B. The status of the recommended actions in the current plans is detailed in Appendix E.

4.1.3 Strategic direction

The strategic direction for management of the Clarence Valley coastline and estuaries is established through the following:

- The NSW Coastal Management Framework (Section 1.1).
- The *Marine Estate Management Strategy (2018 - 2028)*.
- Regional and local plans as discussed in Section 4.1.2.
- Council's IP&R Framework (refer Appendix B) - the Clarence Community Strategic Plan (*The Clarence 2027*), the Delivery Program and Operational Plan.

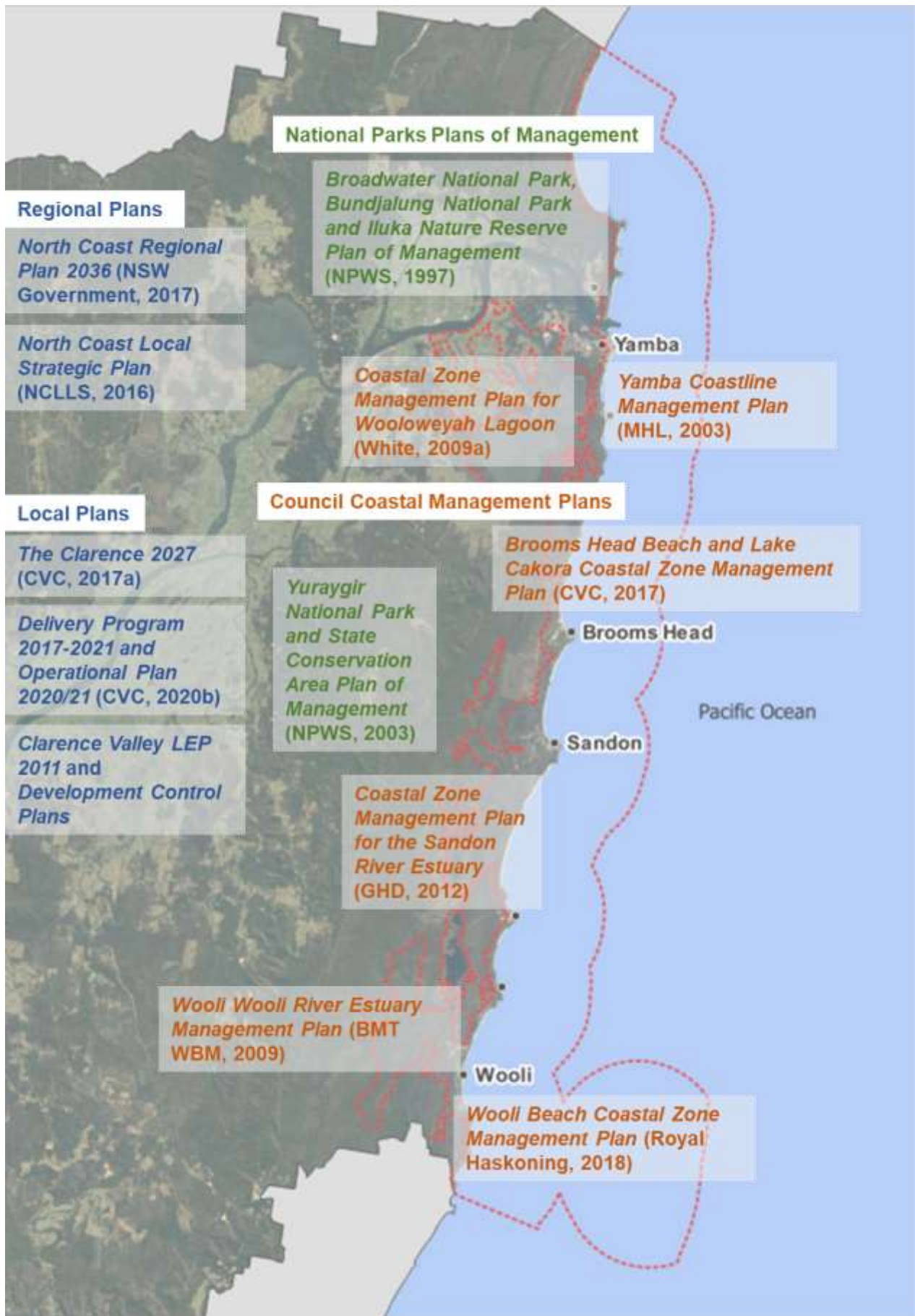


Figure 11: Regional and local strategies and management plans for the Clarence Valley coastal zone

4.2 Culture and Heritage

The Clarence Valley coastline is the traditional land of the Yaegl People. The Yaegl Country centres around the lower Clarence River extending south along the coastline to Red Rock and north to Black Rocks (Jerusalem Creek). The Yaegl Traditional Owners Aboriginal Corporation (YTOAC) are the traditional owners and custodians of Yaegl Country. Yaegl Country is bordered by Gumbayngirr Country to the south and south-west and Bundjalung country to the north and north-west. The Yaegl people's ongoing use and relationship to country is recognised with the successful Native Title determinations over lands and coastal waters along the coastline as detailed in Section 5.2.

Prior to European arrival, the Yaegl People occupied and skilfully managed the coastline and surrounding areas for thousands of years. The coastal areas continue to play a significant role in the daily lives of the Yaegl People, providing an abundance of natural resources for survival, ceremonial rituals and a deep social, cultural and spiritual connection. Numerous significant sites, areas and landscapes are located along the coastline. In Kijas (2009) Ken 'Fox' Laurie notes the ongoing attachment of the Yaegl People to the Clarence Valley coastline:

"The Yaegl people are the traditional custodians of the Clarence Coast. Its outcrops, estuaries and beaches hold places where people have camped for thousands of years and used abundant resources provided by nature in this favourable location... The coastline is a network of pathways between places of spiritual importance. Its landmarks are associated with stories and important figures. A local dreamtime story relates to Durrangan and the creation story of the stone canoe... A strong attachment between the Goorie people and their local landscape indicates the presence of long-standing knowledge about animals, plants and the environment: a complex web of places associated with fishing, hunting and collecting where people continued to return to meet, to fish, to collect bush foods and to trade."

The estuaries and their forested catchments include ceremonial sites (carved trees, stone arrangements, natural mythological ceremonial sites, initiation grounds and waterholes), extractive sites (stone and ochre quarries, axe grinding grooves and scarred trees), open campsites, middens, fish traps, contact sites, rock shelters and art sites (Kijas, 2009).

Europeans began to colonise the Clarence Valley coastline in the mid-1800s, particularly cedar getters and pastoralists. A brief European historical context of Yuraygir National Park and surrounding area is provided below as described in Tuck (2007 and 2018) and is typical of the Clarence Valley coastline:

- Timber getting – cedar getters were the first to arrive.
- Squatting and stock grazing – sheep initially then cattle.
- Cropping – maize then bananas from the late 1860s then sugarcane.
- Timber – became popular again in the early 1900s.
- Establishment of camps, villages and towns – most coastal villages were established in the early 20th century.
- Commercial fishing - trawling, netting, trapping and line fishing at beaches, rivers, creeks, estuaries and inshore waters from the early 20th century in addition to oyster growing.
- Sand mining – extensive sandmining occurred along the coast predominantly in the 1960s and 1970s.
- Recreation - recreational fishing, camping and hunting dates from the early 20th century. Increased tourism from the late 1960s includes surfers, recreational fishers, bushwalkers and naturists among the visitors.

These European activities changed the natural coastal landscape, and as such, sites, artefacts and values relating to these activities have also become part of the contemporary coastal landscape. Places of local heritage significance and conservation areas are identified in the Clarence Valley LEP 2011.

4.3 Environmental Context

4.3.1 Environmental values

The many environmental values of the study area have been documented in previous plans and studies (e.g. GHD, 2012; Royal HaskoningDHV, 2018a; SMEC, 2013d; WBM, 2006) and established through previous consultation activities (Appendix D). Previous findings have been confirmed by community consultation undertaken as part of this study (refer Appendix C). The core environmental values of the study area are associated with its landscape amenity (i.e. geographical features, scenic amenity and views), healthy and diverse natural environments and biodiversity values.

The natural beauty of the Clarence Valley coastline is highlighted in the large areas of National Parks and Nature Reserves. The National Parks protect and conserve habitat for a large range of endangered ecological communities and threatened flora and fauna species. The study area also includes a large component of the Solitary Islands Marine Park (SIMP) which contains diverse habitats (estuaries, sandy beaches, intertidal rocky shores, sub-tidal reefs and open oceans) and the Solitary Islands. The SIMP's northern estuaries are some of the state's most pristine, largely because the majority of adjacent land remains in a near natural state and is conserved as part of Yuraygir National Park. The local Aboriginal communities within the Yaegl Nation have strong cultural links with the marine park and are actively involved in conservation planning.

The coastline and estuaries are dynamic and diverse encompassing a broad range of natural features including sandy beaches, coastal dunes, rocky headlands, marine areas, ICOLLs, estuary entrances, littoral rainforest, wetlands/heathlands and estuarine environments. Locals and visitors place a high value on the abundance of natural resources, uncrowded areas for nature-based recreation and stunning scenic amenity. Beaches, headlands and waterways provide a place for recreation and social interaction and results of the community survey undertaken during this Scoping Study indicate that for many community members, interaction with the coast and estuaries is a highly valued part of life.

4.3.2 Geomorphology, geology and soils

The study area and the broader catchments of waterways within the study area lie within the southern area of the Clarence Basin. The coastal zone throughout the study area is dominated by quaternary sand beach barrier systems and coastal plains which overlay the Clarence Basin material. Bedrock outcrops (typically sandstone and siltstone) occur as headlands punctuating the beach system.

Sediment compartments are used to compartmentalise sections of the Australian coastline with similar characteristics and processes. A sediment compartment is a section of coast which shares a common sediment resource with clearly defined physical boundaries (Short, 2018). A compartment may be open, leaky or closed at either or both boundaries and the sediment budget may be positive, stable or negative. The sediment compartment concept uses a hierarchy classification including province, division, region, primary and secondary. The Clarence Valley coastline lies within the temperate province, south-east division and central eastern region and spans over two primary coastal sediment compartments, Clarence River to Point Danger (Tweed Heads) and Yamba Heads to Bare Bluff (Sapphire Beach). The secondary sediment compartments within the study area are Bundjalung, Yuraygir and Woolgoolga which are described in Table 2 and illustrated in Figure 12.

Table 2: Description of secondary coastal sediment compartments within study area

Compartment	Bundjalung	Yuraygir	Woolgoolga
Extent	Yamba Point to Evans Head	Wooli to Yamba Point	Bare Bluff (Sapphire Beach) to Wooli
Shared LGA	Clarence Valley and Richmond Valley	-	Clarence Valley and Coffs Harbour
Geomorphology	Sandstone and conglomerate headlands, zeta-form bays, large and small embayed beaches, extensive Pleistocene prograded beach ridge plain, dunes, Holocene prograded barriers, Clarence River mouth and estuary.	Sandstone, siltstone and conglomerate headlands, zeta-form bays, sandy beaches, episodic transgressive dunes.	Increasing bedrock control, embayed beaches, narrow Holocene barrier deposits, backed by Pleistocene transgressive dunes.
Sensitivity rating ¹	Sensitivity rating is 4 with several sections already 5. The Woody Bay region is sensitive and undergoing erosion.	Sensitivity rating is 4 with several localised erosion spots already rated 5.	Sensitivity rating is 4 and the coast appears to be sediment starved.
Confidence rating ²	Medium to high	Medium	Medium

1. Relevant sensitivity rating from 1 (low) to 5 (high): 3 - Relatively stable shorelines which may be subject to periodic erosion followed by recovery (accretion), but no long-term recession expected in the next few decades since the sediment budget remains sufficiently balanced over time from offshore, alongshore or terrestrial sources. 4 - Shorelines that currently do not show evidence of long-term recession but are likely to begin receding with continuing sea-level rise (based on sediment availability onshore and offshore). 5 - Shoreline recession is occurring now (typically documented by historical shifts in shoreline position) and the shoreline is likely to continue to recede as sea level rises (possibly at a faster rate depending on local conditions).

2. Confidence rating: Medium - Some information is available on changes to landforms, from multiple sources, which may include recent landform change from site descriptions and irregular aerial photographs over the past decade. High - detailed information is available identifying changes to coastal landforms spanning the historical period and includes regular remotely sensed information over the past 30 years or more.

Source: CoastAdapt (2017d)

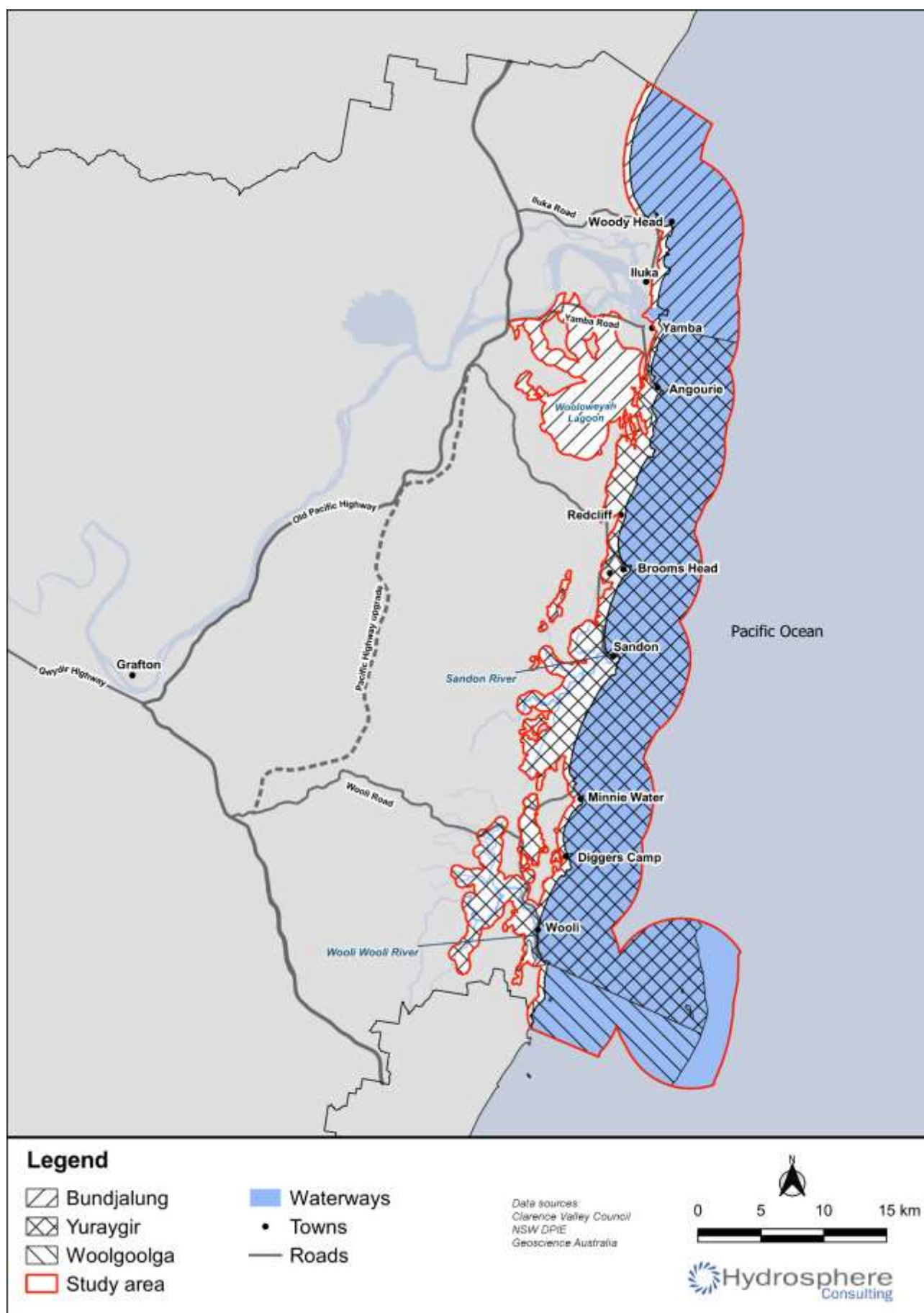


Figure 12: Secondary coastal sediment compartments within the study area

Based on the sediment compartment framework the majority of the Clarence coastline is dominated by sediment compartments that are characterised by rocky headlands, zeta form bays and sandy beaches (Plate 3) and the majority of the coast consists of shorelines that do not show evidence of long-term recession but are likely to begin receding with continuing sea-level rise. However, there are several sections where shoreline recession is currently occurring and is likely to continue.



1 - Yamba



2 – Brooms Head



3 – Iluka Beach



4 – Sandon Beach

Plate 3: Study area coastline

Acid sulfate soils (ASS) are mapped in the *Clarence Valley Local Environmental Plan (LEP) 2011* along much of the coastline. ASS are classified under five classes which indicate when development consent is required for works on that land. The presence and characteristics of ASS/PASS within the Wooloweyah Lagoon catchment are well documented in Whitehouse (2001). Low pH water in several drains and channels within the catchment have been attributed to acid export from surrounding ASS (Whitehouse, 2001).

The coastal geomorphology of the region is influenced by the following processes (CoastAdapt, 2017a; 2017b; 2017c):

- The humid warm to cool temperate climate.
- Micro-tides.
- South-easterly Tasman Sea swells.
- Easterly seas.

- Dominant quartz (terrigenous) sediments with northerly longshore transport in the northern part.
- The El Niño Southern Oscillation (driving beach erosion/accretion cycles, cyclone frequency).

The Clarence Valley coastline is a wave dominated coastline and the estuary geomorphology types are influenced by this setting. The estuaries within the study area are either wave-dominated barrier estuaries or coastal lagoons (Table 3 and Plate 4).

Table 3: Estuary types within the study area

Estuary	Type	Entrance
Clarence River	Wave dominated barrier estuary	Open trained
Wooloweyah Lagoon	Tidal barrier estuary lagoon	-
Mara Creek	Coastal lagoon	Intermittently open, untrained
Lake Arragan	Coastal lagoon	Intermittently open, untrained
Lake Cakora	Coastal lagoon	Intermittently open, untrained
Sandon River	Wave dominated barrier estuary	Open, natural control point to the south with a bedrock headland and the Plover Island tombolo on the northern side
Wooli Wooli River	Wave dominated barrier estuary	Open trained

Source: EES (2018a; 2018b; 2018c), Roy *et al.* (2001)

Whiting Beach is situated within the entrance of the Clarence River and formed in the early 1900s as a result of changes in hydrodynamics and sediment transport in the lower estuary, in particular due to the construction of Middle Wall (Royal HaskoningDHV, 2014).

Wooloweyah Lagoon with a surface area of approximately 24 km² (Adlam, 2015) is part of the broader Clarence River estuary. The lagoon developed due to infilling of a deeper river valley which had formed during periods of lower sea level and formation of a barrier dune to the east against bedrock exposures, separating the lagoon from the coast (Woodhouse, 2001). The lagoon is a depositional environment with the lagoon continuing to infill with marine sands deposited as a flood-tide delta at the entrances to the channels at the northern end of the lagoon and sediments and silts deposited throughout the lagoon during floods (Woodhouse, 2001; Hashimoto and Hudson, 1999).

Minnie Water and Lake Hiawatha are two freshwater lakes located to the west and south-west of Minnie water village. The area of Minnie Water and Lake Hiawatha is approximately 52 ha and 315 ha respectively and are both relatively deep (approximately 10 metres) in parts (Timms, 1982). The lakes are impounded on country rock by inland high sand dunes (Timms, 1982). Minnie Water and Lake Hiawatha are the town water supplies for Minnie Water village and Wooli, respectively.



1 – Wooloweyah Lagoon



2 – Sandon Beach and Plover Island



3 – Wooli Wooli River entrance



4 – Lake Arragan entrance



5 – Lake Cakora entrance



6 – Clarence River entrance breakwaters

Plate 4: Study area estuaries

4.3.3 Hydrology and catchment modifications

The hydrology and catchments of the study area estuaries apart from Wooloweyah Lagoon are largely unmodified.

The eastern section of the Wooloweyah Lagoon catchment is within Yuraygir National Park. The hydrology within the western area of the catchment is highly modified with various ephemeral streams and man-made drains in the south-western catchment flowing north-east into the Taloumbi ring drain (Figure 13). The Taloumbi ring drain is a major perimeter drain which is approximately 8.5 km long running just landward and parallel to the south-western shoreline of the lagoon. A levee (constructed with excavated material from the ring drain) is situated between the drain and the lagoon shoreline. The ring drain receives runoff from four major radial drains (Taloumbi radial drains 1-4) and discharges into Palmers Channel at its northern end and into the lagoon at the intersection with each radial drain (White, 2009). Many kilometres of private drains and levee systems have been constructed that link to the drain (Engeny, 2019). It has been estimated that more than 70% of runoff enters the lagoon through the Taloumbi ring and radial drainage system due to the extensive drainage network on the western flats (Foley & White, 2007). One radial drain (drain 5) is not linked to the ring drain and discharges directly into the lagoon (White, 2009).

Engeny (2019) notes that there are a number of impediments to the drainage of the land connected to the ring drain, including:

- Low elevation of surrounding land (approximately 0 mAHD).
- Attenuated tidal range caused by the lagoon.
- Blocked floodgates due to sedimentation at the mouth of the inlets (requiring regular removal by Council).
- General shallowing of Wooloweyah Lagoon (estimated to be 4 mm – 30 mm per year, depending on the location).
- Sea level rise.
- Condition of assets and floodgate leakage.

Options to manage the Taloumbi ring drain and surrounding areas of poor drainage are currently being explored by CVC.

Further to the north of the Taloumbi ring drain catchment, the area east of James Creek flows into Palmers Channel primarily through three flood-gated drainage systems, the most significant being Carrs Drain. To the east of the lagoon the catchment is bound by dunes and ridges where various wetlands and small streams flow west into the lagoon. North of the lagoon lies Palmers Island, Micalo Island and various other small low-lying, low relief islands. Various channels flow through these islands, with Palmers, Micalo and Oyster Channels the most significant, connecting the lagoon to the lower Clarence River estuary.

The drainage of Palmers and Micalo Islands have also been extensively modified with large areas of wetlands drained. Woodhouse reported that there was a 53% loss of wetlands on Palmers Island between 1942 and 1994 due to the artificial drainage. A levee extends the length of the eastern side of Palmers Island on the western bank of Micalo Channel. This levee adjoins the Taloumbi levee in the south. Micalo Island also has several constructed drains and a large prawn farm (disused) which has severely altered the natural hydrology of the island. Woodhouse (2001) reported that Micalo Island lost approximately 166 ha of wetland between 1942 and 1994 primarily due to the construction of the prawn farm.



Figure 13: Wooloweyah Lagoon floodplain modifications

4.3.4 Water Quality

Water quality is one of the prime estuarine “health” indicators and clean waterways are highly valued by the community. Many of the key economic industries in the local area rely on good water quality including tourism, aquaculture (oyster production) and commercial fishing. Although, poor water quality was not raised as a significant issue by the public, good water quality was raised as the most important attribute of the Clarence coastline and estuaries into the future.

The collection of water quality data in the study area has been sporadic, site/ project specific and there has been little or no integration between sampling efforts, or of data storage and analysis. CVC participated in the Beachwatch Partnership Program between 2002 and 2011 with many locations monitored within the LGA and a portion of these within the study area. The *Clarence Catchment Ecohealth Project: Assessment of River and Estuarine Condition 2014* (Ryder *et al.*, 2014) assesses the health of the Clarence River catchment and the coastal catchments. This project was conducted over a 12-month period (August 2012 to August 2013) covering 88 sites across 37 river systems to contribute to the assessment of the ecological condition of the catchments. Of these sites, eight are located in the study area with one in Wooloweyah Lagoon, Lake Arragan and Lake Cakora, two in Sandon River and three in Wooli Wooli River. Ecohealth results are discussed in the relevant sections below.

DPIE - EES developed an estuary health risk dataset for each estuarine catchment in NSW (Dela-Cruz, *et al.*, 2019) to support development of CMP Scoping Studies. The dataset identifies land use pressures and the consequent risks of impacts based on sub-catchment scaled attributes such as land use, soil type and climate and provides modelled estimates of surface flows and the nutrient and total suspended solids loads.

Coastline

There are no recent data on water quality at the beaches. However, several sites (Whiting Beach, Yamba Main Beach, Brooms Head, Minnie Water and Wooli Beach) were included in the Beachwatch monitoring program between 2003 - 2009 where enterococci levels were recorded. All sites had acceptable levels of enterococci during the monitoring periods.

Blue Pools

The Blue and Green pools (collectively known as the Blue Pools) located within Angourie Reserve between Spooky Beach and Angourie Beach are two former quarry sites that are filled with fresh water. These pools are a popular recreational location and have been used for swimming and diving for well over a century. However, the pools are subject to blue-green algal blooms particularly over the warmer months, which can be toxic and the pools may not be suitable for swimming at all times. CVC monitors the level of algae on a regular basis over the summer months and has signs on site (and a webpage) to indicate if the pools are open to swimming.

Wooloweyah Lagoon

Poor water quality has consistently been raised as an issue in Wooloweyah Lagoon over at least the last 30 years (e.g. Lancaster (1990); Woodhouse (2001); White (2009) and various earlier studies). This has resulted in many water quality studies undertaken within the lagoon over this time providing a reasonable understanding of processes occurring within the catchment. Poor water quality, particularly with reference to perceived impacts on seagrass continues to be raised as an issue by the community.

Woodhouse (2001) provides a detailed synthesis of water quality monitoring undertaken until 2001 in previous studies which is summarised below:

- Water clarity is poor due to resuspension of sediments by wind action and possibly trawlers.
- Nutrient concentrations increased during low flow conditions which supported algal blooms.

- The lagoon has a poor flushing rate with a high retention of nutrients after rainfall.
- The channels, creeks and drains running into the lake sometimes contain sufficiently high nutrient concentrations to cause eutrophic conditions.
- During the dry season the lake has high salinity. During the wet season the lagoon is periodically eutrophic and under dissolved oxygen stress.
- pH is generally within acceptable levels.
- The lagoon was considered to be 'very poor', Oyster Channel 'poor' and Palmers Channel 'very poor' for aquatic ecosystem protection.
- After rainfall events pH is lower in the drains within the catchment particularly those flowing into Palmers Channel.
- Increased turbidity within the lagoon coincided with the opening of the prawn trawling season.
- Dissolved oxygen (DO) within monitored drains was generally low.

The *Wooloweyah Lagoon Condition Assessment* (White, 2009c) provided an understanding of the health of the lake at that time. In particular, the study explored turbidity and nutrient levels within the lagoon. Key findings of the study are summarised below:

- Turbidity within the lagoon was found to be highly variable however was often above the adopted trigger level (25 NTU) with an average of 45 NTU and 58% of all values above the trigger. However, during regular monitoring (outside rainfall events) turbidity was generally below the trigger value. Turbidity increased throughout the monitoring area between October and November and remained elevated throughout December. In terms of the catchment, turbidity was generally highest in the Middle Road Drain, Carrs Drain and the National Park.
- Results indicated that high turbidity was a function of wind and catchment runoff. Average turbidity was highest when the wind was from the south and south-east, which was also when average wind speed was highest. The impact of prawn trawling on turbidity was explored in the study. A water sample from behind a trawler had a value of 170 NTU (over six times the trigger level of 25 NTU) when other nearby sites had levels ranging between 19 and 36 NTU. An increase in turbidity between October and November was recorded which corresponded to increased trawler activity however also coincided with increased rainfall and increased turbidity of catchment runoff. Although viable turbidity data was not collected during the whole trawling season (as the logger was removed for maintenance), the study concluded that while prawn trawling may have some impact on the turbidity within the lagoon it was not significant in comparison to the effect of wind-induced waves. Any change in turbidity due to trawling alone was not identified due to the combination of conditions at the time (trawling coinciding with high rainfall). The causes of high turbidity should be assessed further.
- Nutrient concentrations within the lagoon were variable with most nutrients generally below trigger values. Total nitrogen, ammonia and nitrite were often above trigger values which is attributed to catchment runoff.
- Within the catchment, nutrient concentrations were highest in Palmers Channel and the drains (Middle Road and Carrs Drain) which discharge into it. Although concentrations in Carrs Drain were high its relative contribution was questioned due its low discharge volume.
- Chlorophyll a concentrations were generally elevated throughout the lagoon however no algal blooms were evident during the study.
- ASS within the catchment did not appear to be negatively impacting water quality.

- Dissolved oxygen was generally acceptable except one low DO event recorded in Palmers Channel which was attributed to poor quality discharge from Middle Road Drain and Carrs Drain.

A study by EAL Consulting Service (2011) was conducted within the Clarence River including Wooloweyah Lagoon to examine water quality in response to the closure of the commercial prawn fishery. The study included 'snapshot' water quality sampling within Wooloweyah Lagoon and the key findings are summarised as follows:

- Turbidity within the lagoon was elevated and total dissolved solids were orders of magnitude higher than other sites within the Clarence river estuary.
- TN and TP exceeded trigger values.

Most recently, one site was located in Wooloweyah Lagoon for the Ecohealth assessment (Ryder *et al.*, 2014) as discussed above. It received an overall score of C (Fair) resulting from C+ (Fair-Good) for water quality and D+ (Poor-Fair) for riparian condition. Individual water quality parameters were not discussed in the report. The estuary health risk mapping (Dela-Cruz, *et al.*, 2019) suggests the following:

- Likely high loads of total nitrogen (TN) (kg/ha) from Palmers Island and Yamba sub-catchments.
- Likely elevated total phosphorous (TP) (kg/ha) from the Palmers Island sub-catchment.

The causes of high turbidity and other water quality issues in the lagoon should be confirmed as part of detailed CMP investigations for the Clarence River estuary.

Lake Cakora

The community considers poor water quality to be a significant issue within the lagoon (CVC, 2009).

Water quality data is briefly summarised in CVC (2017b) as follows:

- Water quality is influenced by catchment runoff, water depth, entrance conditions and the degree of tidal mixing.
- Low-lying domestic on-site wastewater management systems may potentially impact water quality within Lake Cakora.
- Salinity ranges from that of seawater (35 ppt) to freshwater (0 ppt).
- Temperature fluctuates seasonally ranging from 10°C in winter to 35°C in summer, however, is also influenced by water depth.

Lake Cakora was included in the Ecohealth assessment (Ryder *et al.*, 2014) and scored an overall score of D (Poor). Water quality sampling found that TN and bioavailable nitrogen consistently exceeded adopted trigger values. Although TP levels were low, soluble reactive phosphorous consistently exceeded the trigger value. pH was highly variable, dropping below the lower trigger value on one occasion. The estuary health risk mapping (Dela-Cruz *et al.*, 2019) suggests there are likely very high TN and TP loads from the south-east of the catchment. In addition, the community perceives water quality to be poor at times due to periodic tannin-stained water.

Sandon River

No long-term water quality monitoring has been undertaken within the Sandon River estuary catchment. GHD (2011) describes water quality within the estuary based on two small (1997 and 1999/2000) water quality studies and a snapshot of water quality in 2010. Discussion from GHD (2011) is summarised as follows:

- Turbidity within the estuary is generally low although is elevated during periods of high flow.

- The entrance channel, mid reach of Toubaal Creek and upper reach of the Sandon River estuary are dominated by the ingress of marine water. Salinity decreases with distance upstream from the lower estuary.
- pH is within the expected range with the upper estuary typically having a lower pH due to freshwater input and increasing downstream as marine water influences increase. The degree of mixing (fresh-marine water) is the greatest driver of pH within the estuary.
- DO within the estuary appears to be typically below guideline values. However, GHD (2011) assumed that the levels recorded are within the natural range for the estuary. DO gradually decreased with distance upstream.
- Relatively low concentration of TN. Conversely, TP was typically elevated above trigger values.
- Faecal coliforms were elevated during the 1999/2000 sampling period. Septic systems were considered to be the source.
- Water quality was not expected to deteriorate further into the future given the relatively natural condition of the majority of the catchment. However, climate change may impact water quality.

The Ecohealth assessment (Ryder *et al.*, 2014) included two sites within the Sandon River system, one in the lower estuary and one in the upper estuary. The overall site scores were C+ (Fair-Good) and C- (Fair-Poor) respectively. TN exceeded adopted trigger values in all samples at the upper estuary site and 50% of the sampling period in the lower estuary. Bioavailable nitrogen was below the trigger value on all occasions in the upper estuary however it was consistently exceeded in the lower estuary. Although TP was low, soluble reactive phosphorous was high in all samples. Turbidity and pH were consistently within the expected range.

The estuary health risk mapping (Dela-Cruz *et al.*, 2019) suggests there are likely slightly elevated TN loads from south-west of the catchment and low TP loads throughout the catchment.

Wooli Wooli River

WBM (2006) provides an analysis of water quality data from the Wooli Wooli River collected in the early 2000s from a number of sources:

- There is some evidence of elevated faecal coliforms within the estuary however data are limited and available data is questionable.
- Chlorophyll a concentration increases after rainfall however due the undeveloped nature of the catchment is considered to be a natural response.
- Nutrient data is limited.
- Salinity monitoring indicates it is a well-mixed estuary. The upper estuary has a low tidal flushing capacity however within the lower estuary the ocean is pushed into the estuary on every tide. The limit of flood tide incursion is about 6 km.

Two sites within the lower Wooli Wooli River estuary were monitored in the Beachwatch Partnership Program between 2002 and 2010 as discussed above. More recently, three sites within the Wooli Wooli River system were included in the Ecohealth assessment (Ryder *et al.*, 2014) in the lower, mid and upper estuary. Site scores were provided only for the lower site which scored a C- (Fair-Poor) for water quality. The water quality results are summarised below:

- Chlorophyll a was consistently low within the mid and upper estuary however had a relatively large range of values in the lower estuary and exceeded the trigger value several times.

- TN exceeded trigger values in 50% of samples for all three sites. There also appeared to be a slight longitudinal increase in values from upstream to downstream. Bioavailable nitrogen was also consistently high particularly in the lower estuary.
- TP exceeded the trigger value between 33 and 50% of samples, generally in the low flow period. Relatively high levels were recorded in the upper estuary. A longitudinal trend of increasing soluble reactive phosphorous (bioavailable) upstream to downstream was evident.
- pH increased longitudinally upstream to downstream. Trigger values were exceeded at all sites and values fell below the lower trigger value at the mid and upper sites.
- Turbidity increased longitudinally upstream to downstream. Turbidity trigger values were exceeded on all occasions at the lower estuary site, several times at the mid site and once at the upper site.

The estuary health risk mapping (Dela-Cruz *et al.*, 2019) suggests the following:

- Likely slightly elevated TN in the northern Bookram Creek catchment and southern areas of the catchment.
- Likely high TN loads from the Wooli township catchment.
- Likely high TP loads from the far south of the catchment.

Water quality monitoring has previously also been undertaken by oyster growers.

Freshwater lakes

There is no recent ecosystem health data available for Lake Hiawatha or Minnie Water. However, the water quality of drinking water extracted from both lakes is regularly monitored for drinking water quality. Lawrence (2020) provides drinking water quality monitoring results (post-chlorination) from the lakes for period 2014-19. Water from both sources consistently met drinking water guideline values for the parameters tested (including metals, pH, turbidity, *Escherichia coli*, total coliforms).

Sources/causes of poor water quality

The following causes of poor water quality have been identified within the study area.

Urban wastewater management

Within the study area, CVC operates centralised sewerage collection and treatment systems at Yamba (servicing Yamba, Angourie, Wooloweyah and Oyster Channel) and Iluka (constructed in 2013). Yamba and Iluka discharge treated effluent at an ebb-tide release in the Clarence River entrance (all water clears the entrance on the outgoing tide). The Iluka release was completed in 2013 however has never been used except for monthly testing. Iluka's effluent is effectively all re-used for irrigation of open space. The Yamba release was completed in 2016.

The ebb-tide release allowed CVC to cease discharge of treated effluent to Wooloweyah Lagoon (via a non-defined creek on private land to the south-west of the Yamba STP). CVC is also planning for reuse of treated effluent for irrigation of open space in Yamba and Iluka. Wastewater from all other villages within the study area and National Park campgrounds is managed using on-site wastewater management systems. CVC's *On-site Wastewater Management Strategy* (CVC, 2019) includes risk assessment and monitoring activities. The CVC sewerage systems are shown in Figure 14 and private land serviced by on-site wastewater management systems within the study area are shown on Figure 15. Systems located within National Park areas (such as picnic areas and campgrounds) are not shown as data was unavailable.

Discharges of sewage effluent from on-site wastewater management systems is identified as a regional priority threat in the *Threat and Risk Assessment (TARA) for the Marine Estate* (BMT WBM, 2017). Overflow from on-site wastewater management systems has been identified as an issue within the Wooli Wooli River

catchment (WBM, 2006) and Lake Cakora (SMEC, 2017). Intermittent flooding of on-site wastewater management system disposal fields adjacent to Lake Cakra may also increase associated impacts. On-site wastewater management systems (within the village and/or the campground and cottages) were identified as the potential source of elevated faecal coliform counts within the Sandon River estuary (GHD, 2011). GHD (2011) also noted that the risk to water quality from on-site wastewater management systems in the Sandon River estuary is likely to increase into the future due to climate change, further degraded systems and more intensive use. On-site wastewater management systems at Sandon River campground have since been upgraded.

Diffuse sources

Key diffuse sources of water pollution include:

- Agricultural diffuse source runoff (BMT WBM, 2017) key state-wide threat and regional priority threat) - large areas of the Wooloweyah catchment are under agriculture, mainly grazing and sugarcane. White (2009) identified the areas of poorest water quality (turbidity and nutrients) were associated with sugar cane drains and Taloumbi drain, which drain areas of sugarcane and grazing.
- Urban stormwater (BMT WBM, 2017) key state-wide threat and regional priority threat) - urban stormwater discharges into the study area from all urban areas within the study area including Yamba, Wooloweyah, Angourie, Brooms Head, Minnie Water and Wooli. Stormwater runoff from the Sandon and Diggers Camp villages is considered to be minimal. Stormwater runoff pollution was identified as an issue within the Wooli Wooli River estuary and Lake Cakora (WBM, 2006; SMEC, 2013; SMEC, 2017). Woodhouse (2001) also identified urban areas within the Wooloweyah Lagoon catchment as a non-point source of pollution to the lagoon. The risks of urban runoff impacting water quality within the Wooloweyah Lagoon may increase into the future with urban expansion within the catchment (e.g. at West Yamba Urban Release Area, Gulmarrad, James Creek).
- Hydrological modification of wetlands including drainage (BMT WBM, 2017) key state-wide threat and regional priority threat) - the installation of levees, floodgates and weirs resulting in export of acidity, low dissolved oxygen particularly after flood events (blackwater), metals including iron and aluminium, nutrients and bacterial contamination either by groundwater flow or surface runoff. Large areas of the floodplain within the Wooloweyah Lagoon catchment are artificially drained (refer Section 4.3.3).
- Amplification of the effects of poor flushing. The entrance condition of estuaries and ICOLLs, in particular, can contribute to reduced flushing times and eutrophication. The condition of the Lake Cakora entrance influences water quality in the estuary.
- Wind waves were identified as a significant cause of turbidity in Wooloweyah Lagoon (White, 2009).
- Trawlers cause temporary localised increases in turbidity within Wooloweyah Lagoon (White, 2009).

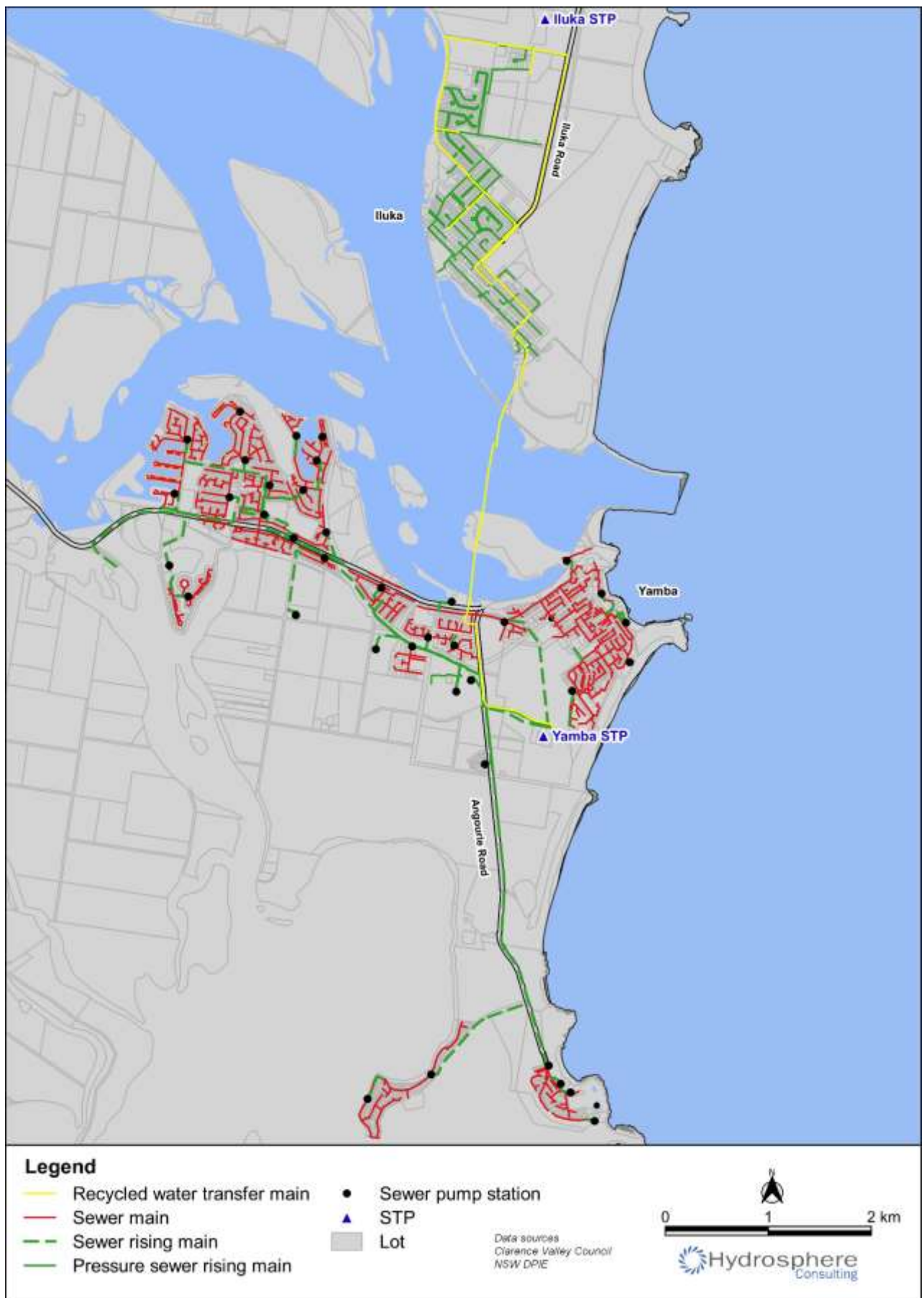


Figure 14: CVC sewerage systems

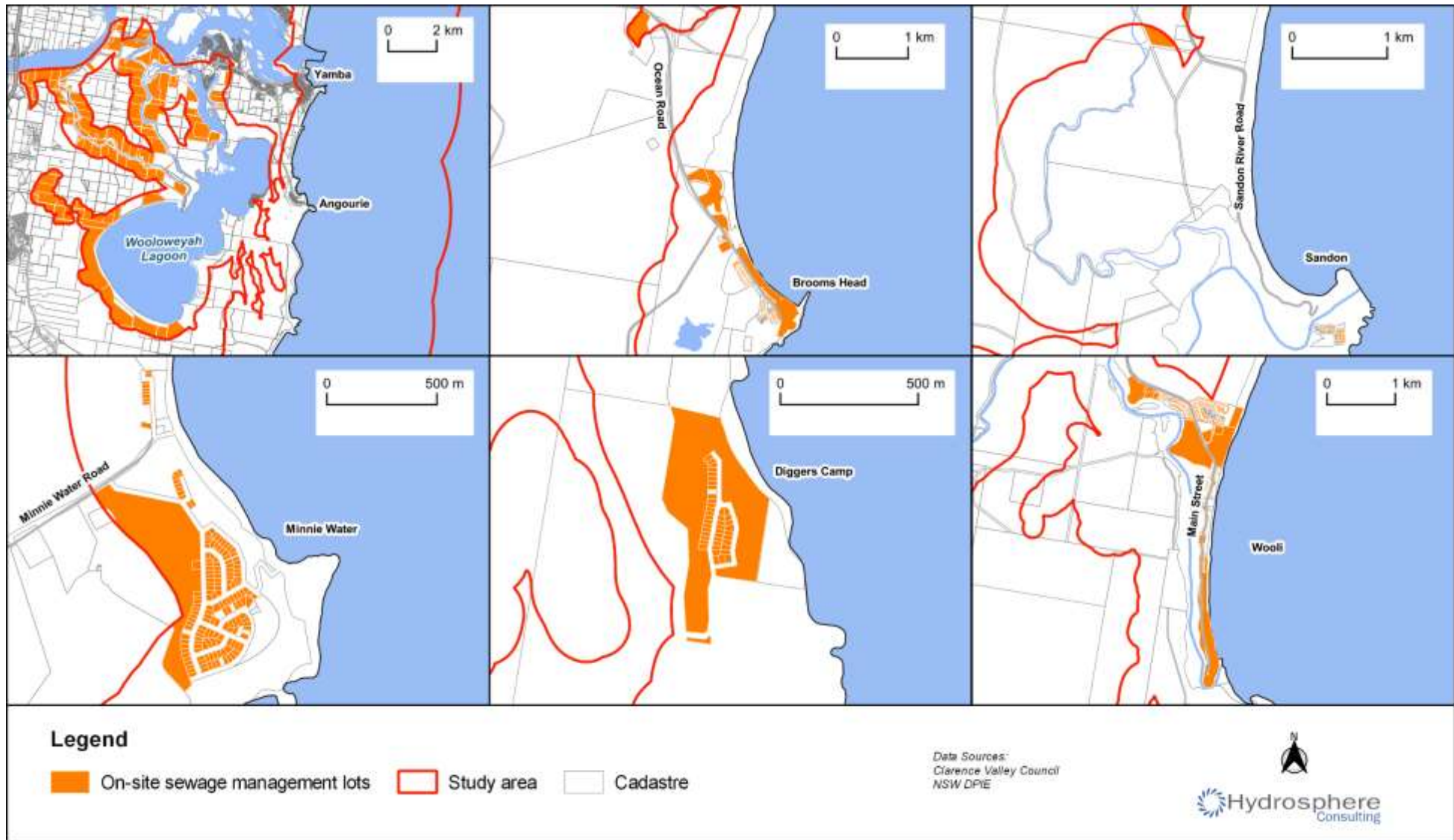


Figure 15: Lots serviced by on-site sewage management systems within the study area

4.3.5 Ecology

Wooloweyah Lagoon

Woodhouse (2001) provides detailed discussion on the ecological characteristics and values of the lagoon.

Wooloweyah Lagoon is listed under the Directory of Important Wetlands as a nationally important wetland as (Department of Agriculture, Water and the Environment, 2019):

- It is a good example of a wetland type occurring within a biogeographic region in Australia.
- It is a wetland which is important as the habitat for animal taxa at a vulnerable stage in their life cycles, or provides a refuge when adverse conditions such as drought prevail.
- The wetland supports native plant or animal taxa or communities which are considered endangered or vulnerable at the national level.

Notable ecological features of the lagoon include (Department of Agriculture, Water and the Environment, 2019):

- Supporting large areas of seagrass, mangroves and saltmarsh (based on findings of West *et al.* (1985)). Estuarine macrophyte mapping undertaken in 2009 is discussed below.
- Important habitat for many species of migratory waders.
- An important habitat for many commercial fish species.
- A large number of threatened fauna species have been recorded in the lagoon.

Threats to the lagoon include (Department of Agriculture, Water and the Environment, 2019):

- Flood mitigation and localised dredging.
- Urban and resort development in the lagoon catchment.
- Agriculture and grazing in the catchment.
- ASS.
- Trawling and aquaculture.

Estuarine macrophytes

Estuarine macrophytes include seagrass, mangroves and saltmarsh. These vegetation types provide habitat and perform a range of essential ecosystem functions and are an important part of any healthy estuarine environment. Mapping to determine the extent of estuarine macrophytes was last undertaken across NSW by Creese *et al.*, (2009) with the survey undertaken in 2004. Areas of seagrass within each estuary in the study area are presented in Table 4 and discussed below.

- At the time of mapping, the Wooloweyah Lagoon catchment and associated channels had the largest areas of mangroves, saltmarsh and seagrass within the study area. Large areas of mangroves and saltmarsh were present on the southern section of Micalo Island, Thorny island, Joss Island and other islands associated with the flood tide delta at the northern end of the lagoon. A strip of mangrove also bordered the west and south-west of the lagoon. Two seagrass species (*Zostera capricorni* and *Halophila ovalis*) were recorded with the distribution restricted to the north-east corner of the lagoon. Seagrass in Wooloweyah is discussed further below.
- No macrophytes were recorded in Lake Arragan.
- No mangroves or seagrass were mapped in Lake Cakora however relative to the size of the estuary a large area of saltmarsh was present.

- Areas of mangrove and saltmarsh are present throughout the mid Sandon River estuary. *Z. capricorni* was present in the lower estuary with a large meadow in lower Toumbaal Creek.
- Woolli Woolli River supported large areas of mangroves and saltmarsh in its middle reaches with only small areas mapped in the lower estuary. *Z. capricorni* appeared to be scattered relatively consistently along both sides of the main channel from the entrance to just upstream of the township.

Table 4: Area of estuarine macrophytes within the study area (2004)

Waterway	Mangrove (ha)	Saltmarsh (ha)	Seagrass (ha)
Wooloweyah Lagoon (and associated channels)	213	158	18
Lake Cakora	0	13	0
Sandon River	57	48	9
Woolli Woolli River	86	67	9
Total	357	285	36

Source: Derived from NSW DPI (2009) mapping (survey and mapping from 2004)

MEMA (2017) compared the most recent estuarine macrophyte mapping (NSW DPI, 2009) to historic mapping (1985) across NSW estuaries and found that saltmarsh, mangrove and seagrass areas had increased across this timeframe in the Sandon and Woolli Woolli River estuaries. Saltmarsh and mangroves had also increased within the Clarence River estuary however seagrass was found to be variable (Wooloweyah Lagoon was not assessed separately).

There is anecdotal evidence to suggest that seagrass has been in decline in the Sandon River estuary in recent years particularly in Toumbaal Creek (pers. comm., D. Greenhalgh). GHD (2011) explored changes in seagrass distribution within the estuary reporting that West *et al.* (1985) estimated the total area of seagrass to be approximately 0.028 km² and Kuster (1997) mapped approximately 0.098 km² in 1997 suggesting an increase in this period. NSW DPI (2006) mapped approximately 0.086 km² in 2006 suggesting a decrease between 1997 and 2006. GHD (2011) noted the decrease could be due to wet weather in 1999 and some variation could be due to different survey techniques and data sources. No seagrass mapping has been undertaken in the estuary since NSW DPI (2006) and therefore any changes since this time cannot be quantified.

An apparent decline in seagrass, particularly within Wooloweyah Lagoon, has been raised as an issue by the community with numerous responses and submissions expressing concern (refer Section 3.2). The issue has a long history. Woodhouse (2001) reports that West, *et al.* (1985) and Creighton (1985) both documented reported loss of seagrasses, with the Oyster Channel supporting one of the largest belts of seagrass in the Clarence at the time. Parker (1999) reported a 60% loss of seagrass beds since the 1940s (when aerial photography was first available) from the main Clarence River channel and from Oyster Channel. Seagrass decline within the lagoon was again raised by the community in local media in 2017 with further concerns in 2018 (Hourigan, 2018). More recently the issue was also raised with the CEMC which is in discussion with researchers at Southern Cross University regarding studies to assess seagrass changes in Wooloweyah Lagoon. The scope and extent of the studies are still being developed.

A brief review of historic seagrass distribution within Wooloweyah Lagoon indicates that seagrass was widely distributed in the lagoon in 1999 as presented in Figure 16. Although the mapping appears to be low resolution it suggests that seagrass was widespread in the lagoon at the time. Howland (1998) reported that the north-eastern end of the lagoon contains large areas of continuous seagrass. Four species had been recorded within the lagoon and associated channels including *Z. capricorni*, *Ruppia spiralis*, *Halophila ovalis* and *Halodule uninervis* (Woodhouse, 2001). Mapping by NSW DPI (2006) indicates that seagrass

distribution in the lagoon was restricted to the far north-east portion of the lagoon in 2006 (Figure 17). No other mapping or studies of seagrass in the lagoon have been undertaken since this time however anecdotal reports suggest that seagrass has been at very low levels/non-existent in the lagoon over recent years. Within the broader Clarence River estuary an 80% decline in seagrass areas between 1940 and 1986 was recorded by Umwelt (2003) with a decline of 46-52% between 1983 and 2004 (Williams et al., 2006).

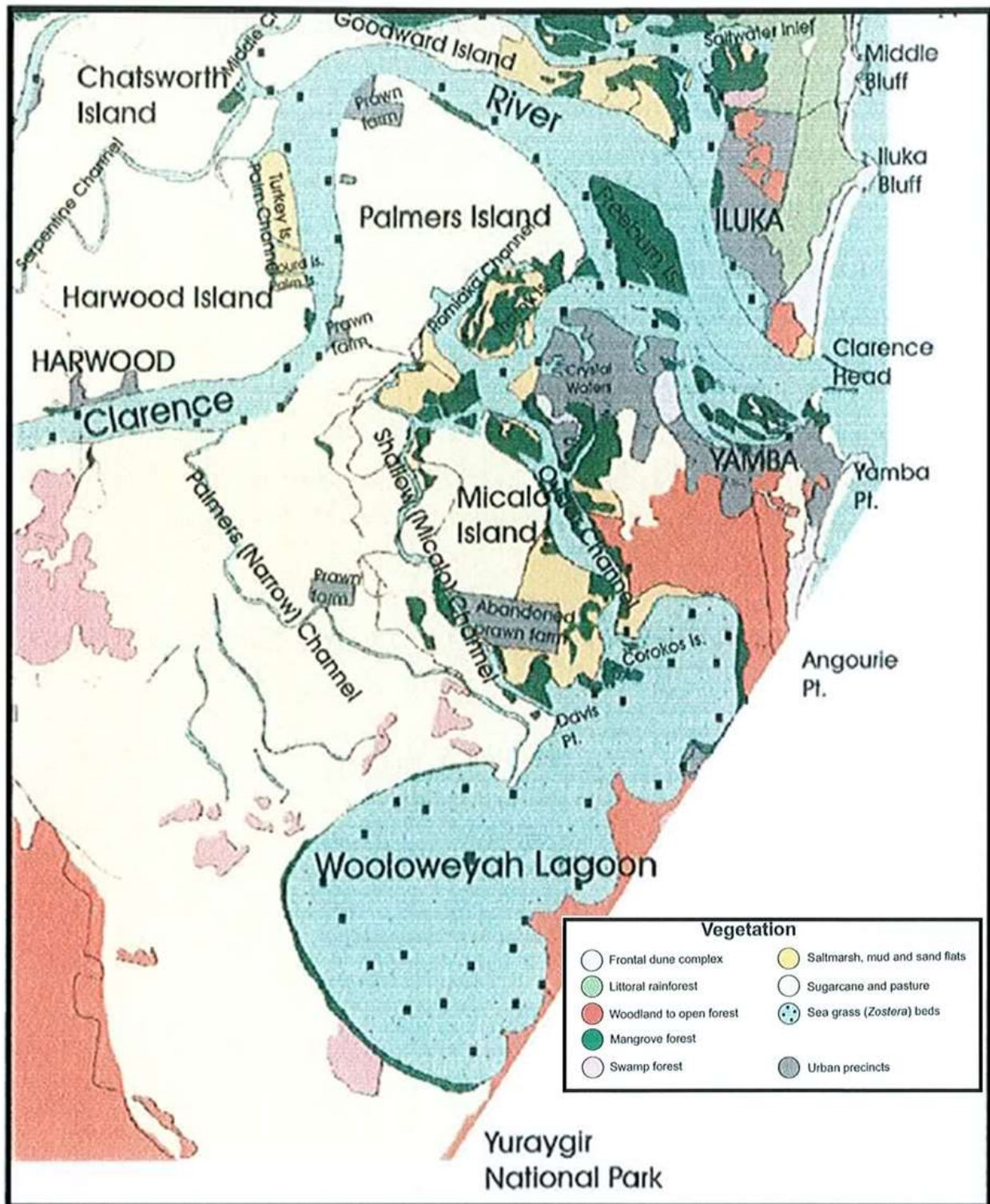


Figure 16: 1999 vegetation map of Wooloweyah Lagoon showing seagrass distribution within the lagoon

Source: Woodhouse (2001)



Figure 17: NSW DPI (2009) seagrass mapping in Wooloweyah Lagoon – survey and mapping undertaken in 2004

Seagrass growth and distribution is influenced by a multitude of factors. In the Northern Rivers region, the major factor affecting seagrass growth is typically weather events which exhibit a range of growth-limiting mechanisms. Wet season events bring increased turbidity (reduction in light), scouring through strong currents and sedimentation (smothering of seagrass beds). These high rainfall events generally occur in the summer months reducing seagrass growth and distribution. In winter, cold water temperatures are common which can lead to a reduction in productivity causing winter die back of seagrass. Anthropogenic impacts such as reduced water quality, dredging, vessel damage, land reclamation, built structures and smaller scale impacts such as trampling also influence seagrass growth.

Within Wooloweyah Lagoon specifically, several theories on the loss of seagrass have been documented. Woodhouse (2001) reported that the operation of trawlers and nets in the shallow depths of the lagoon causes high mixing and disturbance to the bottom habitats such as seagrass beds and sediments, resulting in increased turbidity. The Healthy River Commission of NSW (1999a) conceded that the issue of trawler impacts on the lagoon including seagrass was a matter of some debate. It suggested that seagrass changes in Wooloweyah Lagoon could be the result of episodic prawn trawling in the lake, natural growth cycle of

some seagrass species or increased water turbidity and is most likely to be a combination of these and other factors. Further, Woodhouse (2001) suggests that fishers had identified that flood mitigation within the catchment had increased sedimentation and associated turbidity problems within the lagoon leading to a loss of seagrass. White (2009a) added to the discussion suggesting that if any decrease in seagrass within the lagoon has occurred it could potentially be due to reduced flushing of the lagoon and the associated nutrient increase. White (2009c) undertook water quality monitoring within the lagoon (Section 4.3.4) which investigated the impact of trawlers on turbidity in the lagoon. It was concluded that monitoring of turbidity did not show any evidence of trawling significantly increasing long-term turbidity within the lagoon. The causes of high turbidity and loss of seagrass should be assessed further.

Coastline and Coastal Waters

The Clarence Valley coastline is comprised predominantly of sandy beaches and associated dune systems with rocky headlands and intertidal rock platforms. These habitats support a wide range of flora and fauna.

The coastline within the study area north of the Clarence River estuary is primarily located within Bundjalung National Park and Iluka Nature Reserve. Vegetation of Bundjalung National Park within the coastal zone is predominantly coastal heathland communities consisting of both wet and dry heath. This vegetation occurs on the sand ridges and plains backing the beach and are interspersed with swamps (particularly behind Shark Bay/Ten Mile Beach north of Iluka Road). Sand dunes support dune complex vegetation species. A large area of remnant subtropical littoral rainforest occurs within the Iluka Nature Reserve (part of the Gondwana Rainforests of Australia World Heritage Area), the largest remaining stand in NSW. The vegetation within this area supports a diverse range of fauna species with over 280 species of reptiles, birds and mammals, including threatened species known to occur within Bundjalung National Park (NPWS, 1997).

South of Yamba the land adjacent to the coastline is primarily located within Yuraygir National Park (except for the villages). The eastern portion of the northern and central sections of the Park are dominated by heathlands, consisting of dry, wet and graminoid clay heath of various associations, with minor occurrences of sedgeland, melaleuca woodlands and eucalypt forest. The southern section of the park is dominated by wet heathland and sedgeland communities, melaleuca woodlands and eucalypt forest. The diversity of vegetation features within Yuraygir National Park provides a broad range of habitats supporting an extensive variety of fauna species including (NPWS, 2003):

- 180 bird species including numerous threatened species.
- Numerous threatened mammal species.
- Significant amphibian and reptile species.

Waters along the coast from the Sandon River estuary south (including Sandon River and Wooli Wooli River estuaries) are within the SIMP. This marine park encompasses a diverse range of habitats including estuaries, sandy beaches, intertidal rocky shores, sub-tidal reefs, open oceans and rocky offshore islands. These habitats within the SIMP support more than 530 reef fish, 90 hard coral, 700 mollusc species, crustaceans, echinoderms, marine worms, 35 shark and ray species, 30 marine mammal species, marine reptiles and over 120 coastal and marine bird species.

Northern NSW beaches provide potential nesting habitat for two threatened marine turtle species, Green Turtle (*Chelonia mydas*) and Loggerhead Turtle (*Caretta caretta*). Both species of marine turtle require open sandy beaches to lay eggs with sand temperatures between 25 - 33°C to successfully hatch. In southern Queensland and northern NSW, the breeding seasons occur from October to March for *C. caretta* and from October to May for *C. mydas*. Both species, but more commonly Green turtles, are known to nest on several beaches along the Clarence Valley coastline (pers. comm., John Kennedy). Nesting events on northern NSW beaches are becoming more frequent suggesting NSW beaches may play an increasingly important role as climate refugia (DPIE, 2020a).

Specific threats to marine turtles nesting on beaches within the study area include:

- 4WDs and motor bikes traversing the beach above the high tide mark directly impacting nests. Wheel ruts from vehicles traversing the intertidal zones also impact hatchlings by hampering their route to the ocean increasing their susceptibility to predation.
- Predation of nests and hatchlings by foxes, cats, dogs and pigs.
- Human interference.

Other more general threats to nesting marine turtles include:

- Increased temperatures, sea level and extreme weather events from climate change.
- Artificial light impacting hatchling behaviour and survival.
- Natural predation and weather events.

Humpback and Southern Right whales are the two most common whale species along the NSW coast including the Clarence Valley coastline. These species migrate north from Antarctic waters during autumn to warmer tropical winter breeding and calving grounds before migrating back south again in spring. Whales are often seen along the Clarence Valley coastline, typically between May and October however this may vary year to year. Whale numbers along the coast have steadily increased since the cessation of whaling in the 1970s.

Although increased whale activity is a positive ecological and tourism outcome, increased whale numbers is likely to result in an increased number of whale carcasses washing ashore along the coastline on beaches. The management of whale carcasses on beaches was an issue raised by NPWS and CVC for this study. During October/November 2020, NPWS was required to remove a whale carcass from Shark Bay with high costs and challenges associated with removing and disposing of the whale carcass.

DPIE (2019a) undertook a review of the management of deceased whales in NSW and provided recommendations on how deceased whales should be managed, responsibilities and timeframes. This document provides guidance to land managers on how whale carcasses are to be managed in NSW. Key recommendations from DPIE (2019a) include:

- Land managers are responsible for the management of deceased whales on their land and the associated costs.
- Land managers should leave deceased whales to decompose naturally, unless the carcass is in an urban or high visitation area. In urban and high visitation areas the preferred management option is to remove deceased whales except where:
 - A beach is not accessible by the machinery needed to transport the carcass to landfill.
 - Removal would pose a high health and safety risk to responders.
- The Environment Protection Authority (EPA) seek approval from the Minister for Energy and Environment to commence a process to amend legislation to allow lawful exemption from the waste levy for land managers disposing of whale carcasses to landfill.

Shorebirds along the coastline can be grouped into two broad categories, migratory and resident species. Migratory shorebirds typically migrate large distances south from the northern hemisphere for the Australian spring-summer period. Resident shorebirds are relatively sedentary species living in the one area for the majority of their lifecycle (except for the juvenile dispersal stage).

Numerous migratory shorebird species utilise a range of habitats across the study area including ocean beaches, rocky headlands/platforms, sand and mudflats within the estuaries and lagoons and adjacent mangroves and saltmarsh. Habitats used vary between species and intent (roosting or foraging) however the majority of these coastal habitats are used at some stage by migratory shorebirds.

A number of resident shorebird species utilise habitat along the coastline and within estuaries including threatened species such as:

- Australian Pied Oystercatcher (*Haematopus longirostris*).
- Sooty Oystercatcher (*Haematopus fuliginosus*).
- Beach Stone Curlew (*Esacus magnirostris*).
- Little Tern (*Sterna albifrons*).

All four species forage, roost, nest and breed within the study area. Pied Oystercatcher typically forage within the intertidal zone on ocean beaches, however will also utilise estuarine environments. The species typically nests on coastal sandy beaches making a nest with a scrape in the sand above the high tide line. The Sooty Oystercatcher forages across rocky habitats and nests in similar locations to the Pied Oystercatcher. The Beach Stone Curlew forages in the intertidal zone on both open beaches and lower estuaries. They also nest above the high tide line on open beaches and lower estuaries. The Little Tern is a partly migratory species that utilises the NSW coastline for nesting and breeding. The species typically nests in the foredunes above the high tide mark on beaches usually within close proximity to estuary entrances or coastal lagoons.

The coastline between Evans Head and the Clarence River is considered to be a priority breeding habitat for the Pied Oystercatcher (DECCW, 2010). The Clarence River, Sandon River and Wooli Wooli River estuaries are considered to be priority locations for Beach Stone Curlews. Specific nesting areas of the species within the study area include lower Clarence River estuary (including Hickey Island), Angourie, Brooms Head to Sandon, Minnie Water, Diggers Camp, Wilsons Headland and Wooli (pers. comm. John Kennedy, 2020).

The nesting habits of these species make them particularly susceptible to human induced impacts including impacts from:

- Human disturbance particularly in high visitation areas.
- Dogs.
- Feral animals such as foxes.
- Recreational and commercial fishing and boat users.
- Vehicles on beaches.



Plate 5: Vehicle damage to coastal wetland in Yuraygir National Park

Source: D. Redman, NPWS

4.4 Coastal Processes and Hazards

The understanding of coastal hazards occurring along sections of the Clarence Valley coastline are discussed in the following sections. Bank erosion within the estuaries (the hazard of erosion and inundation of foreshores caused by tidal waters and the action of waves, including the interaction of those waters with catchment floodwaters) is discussed in Section 4.5.

4.4.1 Coastal Processes

The subtropical climate is a dominant factor in processes occurring within the ICOLLs and estuaries with seasonal changes in rainfall and evaporation influencing runoff, water levels and salinity within these systems. The ocean conditions and wave climate along the coastline is also influenced by short-term weather and longer-term climatic conditions. Coastal processes and influences on coastal processes occurring along the Clarence Valley coastline include:

- Wave direction – the dominant swell direction along the Clarence Valley coastline is from the east to south-east. There is a seasonal trend in wave direction with swells predominantly east-south-east during summer, shifting further south in autumn with dominant south-east to south-south-east during winter (Figure 18). The spectrum expands in spring with some winds coming from the north-east sector but is still predominately south-east. During summer, east to south-east swells are dominant. Typically, the largest swells come from the south-south-east with a small portion of larger swells from the north-east east during summer. These seasonal variations can cause embayment or beach rotation to occur.
- Wave height – the mean significant wave height recorded at Coffs Harbour is 1.58 m with mean wave heights peaking between March and April. Periodic weather events can result in large wave conditions that impact on shorelines.
- Wind – morning winds are typically light and from the west with stronger winds from the south occasionally. Afternoon winds are typified by stronger north-east and south-east winds. Winds influence aeolian transport of sand and local wave conditions.

- Sediment movement – the Clarence Valley coastline is a longshore drift coastline. Overall sediment movement (in a northerly direction) is influenced by the predominant swell direction (south-easterly). Longshore drift occurs within and between sediment compartments. There are other localised sediment movement, including on and offshore movements under different conditions and other localised anomalies.
- Weather patterns – the El Niño Southern Oscillation (ENSO) is responsible for influencing weather patterns on the east coast and subsequently is major driver of wave climate and associated coastal processes and conditions. The ENSO drives the El Niño/ La Niña weather cycles. Typically, El Niño events are associated with reduced storminess, weaker easterly trade winds and a generally more southerly wave climate. La Niña events are typified by the reverse characteristics, increased storminess, stronger trade winds and a more easterly wave.

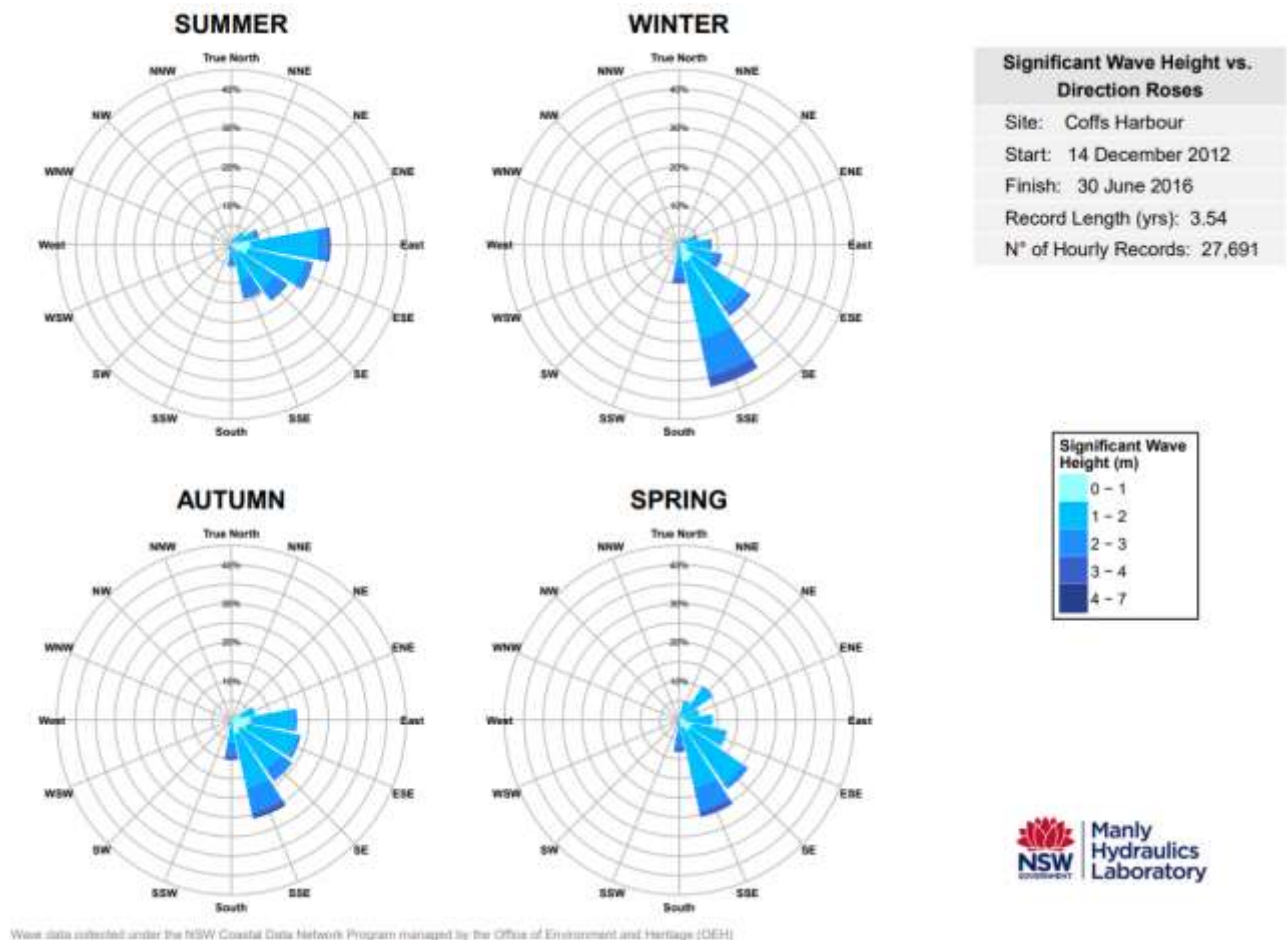


Figure 18: Seasonal wave trends at Coffs Harbour (2012-2016)

Source: Manly Hydraulic Laboratory - <https://www.mhl.nsw.gov.au/Station-COFHOW>

4.4.2 North of the Clarence River

Coastal processes north of the Clarence River have been studied extensively over the last 40 years:

- Walsh and Roy (1983) established the geology and coastal evolution of the coast.
- PWD (1993) undertook photogrammetric analysis of Woody Bay.
- Lord and Edwards (2000) completed a coastal processes and hazard definition study of Woody Head.

- Goodwin *et al.* (2006) established a sand budget and described the coastal evolution for the Iluka-Woody Bay coast.
- DECCW (2012) provides coastal processes and hazards information for Woody Bay.
- Doyle *et al.* (2019) provides updated recession rates for Woody Bay.

Goodwin *et al.* (2005) provides a synthesis of the processes occurring north of the entrance which is summarised as follows:

- The Iluka-Woody bay coastline is a progradational Holocene barrier. The coastline has prograded overall over the last 1,500 years however has experienced recession events within this timeframe.
- Sand is supplied to the beaches by longshore drift.
- Since 1942, the Iluka Beach compartment has prograded, at a shoreline sand supply rate of 10.3 m³/m/yr. Back Beach and Bluff Beach have remained stable during this time, indicating that the longshore drift has been maintained north of Iluka Bluff and anthropogenic factors associated with the Clarence River entrance are not considered to be a primary cause of the shoreline recession trend at Woody Bay.
- In the past 50 years, the north-east aspect shoreline has experienced a rapid recessional trend, which is associated with a shift in modal wave climate, to a more east-south-easterly direction, and a reduction in headland sand bypassing.

Beach erosion and shoreline recession are a significant concern at Woody Head/Woody Bay. NPWS and the community consider that beach erosion/shoreline recession is a major issue for the location with concerns regarding the impacts of the receding shoreline on the area of campground, safety and amenity issues around beach access and falling trees along Woody Bay and the eventual impact on the Woody Head access road and associated assets and services. CVC is also concerned about shoreline recession of Shark Bay and coastal inundation on Iluka Road at Shark Bay. Coastal hazards at Woody Head/Woody Bay were assessed by DECCW (2012) and are summarised below:

- Beach erosion – due to a lack of detailed photogrammetry a storm-bite erosion volume of 130 m³ was adopted for Woody Bay and Shark Bay.
- Shoreline recession - over the last 70 years, Woody Bay has experienced rapid and sustained shoreline recession. A rate of 1.74 m/yr was applied along Woody Bay.
- Sea level rise recession – estimates were made using the Bruun Rule and sea-level rise of 0.4 m and 0.9 m for 2050 and 2100 and recession was calculated at 40 m and 90 m for 2050 and 2100 respectively.

Coastal hazard lines were derived for Woody Bay and Shark Bay and are presented in Figure 19. The hazard lines show that the campground was within the immediate threat area with the campground access road (and associated services) and Iluka Road at Shark Bay at risk at the 2050 line. The hazard lines took into account the effect of rock revetment at the time however did not include the process of end wall effects which is likely to cause erosion both in and behind the seawall. The seawall in front of the camping ground has been extended since this time.

Coastal inundation and tidal inundation at Woody Head/Shark Bay have not been assessed.

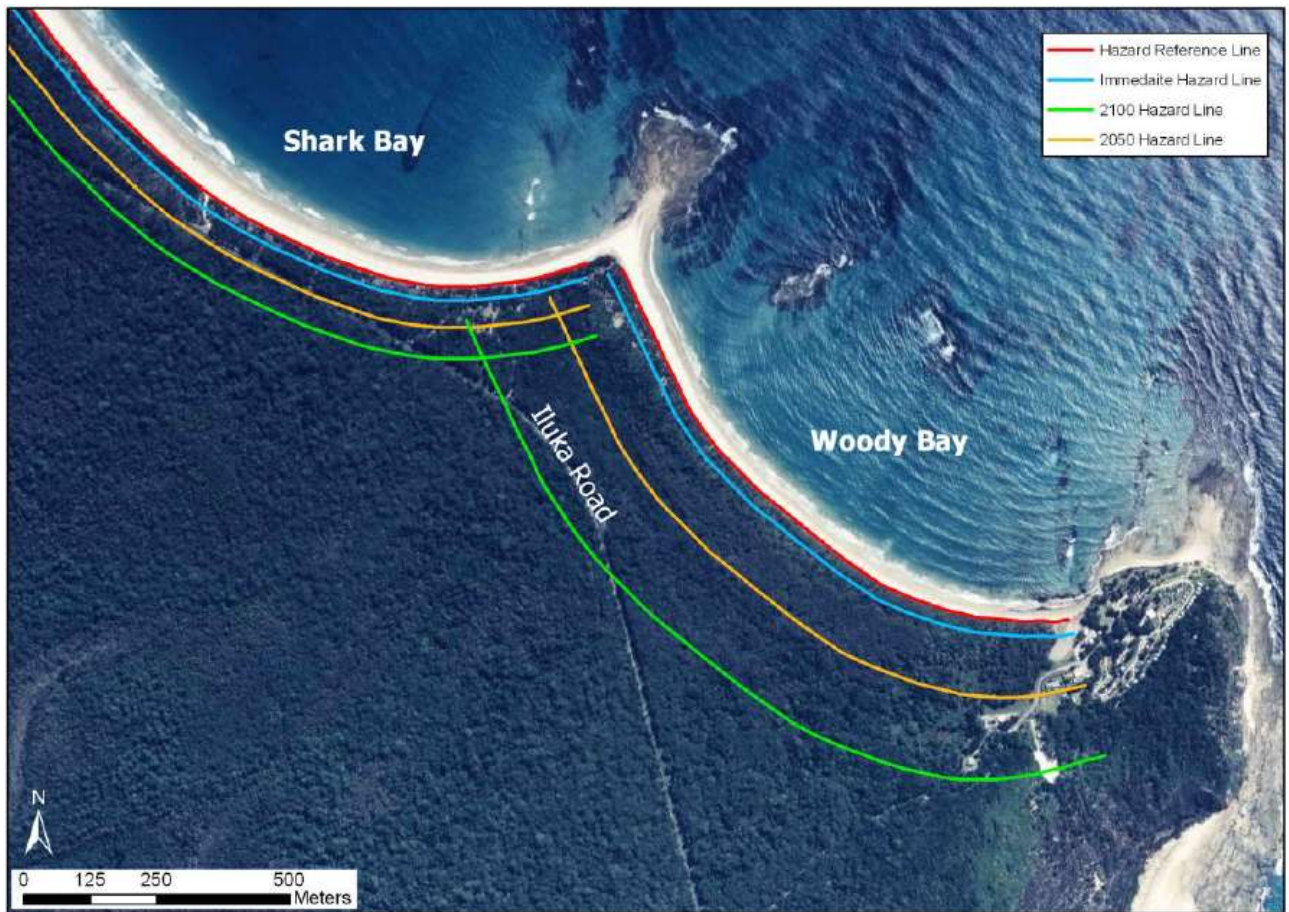


Figure 19: Coastal hazard lines for Woody Bay and Shark Bay

Source: DECCW (2012)

4.4.3 Clarence River entrance

The Clarence River entrance is stabilised with a southern breakwater from Yamba headland and another breakwater on the northern side at Iluka (Figure 20). The lower estuary is further stabilised with a number of other training and protection walls including along the foreshore at Yamba and Iluka, Middle Wall, Moriarty's Wall, Iluka, Freeburn and Goodwood Island training walls. The construction of these walls occurred over 100 years under various schemes with the last of the construction finishing in the late 1960s/early 1970s. The breakwaters have had maintenance works and slight adjustments undertaken over the last 50 years with latest work undertaken recently including the repair of damaged sections, upgrade of the face and surface of the breakwaters.

A bar exists around the entrance to the river formed and maintained by the ebb tide with its position determined by the equilibrium between off-shore transport of sand by the ebb tide and on-shore transport by wave action. A rock reef, recognised as a significant cultural site to the Yaegl Aboriginal community, consisting of hard sandstone controls water depths in the river downstream of Moriarty's Wall. The river mouth is subject to storms from a south-east direction which produce a northerly littoral sand drift. Swell from a north-east direction produces a smaller drift of sand towards the south (MHL, 1970). Prior to the construction of the training works, floods caused marked changes to the shape of the river entrance and location of navigable channels. Floods continue to play a major role in the exchange of sediment between the river and coast (PWD, 1984).

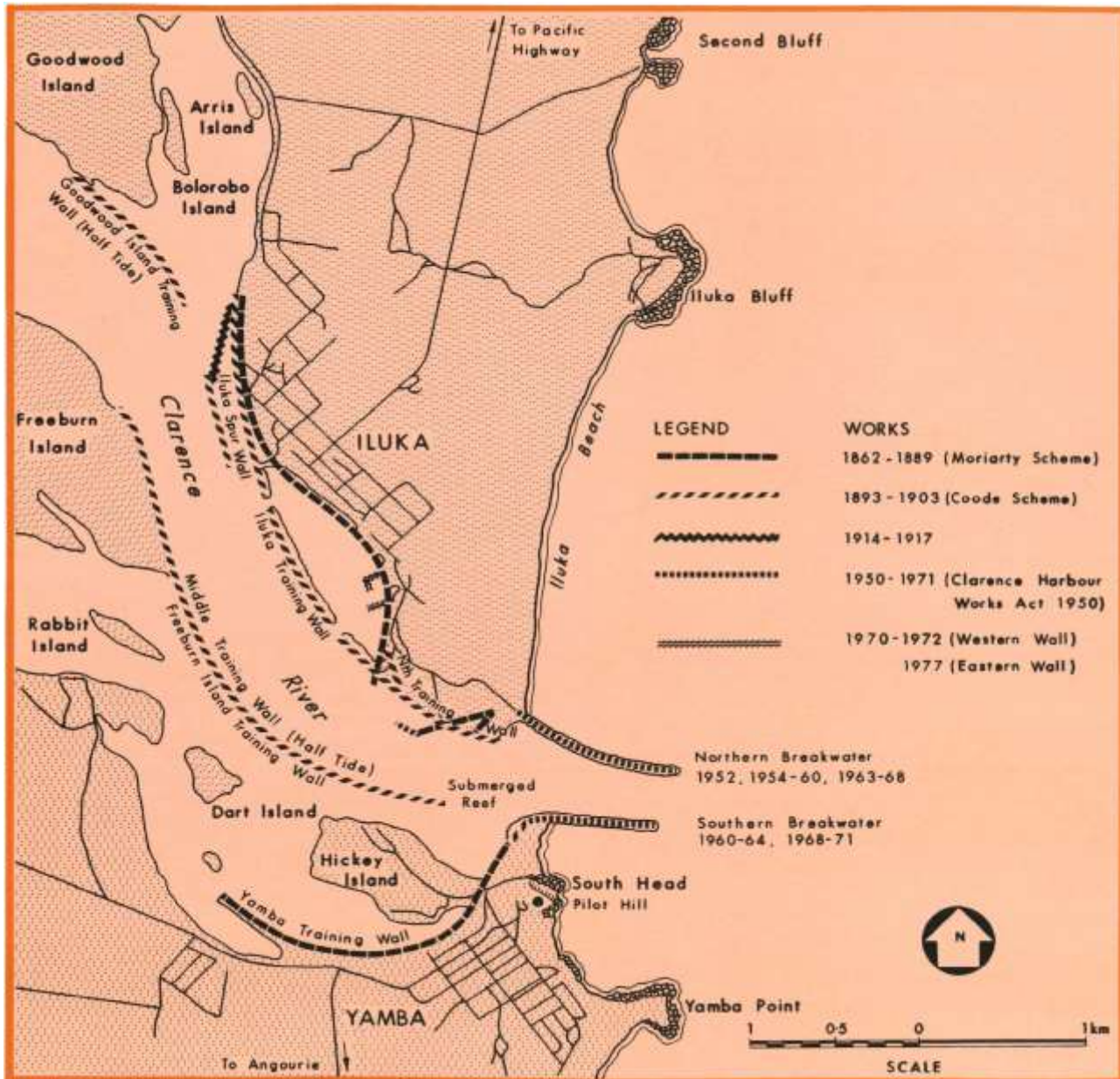


Figure 20: Construction history of Clarence River entrance training works

Source: PWD (1984)

4.4.4 Whiting Beach

Royal HaskoningDHV (2014) provides a detailed description of coastal processes occurring at Whiting Beach which is summarised as follows and conceptualised in Figure 21:

- Hickey Island/Whiting Beach formed in the 1920s in response to changes in tidal currents and sediment transport due to construction of training walls, particularly Middle Training Wall in the early 1900s. At this time sand transported north by longshore drift from Turners Beach would have supplied marine sand to the beach.
- The extension of the entrance breakwalls in the 1950s - 1970s significantly reduced the supply of marine sand into Whiting Beach. Since this time Whiting Beach has been receding primarily due to ocean swell wave action in combination with the reduced sand supply.



Figure 21: Conceptual sediment processes occurring at Whiting Beach

Source: Royal HaskoningDHV (2014)

Sand eroded from Whiting Beach by waves is transported by longshore processes in a north-westerly direction along the beach. The sand is then transported either to the ebb tidal delta or the sediment sink between Hickey and Dart Islands by tidal currents, or to the ebb tidal delta due to currents resulting from flood events.

Whiting Beach has a long history of beach erosion and shoreline recession. Erosion and recession have been an ongoing concern at this location for a number of reasons including the high recession rate, close proximity of services and infrastructure, loss of amenity and public access and hindered use of the popular beach. In response to concerns, CVC engaged Royal HaskoningDHV (2014) to undertake a detailed erosion processes study on Whiting Beach to gain a better understanding of the causes of erosion and recession at the beach. The study also provides projected shoreline positions and considers coastal inundation.

Key assumptions and outcomes are summarised below:

- Based on historical recession rates the future projections adopted a future rate of net sediment loss of 1.4m/year. The projected long-term recession in 2050 and 2100 (relative to 2013) is 52m and 122m respectively.
- Projections assume no erosion protection/mitigation (i.e. beach nourishment).
- Using the Bruun Rule and adopted sea level rise benchmarks of 0.4 m (2050) and 0.9 (2100) recession due to sea level rise was projected to be 6.6m in 2050 and 16.6m at 2100.
- Calculated combined recession of 59 m in 2050 and 139 m at 2100.

The projected recession based on the values above is illustrated in Figure 22. Royal HaskoningDHV (2014) note that the illustrated lines are simplistic ignoring the potential change in shape of the northern side of Hickey Island over time due to hydrodynamic feedback but is considered to be adequate for planning purposes. Based on these projections, it is evident that by 2050 most of the car park at Whiting Beach would have been lost as well as a section of Harbour Street. There would be a complete breakthrough to Yamba Bay by about 2070 (Royal HaskoningDHV, 2014).

Elevations of Whiting Beach/ Hickey Island are presented in Figure 23. Royal HaskoningDHV (2014) notes the following in relation to coastal inundation:

- Based on a present day 100-year ARI water level of 1.5 mAHd, areas in darker blue (at a level of 0.5 to 1.5 mAHd) are subject to inundation in extreme storms at present.
- With projected 100-year ARI water levels at 2050 and 2100 of 1.8 m and 2.3 m respectively, areas in light blue (at a level of 1.5 to 2.5 mAHd) would be expected to become subject to inundation in extreme storms in about 40 years.
- Given the position of the recession lines, it is evident that by about 2030 it is projected that water could flow over the neck of Hickey Island (at the south eastern corner of Whiting Beach) and through into Yamba Bay in extreme storms.

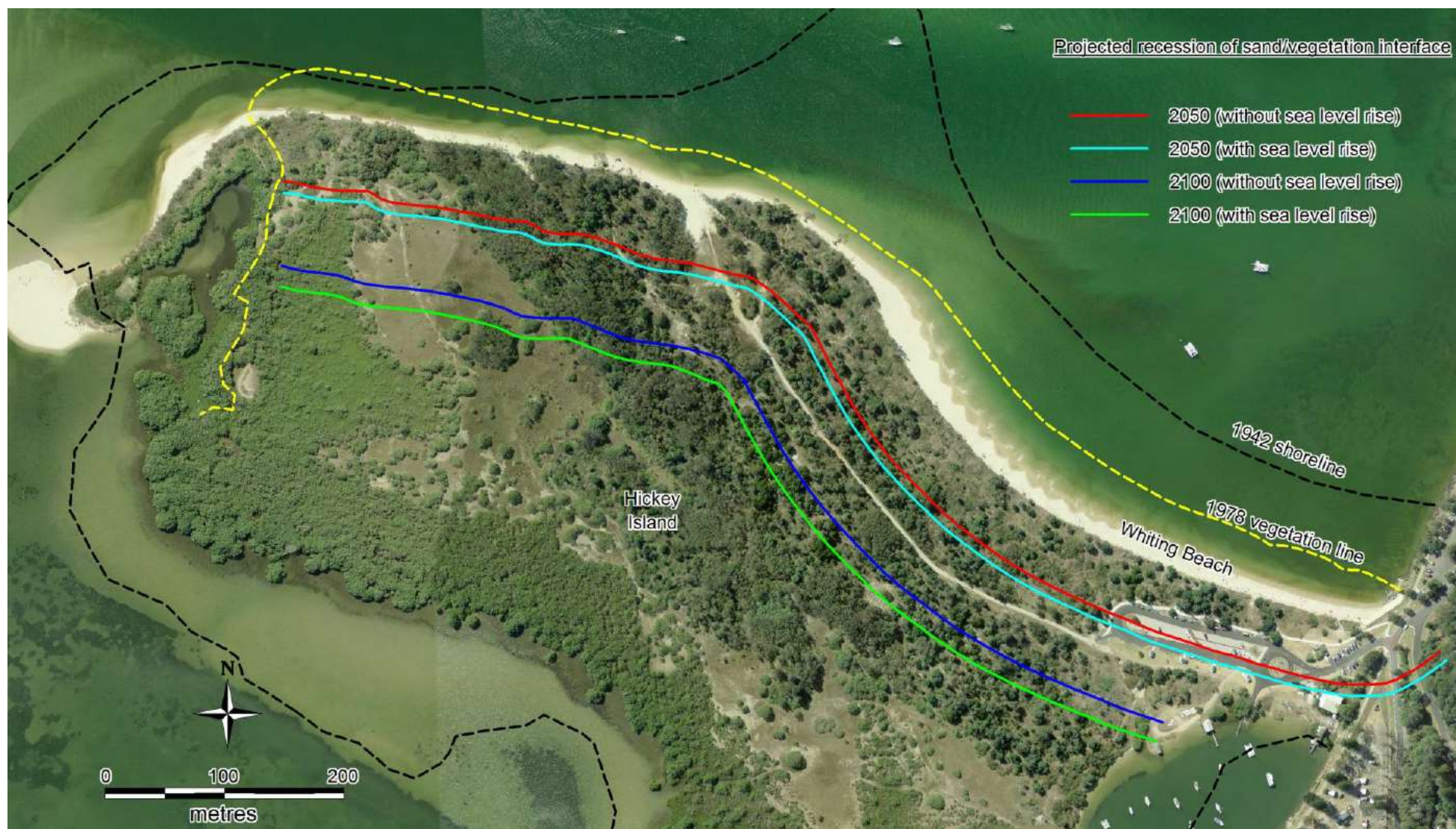


Figure 22: projected shoreline recession at Whiting Beach

Source: Royal HaskoningDHV (2014)

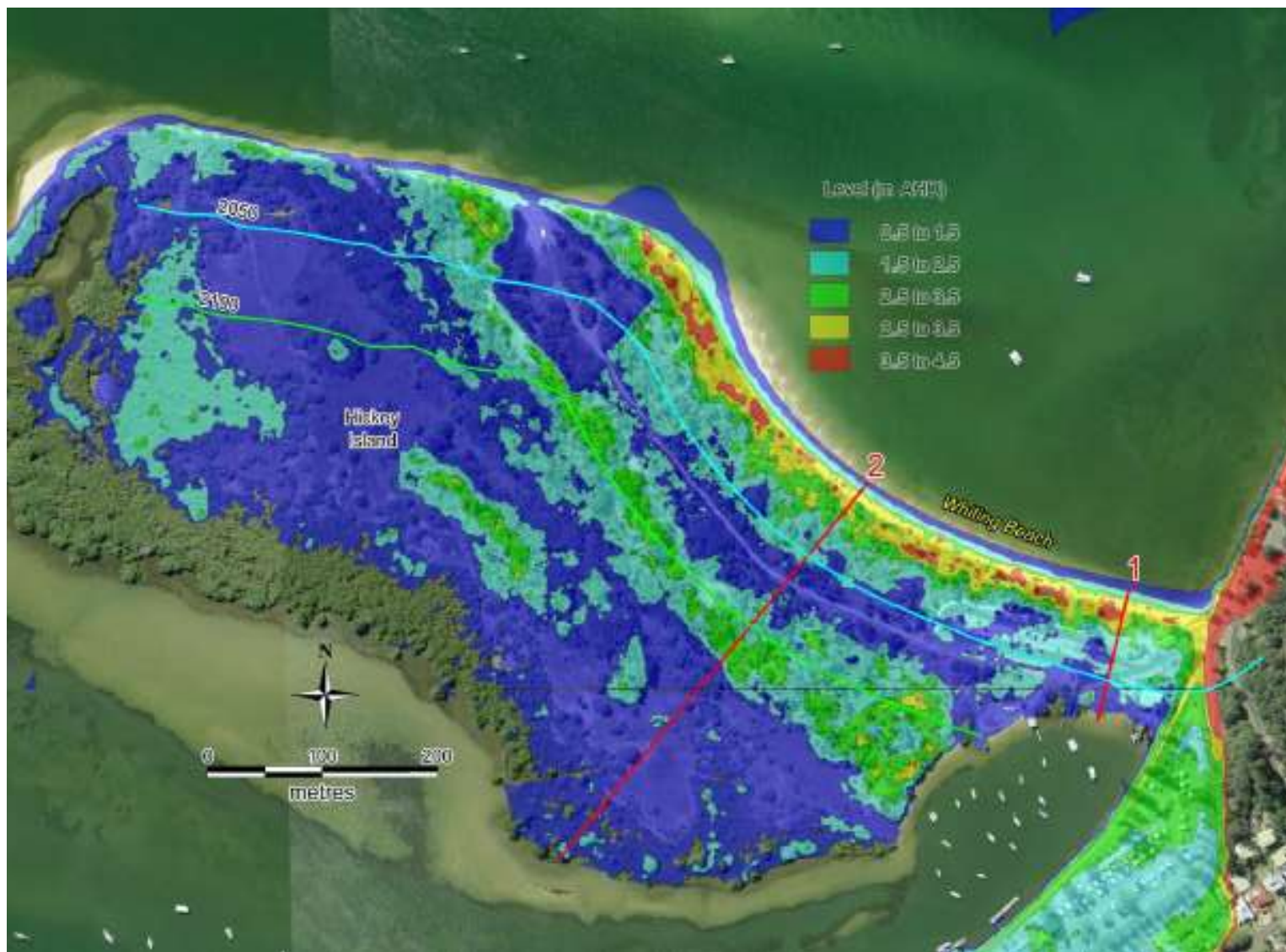


Figure 23: Hickey Island/Whiting Beach elevations

Source: Royal HaskoningDHV (2014)

4.4.5 Yamba beaches

A coastal hazard study of the Yamba coastline (Plate 6) including the northern end of Pippi Beach, Convent, Main and Turners Beaches was undertaken by MHL (2002). Key outcomes of the study are:

- Inundation was found to be a minimal threat except for the Yamba Surf Life Saving Club. Inundation of the club has occurred many times throughout history with the first documented reports from the 1940s. Inundation of the club continues to be an issue.
- Slope instability is the critical issue for the Yamba coastline particularly the areas backing Convent and Main Beach (discussed further below).
- No developments were located within the immediate threat area for Pippi, Convent or Turners Beaches. At Yamba Beach the immediate impact line is landward of the existing bitumen-rock revetment, which suggests that this structure would be subject to wave attack and toe scour during a storm.
- For the 50 and 100-year hazard lines the only structure affected is the Yamba Surf Life Saving Club.



1 – Turners Beach



2 – Yamba Main Beach



3 – Convent Beach



4 – Pippi Beach

Plate 6: Yamba beaches

Royal HaskoningDHV (2016) provides a detailed description of coastal processes occurring at Pippi Beach. A conceptual model of sediment processes is illustrated in Figure 24 and summarised below:

- Dominant swell and wind direction are both from the south-east.

- Only a small net northerly littoral drift is considered to occur along the shoreline.
- There is only a small supply of wind driven sand to Pippi Beach from Barri Beach.
- Sediment from the Clarence River is unlikely to influence Pippi Beach.
- High rates of accretion on the sub-aerial beach occurred in the northern corner of Pippi Beach since revegetation of the tombolo.
- Pippi Beach is considered to be a closed compartment with regard to longshore sediment transport, in that it does not supply significant volumes of sediment to adjacent embayments nor gets supplied with significant volumes of sediment from adjacent embayments.
- There is a low rate of recession evident along Pippi Beach.
- The annual longshore sediment transport rate at Yamba is in the order of 50,000 to 75,000 m³/yr.

In response to concerns about impacts of recent storms at the time and the potential erosion risk to a proposed footpath, Royal HaskoningDHV (2016) prepared a review of coastal hazards for Pippi Beach and Yamba Point. The review assessed beach erosion and dune instability, shoreline recession, coastal inundation and coastal cliff instability to delineate coastal hazard areas. Key assumptions and information from the study are summarised below.

- Beach erosion - a storm demand of 170 m³/m and scour and swash levels of -1 m AHD and 2 m AHD (respectively) were adopted for Pippi Beach.
- Shoreline recession – the estimated recession due to net sediment loss ranged between 0 and 0.15 m/year. The Bruun Rule was used to estimate sea level rise related recession which was calculated to be approximately 14 m at 2050 and 34 m at 2100.
- Coastal inundation – calculated runup levels for 2050 were 6.5 m AHD and 8.4 m AHD for the southern and northern ends of Pippi Beach respectively. Levels for 2100 were 7.0 m AHD (southern) and 8.4 m AHD (northern).
- Coastal cliff and bluff instability – this assessment was in relation to a proposed coastal path and existing informal tracks around Yamba Point. The majority of the geotechnical landslide hazards at this site result from the effects of coastal actions on the beach and dunes. The exceptions are the risks associated with instability of the moderately steep headland slopes on the northern side of Yamba Point and the potential for rock falls from underneath the path on the southern side of Yamba Point.

The coastal hazard lines derived for Pippi Beach by Royal HaskoningDHV (2016) are presented in Figure 25 and Figure 26. The hazard lines indicate that whilst the beach is expected to continue to erode and recede into the future, no significant natural or built assets have been identified as at risk within the immediate or 2050 timeframes.

The eastern slopes of Pilot Hill from Pilot Street at the back of Main Beach (Plate 7) have been subject to instability and landslides over a long period with early reports from the 1920s and 1950s and the most recent in 2011. Slope instability in the area has also been studied both on a broader area basis and site/development basis as documented in J&K (2000) and more recently in JK Geotechnics (2017). The area is divided into land risk zones (LRZ) with each LRZ defined by a landslide risk as follows (JK Geotechnics, 2017):

- LRZ1a (Pacific Hotel) had the highest landslide risk.
- LRZ1b (residential dwellings near the Pacific Hotel) also had a tolerable - unacceptable landslide risk.
- LRZ 1c (toe slope areas) was relatively low the probability of a landslide is still high.



Figure 24: Conceptual model of sediment processes at Pippi Beach

Source: Royal HaskoningDHV (2016)



Figure 25: Coastal hazard lines for Pippi Beach - north

Source: Data from Royal HaskoningDHV (2016)

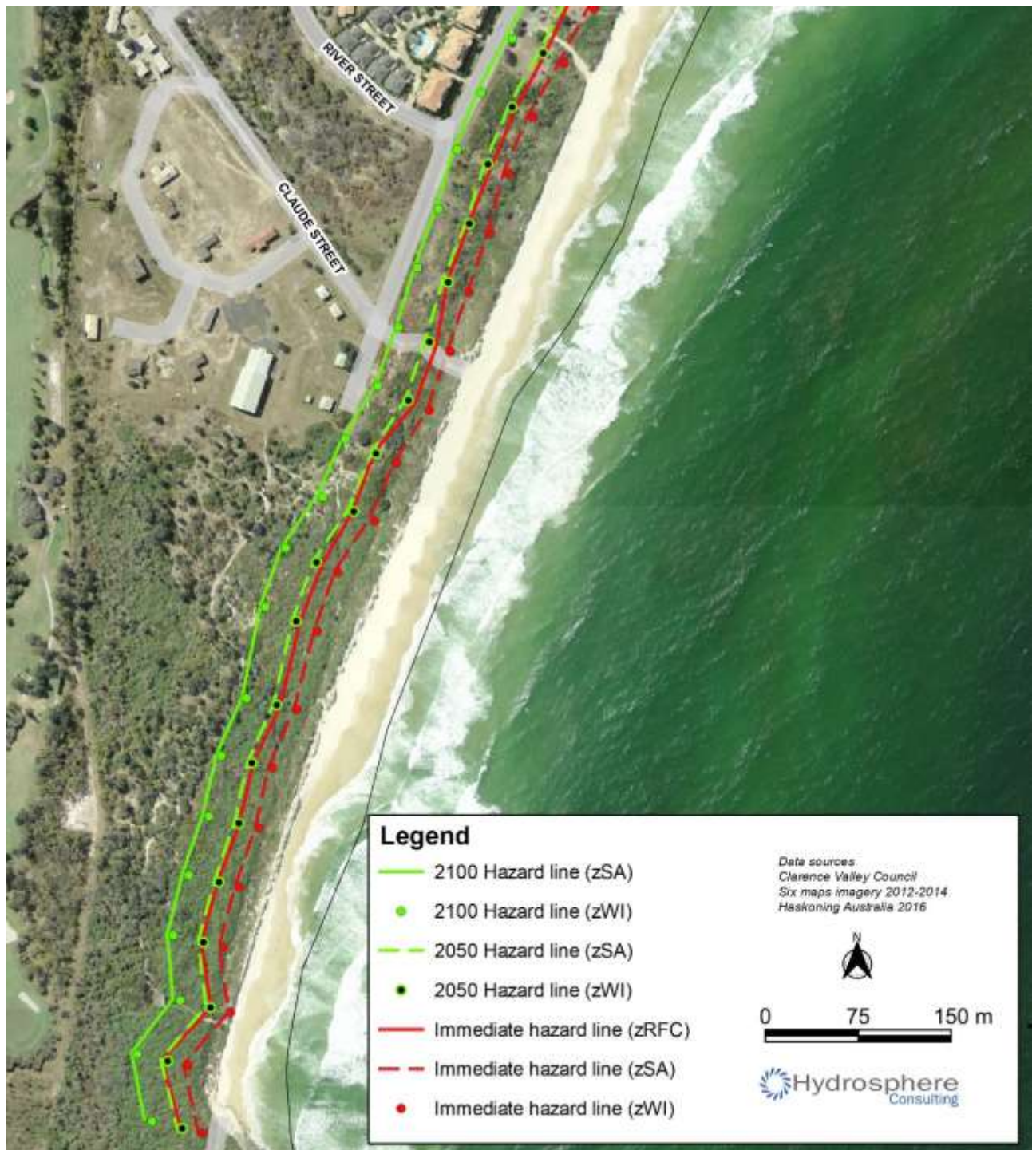


Figure 26: Coastal hazard lines for Pippi Beach - south

Source: Data from Royal HaskoningDHV (2016)



1 – looking south



2 – Pacific Hotel – view from beach

Plate 7: Pilot Hill

Coastal hazard assessments have not been undertaken for the Angourie coastal area. Localised erosion of dunes and beach access points is known to occur in the area.

4.4.6 Wooloweyah Lagoon

Engeny (2019) mapped the future, 2050 and 2100 sea level rise inundation (highest astronomical tide) for the south-western catchment of Wooloweyah Lagoon. Mapping indicated that some inundation would occur by 2050 with large areas becoming inundated by 2100 (Figure 27).

4.4.7 Brooms Head and Lake Cakora

Coastal processes occurring at Brooms Head are detailed in SMEC (2013), illustrated in Figure 28 and summarised below:

- There is a net northerly littoral drift of sand along the Brooms Head coastline.
- The dominant sand path is around Cakora Point with a small amount by-passing through the headland and across the reef into the southern corner of Brooms Head Beach.
- There is episodic on/offshore sediment movement in the southern corner and further along the beach (often in storm events or in low swell).
- Entrance instability at Lake Cakora entrance – breakout events are a function of rainfall and coastal conditions. During entrance breakouts, sediment from the entrance foreshore is transported into the nearshore area. Sediment is then reworked by coastal processes and transported back onshore by waves to reform the entrance berm.
- Some aeolian sand loss occurs at the northern end of Brooms Head Beach.
- There is significant sediment bypassing to the north of Brooms Head Beach.

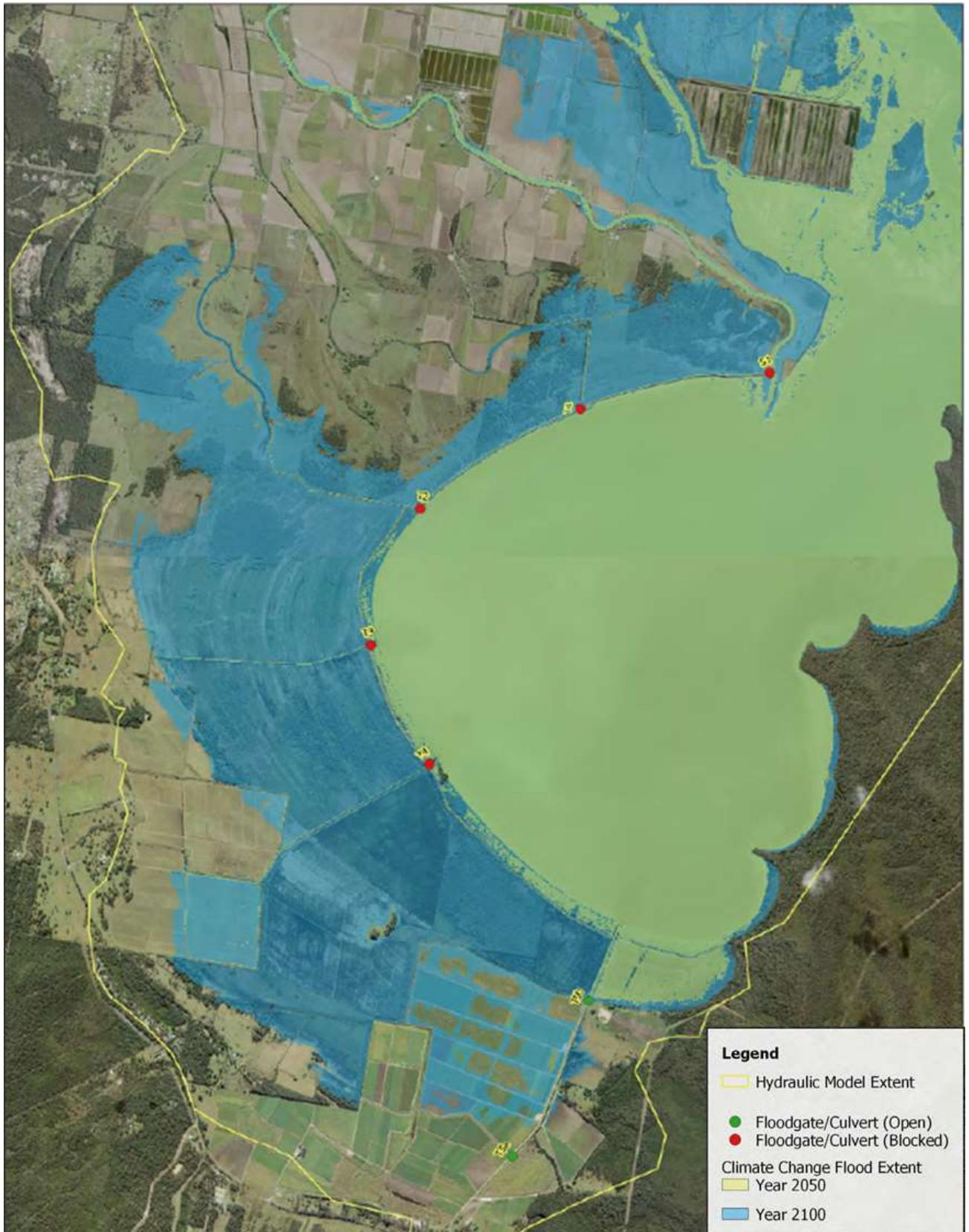


Figure 27: Highest astronomical tide inundation mapping for south-west Wooloweyah Lagoon - 2050 and 2100 sea level rise scenarios

Source: Engeny (2019)



Figure 28: Conceptual model of coastal processes occurring at Brooms Head

Source: Reproduced from SMEC (2013)

A coastal hazard study for Brooms Head beach was undertaken by SMEC (2013) and assessed the following hazards:

- Beach erosion - the adopted open coast storm demands for planning purposes at Brooms Head ranged between 150 and 220 m³/m.
- Shoreline recession – long-term recession due to net sediment loss is at a rate of approximately 0.6 m/yr.
- Sand drift - no sand drift hazard.
- Coastal inundation - most of the foreshore reserve and southern beach foreshore is sufficiently elevated to prevent inundation due to elevated still water levels. The only exception to this is some caravan park sites which would be subject to inundation by 2100. Parts of the foreshore comprising the Ocean Road dwellings would be subject to coastal inundation during the 100-year ARI elevated still water level event. The entire foreshore would be subject to coastal inundation by 2100. Wave overtopping in the caravan park is a severe safety hazard.
- Stormwater erosion - negligible.
- Climate change - the estimated shoreline recession due to projected sea level rise for the study area is in the order of 20 m over the next 38 years and 42 m by the year 2100.
- Entrance instability - entrance instability is considered to pose a significant hazard for properties and structures on Ocean Road in this vulnerable area.

Following the SMEC (2013) study local residents on Ocean Road suggested that, due to the existence of subsurface clay, cobbles and other erosion resistant strata adjacent to the Lake Cakora entrance and the distance of the properties from the ocean, the coastal hazard risk was not as significant as stated in SMEC (2013). Subsequently, a review of coastal hazards at the entrance to Lake Cakora was undertaken by Royal HaskoningDHV (2018). The study found that although a shallow layer of gravel and cobbles exists intermittently within the vicinity of the entrance, due to its depth and the relatively small gravel sizes this layer is not expected to provide any significant protection against scour during high energy storm conditions. The estimated longshore recession rates due to sediment deficits were estimated to vary between 0.2 and 0.5 m/year for the various beach sections. The estimated storm demand varied from 40 to 220 m³/m for the 100-yr ARI storm. Shoreline recession attributed to sea level rise was in the order of 13 and 38 m for the 2050 and 2100 planning horizons, respectively.

Coastal hazard lines generated by Royal HaskoningDHV (2018) are presented in Figure 29. The hazard lines indicate that the erosion and recession will continue to occur into the future. Potential assets at risk in each hazard area are briefly outlined below.

- Immediate – northern section of the caravan park (approximately 19 sites and amenities block) and foreshore reserve, seven residential properties on Ocean Road and Ocean Road bridge abutments.
- 2050 – a further 8 caravan park sites, Ocean Road and bridge, the bowling club car park, drinking water infrastructure, additional residential properties on Ocean Road and break through to north arm of Lake Cakora.
- 2100 – residential properties on the western side of Ocean Road, bowling club, additional properties on the eastern side of Ocean Road.



Figure 29: Brooms Head/Lake Cakora coastal hazard lines

Source: Royal HaskoningDHV (2018)

Slope instability and associated risks in relation to CVC infrastructure and individuals at Cakora Point (Brooms Head) was assessed by SMEC (2012). Slope stability hazards were identified including:

- Rock falls and tumbling from jointed greywacke.
- Crest fretting causing receding crests.
- Rock falls from overhangs.

The following hazard mechanisms and associated assets at risk were identified including:

- Receding cove – walkway, lookout road.
- Undermining - walkway, lookout road.
- Crest fretting and block toppling - lookout carpark.

The adopted acceptable risk was 0.001%. The annual probability of risk to life was estimated to range from 0.000083% to 0.001%. The greatest risk to loss of life come from falls or toppling of blocks and collapse from overhangs.

4.4.8 Sandon/ Minnie Water/ Diggers Camp

No coastal hazard studies have been undertaken for the coastlines in these areas.

Erosion is occurring adjacent to the Sandon Village houses on the southern bank of the estuary entrance. Ad hoc measures have been undertaken by adjacent landowners in an attempt to provide protection (refer Section 4.9.3).

There are also community concerns around periodic localised beach erosion at Diggers Camp and Minnie Water, particularly around beach access points (Plate 8). CVC has identified the following erosion sites:

- At Nip Welsh Park in Minnie Water, high tides and swell events erode public land.
- At Diggers Camp, long-term coastal erosion has seen the beach eroded some 30 m landward of cadastral boundaries of the Crown reserve. This process is continuing and now impacting the emergency access ramp onto the beach.



Plate 8: Localised erosion at Minnie Water beach access beside surf club (left) and boat ramp (right) - 2013

4.4.9 Wooli

Coastal processes influencing Wooli Beach are detailed in Royal HaskoningDHV (2020). A key process that is occurring on Wooli Beach is beach rotation. Analysis undertaken by Royal HaskoningDHV (2020) indicates that inter-annual and interdecadal oscillations in the rotation of Wooli Beach is occurring. A

predominantly easterly wave climate over summer results in anti-clockwise rotation of Woolli Beach (with the northern portion eroding and southern portion accreting in the shorter term). Conversely, the south-easterly wave direction over winter causes clockwise rotation of the beach (with the northern end accreting and southern end eroding).

Woolli Beach has a long history of coastal recession and as a consequence the village of Woolli is currently at significant risk from coastal erosion and longer-term recession (Royal HaskoningDHV, 2018a). Coastal hazards were originally defined for the Woolli coastline in 1997 and subsequently updated in 2010 by Worley Parsons (2010a). The study considered beach erosion, shoreline recession, river entrance stability and considerations of the effects of climate change. The following assumptions were used in Worley Parsons (2010a):

- Beach erosion - a conservative storm demand of 220 m³/m was adopted.
- Shoreline recession - historic long-term shoreline recession varies along Woolli Beach. The median recession rate was between 0.3 and 0.4 m/year for the majority of the length of Woolli Beach. A higher rate of 0.5 m/year recession is evident fronting the southern portion of Woolli. Negligible net recession was shown at the southern and northern extents of the beach, with the analysis indicating a prograding trend.
- Sea level rise - adopted long term recession due to sea level rise was 17 m and 42 m for 2050 and 2100 respectively. Long term recession due to sediment loss varied from 0 to 20 m for 2050 and 0 to 45 m for 2100.
- Coastal entrance instability – the existing trained entrance is relatively stable however the narrow spit that separates the Woolli Woolli River estuary and the ocean is vulnerable to floodwaters and potential breakout of a new entrance (the area of highest potential for this to occur is just north of the southern section of the village).

The hazard lines represent the predicted position of the back beach erosion escarpment after a 100 year ARI coastal storm in 2010, 2050 and 2100 respectively, including subsequent slumping to a stable angle of repose (Figure 30 and Figure 31).

Royal HaskoningDHV (2018a) identified the following assets at risk:

- 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 Woolli water tower, Woolli Public School, South Terrace roadway and the Marine Rescue building.
- 2100: 159 dwellings (out of 183 in the original Woolli), six businesses, public buildings, and nearly all roads, public reserves and services.

In addition to this, the section of dune to the north and fronting the newer Woolli subdivision and southern half of Yuraygir National Park would be at risk by 2100 (Royal HaskoningDHV, 2018a).

CVC has identified erosion along the beach along South Terrace with the beach eroded approximately 30 m from the seaward cadastral boundary of the Crown reserve along the coast, impacting the access road and public facilities.

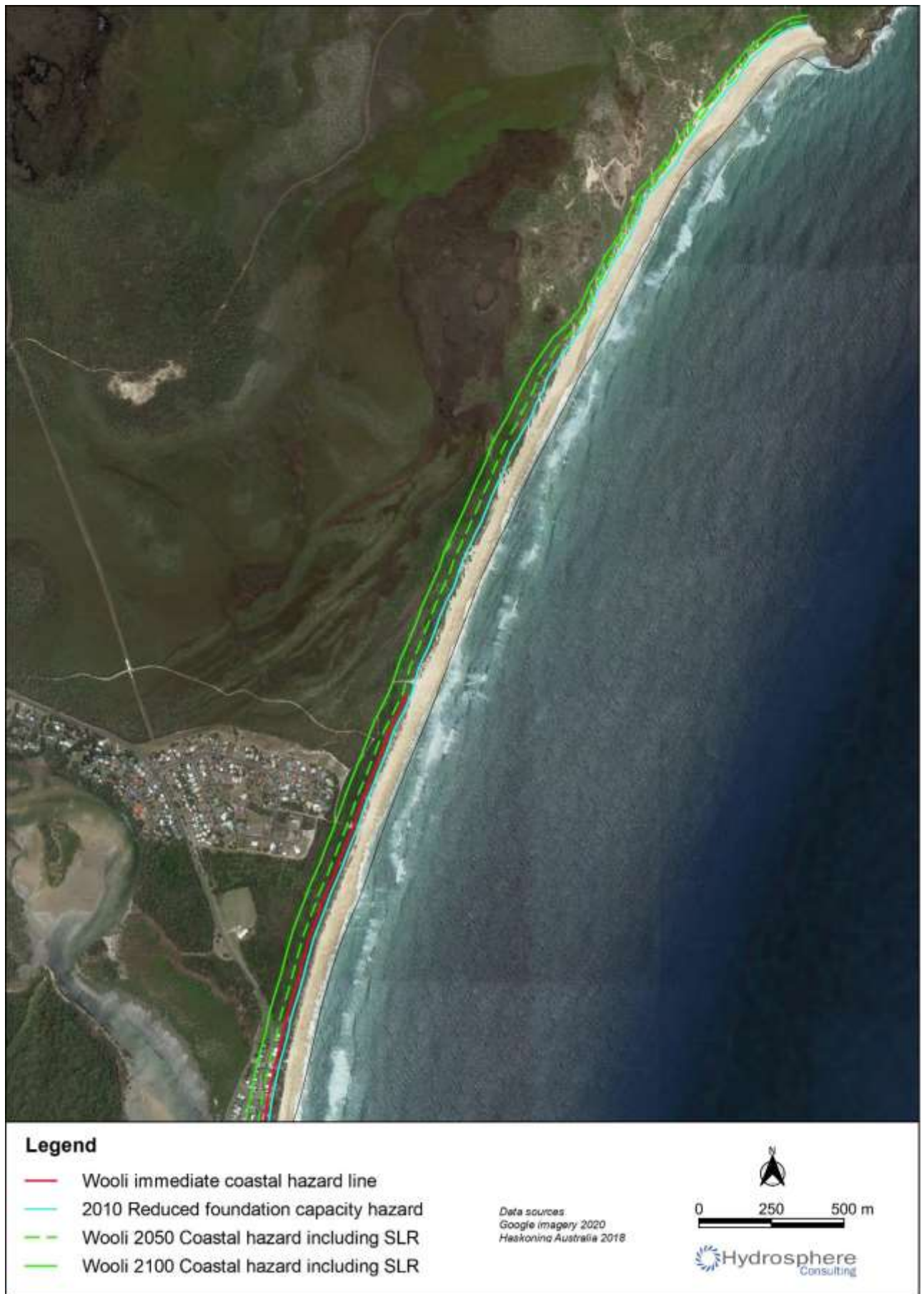


Figure 30: Coastal hazard lines Woolli Beach – north

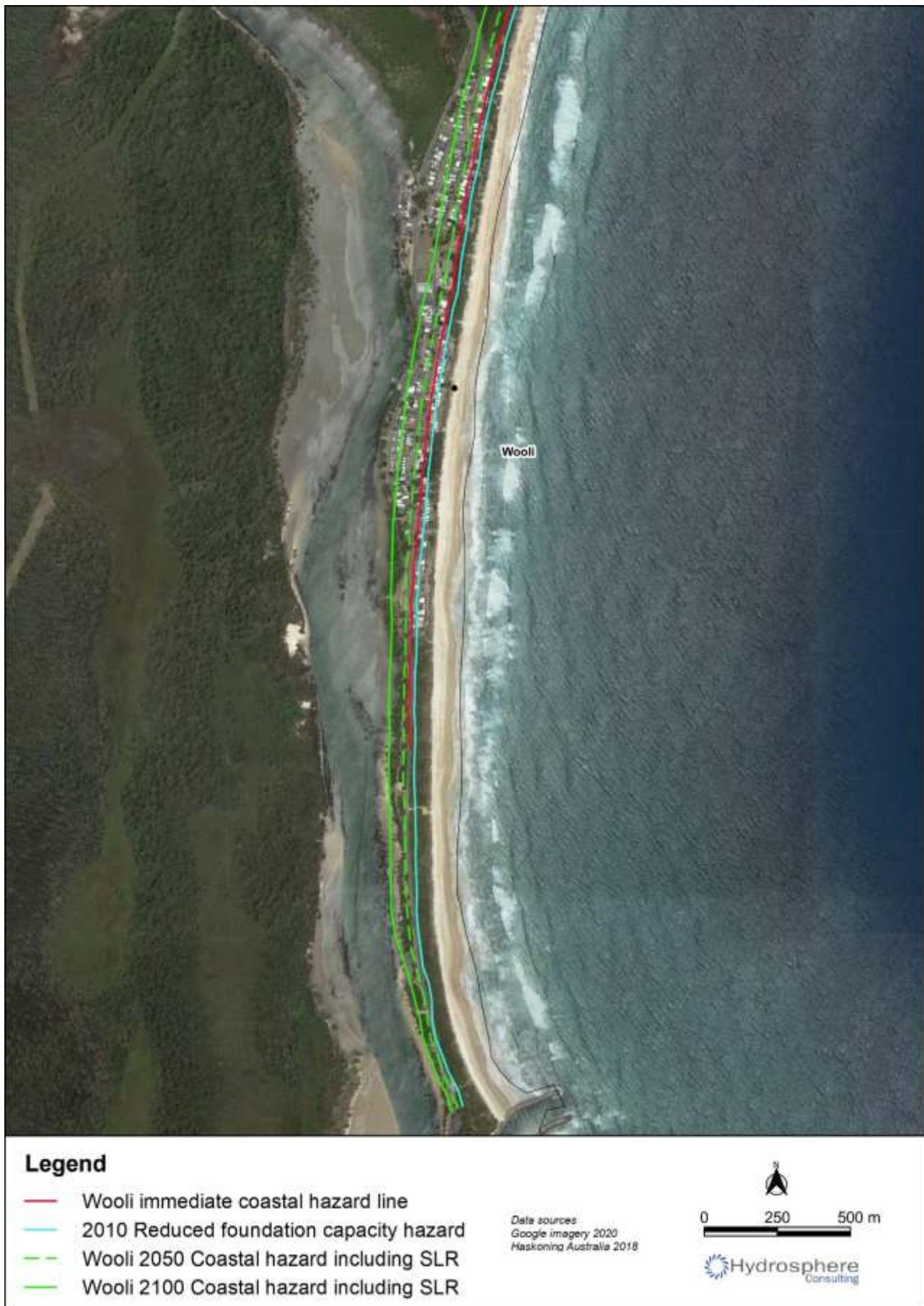


Figure 31: Coastal hazard lines Woolli beach - south including village

4.4.10 National and state-wide assessments

Tidal inundation

The Federal government's online tidal inundation model, Coastal Risk Australia (2020) provides a visual, conservative indication of those places at risk from tidal inundation in the present day (for example, Figure 32). The mapping indicates that large areas of the study area may be at risk of tidal inundation, most notably:

- Low lying areas of Bundjalung National Park to the west of Shark Bay/Ten Mile Beach.
- Low lying areas surrounding Wooloweyah Lagoon and associated channels including Palmers Island, Micalo Island and areas to the south-west and north east of the lagoon (including west Yamba).
- Northern section of the original Wooli village and the areas between the original and northern parts of the Wooli village (sportsground), including road access.
- Large areas of National Park adjacent to the middle and upper reaches of the Wooli Wooli River.

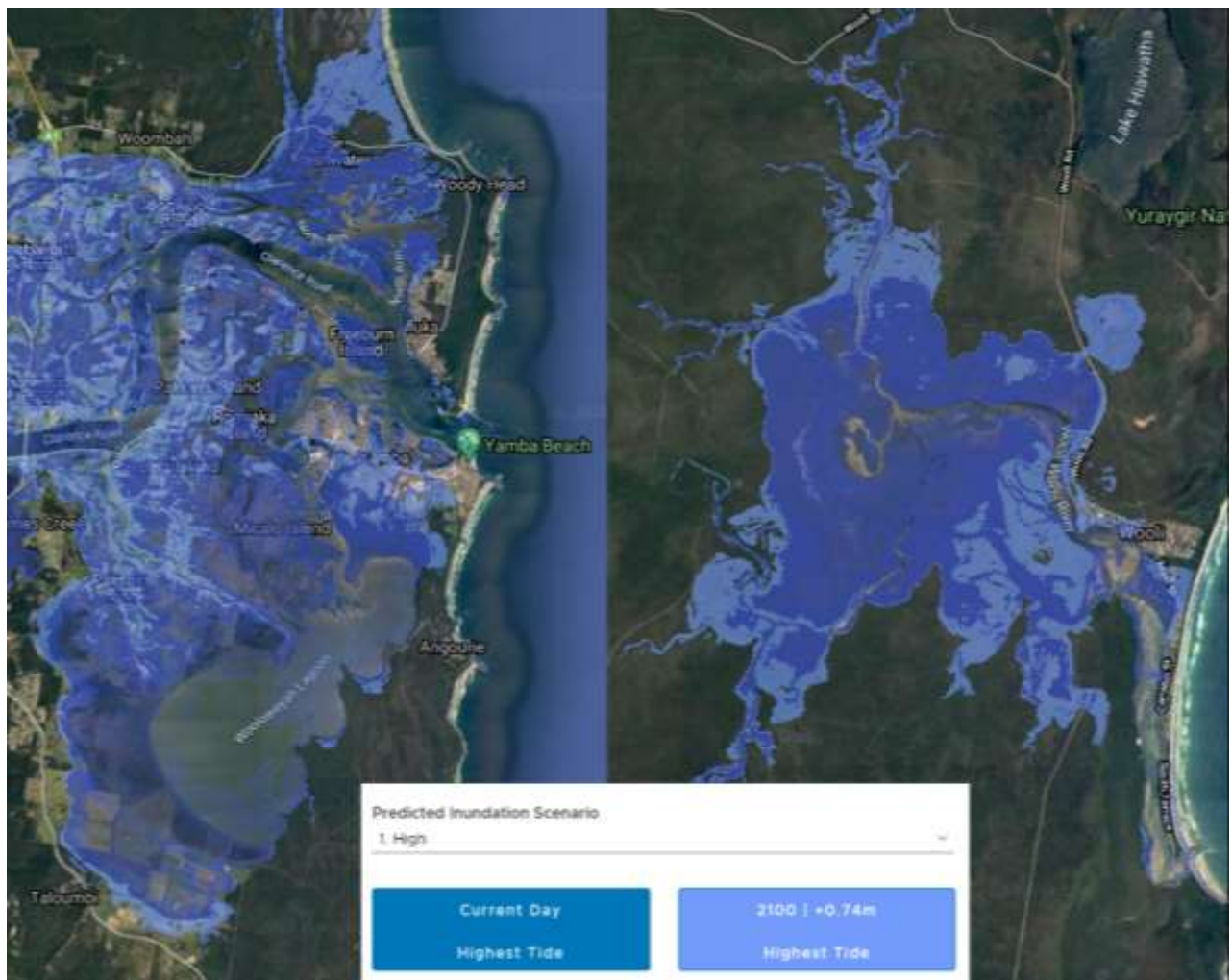


Figure 32: Conservative first-pass mapping of present-day and 2100 risk from tidal inundation

Source: Coastal Risk Australia (2020)

A NSW-wide estuary tidal inundation exposure assessment was undertaken by OEH (2018c) to assess the number of properties and roads potentially affected by future estuary tidal inundation. The assessment was based on 0, 0.5, 1.0 and 1.5 m sea level rise scenarios. Results from the assessment indicate that:

- No properties and an insignificant amount of road within the Lake Arragan catchment are likely to be impacted by current or future tidal inundation.
- A relatively significant number of properties may be affected by future tidal inundation within the Lake Cakora catchment and the number affected is expected to increase as sea level rise increases. Roads are also expected to be impacted.
- No properties within the Sandon River catchment are expected to be impacted by current or future inundation. A small length of road is expected to be affected.
- A relatively significant number of properties maybe affected by future tidal inundation within the Woolli Woolli River catchment and the number affected is expected to increase as sea level rise increases. Roads are also expected to be impacted.

It should be noted that the OEH (2018c) study is a coarse state-wide assessment based on numerous assumptions and limitations. As such, its results only provide an indicator of the future level of risk of tidal inundation within each catchment.

Coastal erosion

A state-wide assessment of exposure to coastal erosion in NSW was undertaken by OEH (2017). It is intended to provide an overview of potential present and future impacts of erosion on coastal properties and infrastructure in the state. The report is limited to considering exposure to coastal erosion and shoreline recession on open-coast NSW beaches. An exposure assessment identifies assets that may be impacted by a hazard (coastal erosion), based on data or modelling of the hazard. Equally exposed assets are not necessarily equally vulnerable to a hazard. The approach uses properties and roadways as a metric for the level of exposure, reflecting that at a state-wide scale, impacts to other infrastructure, public facilities, and beach amenity, generally scale with the number of properties and lengths of roadways affected. The data have been assembled from a broadscale probabilistic approach using regional compartment scale parameters and has not accounted for local scale parameters.

4.5 Erosion

4.5.1 Stormwater Erosion

Poorly managed stormwater, particularly in urban areas, can cause and/or contribute to erosion. Within the coastal zone common areas for this to occur are at stormwater outlets on estuary banks or ocean beaches. There are stormwater outlets onto beaches and into estuaries associated with urban areas located throughout the study area.

Stormwater erosion was considered in the Pippi Beach and Brooms Head coastal hazard studies and the following was noted:

- The stormwater erosion hazard at Brooms Head is considered to be negligible (SMEC, 2013b).
- No current stormwater issues were noted at Pippi Beach (Royal HaskoningDHV, 2016).

4.5.2 Estuarine Bank Erosion

Bank instability and erosion is a key threat within the estuaries and contributes to loss of land, estuarine vegetation and riparian habitat loss, increased sedimentation and water quality issues. Channel migration and associated riverbank erosion is a natural fluvial process, however when rates of change exceed natural regimes or threaten assets the active management marural fluvial process, however when rates of change

exceed natural regimes or threaten assets the active management may be needed. Bank erosion throughout the study area is discussed in the following sections.

Wooloweyah Lagoon

White (2009c) assessed bank erosion at 17 monitoring sites. Most of the sites were considered to be stable, seven sites had minor spot erosion and one site was classified as having moderate erosion. White (2009b) reported the main areas of significant bank erosion occurring in the Wooloweyah Lagoon catchment were in Palmers Channel, Oyster Channel and Micalo channel. It was noted that it was unclear whether the erosion was caused by boat wake (especially Palmers Island), wind-wave action, land use (cattle), natural processes or a combination.

The CZMP (White, 2001a) includes actions to identify and prioritise riparian areas for rehabilitation and regeneration and reduce bank erosion along Palmers, Micalo and Oyster Channels. In 2008 rock fillets were placed along 850 m of bank on the north-western shore of Wooloweyah Lagoon to remedy bank erosion and along a stretch of bank in Romiaka channel in 2008. Monitoring of the site during 2013 indicated the fillets were a success (Plate 9).



1 - rock fillets placed along a section of eroding shoreline, Wooloweyah Lagoon



2 - Rock fillets in Romiaka Channel installed in 2008 showing good mangrove recruitment, photo from 2013

Plate 9: Wooloweyah Lagoon bank management

Source: P. Wilson, CVC

Serious bank erosion in Palmers Channel was reported in local media in 2016 (Daily Examiner, 2016). However, there is no recent data on the estuarine bank erosion status of Wooloweyah Lagoon or associated channels.

Lake Cakora

Bank erosion has been identified as an issue by the community in the past (CVC, 2009), however CVC (2017b) noted that there were no significant bank erosion sites within the system. The current state of bank erosion within the estuary is unknown. Erosion at the entrance to the lake is discussed in Section 4.4.7.

Sandon River

GHD (2011) undertook a bank erosion assessment of the Sandon River estuary in 2010 and found the following:

- Bank erosion is occurring throughout the estuary (Figure 33).
- Erosion ranged from minor to severe with the majority of occurrences being moderate. Three sites were severe.

- All sites were located on outside bends and typically occurred along 30 – 100 m of bank.
- Due to high vegetation cover on banks and the undeveloped nature of the catchment, all erosion was considered to be natural and due to the ongoing lateral adjustment of the waterway.

No erosion assessments have been undertaken since GHD (2011). There has been no integrated management of bank erosion occurring at the entrance to the estuary. It is understood some minor ad hoc erosion control works have been undertaken on the southern bank of the entrance adjacent to the residential properties. No other works have been undertaken to address the other identified erosion sites.

An area of recent bank erosion is visible adjacent to the entrance of Tumbaal Creek potentially threatening Sandon River Road.

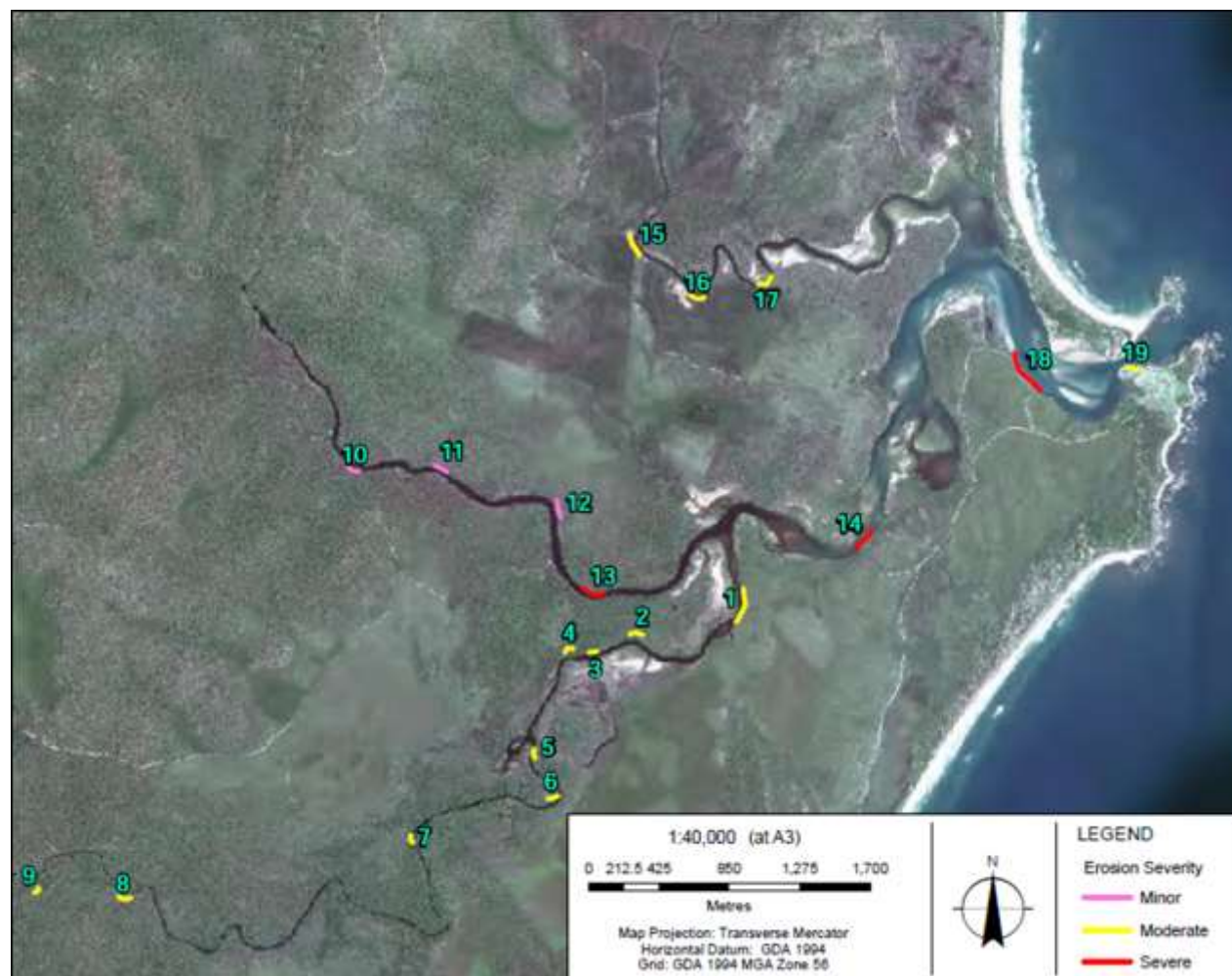


Figure 33: Bank erosion within Sandon River estuary

Source: Edited from GHD (2011)

Wooli Wooli River

An estuarine bank erosion assessment was undertaken during the estuary processes study (WBM, 2006) which identified several locations experiencing bank erosion (Figure 34):

- The banks adjacent to the boat ramp and continuing downstream to the car park at the end of South Terrace.
- The banks adjoining the Solitary Islands Marine Park Resort Caravan Park.
- Between the bowling club and the Caravan Park.

- The southern bank approaching “The Forks”.
- Isolated areas along Bookram Creek.



Figure 34: Estuarine bank erosion identified within Wooli Wooli River estuary during the estuary processes study

Source: WBM (2006)

Bank erosion was attributed to a variety of causes but mostly related to removal of riparian vegetation combined with tidal and flood flows or boat wake and wind waves.

No bank erosion assessments have been undertaken since WBM (2006). However, bank erosion is still occurring adjacent to the boat ramp and further downstream (Plate 10). CVC is proposing to install erosion controls near the boat ramp. Further upstream, a project has been recently approved which includes the installation of mangrove rock fillets to prevent bank erosion adjacent to the Solitary Islands Marine Park Resort Caravan Park. The current extent of bank erosion throughout the remainder of the estuary is unknown. The existing EMP (BMT WBM, 2009) includes actions to protect public infrastructure from bank erosion and revegetate foreshores and riparian zone while enabling adequate opportunities for public access to the river.



1 - erosion downstream of boat ramp



2 - erosion opposite Marine Rescue Tower threatening footpath

Plate 10: Estuarine bank erosion in lower Wooli Wooli River estuary (July 2020)

4.6 Shoaling and Sedimentation

4.6.1 Clarence River entrance

Shoaling occurs in the Clarence River entrance. Sand accumulates to the east of the breakwaters forming an ebb tide ring bar at the entrance (Figure 35), with its position determined by the equilibrium between off-shore transport of sand by the ebb tide and on-shore transport by wave action. Depending on the height of the bar, it can cause a navigation hazard which was identified as an issue in the *Clarence River Estuary Management Plan* (Umwelt, 2003). The entrance bar was dredged in 2004 (Section 4.9.1). Sedimentation and navigation impacts within the Clarence River entrance was also raised as a current issue during consultation activities for this Scoping Study.

Sand also accumulates inside the entrance in the Yamba Harbour approach channel, creating a navigation issue. Sand from within the approach channel is periodically dredged to a navigable depth when required (Section 4.9.1).

The *Clarence River Estuary Management Plan* (Umwelt, 2003) contained actions for the NSW government, led by DPIE - Crown Lands, to coordinate studies of sedimentation in the estuary. To date those assessments have not been completed and hence there is limited understanding of sedimentation processes and related impacts affecting the estuary and entrance.

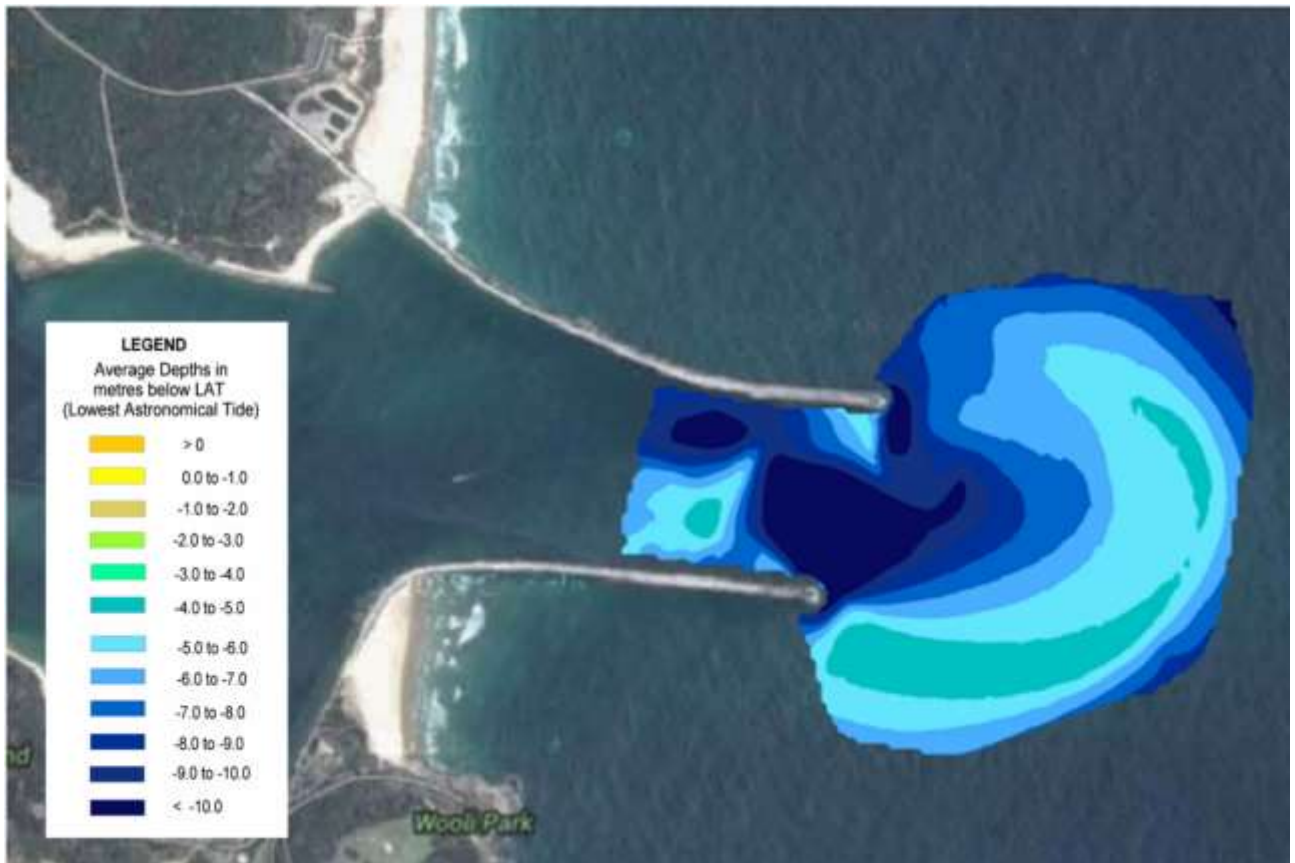


Figure 35: Hydrographic survey of the Clarence River entrance (2015) showing formation of entrance bar

Source: GPS & Hydrographic Services

4.6.2 Wooloweyah Lagoon

Wooloweyah Lagoon is a depositional environment with the lagoon continuing to infill with marine sands deposited as a flood-tide delta at the entrances to the channels at the northern end of the lagoon and sediments and silts deposited throughout the lagoon during floods (Woodhouse, 2001; Hashimoto and Hudson, 1999). Sediment core data indicate that the sedimentation rate with the lagoon is between 0 - 3.0 cm/ year (ANSTO, 2009), a relatively high rate of accretion.

Sedimentation of Palmers and Oyster channels was identified as an issue in White (2009a). Sedimentation was attributed to causing restrictions in tidal exchange through the channels and also a navigational restriction particularly in Palmers Channel. Palmers Channel was dredged in 2011.

4.6.3 Sandon River

The Sandon River estuary has a net upstream movement of marine sands by tidal currents resulting in the formation of shoals in the lower estuary. Sedimentation was raised as an issue by the community during consultation for the previous CZMP (GHD, 2012) however GHD (2012) concluded that sedimentation due to upstream sources is not greatly affecting the estuary and that sand movement within the estuary is deemed to be predominantly natural.

4.6.4 Wooli Wooli River

Shoaling within the Wooli Wooli River estuary and the impacts on safe navigation were raised as a key issue in the *Wooli Wooli River Estuary Management Plan* (BMT WBM, 2009). Shoaling at the entrance was a prime concern to the community at the time. WBM (2006) found that within the lower estuary, the shoal

pattern had remained relatively stable over the previous 50 years, with the exception of the shoals around Mangrove Island. In the vicinity of Mangrove Island, shoals appeared to have moved downstream by episodic flood events and then slowly reworked back into upstream orientations by inflowing (flood) tides. Sand build-up and entrance condition/safety was also raised as an issue for the Wooli Wooli River in the community survey for this scoping study.

4.7 Social Context

4.7.1 Land Use

The latest available land use data (DPIE, 2020b) for the study area and estuary catchments is presented in Figure 36 and Figure 37. Land use within the study area and catchments is described below:

- National Parks and Reserves are the largest land use throughout the catchments and the study area as a whole (approximately 80% of the entire study area). This increases further along the coastline with 90% of the coastline catchments under parks and reserves and 95% north of the Clarence River estuary.
- The Solitary Islands Marine Park in conjunction with the adjacent Yuraygir National Park, is one of the few areas in Australia, where a full combination of estuaries, beaches, headlands, islands and offshore waters as well as a significant proportion of the catchments of those estuaries are protected.
- Grazing and cropping are the next largest land uses, covering 9% and 6% of the study area respectively. Only 3% of the study area is under residential land uses.
- Grazing (34%) is the largest land use within the Wooloweyah Lagoon study area followed closely by cropping (29%). Grazing and cropping (sugarcane) are located to the west and north-west of the lagoon on Palmers and Micalo Islands. The parks and reserve area (15%) is predominantly situated within the south-east portion of the catchment and the Clarence River Estuary Nature Reserve located to the north of the lagoon. A relatively low percentage of the catchment (1.2%) is urban (Wooloweyah, Palmers Island and areas of Yamba).
- Virtually 100% of the Lake Arragan catchment lies within Yuraygir National Park except for a small number of roads.
- The vast majority (96%) of Lake Cakora catchment is within parks and reserves (predominantly Yuraygir National Park) with a small area of urban residential (Brooms Head) within the lower catchment.
- The Sandon River catchment is predominantly within parks and reserves (68%) and forestry (32%) which is located in the western upper catchment on the eastern slopes of the Coast Range. Included in this is the NPWS campground at the entrance. About 35 residential/holiday dwellings are located on the southern side of the entrance.
- The Wooli Wooli River catchment is dominated by parks and reserves (82%) and forestry (15%). A small area of grazing (3%) is mapped however this appears to be an anomaly where Travelling Stock Reserves have been classified as grazing (however it is highly unlikely any grazing occurs within these areas). The Wooli village is located on the eastern side of the lower estuary but only represents a small area of the total catchment.

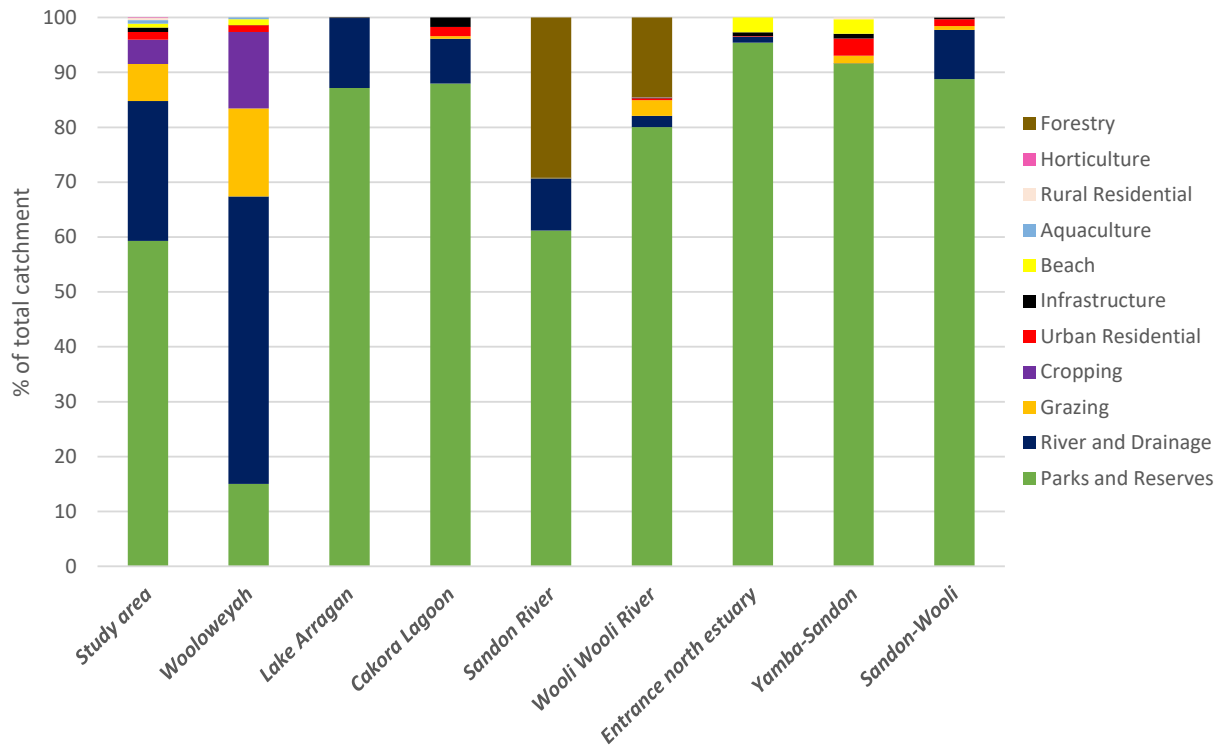


Figure 36: Land use percentages within the study area and catchments

Source: DPIE (2020b)

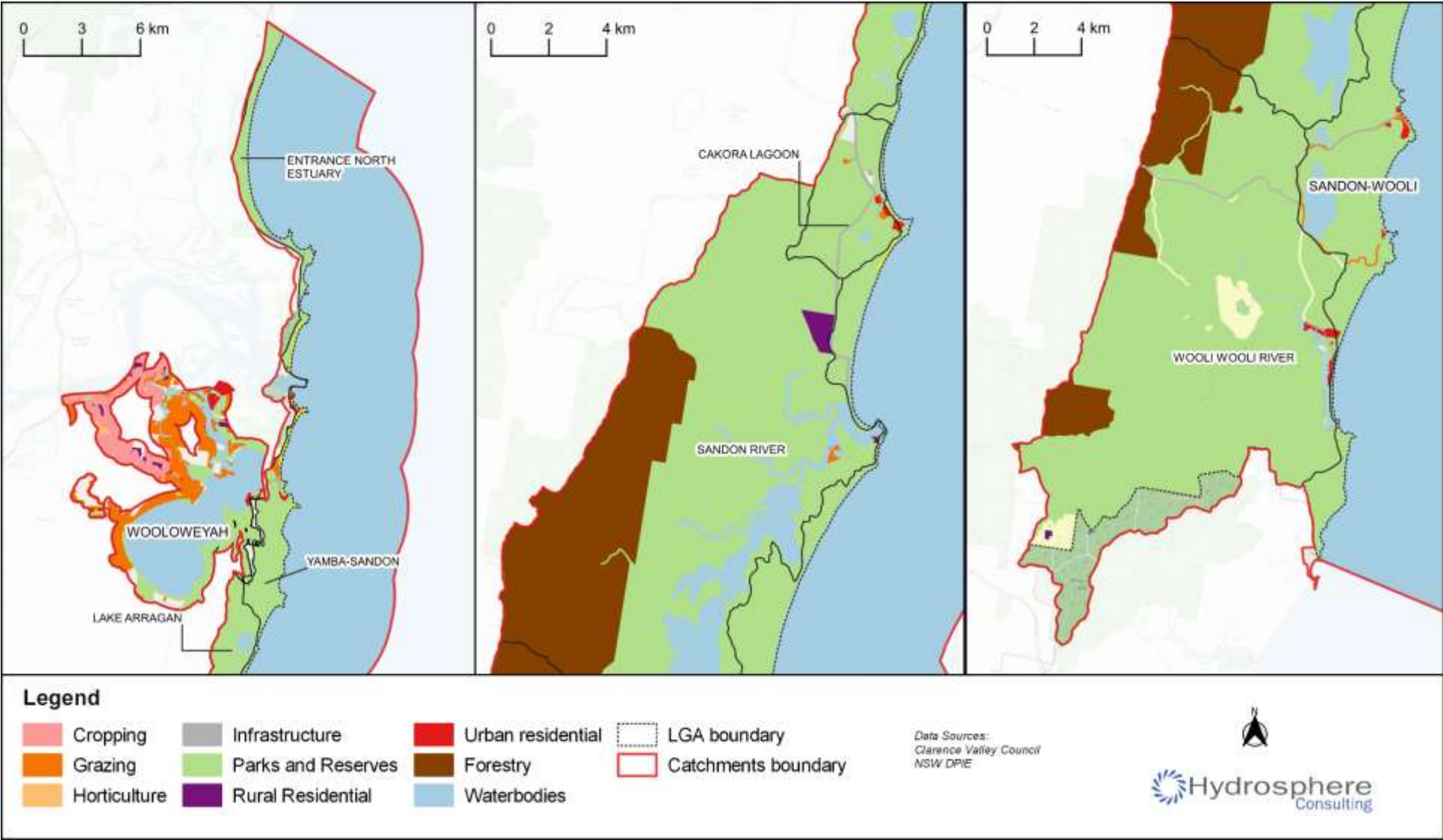


Figure 37: Land use within the study area and estuary catchments

4.7.2 Population and Demographics

Information on the Clarence Valley local government area (LGA) community has been analysed and reported from Census data by .id (2020). Further detail is provided in the Stakeholder Engagement Plan (Appendix D). The estimated resident population of CVC LGA was 51,662 in 2019. The population living in coastal towns and villages was 10,031 people in 2016 (20% of the LGA population). The resident population increased by 991 people (0.65% p.a.) since the 2016 Census. From 2011 to 2016, the LGA population increased by 1,005 people (0.4% p.a.). NSW Government (2020) population projections suggest that the Clarence Valley LGA population will increase at a similar rate until 2026 before a decline in population through the 026-2041 period.

A summary of .id (2020) demographic information for the LGA is provided in Table 5. Aboriginal and Torres Strait Islanders made up 6.3% of the LGA population (3,214) in 2016. The most common ancestry is Australian and English. The LGA population is generally older than other regional areas with 34% of the population aged 60 years and over. Household income and rent are generally lower than other areas of NSW. There is a lower level of ethnicity than elsewhere in NSW and Australia.

Table 5: Demographic data for Clarence Valley LGA (2016)

Indicator	CVC LGA (2016)	Regional NSW	NSW	Australia
Median age	49	43	38	38
Couples with children	20%	25%	32%	30%
Older couples without children	15%	13%	10%	10%
Lone person households	26%	26%	22%	23%
Aboriginal and Torres Strait Islander population	6.3%	5.5%	2.9%	2.8%
Medium and high-density housing	12%	17%	33%	27%
Median weekly household income	\$915	\$1,166	\$1,481	\$1,431
Median weekly rent	\$265	\$278	\$384	\$339
Households renting	24%	26%	30%	29%
Households with a mortgage	24%	29%	30%	32%
Overseas born	8%	11%	28%	26%
Unemployment rate	9.0%	6.6%	6.3%	6.9%
Language at home other than English	2%	6%	25%	21%
SEIFA index of disadvantage ¹	926	971	1,001	1,002

Source: .id (2020)

1. Socio-Economic Indexes for Areas (SEIFA) measure the relative level of socio-economic disadvantage and/or advantage based on a range of Census characteristics. A higher score on the index means a *lower* level of disadvantage. A lower score on the index means a *higher* level of disadvantage

4.7.3 Community Uses and Values

Previous plans and the results of the community survey undertaken during this Scoping Study (Section 3) indicate that for many community members, interaction with the coast and estuaries is a highly valued part of

life. The beaches and waterways provide a place for social interaction, recreation, relaxation, nature appreciation, connection, exercise and commercial activities.



1 – water-based activities at Sandon River



2 – Iluka rainforest walking track (Source: J. Chivers, NPWS)



3 – camping at Woody Head



4 – Whiting Beach

Plate 11: Community uses and values

The most commonly stated (>70% of responses) community values from the community survey respondents were scenic beauty, being able to get away from crowds, access to beaches and waterways, environmental value/biodiversity/ecosystems/habitats and clean waterways. These attributes were consistently highly valued across the study area by most respondents.

The most common activities within the study area (>70% of responses) are swimming, walking, wildlife/nature appreciation, picnicking/BBQs and exercise. Generally, usage for these activities is concentrated in the Yamba/Angourie, Woolli and Minnie Water areas. Swimming and walking were the two most popular activities with over 90% of respondents indicating they swim and walk at one location, at least along the coast. Yamba beaches are very popular for swimming and walking, including Whiting Beach (particularly so for families) however all beaches particularly around the villages and campgrounds are popular and valued for swimming. The Blue Pools at Angourie are also a popular and novel swimming location. Cliff jumping/diving is also popular at the Blue Pools and the headland adjacent to Turners Beach quarry. Climbing the cliffs and diving is a high-risk activity which is currently managed through Council's open spaces program.

Beaches are also very popular for walking, particularly those close to and easily accessible from towns and villages. Bushwalking tracks, both formal and informal, exist along the coastline, mostly within National Parks. The two most notable bushwalks are the Iluka Nature Reserve track and the Yuraygir Coastal Walk within Yuraygir National Park extending 65 km from Mara Creek in the north to Red Rock in the south. The track can be accessed at various locations along the route.

Surfing is very popular along the Clarence Valley coastline. Surfing is typically concentrated around the population centres, particular Yamba and Angourie. Angourie Point in particular is a national class surf break and considered to be 'sacred' break amongst the local and national surfing community. The importance of Angourie Point to the surfing community is highlighted in the designation of Angourie Point as a National Surfing Reserve (one of the first of its kind in Australia).

In the community survey, four-wheel driving was particularly popular on the Woody Head/Iluka, Sandon, Minnie Water and Wooli coasts, although four-wheel driving was undertaken by only a small portion of respondents (26%). 4WD beach access is available at a number of locations along the coastline including (from north to south, Figure 38):

- Ten Mile Beach/Shark Bay – north of vehicle access point.
- Woody Bay – for boat launching and retrieval only.
- Iluka Main Beach – north of vehicle access point.
- Barri Beach, Wave Trap Beach (Dumpers Beach) and Moriartys Wall Beach - for professional fishers undertaking hauling only.
- Spooky Beach (Angourie) - for boat launching and retrieval only.
- Brooms Head Beach - north of Lake Cakora with a boom gate and associated vehicle access prevention bollards installed at Lake Cakora.
- Brooms Head - boat launching ramps within the holiday park for boat launching and retrieval only.
- North Sandon Beach - north of the vehicle access point at the Sandon River camping ground to the National Park/Crown Lands boundary at Brooms Head Back Beach.
- Sandon Beach - north of the vehicle access point at Illaroo.
- Minnie Water Beach and Boat Harbour – south of Nip Welsh Park vehicle access point.
- Diggers Camp Beach - for boat launching and retrieval only.
- Wilsons Headland – southern side of headland/ northern end of Wooli Beach via Yuraygir National Park
- Wooli Beach – north of the Wooli village via Yuraygir National Park.
- Wooli Beach - north of South Terrace 4WD access point with a boom gate and associated vehicle access prevention bollards installed at Wooli breakwater access point.

All access points are managed by CVC with the exception of Shark Bay, Woody Bay and Sandon beaches. Generally, a permit is required for vehicle access to all beaches except for those managed by NPWS including Ten Mile Beach, Woody Bay, North Sandon and Wooli Beach adjacent to the National Park, subject to vehicles displaying a NPWS pass. Details on access and permits are provided in CVC (2020c).



Figure 38: Beach vehicle access locations within study area

Source: CVC (2020c)

Approximately 40% of survey respondents indicated that dog walking was a primary activity within the study area. Several designated off-leash dog areas are located along the coastline within the study area including:

- Iluka Main beach - north of the 4WD access and car park.
- Pippi Beach - south of Dolphin Park 4WD entrance, along the beach to the rocky outcrop on Miners Beach.
- Angourie - grassed area to the north of the Green Point car park.
- Brooms Head Beach - north from the Lake Cakora 4WD access only on beach.
- Hiawatha Crescent, Minnie Water.
- Centenary Community Reserve (Oval), Wooli.

On-leash areas at beaches include:

- Moriarty's Wall Beach, Iluka.
- Whiting Beach, Yamba.
- Green Point Cove.
- Brooms Head Back Beach.
- Diggers Camp Beach.
- Minnie Water Main Beach.
- Wooli Main Beach.

Varying amounts of beach-cast kelp/seaweed accumulate sporadically across various beaches along the Clarence Valley coastline. Large volumes are occasionally deposited, usually in the southern corners of beaches. Anecdotally, it appears to accumulate more frequently and in larger volumes at some beaches more than others, such as Brooms Head, Woody Head and Shark Bay. The accumulation of large amounts of seaweed may temporarily impact the community by restricting public access, emitting offensive odours as it decomposes, attracting undesirable fauna such as maggots, creating a perceived negative impact on public health and restricting commercial access (i.e. boat launching) and emergency beach access.

The accumulation of beach-cast seaweed on beaches is a natural process and plays an important role in a beach ecosystem. Beach-cast seaweed provides food and habitat for a wide range of fauna species and plays an important role in the cycling of nutrients on beaches. The deposition of large amounts of seaweed can also play a role in stabilising beaches by promoting the accretion of sand.

During early December 2020, large volumes of kelp accumulated on Brooms Head Beach directly adjacent to the holiday park (Plate 12). In some areas the kelp was piled up over 2 m in height. The deposited kelp restricted beach access in some areas and generated unpleasant odours as it decomposed. There were some calls from the community to remove the kelp due to the reduced amenity. Due to the ecological function of the material on the beach and the significant approvals required to remove it, the kelp was left on the beach to be removed through natural processes. By the end of January 2021, the majority of the material had disappeared naturally, either decomposed, dried out, moved by wave/currents or covered by sand (Plate 12).



1 – Kelp deposited on Brooms Head Beach (early December 2020)



2 – Brooms Head beach (late January 2021) showing the absence of kelp on the beach

Plate 12: Beach-cast seaweed on Brooms Head Beach

4.8 Socio - Economic Context

The Clarence Valley LGA takes in an array of coastal and hinterland communities. Grafton (outside the study area) is a strategic centre that provides a range of high-level specialist services to local residents and the wider regional community and was one of the first major commercial centres on the North Coast. Yamba and Maclean fulfil the local service needs of residents north of Grafton and on the coast. Major infrastructure investment in projects like the Pacific Highway upgrade and the second Clarence River Crossing project will significantly enhance regional connectivity and provide new economic opportunities.

The Clarence Valley has several favourable characteristics related to economic opportunities in the coastal zone including coastal, riverine and hinterland amenity, arable soils, favourable climate and access to Sydney and Brisbane via the Pacific Highway. The *Clarence Valley Regional Economic Development Strategy 2018 – 2022 CVC* (2018b) provides an outline of future economic development in the valley. The strategy outlines 'Engines of Growth' which are expected to be the basis of future economic growth in the area and which are related to or have the potential to influence the study area including tourism, horticulture (blueberries, macadamias and sugar cane), aquaculture, forestry and marine manufacturing.

4.8.1 Commercial Fishing and Aquaculture

Estuary prawn trawl fishery

The estuary prawn trawl fishery uses trawl nets to target school prawns and eastern king prawns in three estuaries in NSW (the Clarence, Hawkesbury and Hunter Rivers) with school prawns comprising the majority of the total fishery catch (NSW DPI, undated). Prawn trawling in Wooloweyah Lagoon is a part of the NSW Estuary Prawn Trawl Fishery. Wooloweyah Lagoon is open to prawn trawling from the first Tuesday on or after 1 October each year and finishes on the Friday nearest to 31 May in each following year. The lagoon is closed to trawling outside this period. Trawlers may work all waters of the Lagoon (i.e. there are no legislated spatial restrictions), however there are many areas of the Lagoon that cannot be accessed due to the shallow depth of the Lake (pers. comm, Darren Hayle, DPI Fisheries). Estuary prawn trawling does not occur in other areas of the study area.

There are presently 46 commercial fishing businesses that are authorised to trawl for prawns in the Clarence River including Wooloweyah Lagoon. Prior to recent industry reforms (known as the Commercial Fisheries Business Adjustment Program) there were approximately 110 fishing businesses endorsed to trawl for prawns in the Clarence River estuary. Anecdotally, approximately 20 years ago it was not unusual to see up to 50-60 trawlers on the lagoon on the first day of the season. Of those authorised to operate in the lagoon, 29 reported trawling for prawns in Wooloweyah Lagoon at one time or another during the 2019/2020 season. This equated to a total of 1,276 days for a catch of approximately 115 tonnes. The number of days reported for each business trawling in Wooloweyah Lagoon ranged between 1 day and 91 days (pers. comm. Darren Hayle, 2020).

Estuary general fishery

The estuary general fishery includes all forms of estuarine commercial fishing, including the collection of pipis and beach worms from ocean beaches, except for estuary prawn trawling. The fishery targets a wide range of species including fish and crab species. On average across NSW, the 10 species that make up over 80% of landings by weight are Sea mullet (*Mugil cephalus*) 40%, Luderick (*Girella tricuspidata*) 8%, Yellowfin bream (*Acanthopagrus australis*) 8%, School prawn (*Metapenaeus macleayi*) 5%, Blue swimmer crab (*Portunus pelagicus*) 4%, Dusky flathead (*Platycephalus fuscus*) 4%, Sand whiting (*Sillago ciliata*) 3%, Pipi (*Donax deltoides*) 3%, Mud crab (*Scylla serrata*) 3% and Silver biddy (*Gerres subfasciatus*) 2% (NSW DPI, 2017). Methods include handlining, meshing, various prawning methods, fish trapping, crab and eel trapping, hauling and hand gathering (pipis and beach worms).

Within the study area estuary general fishery activities occur in the lower Clarence River estuary, Wooloweyah Lagoon, Sandon River and Wooli Wooli River estuaries. In Wooloweyah Lagoon, during 2019/2020, 24 commercial fishing businesses reported using fishing methods other than estuary prawn trawling. The total days fished using these other methods was 723 for a total of 86 tonnes of fresh seafood. The number of days that each business reported using these other methods ranged between 1 and 107 days (pers. comm. Darren Hayle, 2020).

Beach worm and pipi collection occur on various beaches throughout the study area at various times. Various restrictions and closures occur within the study area.

Ocean haul

Ocean hauling is the use of hauling and seine nets from ocean beaches and ocean waters within three nautical miles of the coast. Ocean hauling occurs along the length of the Clarence Valley coastline with the exceptions outlined below. The main species targeted in the area is Sea mullet (*M. cephalus*) which are typically targeted between April and September each year. Ocean hauling is prohibited in several areas of the study area including:

- Woody Bay – from the north-eastern most point of the headland to just west of the campground.
- Turners to Pippi Beach – from the southern breakwall south to the vehicle access track at Pippi Beach (excluding Convent Beach).
- Angourie Point south to Lake Arragan entrance.

Ocean trawl fishery

Ocean trawling is the use of otter trawl net and targets fish and prawns. There is currently no data available on this fishery operating in the study area.

Oysters

The *NSW Oyster Industry Sustainable Aquaculture Strategy* (NSW DPI, 2016) identifies areas within NSW estuaries where oyster aquaculture is a suitable and priority outcome. These areas are known as Priority

Oyster Aquaculture Areas (POAA). Within the study area, POAA are located in Sandon River (4.5 ha) and Wooli Wooli River (18.3 ha) estuaries. It appears that no active oyster leases are present within Sandon River however a number are located within the lower Wooli Wooli River estuary (Figure 39).

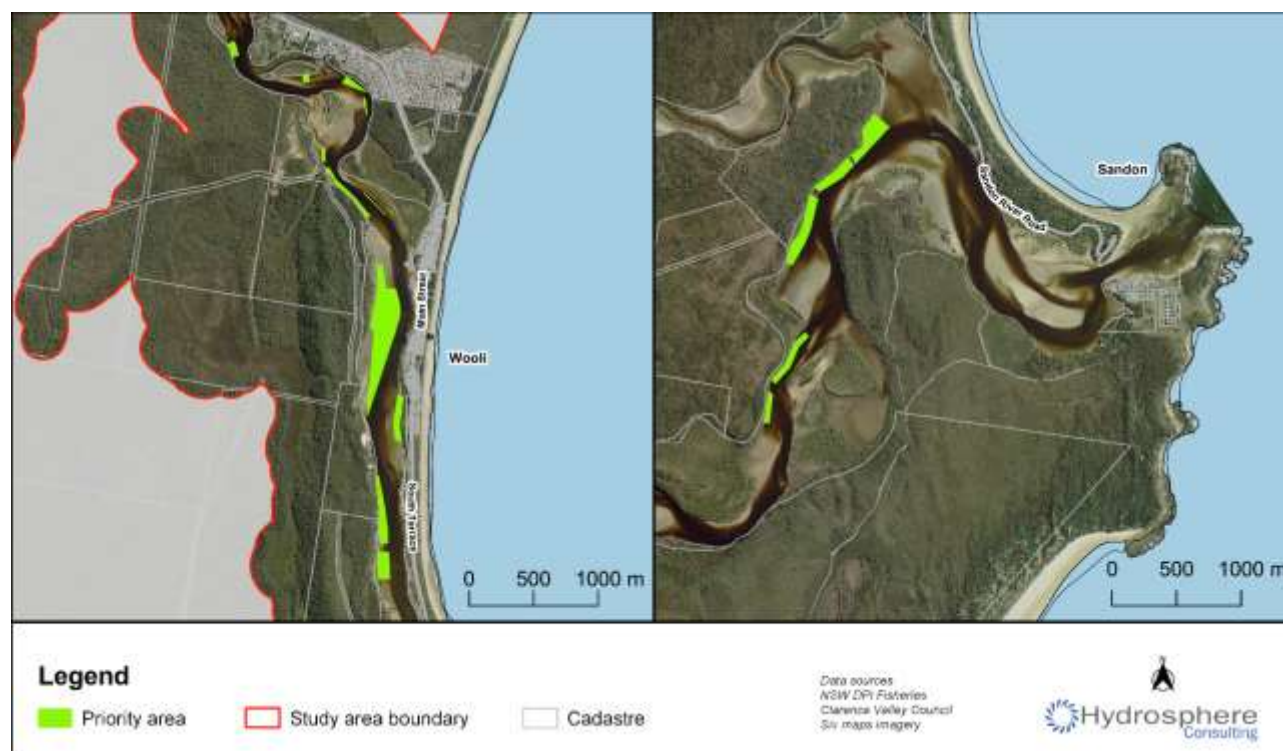


Figure 39: Priority oyster lease areas within the study area

The NSW oyster industry is the largest aquaculture industry in NSW worth \$59 million in 2018/2019 (NSW DPI, 2020a). The Wooli Wooli River estuary is a small contributor to the overall industry contributing a share of 2.7% of the industry (by value) in 2018/19 in conjunction with numerous other small estuaries (NSW DPI, 2020b).

Land-based aquaculture

Land-based aquaculture activities within the study area are restricted to the Wooloweyah Lagoon catchment. Several areas of land-based saline pond aquaculture are situated on Palmers Island but some areas are no longer in use. The dominant species farmed is Black Tiger Prawns (*Penaeus monodon*).

4.8.2 Port of Yamba

A regional seaport at Yamba is situated at the mouth of the Clarence River which is one of five internationally recognised ports in NSW and provides maritime links for export timber and supply vessels to Norfolk Island and a trade link to other South-Pacific markets. The loading wharf of the Port of Yamba is located on Goodwood Island (outside the study area) however the jurisdictional extent of the Port extends throughout the lower Clarence River estuary including the river entrance and channels in the lower estuary. The Port of Yamba is Australia's eastern most seaport offering customs and quarantine classification and unrestricted port of first entry for overseas imports status. The port handles approximately 12,000 mass tonnes of cargo per annum. As a result, the shipping channel depths are maintained to accommodate large vessels (TfNSW, 2015). A rock reef in the Clarence River entrance, known as Dirrangun, a highly significant Aboriginal site, provides a depth constraint for the navigation of large vessels.

4.8.3 Tourism

The Clarence Valley coastline is a popular tourist destination for activities such as fishing, water sports, whale watching, coastal walks, wildlife appreciation with many camping and accommodation options.

Accommodation for visitors includes motels, holiday cottages and caravan parks in the adjoining coastal villages. Within the parks and reserves, Woody Head camping area (Bundjalung National Park) and various small camping areas cater for low-key, short-term camping (Black Rocks camping area in Bundjalung National Park and Station Creek, Pebbly Beach, Sandon River, Illaroo, Boorkoom, Red Cliff and Lake Arragan camping areas in Yuraygir National Park). A range of National Park picnic areas and day walks is also provided in these coastal parks. NPWS revenue from Woody Head camping area exceeds \$1 million p.a. (the second highest NPWS campground revenue source in NSW) (pers. comm. John Kennedy). The Clarence group of National Parks and Nature Reserves is central to a section of the east coast of Australia which is characterised by both a high population density and a high rate of population growth.

In 2018/19 the LGA was estimated to have had 3.11 million visitors, with 79% of these staying overnight. Total visitation has dramatically increased by 47% over the period of 2011 to 2019 which is slightly higher than that of NSW (id, 2020). The number of day trippers to the LGA increased by 14% over the same period. Domestic and international stay overs in the LGA have both shown significant growth over the last nine years (62% and 18% respectively). The high daily visitation rates are expected to be variable across the year and cyclical depending on a variety of factors, such as season/time of year (Australian and overseas holidays, events) and time of week.

In 2018 there were 518 tourism businesses in the Clarence Valley LGA with the United Kingdom the top international market followed by the United States of America and Germany (TRA, 2018). The sectors most closely associated with tourism activity are Accommodation and Food Services, Retail Trade, Arts and Recreational Services, Rental, Hiring and Real Estate Services and Administrative & Support Services. The total impact of tourism expenditure on the Clarence Valley's economy can be summarised as 13.1 per cent of total wages, 16.5 per cent of total employment and 14.2 per cent of total output (CVC, 2018b).

Since COVID-19 the tourist demographic within the Clarence has changed, with a significant decrease in international tourists and increase in Australian visitors. The recently completed Pacific Highway upgrade is also expected to influence tourist demographics with significantly decreased travel times and ease of travel likely to make the Clarence Valley more attractive to the large population areas of the nearby Gold Coast and broader South East Queensland and thereby increasing visitation from these areas.

4.9 Coastal Management Strategies

4.9.1 Entrance Management

The construction of breakwaters and training walls in the Clarence River entrance does not eliminate the formation of entrance bars and accretion of sand in the navigation channels. Historically, dredging has occurred in the Clarence River entrance to improve navigation and for sand and gravel supply to the construction industry. Since 2000, dredging has been undertaken in the following locations within the study area (Figure 40, Royal HaskoningDHV, 2014):

- 2004 – Entrance Bar, approximately 30,000 m³ of material was removed and disposed to the north of the entrance.
- 2004 – Yamba Approach Channel, approximately 9,000 m³ of material was removed and disposed offshore of Iluka.
- 2008 – Yamba Approach Channel, approximately 17,900 m³ of material was removed and used to nourish Whiting Beach (9,400 m³) and Turners Beach (8,500 m³).

- 2016 – Yamba Approach Channel (near Dart Island), approximately 10, 000 m³ was placed on Whiting Beach and some disposed offshore.



Figure 40: Location of dredge areas within the lower Clarence River since 2000

Source: Royal HaskoningDHV (2014)

Lake Cakora is also an ICOLL with an untrained entrance. There is no formal entrance management policy for the entrance however anecdotally, members of the public informally open the entrance periodically. It appears that this is typically done for one of two reasons, the water level is perceived to be too high within the lake or the water quality is perceived to be poor, usually after it has not been open to the ocean for a period of time and particularly when this coincides with the summer holiday period. When poor water quality is perceived, it appears members of the public use a shovel to open the lagoon to the ocean (unauthorised) under the impression that doing so will improve water quality within the lagoon.

The entrance opening regimes of Lake Cakora have been documented previously:

- The entrance opened six times between September 1999 and July 2000. Of those, three were natural events and three were artificial openings (SMEC, 2013d). The duration the entrance remained opened varied from 1 to 37 days (SMEC, 2013c).
- SMEC (2013c) found that between July 2010 and November 2011 the entrance opened on 16 occasions and was opened more often than it was closed in this time. Over this period the duration the entrance remained open varied from 2 to 58 days. During one closure event it remained closed for 70 days.

There has been no official documentation of Lake Cakora entrance opening events since 2011.



1 – April 2019



1 – October 2019

Plate 13: Lake Cakora entrance opening

Source: Friends of Brooms Head Facebook page

An entrance management regime was adopted in the certified CZMP for Lake Cakora:

- Artificial breakout of Lake Cakora entrance during swimming season for recreational purposes if lake water level has reached 1.6m AHD without breaking out naturally. The location of the pilot channel to be determined in association with preparation of a review of environmental factors (REF) for implementation of this action. Install fixed gauge adjacent to Ocean Road Bridge to monitor lake water levels.

Options for entrance management will be reviewed as part of Stage 3 of the CMP development.

Lake Arragan and Mara Creek are ICOLLs with untrained and unmanaged entrances. Stakeholders (e.g. NPWS) have not raised any issues related to the entrance opening regime of either ICOLL and there is no need or desire to manage the entrances.

Sandon River has a permanently open, untrained entrance. Wooli Wooli River has a trained entrance (Plate 4).

There is no data on the entrance opening regime of Lake Arragan however it is estimated that it naturally opens 3-4 times per year, depending on conditions (pers. comm. John Kennedy, NPWS). The state of the entrance varies naturally in response to prevailing catchment runoff and coastal conditions. Breakout events typically occur during summer-autumn coinciding with periods of high rainfall and often high tides and large seas. There are no issues related to the entrance opening regime at Lake Arragan. There is also no information on the opening regime of Mara Creek.

4.9.2 Beach Nourishment

Whiting Beach

As discussed in Section 4.4.4, Whiting Beach experiences erosion and has been impacted by ongoing shoreline recession over a long period of time. In 2012, Whiting Beach experienced a severe erosion event. Royal HaskoningDHV (2015) provides options to manage recession at the beach. The primary recommendation to manage recession was to undertake periodic beach nourishment campaigns in conjunction with DPIE - Crown Lands. The objective was to use dredged material from navigation maintenance dredging projects within the lower Clarence River estuary to renourish Whiting Beach.

Dredged material has been placed on Whiting Beach in 2008 (Section 4.9.1) and in 2016 with approximately 10,000 m³ of material placed on the beach in 2016 from dredging of the navigation channel at the tip of Dart

Island. The material was pumped directly to Whiting Beach, dewatered on site before being reprofiled by an excavator.

Dredging of the lower Clarence River estuary, in particular the entrance channels to Iluka and Yamba boat harbours, is identified as a Key Investment Location in the *NSW Coastal Dredging Strategy* (DPIE, 2019b) with Whiting Beach identified as a nourishment opportunity. The Marine Infrastructure Delivery Office (MIDO) has noted that there will be a dredging campaign in the lower Clarence River with nourishment at Whiting Beach if surveys and the feedback from stakeholders demonstrate a need. However, the opportunistic use of dredged material for the nourishment of Whiting Beach is an inconsistent approach that relies on maintenance dredging occurring within the lower Clarence River estuary and the material being suitable and available for use on Whiting Beach. Royal HaskoningDHV (2015) recommended that CVC investigate alternative sand sources for the nourishment of Whiting Beach. Sand between Hickey and Dart Island was identified by Royal HaskoningDHV (2015) as suitable and a draft REF for the use of the material was prepared with the recommendation that CVC finalise the REF and any other approvals required to use the material when required.

Wooli Beach

A key recommendation of the Wooli CZMP (Royal HaskoningDHV, 2018) was the detailed design and implementation of a beach nourishment scheme/beach management strategy for Wooli Beach. A beach management strategy is currently being prepared for CVC. The strategy is a short to medium term strategy that aims to mitigate risks to built assets from coastal erosion and 'hold the line' against long term recession. The primary method in the strategy for beach management is beach scraping/backpassing (in conjunction with other auxiliary measures such as dune stabilisation and revegetation). The strategy is investigating a number of potential sand sources on Wooli Beach for the scraping including the northern end of the beach and the beach adjacent to Wooli. The intention of the strategy is to be flexible to cater for beach conditions at the time of scraping activities.

Prior to the development of the beach management strategy, due to the immediate need to provide protection to the Wooli village, a trial beach scraping event was undertaken to renourish a section of Wooli Beach adjacent to the village. The scraping trial involved two passes, the first was completed in seven days (concluding in April 2019), and the second, five days (concluding in May 2019). Sand was scraped to a depth of 300 mm from within the intertidal zone with a total of ~13,600 m³ distributed over the 800 m long nourishment area (equating to approximately 15-17 m³/m), with the majority deposited in front of the southern terrace section of the village (Saye, 2019). Large machinery including a bulldozer and two excavators were used to move and profile the sand (Plate 14). These scraping works were expected to provide protection against a 1:20 year ARI event. The scraping was undertaken by CVC with funding and technical assistance from DPIE - EES and the local community. The works are considered to be highly successful and effective at providing interim protection to Wooli. Due to the success of the trial scrape an additional round of scraping is proposed (with a grant proposal for the works currently submitted). The aim of the scraping is to build suitable sand reserves to try and achieve protection against an up to 1:50 year ARI event.



1 – beach scraping (2019)



2 – beach profile (2019) after scraping



3 – partially revegetated dune (July 2020)



4 – community signage

Plate 14: Trial beach scraping at Wooli Beach (2019) and dune formation in June 2020

Source: Clarence Valley Council

4.9.3 Slope stabilisation

J K Geotechnics (2017) recommended a suite of strategies to effectively manage slope instability and associated landslips at Pilot Hill including:

- Formalised groundwater drainage stabilisation.
- Trench drains and other surface water drainage improvements.
- Ongoing inclinometer and groundwater monitoring.

Ongoing monitoring is undertaken and the surface water drainage improvements have been completed.

4.9.4 Coastal Protection Assets

Some coastal protection assets are in place along the Clarence Valley coastline. In addition to those discussed below, small localised coastal protection works, formal and informal, have been undertaken in

several locations, typically around beach access points (e.g. Spooky Beach) and estuary banks (e.g. Wooli Wooli River).

Woody Head/Woody Bay

A rock revetment was constructed along the shoreline of the Woody Head campground by NPWS (Figure 41) to provide protection against beach erosion and shoreline recession. The revetment can be categorised as two sections – east of the boat ramp and west of the boat ramp. The section east of the boat ramp is an older rock revetment founded on bedrock. The section to the west of the boat ramp was constructed more recently and built progressively west from the boat ramp in several sections. This section (Plate 15) was built in November 2018 and is not founded on bedrock (pers. comm, Dean Egan, 2020).



Figure 41: Location of rock revetment and artificial dune at Woody Head



1 – western section



2 – eastern section

Plate 15: Rock revetment at Woody Head (July 2020)

End effects of this structure have exacerbated erosion directly north of the structure impacting beach access and may be accelerating erosion and recession towards the road (Plate 16).



1 – End wall erosion at seawall impacting public access



2 - Shoreline recession impacting vegetation

Plate 16: Erosion and recession at Woody Head (July 2020)

An artificial dune was constructed at Woody Bay in 2004. The dune is approximately 100 m in length, 25 m wide and 2.5 m in height and has been revegetated with local dune species (Figure 41). The purpose of this dune was to limit overtopping and coastal inundation of low-lying areas of the campground and provide protection to the facilities as any ongoing erosion of the foreshore proceeds. When planned and constructed, these works were seen as a management option to permit the natural processes to proceed, whilst affording protection to the main areas of the campground. In line with the original strategy the western node of the campground was relinquished at the time of the dune construction. Part of the management strategy was to allow for the natural realignment of the front of the dune while subsequently building up the back which would allow the dune to move further landward. However, the location of the amenities block and sewer pumping station behind the eroded section of the dune has not allowed dune replenishment to take place (DECCW, 2012). Instead, the seawall fronting the dune has been progressively extended as required to provide protection for the site.

Whiting Beach

Whiting Beach experienced a severe erosion event in 2012 which threatened Council infrastructure including the footpath, road, stormwater and sewer assets at the eastern end of the beach adjacent to the breakwall. A geotextile sand container (GSC, geobag) revetment was constructed to protect against future erosion (Plate 17). GSCs were selected as they provide adequate protection but also fit in well with the surrounds and are safe and conducive to the public use of the area. The GSCs appear to provide adequate protection and with fencing and revegetation above the structure continue to fit in with the aesthetics of the location.



1 - Site after erosion event in 2012



2 - Construction of GSC revetment



3 – Post-construction



4 – July 2020

Plate 17: Geobags at Whiting Beach

Source: top left, right and bottom left Geosynthetic (2012)

Yamba

A rock revetment, approximately 180 m, is located along Yamba Main Beach. The revetment has a relatively low profile with the majority of rock voids infilled with concrete. The revetment provides protection to the Main Beach foreshore, public toilets, pathways, carpark, Yamba Surf Life Saving Club building and access way.

Royal Haskoning (2012) completed an inspection of the Main Beach revetment in 2012 and made recommendations for its upgrade. A number of potential options were considered with the final recommendation a rock revetment with banks of suspended concrete bleaches (large steps) into the face of the revetment. A concept design for the structure was prepared however it has not been constructed.



Figure 42: Location of rock revetment at Yamba Main Beach



Plate 18: Yamba Main beach rock revetment

Brooms Head

A rock revetment is located along the majority of the Brooms Head Foreshore Reserve shoreline (Plate 19). The revetment extends approximately 1 km west from the most eastern point of the caravan park (Figure

43). The northern extent of the revetment is the most recently constructed section. There is approximately 80 m of caravan park (far western extent) that is not protected by rock revetment. An action in the existing Lake Cakora/Brooms Head CZMP is to extend this revetment to provide protection to the remainder of the foreshore reserve. CVC has commenced the design of the revetment extension.

The existing revetment is in generally good condition and is effective in protecting the shore from beach erosion and shoreline recession. Storm surge/large seas can overtop the revetment and inundate parts of the holiday park and reserve. The revetment has been largely reconstructed over the last 10-15 years. Undersized rock is used in some sections of the revetment, especially east of the boat ramp, which can become dislodged during large seas.



Figure 43: Current extent of foreshore rock revetment at Brooms Head



1 – northern section



2 - southern section

Plate 19: Brooms Head rock revetment (July 2020)

Sandon

Short sections of ad hoc rock revetment and other structures made from various materials have been constructed adjacent to residences in Sandon Village by private landowners (Plate 20). Although located within the estuary entrance this section of bank is subject to erosion from coastal processes. The condition and effectiveness of the structures varies along the bank.



Plate 20: Coastal protection structures at Sandon Village

4.9.5 Beach monitoring

Five beach monitoring poles are located along the Clarence Valley coastline, two at Brooms, one either side of the lake entrance, two at Wooli Beach and one at Pippi Beach. They are a fixed visual feature that can be used periodically to gauge sand supply on the foredune/beach. A method has been developed that enables

people to use the poles to manually record observations of sea and beach conditions. The poles are currently not used for any formalised regular monitoring however were installed to enable monitoring if required. The poles should be retained in place where possible.



Plate 21: Beach monitoring pole - north side of Lake Cakora entrance

4.9.6 Emergency Planning

Emergency Action Sub Plans (EASPs) have been prepared for Brooms Head Beach and Wooli Beach. The EASPs outline Council's intended response to a coastal erosion emergency and in certain locations explains ways in which, and where, beachfront property owners can place temporary coastal protection works in accordance with the *Coastal Protection Act 1979* (now repealed):

- *Brooms Head Main Beach Emergency Action Sub Plan* (SMEC, 2015) - this EASP documents emergency management arrangements of the coastal hotspot at Brooms Head Beach, being the beach from the Lake Cakora entrance at the Ocean Road bridge for at least 400m north of the bridge, plus the length of Beach and headland from the southern side of Brooms Head Reserve.
- *Wooli Beach Emergency Action Sub Plan* (CVC, 2015) - this EASP documents emergency management arrangements for the coastal erosion hotspot at Wooli Beach opposite Main Street and Riverside Drive intersection south to the Wooli Wooli River, plus the length of beach to the northern side of the residential area in the vicinity of the beach access known locally as "One Tree".

A draft emergency plan also exists for the Pilot Hill landslide risk area however has not been adopted.

The EASPs and emergency plan for Pilot Hill will be reviewed and updated as part of the CMP development (Stage 4) to comply with current EASP guidelines (DPIE, 2019c).

4.9.7 Development Controls

The Clarence Valley LEP 2011 makes local environmental planning provisions for land in Clarence Valley in accordance with the relevant standard environmental planning instrument under section 3.20 of the *Environmental Planning and Assessment Act 1979*. The LEP includes local provisions for coastal risk

planning (Part 7, Clause 7.5 of the LEP) with mapping of coastal risks covering parts of Woolli coast and village (refer Section B4, Appendix B). Clause 7.5 requires consideration of a number of matters related to impacts of coastal erosion and land instability and measures to reduce risks and access before granting consent to development. CVC's Development Control Plans (DCPs) provide detailed planning and design guidelines to support the planning controls in the LEP. The *Residential Zones DCP 2011* requires consideration of the NSW Coastal Policy and *NSW Coastal Design Guidelines* (Coastal Council, 2003). Woolli Village Controls (Part V of the Residential DCP 2011 and Part Q of the Business Zones DCP 2020) document the development restrictions that apply within the "Woolli Beach Coastline Management Plan". That plan (prepared in 1997) has been superseded by the *Woolli Beach/ Village Review of Coastal Hazards* (WorleyParsons, 2010a) and *Woolli Village Coastline Management Strategy Update and Options Review* (WorleyParsons, 2010b). Other coastal hazards are not specifically addressed in the DCP.

Council includes advice on Section 10.7 planning certificates regarding coastal hazards consistent with the adopted *Yamba Coastline Management Plan*. In addition, when Council resolved to endorse the final CZMPs for Woolli Beach and Brooms Head/Lake Cakora it also resolved to provide advice on Section 10.7 certificates relating to immediate and future coastal hazards affecting certain land parcels

Current CZMPs include actions relating to development controls which have not yet been implemented (refer Appendix E):

- The CZMP for Brooms Head and Lake Cakora include actions to update the LEP with mapping of coastal risks, update of development control plans and building and development standards addressing coastal hazards in those areas.
- The Woolli Beach CZMP includes actions to amend planning controls to be consistent with the current hazard assessment (WorleyParsons, 2010), update information on planning certificates, update of development control plans and building and development standards addressing coastal hazards in Woolli.
- The Yamba Coastline Management Plan includes actions relating to the landslip risk including compliance of development consents and building approvals, audit of the structural adequacy of works within risk zones, introduction of LEP controls and development consent requirements, development control planning and stormwater management planning.

Development applications (DA) for new development in areas of known coastal hazards are assessed on their merits and despite formal development controls not being in place they are still considered in the assessment of applicable DA's.

4.10 Recent Coastal Events

The most significant coastal event in recent history is the June 2016 East Coast Low (ECL), often referred to as the "Black Nor'easter". This ECL was different to typical ECLs (south to south-easterly wave direction) in that the waves came from the east to north-east. The unusual wave direction combined with heavy rainfall and some of the highest tides of the year amplified impacts along the coast, impacting some 2,000 km of the east Australian coastline (Mortlock *et al.*, 2016).

Documentation of impacts of the Black Nor'easter on the Clarence Valley coastline is limited however impacts of the event were considered to be relatively minimal (on already eroded beaches). Sandon (north side) was one location that was impacted by the event. A large volume of sand was eroded from the beach adjacent to the Sandon River Campground, threatening campground sites and infrastructure (Plate 22). Council infrastructure at Convent Beach was also threatened by the event at Convent Beach. The erosion from this event resulted in the ultimate decommissioning of a sewer pump station (and associated access stairs which were used by the public) located behind Convent Beach and replacement with a pressure sewer network. Impacts from the event were also evident at Whiting Beach and Woolli Beach.



Plate 22: Beach erosion at Sandon river campground following the 2016 Black Nor'easter event

Note: The majority of emergency ad hoc protection works have since been removed
Source: Marc Daley - EES

More recently, two ECLs in quick succession occurred in early mid-July 2020 (known for the erosion event on Wamberal Beach). Areas of beach erosion occurred along the Clarence Valley coast including some sand loss at Whiting Beach and Turners Beach. Anecdotal reports and evidence suggest that the recently constructed incipient dune at Wooli Beach provided sufficient protection in the event with only minor erosion of the dune toe occurring (Plate 23). Recession of Woody Bay is continually occurring. The recession is not attributed to a particular weather event however erosion does appear to accelerate during large north or east swell events.

During the same event the beach at Brooms Head beach appeared to gain sand with signs of accretion occurring in previously eroded areas (Plate 23).



1 – Wooli Beach constructed dune



2 – sand accretion on previously eroded section of Brooms Head beach

Plate 23: Wooli Beach and Brooms Head following July 2020 ECLs

Source: Des Schroder – CVC, Peter Wilson – CVC

4.11 Future Context

4.11.1 Population Growth and Land Development

The Clarence Valley's strong tourism and agricultural base will be supplemented by the continued development and delivery of regional government services including justice and health facilities (NSW Government, 2017). The majority of future urban housing development in the LGA will occur in Clarenza, Junction Hill, James Creek, and West Yamba. All these locations lie outside the study area, however James Creek and West Yamba are located within the catchment of channels (Palmer's and Oyster Channels) associated with Wooloweyah Lagoon. The remaining growth is expected to largely occur in the existing urban growth centres (focused on existing major towns in the shire) and existing rural areas of the shire.

There is some conjecture around future population forecasts for the LGA. NSW Government (2017) projected future population of the LGA in 2036 to be 57,450, an increase of 5,788 people (11% between 2019 and 2036 or 0.65% p.a.). However, NSW Government (2020) indicates an increase from 51,600 (2016) to 53,200 (2026) and then decrease to 50,400 in 2041. Council will be obtaining independent analysis of population forecasts in 2021.

4.11.2 Climate Change

The Clarence Valley coastline will experience broadscale climate change impacts as well as interrelated localised impacts into the future. Climate change impacts expected along the coastline are broad ranging and are summarised as follows:

- Sea level rise – global average sea levels increased by around 25 cm since 1880, with the rate of rise accelerating in recent decades. Observations show that the rate of global mean sea level rise increased from 1.5 ± 0.2 cm per decade (1901–2000) to 3.5 ± 0.4 cm per decade (1993–2019). (CSIRO, 2020). However, the rates of sea level rise to the north and south-east of Australia (including the NSW coast) have been significantly higher than the global average (CSIRO, 2020). Future sea level rise rates will depend on carbon emission pathways and other influences. Depending on future carbon emission scenarios sea levels around eastern Australia could rise between 0.49 to 0.86 m (relative to 1986 to 2005) by 2090 (Church *et al.*, 2016). Based on these changes it is expected that sea level rise will result in:
 - Coastal inundation, primarily an increase in 'wet areas' in estuaries.
 - Increased tidal propagation into estuaries resulting in changing tidal velocities, storm tide inundation, changed geomorphology (shoaling, bank stability and erosion) and migration of estuarine vegetation communities (saltmarsh in particular).
 - Changes to wind speed, wave height and direction and storm surge are likely will impact the coastline and coastal processes.
 - Increased salinity in the upper estuary reaches and subsequent impacts on vegetation communities and distribution of fauna species.
 - Existing coastal gravity drainage, stormwater infrastructure, sewerage systems and some roads potentially becoming compromised over time as the mean sea level increases.
 - Changes to entrance opening regimes for ICOLLs and altered catchment flood behaviour over time.
 - Decrease in the level of protection afforded by existing seawalls and other hard engineering structures due to the increasing threat from larger storm surges and inundation at higher projected water levels.
 - Aquifer salinity.

- Increased coastal erosion and recession.

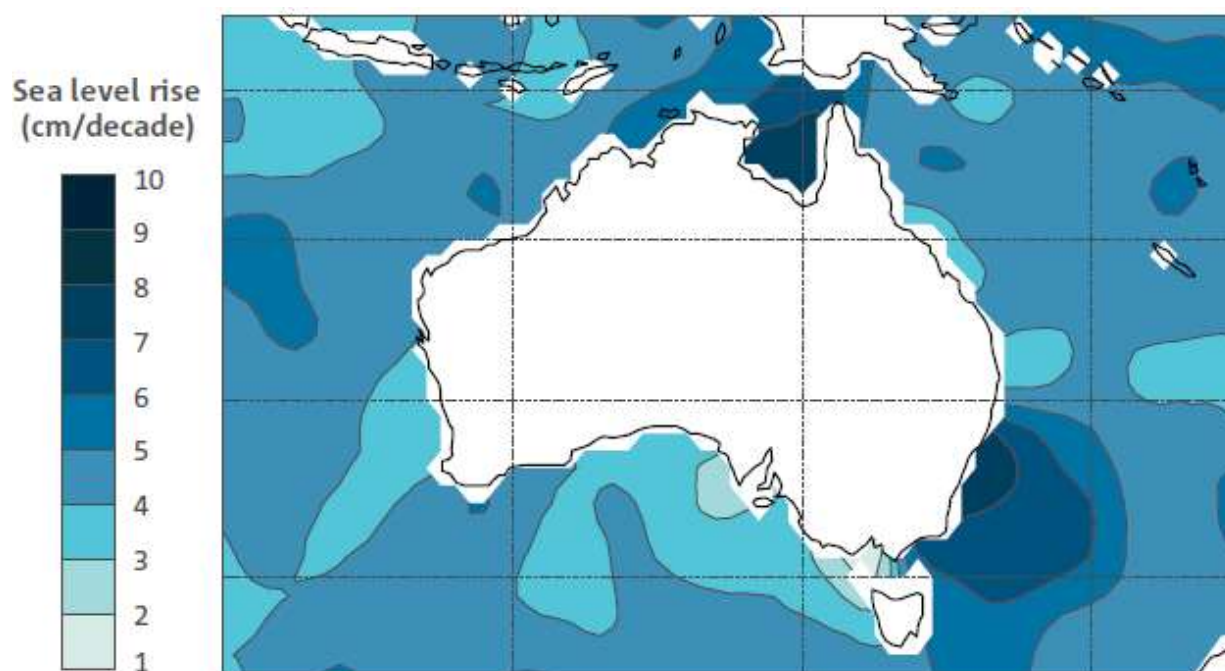


Figure 44: The rate of sea level rise around Australia measured using satellite altimetry, from 1993 to 2019

Source: CSIRO, (2020)

- East coast lows - climate modelling projects a decrease in the number of small to moderate ECLs in the cool season with little change in these storms during the warm season. However extreme ECLs in the warmer months may increase in number but extreme ECLs in cool seasons may not change (AdaptNSW, 2019a).
- Changes in estuary water temperature and acidity – a recent study by Scanes *et al.*, (2020) found that in response to climate change the temperature of Australian estuaries has increased on average approximately 2°C and they have acidified at a rate of 0.09 pH units over the last 12 years. These changes are orders of magnitude faster than predicted in earlier studies. The study found that lagoons were the fastest warming estuary type, noting that shallow estuaries with periodically closing entrances are the most vulnerable to warming. This suggests that ICOLLs may be more susceptible to climate change impacts than other estuary types.
- Floods and storms - extreme rainfall events are associated with storms and flooding. Rainfall extremes are projected to increase in the near future (2030) and far future (2070) (AdaptNSW, 2020b).
- Bushfires - average and severe fire weather is projected to increase in NSW in the future. Increases in average and severe fire weather are projected to occur mainly in summer and spring, with the largest increases by 2070 to occur in spring (Adapt NSW, 2019c).
- Biodiversity – biodiversity will be impacted by climate change induced rising temperatures, sea levels, fire regimes, water quality and ocean chemistry. This will exacerbate degradation of native communities and expansion of invasive species. OEH (2011) assessed the climate change related impacts on specific ecosystems across NSW. Key vegetation communities from within the study area and how they are likely to be impacted by climate change are summarised below:
 - Mangroves, saltmarsh, seagrass - major impacts of climate change on this ecosystem are likely to be from direct inundation from sea level rise, erosion from inland migration of the

coastline, an increase in flood frequency and intensity and subsequent increased silt and nutrient loads and an increase in storm intensity. Increased temperatures may also have an effect. The impact of climate change could be catastrophic on saltmarshes and is likely to cause major changes to the geographic range of mangroves and seagrass communities.

- Coastal freshwater wetlands - coastal wetlands may be affected by sea-level rise, saline intrusion, temperature increase, increased intensity of flooding events and altered fire regimes.
- Coastal forested wetlands - climate change could have a major effect on coastal forested wetland communities, causing substantial changes to species composition over most of their range. Impacts are likely to include sea level and temperature rises, altered fire regime and changes in storm behaviour.
- Coastal heath - the major impacts of climate change on heathlands include more intense droughts during El Niño periods, changes to the fire regime and sea level rise related inundation and saline intrusion, increased storm intensity and coastal development in response to rising sea levels.
- Littoral rainforest - vulnerable to sea-level rise and associated erosion and saline intrusion, increased storm intensity, heat stress, drier seasonal conditions, drought and changes to the fire regime. Large shifts in assemblage composition and abundance are likely and this community is likely to be lost from most of its (already highly limited) geographic extent.

In response to climate change CVC have implemented a range of strategic measures to mitigate impacts. Climate change data has been incorporated in existing Coastline and Estuary Management Plans.

5. CURRENT COASTAL MANAGEMENT ARRANGEMENTS

5.1 Coastal Management Areas

The Coastal Use Area (CUA), Coastal Environment Area (CEA) and Coastal Wetlands and Littoral rainforest Areas (CWLRA) within the study area have been mapped as part of the Coastal Management SEPP and are presented in Figure 7 to Figure 9. Coastal Management SEPP mapping is currently not available for the CVA. The *Coastal Management Act 2016* definitions and objectives of the coastal management areas are discussed in Appendix B1. The management of these areas is discussed in the following sections.

The CEA and CUA, as mapped in the Coastal Management SEPP, are based on defined distances around coastal water bodies and the open coast (Section 1.3).

5.1.1 Coastal wetlands and littoral rainforests

All mapped littoral rainforest within the study area is located within the Iluka Nature Reserve which is part of the Gondwana Rainforests of Australia World Heritage Area. The reserve contains the largest area of littoral rainforest in NSW. The reserve is managed by NPWS under the *Broadwater National Park, Bundjalung National Park and Iluka Nature Reserve Plan of Management* (NPWS, 1997).



Plate 24: Littoral rainforest (Iluka)

Source: J. Chivers, NPWS

The majority of mapped coastal wetlands within the study area are situated within Yuraygir and Bundjalung National Parks and managed under their relevant plans of management. There is also large areas of coastal wetlands located in the Wooloweyah Lagoon catchment particularly in and around Micalo Island and Micalo Channel and along the south and south western perimeter of the lagoon on private or Crown Land. The majority of these wetland areas are mapped as E3 – Environmental Management or W1 - Waterways under

the Clarence Valley LEP 2011. These areas are included in the existing *Coastal Zone Management Plan for Wooloweyah Lagoon* with actions specific to wetland areas including:

- Water quality actions.
- Identify and prioritise wetland/floodplain habitats for rehabilitation.
- Decommission the Taloumbi ring drain and levee.
- Improve water quality, fish passage and habitats in drains.
- Incorporate a foreshore buffer around Wooloweyah Lagoon to allow for ecosystem processes and expected response to future environmental change.

These actions are ongoing or incomplete (refer Appendix E).

A small area of coastal wetland is also located adjacent to the Brooms Head Village and the northern arm of Lake Cakora. These areas are mapped as E2 – Environmental Conservation under the existing under the Clarence Valley LEP 2011. The *Brooms Head Beach and Lake Cakora Coastal Zone Management Plan* provides management actions for these areas including:

- Determine impact of future inundation risk.
- Improve compliance activity on unauthorised actions.
- Implement management actions from review of caravan park effluent management.

These actions are ongoing or incomplete (refer Appendix E).

A small area of mapped coastal wetlands is located outside of the National Park adjacent to Wooli (between the original and new sections of village). It is mapped as E2 – Environmental Conservation under the Clarence Valley LEP 2011.

Climate change related impacts to these areas are discussed in Section 4.11.2. The resilience of coastal wetlands and littoral rainforests to climate change/sea level rise/coastal hazards has not been assessed specifically in the Clarence Valley.

5.1.2 Coastal environment area

The majority of the CEA that extends over land within the study area, particularly north of the Clarence River entrance and south of Yamba, consists of National Park and is managed under the NPWS plans of management. The majority of the seaward extent of the CEA from Sandon south is part of the SIMP.

Community feedback from the community survey indicated that community members highly value the scenic beauty, untouched nature and biodiversity of the Clarence Valley coastline. The community also indicated that the preferred management approach for much for the coastline was do nothing/leave it as is, indicating that the community values of the CEA is being appropriately managed.

5.1.3 Coastal use area

The CUA is managed in several ways including:

- The majority of the coastal use area that extends over land within the study area, particularly north of the Clarence River entrance and south of Yamba, consists of National Park and is managed under the NPWS plans of management.
- Much of the CUA along the coast that is not National Park is Crown Land and is managed under relevant plans of management.
- Significant heritage areas within the coast use area are identified in the Clarence Valley LEP 2011.

- CVC is currently undertaking an Aboriginal cultural heritage mapping project encompassing the study area.
- Angourie Point, a revered surf break, is a declared National Surfing Reserve.

Potential impacts from coastal hazards on the CUA are discussed in 4.4.

5.1.4 Coastal vulnerability area

The CVA along the Clarence Valley coastline is not yet mapped in the Coastal Management SEPP. Mapping of coastal hazards is available for Whiting Beach, Pippi Beach, Brooms Head/Lake Cakora and Wooli Beach and is presented in Section 4.4.

Coastal hazards along the Clarence Valley coastline to be addressed in the CMP include the following, as defined by (OEH, 2019):

- Beach erosion – refers to the removal of beach materials by wave action, tidal currents, littoral currents or wind. It is usually associated with storms or with elevated water levels and can occur on the open coast and in estuaries.
- Shoreline recession - refers to continuing landward movement of the shoreline or a net landward movement of the shoreline over a specified time. As shoreline recession occurs, the beach fluctuation zone is translated landward.
- Coastal lake or watercourse entrance instability - both natural and trained entrances of estuaries and coastal lakes present a variety of potential hazards and risks. The entrance dynamics and the condition of the entrance also affect flood hazards, water quality and ecological health in the estuary or coastal lake.
- Cliff/slope instability - geotechnical or slope instability hazard occurs on the headlands and bluffs. Geotechnical hazards present risks both to property and to life, such as rock falling from headlands and cliff faces, collapse of unconsolidated materials (such as high dune escarpments), reduced foundation capacity, and the collapse of cliffs under houses and development.
- Coastal inundation related to storm events - the temporary flooding of a portion of land within the coastal zone which is generally related to storm events. Coastal inundation occurs when a combination of marine and atmospheric processes raises ocean water levels above normal elevations and inundates low-lying areas or overtop dunes, structures and barriers. It is often associated with storms resulting in elevated still water levels (storm surge), wave setup, wave run-up and over-wash flows.
- Tidal inundation - inundation of land by tidal action under average meteorological conditions. Tidal inundation may include shorter-term incursion of seawater onto low-lying land during an elevated water level event such as a king tide or more permanent inundation due to land subsidence, changes in tidal range or sea level rise.

5.2 Land Tenure

Land tenure within the study area is illustrated in Figure 45 to Figure 47. Most of the study area is managed as National Park/Reserve (66%) with 24% privately owned and CVC and DPIE - Crown Lands both managing approximately 5% each.

The majority (79%) of Wooloweyah Lagoon study area (other than the lagoon water body itself, which is Crown managed) is privately managed, mostly in the south-west to north-east portion of the catchment. The east and south-east area of the catchment is mostly National Park with small areas of the north-east and Oyster Channel perimeter managed by CVC and DPIE – Crown Lands. Virtually the entire Lake Arragan catchment and the majority of Cakora, Sandon and Wooli Wooli catchments is National Park.

Along the coastline, 92% of the coastline north of the estuary is managed as National Park/Reserve, 85% of the Yamba-Sandon and 67% of the Sandon-Wooli coastline areas are managed as National Park/Reserve. North of the Clarence River, CVC manages land adjoining Iluka Main Beach including the northern carpark and hind dune area. The northern break wall and adjacent carpark is managed by DPIE - Crown Lands. All beaches and beach access from Iluka Bluff north are managed by NPWS. Iluka Road and associated assets and services are located immediately behind the beach at Shark Bay and the road reserve is managed by CVC.



1 – Iluka breakwall



2 – Illaroo campground (source: J. Chivers)

Plate 25: Crown Land and National Park

South of the Clarence River, the coastline around Yamba including Whiting Beach is managed by CVC. Green Point, Spooky Beach and the Blue and Green Pools area are also managed by CVC. The majority of Angourie Point is National Park however parking and access to the point is through Council and Crown managed areas. South of Angourie the majority of the coastline is managed by NPWS except for relatively small areas around each of the villages which are managed by CVC and DPIE - Crown Lands.

Several successful native title determinations exist over parts of the study area (Figure 45 to Figure 47) including:

- NCD2015/002 – Yaegl People #1 - covers the tidal waters within the lower Clarence River estuary including Wooloweyah Lagoon and associated channels, Whiting Beach and Clarence River entrance within the study area.
- NCD2015/003 – Yaegl People #2 - covers areas of Crown land within the lower Clarence Valley from Shark Bay in the north to Wooli in the south including areas of National Park.
- NCD2017/003 – Yaegl People #2 (Part B) - covers the majority of the Clarence Valley coastline. It covers all the land and waters, including the tidal waters, from the mean high-water mark 200 m offshore extending from Wooli Wooli River north to the Shark Bay tombolo.

All current successful claims are managed by Yaegl TOAC.

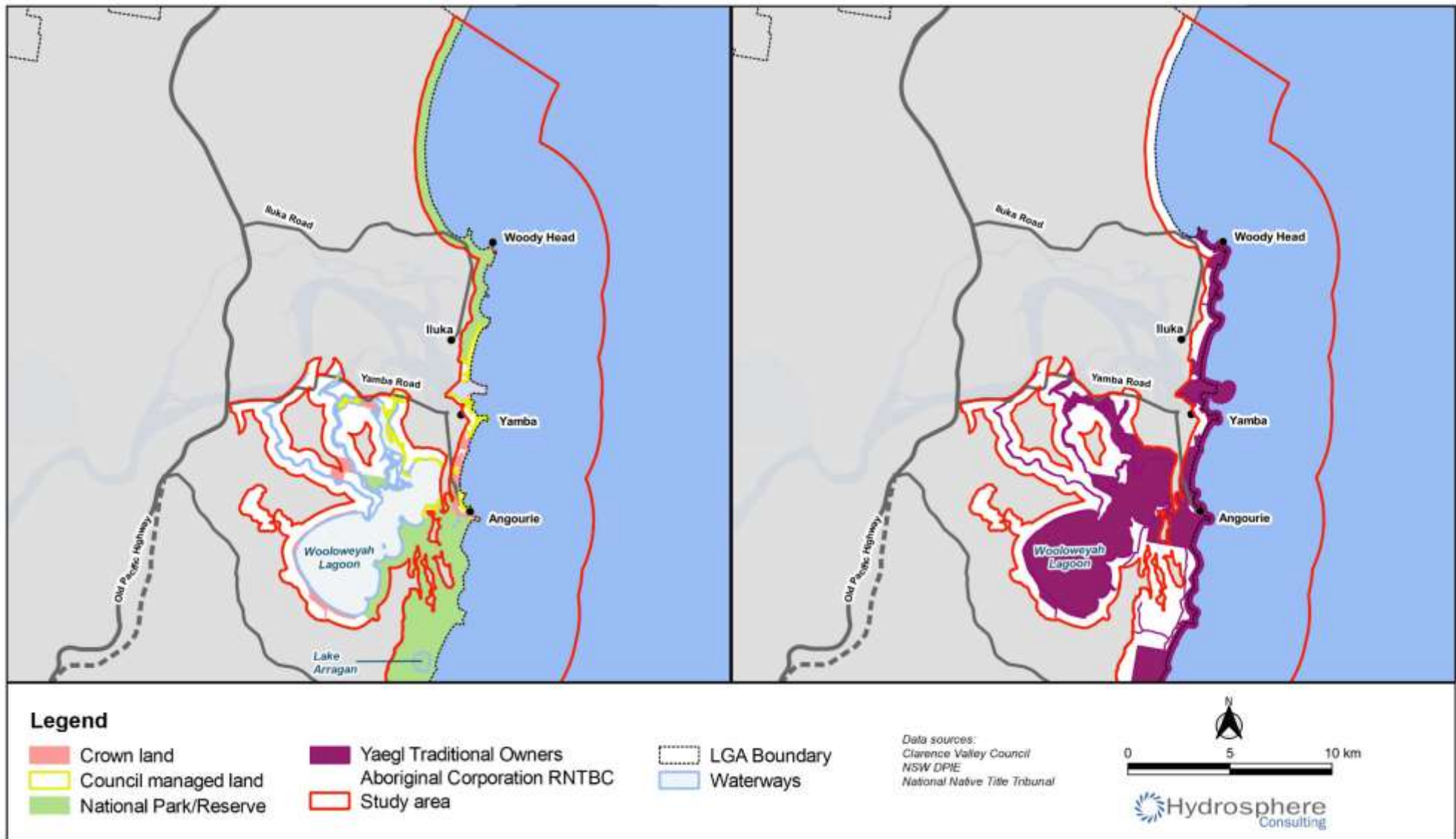


Figure 45: Land tenure and native title: Yamba, Angourie and Wooloweyah Lagoon

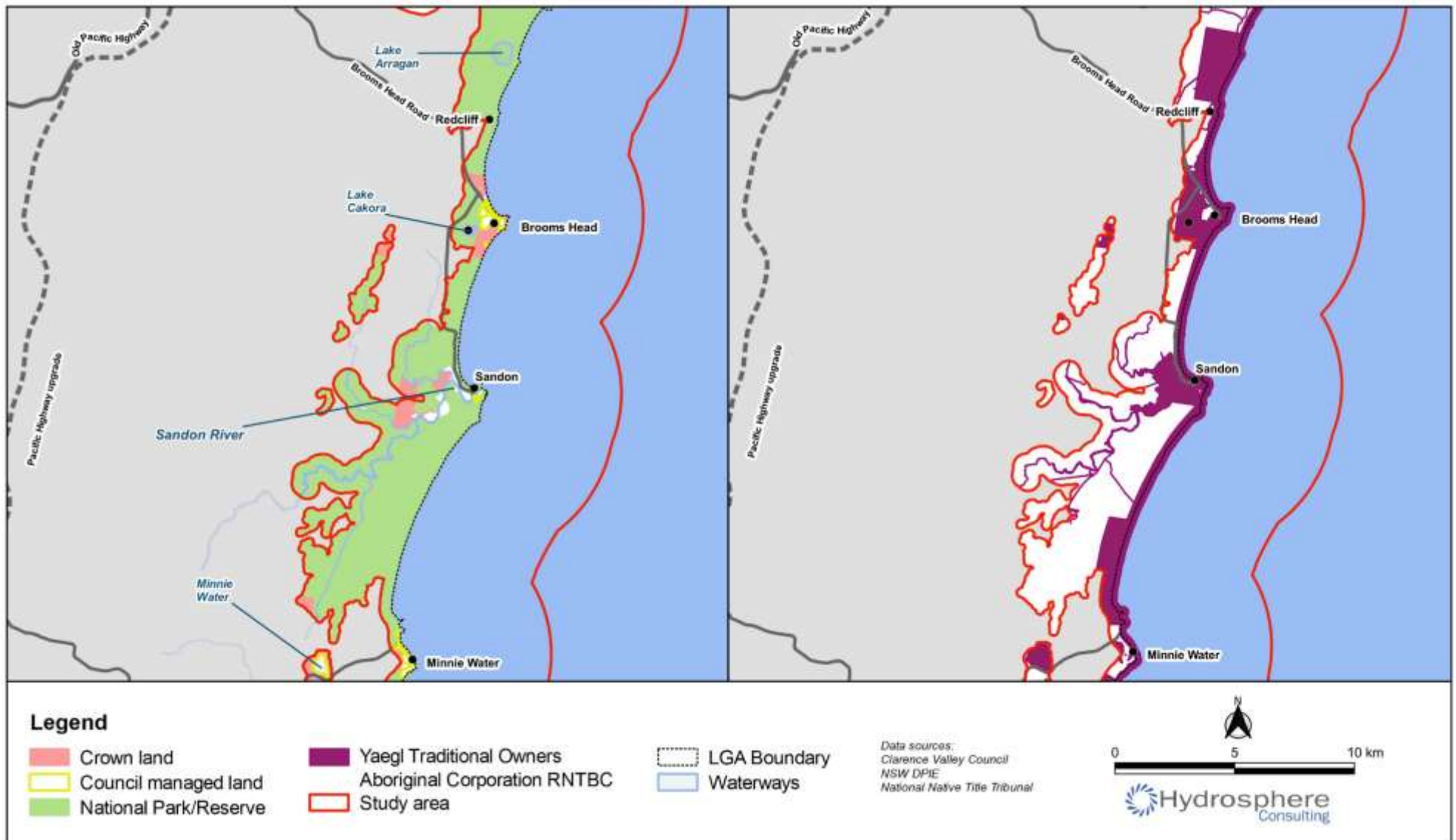


Figure 46: Land tenure and native title: Brooms Head and Sandon River estuary

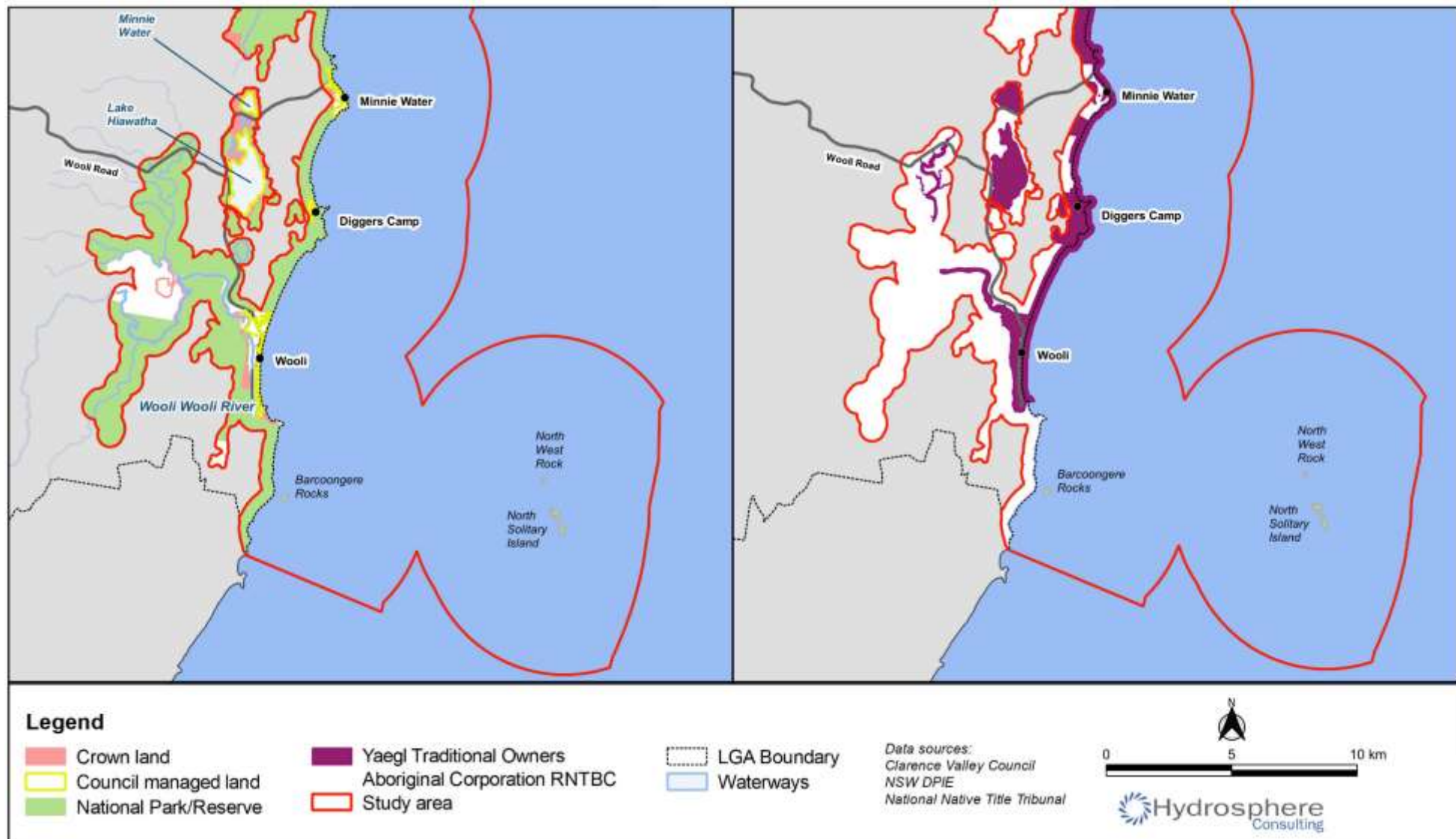


Figure 47: Land tenure and native title: Minnie Water, Lake Hiawatha, Wooli and Wooli Wooli River

5.3 Management Roles and Responsibilities

The study area is managed by CVC, various state government agencies, Aboriginal groups and private landholders (Table 6). A significant proportion of the study area comprises National Parks/Reserves and Native Title land as discussed in Section 5.2. The study area also encompasses part of the SIMP (Figure 48).

Table 6: Management roles and responsibilities

Agency	Role
CVC	Council has a central role in managing the waterways, foreshores and catchments of the study area. CVC is responsible for the management of estuarine and catchment assets that include stormwater and drainage infrastructure, open space assets and foreshore and estuary access points. CVC also manages a range of issues across the study area including cultural heritage, community events, recreational use of the foreshore, estuary and floodplain management and flora and fauna protection and conservation. CVC is also responsible for development planning and controls across the LGA. The objective of these controls is to achieve development that is consistent with the social, economic and environmental values of the study area and to manage the cumulative impact of development in a sustainable manner.
Yaegl TOAC	Yaegl TOAC is the registered native title body corporate for the Yaegl native title determination areas.
Local Aboriginal Land Councils (LALCs)	The study area encompasses land managed by Yaegl, Birrigan Gargle and Grafton-Ngerrie LALCs.
NPWS	NPWS is responsible for management of the <i>National Parks and Wildlife Act 1974</i> and management of National Parks and reserves across the study area. NPWS responsibilities across these areas includes a wide range of activities such as active conservation and habitat protection, fire management, management of tourism and visitation, research and education.
DPIE – EES	DPIE – EES works closely with local councils and communities to reduce threats from flood risk and coastal storms and ensures that people in NSW are well informed about these risks and better equipped to adapt to climate change. DPIE – EES also works with local councils and communities to maintain or improve the health of estuaries/ lakes and enhance the recreational experience. DPIE - EES has provided funding to CVC for the development and preparation of this CMP Scoping Study. DPIE - EES through the Coast and Estuaries Grant Program, provides matched (2:1 or 1:1) funding to councils for the development and implementation of CMPs.
DPIE – Crown Land	Crown Lands is responsible for the administration and/or management of Crown land under the <i>Crown Land Management Act 2016</i> . Crown land includes submerged Crown land, seabed and subsoil to three nautical miles from the coastline of NSW that is within the limits of the coastal waters of the State. Crown land includes much of the submerged land within the estuaries and their associated intertidal areas (below mean high water mark).

Agency	Role
Marine Estate Management Authority (MEMA)	MEMA advises the NSW Government on the management of the NSW marine estate. The Authority brings together the heads of the NSW Government agencies with key marine estate responsibilities (Department of Primary Industries (DPI), DPIE (EES and Planning and Assessment) and Transport for NSW. MEMA ensures policies and programs address priority issues, are well coordinated, efficient, evidence based and result in positive outcomes and undertakes threat and risk assessments, develops management strategies, promotes collaboration between public authorities and fosters consultation with the community.
DPI – Fisheries	DPI - Fisheries administers the <i>Fisheries Management Act 1994</i> and the <i>Marine Estate Management Act 2014</i> and has jurisdiction over all fish (including oysters, crustaceans, polychaetes), and marine vegetation (saltmarsh, mangroves, seagrass and macroalgae) in State Waters including 'water land' below HAT in the estuaries and extending up to 3 nautical miles offshore. Under the <i>Fisheries Management Act</i>, DPI - Fisheries: • Supports economic growth and sustainable access to aquatic resources through commercial and recreational fisheries management, research, aquaculture development, habitat protection and rehabilitation, regulation and compliance. • Mitigates and manages risks from use of land and water. Under the <i>Marine Estate Management Act</i>, DPI - Fisheries is responsible for: • Ensuring strategic and integrated management of the whole marine estate – our marine waters, coasts and estuaries. • Fisheries and aquaculture management, marine biodiversity, marine protected areas, biosecurity, marine estate research, fisheries compliance, marine estate communications and community engagement.
DPI - Marine Parks	The study area also encompasses the Solitary Island Marine Park (SIMP) which extends along the coastline from Muttonbird Island in the south to Plover Island in the north (Figure 48). It includes the tidal reaches of estuaries and seaward to the three nautical mile mark offshore. The park only includes tidal water over Crown Land estate and does not include tidal waters located over private title.
Heritage NSW	Heritage NSW is responsible for the management and protection of Aboriginal cultural heritage and European heritage in NSW.
TfNSW - Maritime	TfNSW – Maritime is the key agency with statutory and policy responsibilities related to the safety and accessibility of New South Wales waterways for recreational and commercial vessel. The Maritime Infrastructure Delivery Office (MIDO) is a joint initiative between DPIE – Crown Lands and Transport for NSW. A number of relevant DPIE – Crown Lands programs are currently managed through the MIDO including: • Coastal Infrastructure Program (i.e. management of estuary breakwalls and training walls). • Rescuing our Waterways dredging program.
Landcare/ Dunecare groups	Non-profit community organisations which encourages and support sustainable natural resource management. The organisation undertakes a range of projects with landholders, volunteer groups, and government agencies including river restoration, farm planning, bush regeneration and some pest control.

Agency	Role
EPA	The primary environmental regulator for NSW. CVC holds environment protection licences issued by the NSW EPA under the <i>Protection of the Environment Operations Act 1997</i> for the operation of the Yamba and Iluka sewerage systems.
State Emergency Service (SES)	The SES has major responsibilities for provision of emergency and rescue services during times of natural hazard emergencies and disasters, including flooding, storms (including storm tide and severe erosion events) and tsunami events.
NSW Police Force	Provide emergency response in a coastal emergency.
North Coast Local Land Services (NCLLS)	NCLLS has previously played a key role in the management of catchment activities and natural resources relevant to estuary catchments and through the facilitation of relationships between landholders and key environmental organisations.
CEMC	The CEMC is represented by key local stakeholder groups including government organisations, CVC councillors and interest groups. The committee ensures that the interests and views of these groups are understood and provides advice to CVC on coastal and estuary management.

Due to the large expanse of coastline and the large size of the Clarence Valley estuary combined with the range of complex and often competing threats to be addressed in the LGA, the implementation of coastal management actions can be hampered by the lack of financial and human resources within Council. As with many regional council areas, the Clarence Valley LGA has a small rate payer base to fund improvement actions. CVC relies on external grant funding (e.g. from the NSW Government) to supplement this revenue although this does not fully overcome the funding limitations faced by CVC. Funding must also be balanced against the many other responsibilities of CVC and requirements for funding.

CVC's ability to prepare CMPs and implement coastal management actions is also limited by internal resources and budget constraints. There is one full-time Coast and Estuary Coordinator for the entire coastal zone. Recent coastal reforms have introduced additional requirements for CMPs that require increased effort relating to staff decision-making, the management of external contracts and internal reporting. In addition, applications for external grant funding (e.g. from the Environmental Trust or Coastal and Estuary Program) require detailed applications and progress reporting.

There are many stakeholders involved in the management of the study area. While this can create competing interests and priorities and the other agencies involved in coastal management are also constrained by the available funding and resources, CVC has established strong working relationships with other agencies, particularly NPWS, DPIE – EES, DPI – Fisheries and DPI – Marine Parks through the CEMC and ongoing management. CVC is also establishing mechanisms for liaison with Native Title holders to ensure council actions are compatible with cultural heritage requirements. Similarly, CVC has established strong working relationships with industry and community groups with the joint funding and implementation of the trial beach scraping at Woolli with the Coastal Communities Protection Alliance (CCPA, Protect Woolli) seen as particularly successful.

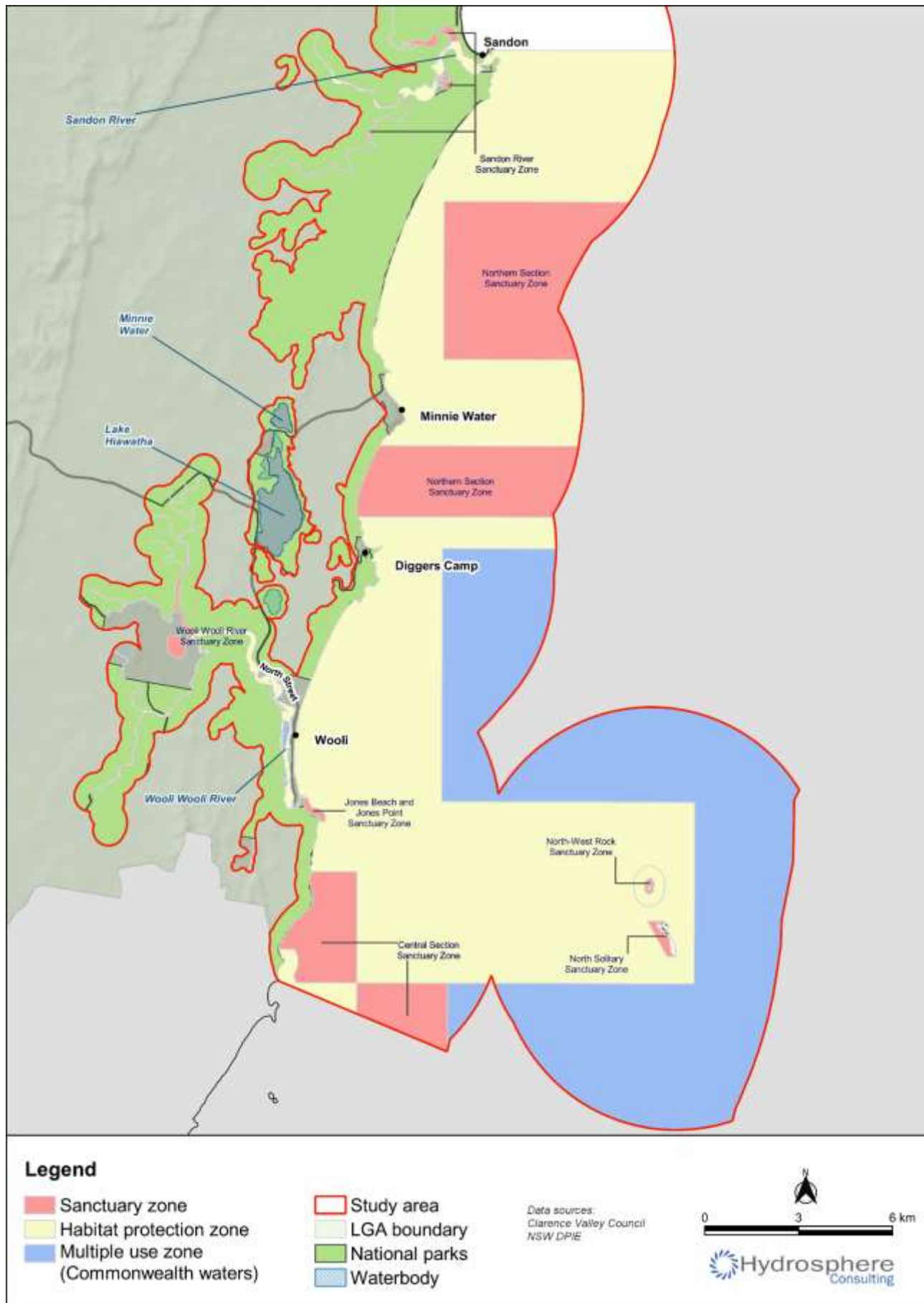


Figure 48: Solitary Islands Marine Park zoning within the study area

5.4 Status of Existing Management Actions

The management actions recommended within all current plans for the study area are collated in Appendix E with the current status of each action. Within the current plans, the management actions were allocated an agency(s) and/or organisation(s) responsible for implementation and in some cases allocated a priority rating of importance of completing the action. Not all management actions have been completed since the adoption of each plan and the timing of preparation of the plans means that some longer-term actions are only now starting to be addressed. However, many actions from each plan have been implemented with targets met through either a combination of on-ground works or other programs undertaken by CVC and other agencies.

There are a number of constraints and limitations that have historically impeded the ability to plan and implement many coastline and estuary management actions in the many different CZMPs, EMPs and other management plans for specific areas. These management plans have traditionally adopted an aspirational approach, with each plan putting forward a long list of potential management actions. As discussed in the previous section, the Clarence Valley LGA has a relatively low population and hence a limited ratepayer base with which to fund the implementation of coastal management actions and the funding provided for coastal management is typically weighed against the many other competing demands on CVC as a service provider to its community. As a result, CVC is generally limited by the funding and resources (such as staffing) available and is reliant on other sources of revenue such as state government grants and subsidies. Given the funding and resource constraints, this has resulted in the need to prioritise and schedule coastal and estuary management actions across the LGA, with implementation typically undertaken on an ad hoc basis as funding becomes available. Further, over time, NSW agencies have changed roles, responsibilities and priorities resulting in some actions being incomplete.

The current CMP process represents an opportunity to develop a more manageable suite of coastal management actions across the LGA with a focus on practical management actions that are rationalised and prioritised by a robust cost-benefit analysis. However, the CMP objectives of integrated and coordinated coastal management between state and local government still needs to be pursued. The CMP represents an opportunity to improve the funding and resources available for coastal management through the NSW Coastal and Estuary Grants Program, CVC's IP&R Framework and other available funding and grant programs.

5.5 Marine Estate Management Strategy Actions

Stage 1 of the MEMS (ending June 2020) focused on addressing the most severe threats to the health of the marine estate, particularly water pollution, which was identified as the greatest threat to the marine estate by the NSW community and through the evidence-based TARA (BMT WBM, 2017). Building on the foundations laid in Stage 1, Stage 2 commenced on 1 July 2020 and is supported by an Implementation Plan for (2020-2021). Some Strategy management actions have included pilot projects in Stage 1 in specific locations along the NSW coast. Other management actions have state-wide benefits, such as the application of a risk-based framework for water quality in estuaries and their main tributaries. MEMA has prepared a status report for local government initiatives (MEMA, 2020) which identified the actions relevant to the study area and issues raised in this Scoping Study (refer Appendix E).

6. SCOPE OF THE CMP

6.1 CMP Area

As discussed in Section 1.2, CVC will prepare a CMP for the Clarence Valley coastline and estuaries addressing the entire coastline and the smaller estuaries. Wooloweyah Lagoon will be included in the future CMP for the Clarence River estuary as the lagoon is a part of the broader Clarence River estuary and many of the issues are similar and/or related to the broader estuary. Addressing Wooloweyah Lagoon in the Clarence River CMP process will provide for a more holistic and integrated management of the entire Clarence River estuary. The CMP for the Clarence Valley coastline and estuaries will be developed for the coastal management areas (CUA, CEA and CWLRA) within the area shown in Figure 49. The freshwater lakes (Minnie Water and Lake Hiawatha) and their catchments will be managed by CVC for town water supply.

The existing mapping for the CWLRA, CEA and CUA (Figure 7 to Figure 9) is considered suitable for management of the coastline and the estuaries and no changes to existing Coastal Management SEPP mapping are proposed for this CMP. However, it is noted that there is no detailed recent mapping of the wetland and littoral rainforest communities in the study area available at this time. Detailed contemporary vegetation mapping is expected to be released by the NSW Government in 2021. Once this revised mapping is available, the adequacy of CWLRA mapping will be reviewed (potentially as a Stage 5 CMP action).

Although Council has undertaken hazard assessments for some coastline areas, there is currently insufficient information available on coastal hazards to map the CVA as part of the Coastal Management SEPP or CVC's LEP. Detailed coastal hazard studies are recommended (Section 6.2.3) and CVC will consider whether the CVA should be mapped and included in the Coastal Management SEPP or LEP (via a planning proposal) as part of the CMP development process.

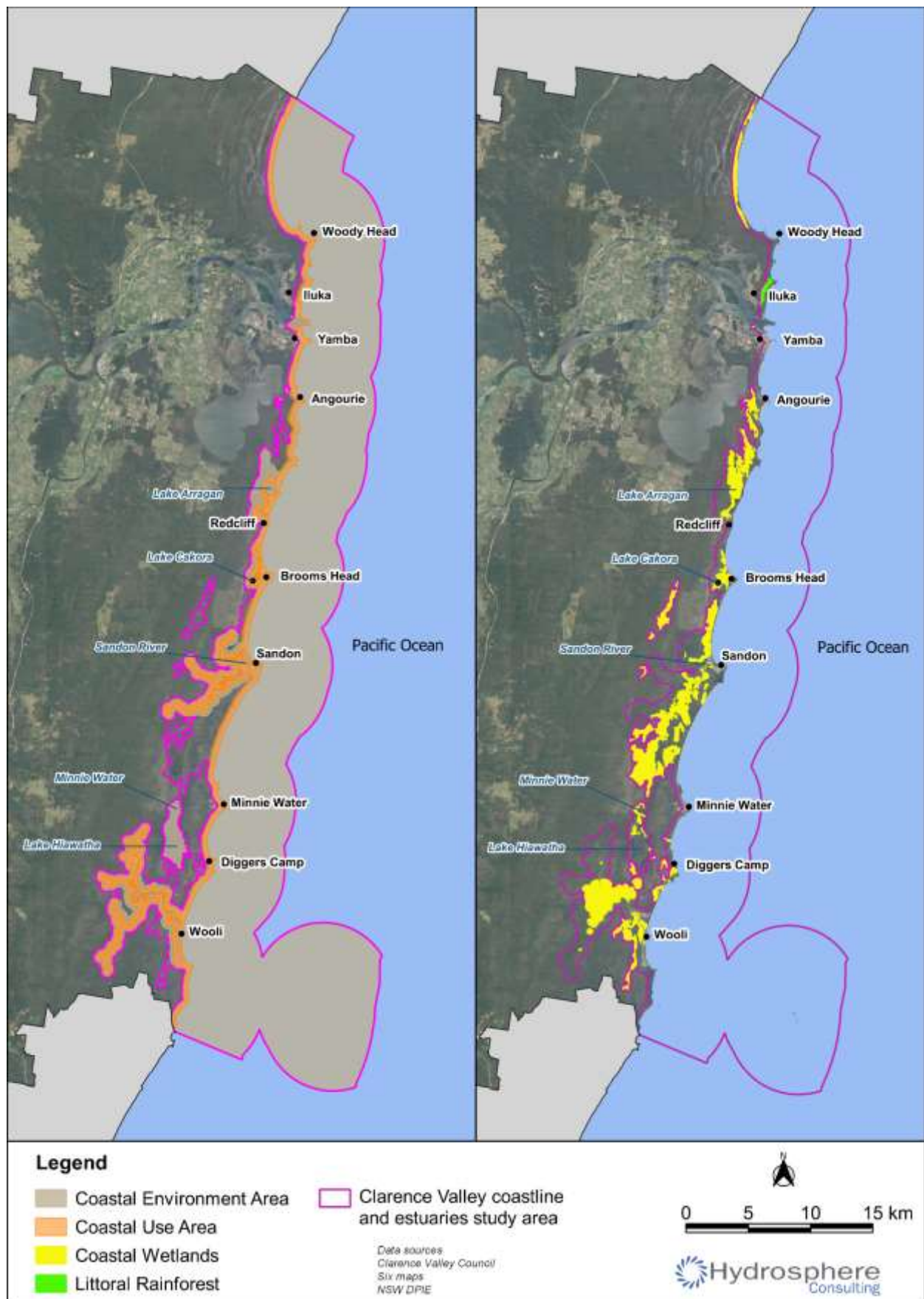


Figure 49: Coastal management areas to be addressed in the CMP for the Clarence Valley coastline and estuaries

6.2 First Pass Risk Assessment and Gap Analysis

Following the identification of the current threats and issues within the study area, a first - pass (or preliminary) risk assessment and gap analysis was completed to prioritise risks and identify those that should be further investigated in subsequent stages of the CMP.

The objectives of the first-pass risk assessment and information gap analysis are:

1. Identify potential management issues/ threats within the study area and assess the risk to known values and assets.
2. Identify gaps in knowledge relating to each issue and assess the importance of addressing each knowledge gap to allow for effective future management.
3. Establish if the risk and gap in knowledge warrants further investigation or detailed assessment.

The risk assessment and gap analysis were combined into one process to streamline the investigation and identify where gaps in knowledge will hinder successful future management of issues.

6.2.1 Methodology

The methodology adopted for the risk assessment is detailed in Appendix F. The risk assessment included the following components:

- Assessment of community uses and values incorporating information gathered during the community survey and other consultation activities.
- Identification of threats and stressors. Current management issues and concerns have been determined from:
 - Previous studies and management plans for the study area and the status of management actions (Appendix E).
 - The environmental context and coastal hazards discussed in Section 4.
 - Relevant state-wide and regional priority threats identified through the TARA for the Marine Estate (BMT WBM, 2017).
 - Results of the community survey and submissions received during the community consultation period (Appendix C and Section 3).
 - Discussions with CVC, NPWS and DPIE - EES.
- Analysis of the level of risk presented by those threats. The analysis was separated into geographic areas (e.g. beaches, towns) based on the land tenure, level of risk and knowledge.

The process identifies credible risks, the likelihood of the risk event occurring, the consequences should the event occur and applies a risk rating. For each of the identified threats, the following factors have been considered for each part of the study area:

- How is the threat currently being managed? Have previous management plans or actions addressed this threat?
- How effective are the current management measures and what is the residual risk?
- In the future, how is the risk level likely to change (over 20, 50 and 100 years)? Specifically, how will climate change, increasing development pressures and population increase these risks?

The gap analysis involved identification of knowledge gaps related to each issue, for each knowledge gap the following factors were considered:

- The assessment of the importance of resolving each knowledge gap to allow for effective future management of the issue.
- The allocation of a timeframe for resolution of knowledge gaps (CMP Stage).
- Recommendations for Stage 2 in regard to further in-depth assessments with an immediate priority for resolution.

Where high priority knowledge gaps exist, the results of this process will feed into Stage 2 of the CMP development to identify where additional information needs to be obtained and to allow for appropriate management options for each issue to be assessed in Stage 3. Lower priority knowledge gaps will be addressed in Stage 5 (CMP Implementation).

6.2.2 Key Issues

The risk assessment outcomes (Appendix F) identify the key threats to be addressed in the CMP. Due to the large geographical area, environmental and social values of the study area, there are several key management threats to be considered in the CMP. Based on the existing information, the threats with a moderate or high risk in the current timeframe are listed Table 7.

Table 7: Key management issues (current timeframe)

Category	Key threats	Locations
Coastal hazards	Beach erosion	Shark Bay, Woody Bay, Whiting Beach, Yamba Main Beach, Brooms Head Beach, Lake Cakora – entrance and Ocean Road properties, Brooms Head foreshore reserve, The Sandon, Sandon River campground and village, Wooli Beach and village, Jones Beach
	Shoreline recession	Shark Bay including Iluka Road, Woody Bay, Whiting Beach, Lake Cakora – entrance and Ocean Road properties, Brooms Head foreshore reserve, Sandon River campground and village, Illaroo campground, Wooli Beach and village, Jones Beach
	Coastal inundation	Shark Bay, Woody Bay, Whiting Beach, Yamba Main Beach, Lake Cakora Ocean Road properties, Sandon River campground and village, Illaroo campground, Wooli Beach and village
	Slope instability/ landslip	Pilot Hill, Yamba Point, Pippi Beach, Cakora Point
	Tidal inundation	Wooloweyah Lagoon and channels, Wooli village and Wooli Wooli River and all other low-lying areas
	Inadequate/ damaged coastal protection infrastructure	Woody Bay, Lake Cakora Ocean Road properties, Brooms Head foreshore reserve, Sandon village
	Estuarine bank erosion	Wooloweyah Lagoon and channels, Lake Cakora bridge footings, Wooli Wooli River
Threats to biodiversity	Historic clearing of riparian vegetation and adjacent habitat	Wooli Wooli River, Wooloweyah Lagoon and channels

Clarence Valley Coastline CMP Scoping Study - Scope of the CMP

Category	Key threats	Locations
	Foreshore development and land clearing for agriculture or urban development	Wooloweyah Lagoon catchment, Yamba-Angourie coast
	Bushfire	All areas
	Invasive weeds	Whole coastline, Wooloweyah Lagoon and channels, Wooli Wooli River estuary
	Uncontrolled stock access to and grazing within the riparian zone	Wooli Wooli River estuary, Wooloweyah Lagoon and channels
	Grazing of wetlands, saltmarsh and mangroves	Wooloweyah Lagoon and channels
	Seagrass decline	Wooloweyah Lagoon and channels, Sandon River, Wooli Wooli River
	Uncontrolled dog access	All areas
	4WD/motorbikes on beaches (Brooms Head, Shark Bay)	Brooms Head Beach, Shark Bay
	Predation and invasion by introduced animals	All areas
Water quality	Urban stormwater pollution	Wooloweyah Lagoon and channels, Lake Cakora, Sandon River, Wooli Wooli River
	On-site wastewater management	Wooloweyah lagoon and channels, Lake Cakora, Wooli village Sandon village and campground
	Poor flushing of ICOLLs	Lake Cakora, Lake Arragan
	Modified environmental flows (floodplain drainage) and catchment runoff	Wooloweyah Lagoon and channels
	Agricultural diffuse source runoff	Wooloweyah Lagoon and channels
	Future development, urban growth	Wooloweyah Lagoon catchment, Yamba
	Long fetch and strong winds increasing turbidity	Wooloweyah Lagoon
Shoaling and estuary hydraulics	Shoaling and sediment movement within estuaries (reducing flushing)	Wooli Wooli River
	Erosion and sedimentation affecting navigation	Clarence River entrance
	Estuary entrance modifications	Clarence River entrance

Category	Key threats	Locations
Use and access	Limited and/or informal pedestrian access to waterways	Wooli Beach
	Bushfire damage to access and infrastructure	National Park areas
	Limited boating access (upper estuaries)	Wooli Wooli River
	Unauthorised access points (boat launching)	Wooli Wooli River
	Damage to beach access points from erosion and coastal storms	All beaches
	Reduced accessible beach at high tide due to rock walls	Brooms Head, Woody Bay
	4WD/motorbikes on beaches	Shark Bay, Barri Point, Brooms Head, Wooli Beach
Governance	Inadequate action on coastal protection (due to difficulties gaining community consensus, high cost of implementation and stringent approval requirements)	All areas
	Inadequate land use planning and development controls	All areas
	Lack of funding for coastal management	All areas
Heritage	Inadequate consultation with Aboriginal land managers	All areas
	Erosion of cultural heritage sites (e.g. middens)	Angourie, Sandon campground
Amenity	Vehicles on beaches (causing safety and noise issues)	Broom Head
	Fallen/ dangerous trees on eroded beaches	Woody Bay
	Litter (terrestrial and marine)	All areas

In terms of local issues, the highest risk threats (current timeframe) are:

- Woody Bay and Wooli Beach – beach erosion, shoreline recession.
- Lake Cakora (Ocean Road properties) – beach erosion, shoreline recession, coastal inundation.
- Pilot Hill, Yamba Point – slope instability/ landslide.

- Wooloweyah Lagoon and channels – agricultural diffuse source runoff, modified environmental flows (floodplain drainage) and catchment runoff and historic clearing of riparian vegetation and adjacent habitat.
- All areas – bushfire.

Emerging threats (next 20 years) are:

- Beach erosion – Shark Bay, Whiting Beach, Lake Cakora entrance, Wooli.
- Shoreline recession – Iluka Road, Shark Bay, Lake Cakora entrance, Wooli.
- Coastal inundation – Yamba Main Beach.
- Tidal inundation – Wooloweyah Lagoon and channels.
- Inappropriate/ damaged coastal protection infrastructure – Woody Bay, Ocean Road, Brooms Head foreshore, Sandon village.
- Damage to beach access points from erosion and coastal storms – all areas.

6.2.3 Information Gaps

Accurate and detailed information about risk and consequence is necessary to assist decision makers generate effective management strategies which identify and prioritise future actions and investment or justify a business-as-usual approach.

The results of the gap analysis identified requirements for several further studies. Resolving immediate priority knowledge gaps in Stage 2 (Section 7.3.1) allows for the identification of appropriate management options/actions that address identified issues. A snapshot of the existing hazard assessments and current beach erosion risk for the coastline areas is provided in Table 8. Coarse assessments have been undertaken for beach erosion and tidal inundation for much of the coastline. Some detailed assessments have been undertaken for some beaches (as discussed in Section 4.4) but these should be updated to enable robust decision-making with regard to development of management options, planning controls and long-term management.

Detailed studies are required in Stage 2 as follows:

- Contemporary coastal hazard assessment:
 - Beach erosion, shoreline recession and coastal inundation (Shire-wide with focus on known hot-spots and areas not yet assessed).
 - Review of existing slope instability assessments and monitoring data.
- Assessment of assets/infrastructure at risk:
 - Asset register including location, use, construction date, condition, coastal hazard risks and timing, level of service (Shire-wide).

Where detailed studies are required to define future risks in areas with multiple land managers and common threats, the studies may be undertaken with concurrence from all managers.

Other information gaps have been identified as detailed in Appendix F but are not considered to be an immediate priority and should be addressed as part of the implementation of the CMP (Stage 5).

The risks identified in this Scoping Study are based on the current information and will be updated once the above assessments have been completed as part of the Stage 2 process.

Table 8: Existing hazard assessments for coastline areas

No.	Area	Components	Existing hazard study						Agency responsibility	Current erosion risk
			Beach erosion	Shoreline recession	Coastal inundation	Coastal cliff/slope instability	Tidal inundation	Entrance instability		
1	Ten Mile Beach	Ten Mile Beach	(1)	-	-	-	(3)	-	NPWS	Low
2	Woody Head	Shark Bay	DECCW (2012), (1)		-	N/A	(3)	N/A	NPWS	Mod
		Woody Bay								High
3	Woody Head – Iluka Bluff	Back Beach, Bluff Beach	(1)	-	-	N/A	(3)	N/A	NPWS	Low
4	Iluka Beach/north Clarence River entrance	Iluka Beach	(1)	-	-	N/A	(3)	N/A	CVC managed Crown Land, DPIE - Crown Land	Low
		Andersons Beach	(1)	-	-	N/A	(3)	N/A	Crown Land	Low
5	Whiting	Whiting Beach	RH (2015), (1)	N/A	(2), (3)	N/A			CVC managed Crown Land	Mod
6	Yamba beaches	Turners	MHL (2003), (1)			JK Geotechnics (2017)	(3)	N/A	CVC managed Crown Land, DPIE - Crown Land	Low
		Main					(3)	N/A	CVC managed Crown Land, Yamba SLSC	Mod
		Convent				N/A	(3)	N/A	CVC managed Crown Land, residents	Min

No.	Area	Components	Existing hazard study						Agency responsibility	Current erosion risk
			Beach erosion	Shoreline recession	Coastal inundation	Coastal cliff/slope instability	Tidal inundation	Entrance instability		
7	Pippi - Barri	Pippi Beach	Royal HaskoningDHV (2016), (1)				(3)	N/A	CVC managed Crown Land, DPIE - Crown Land	Low
		Barri Beach	(1)	-	-	N/A	(3)	N/A	Crown Land	Min
8	Angourie – Brooms Head	Spooky Beach	(1)	-	-	N/A	(3)	N/A	CVC managed Crown Land, DPIE - Crown Land	Low
		Angourie Point, Angourie Back, Shelley and Plumbago Beaches, Red Cliff	(1)	-	-	-	(2), (3)	N/A	NPWS, DPIE - Crown Land	Min
9	Brooms Head area	Main Beach	SMEC (2013), Royal HaskoningDHV (2018), (1)				(3)	N/A	NPWS, DPIE - Crown Land	Mod
		Ocean Road					N/A	(3)	Residents, DPIE - Crown Land	High
		Lake Cakora entrance					N/A	(2)	SMEC (2013) CVC managed Crown Land, DPIE - Crown Land	Mod
		Foreshore reserve					SMEC (2012)	(3)	CVC managed Crown Land, DPIE - Crown Land	Mod
10	The Sandon	The Sandon	(1)	-	-	N/A	(3)		NPWS, DPIE - Crown Land	Mod
11	Sandon area	Sandon campground	(1)	-	-	N/A	(2)	-	NPWS	Mod
		Sandon village							CVC managed Crown Land, residents	Mod

No.	Area	Components	Existing hazard study						Agency responsibility	Current erosion risk
			Beach erosion	Shoreline recession	Coastal inundation	Coastal cliff/slope instability	Tidal inundation	Entrance instability		
12	Sandon Beach	Sandon Beach	(1)	-	-	N/A	(3)	N/A	NPWS	Min
		Illaroo campground	(1)	-	-	N/A	(3)	N/A	NPWS	Low
13	Minnie Water – Wilsons Headland	Minnie Water Beach	(1)	-	-	N/A	(3)	N/A	CVC managed Crown Land	Low
		Minnie Water Back Beach							NPWS	Low
		Diggers Camp							CVC managed Crown Land	Low
14	Wooli	Wooli Beach (north)	WorleyParsons (2010a), (1)	-	-	N/A	(3)	N/A	NPWS	Low
		Wooli					(2), (3)	WorleyParsons (2010a)	CVC managed Crown Land, residents	High
		Wooli Beach (south)				N/A			CVC managed Crown Land	Mod
		Jones Beach				N/A	(3)		NPWS, DPIE - Crown Land	Mod

(1) OEH (2017) *Coastal Erosion in New South Wales – Statewide Exposure Assessment* (detailed mapping was not available for this Scoping Study)

(2) OEH (2018) NSW Estuary Tidal Inundation Exposure Assessment

(3) Coastal Risk Australia (2019) *Tidal inundation model mapping* <https://coastalrisk.com.au/home>

N/A – not applicable in that area

7. PRELIMINARY BUSINESS CASE AND FORWARD PLAN

7.1 Benefits of CMP Development

The coastline and estuaries of the study area provide a high level of ecosystem services (e.g. provision of food, carbon sequestration, habitat provision and aesthetic value) integral to the region's continuing ecosystem health, social and economic value. These values are threatened by increasing pressure from coastal hazards, climate change, sea level rise, tourism growth and coastal development.

There are many organisations from the federal, state, regional and local level that are involved and have responsibilities in governing and managing the study area. Collaboration, cooperation and resource support amongst the landowners and managers is required to provide effective coastal management outcomes.

CVC (supported by State Government agencies) has developed significant knowledge of coastal dynamics and threats to the Clarence Valley coastline and estuaries. Engagement and consultation with the local community and key stakeholders conducted as part of this Scoping Study has highlighted the expectations of the community to progress with coastal management. In addition, key stakeholders and public authorities are willing to participate in a coordinated and collaborative approach to management of the study area. This collaboration will provide additional benefits to CVC and those agencies.

The challenges of limited resources, significant threats to coastal values and multiple land managers have been documented in this Scoping Study. The CMP process provides a mechanism for effective management of short-term risks and development of adaptation pathways for longer-term or increasing risks. Continuing with the development of the CMP will assist CVC with:

- Strengthening stakeholder relationships responsible for management in the coastal zone and the shared understanding of the values, risks and management priorities for each of those stakeholders.
- Obtaining funding for coastal management actions through the NSW Coastal and Estuary Grants Program (refer Section 7.2).
- Protecting, conserving, promoting the sustainable integrated management of ecosystem services and other social, cultural, environmental and economic values of the study area, now and for future generations.
- Collaboration with relevant internal Aboriginal staff and external Aboriginal organisations i.e. Traditional Owners and LALCs as well as Aboriginal staff within relevant government organisations.
- Early identification of opportunities to reduce and adapt to future risks and to reduce associated future financial costs (e.g. disaster management costs), particularly in a climate of emerging coastal, climatic and political risks.
- Limiting Council's liability under Section 733 of the *Local Government Act 1993* with respect to land in the coastal zone through acting in "good faith", i.e. by preparation of a CMP "*substantially in accordance with the principles and mandatory requirements set out in the current coastal management manual under the Coastal Management Act 2016*".

A CMP will set the long-term strategy for the coordinated management of the coastline and estuaries and ensure that the values and benefits of the study area are enhanced and maintained for future generations. In continuing with the preparation and implementation of a CMP, CVC should consider:

- Its obligation to implement a certified CMP under the *Coastal Management Act 2016*.
- The immediate financial cost of CMP preparation (though these are considered negligible in comparison to the future financial risk of not preparing a CMP).

- Competing needs for internal Council resources (funding, staff and equipment etc.). In particular, there are significant coastal and estuary management issues to be addressed in the Clarence River estuary and CVC must balance the resources required based on LGA-wide priorities.
- Competing needs for external stakeholder resources (funding, staff and equipment etc.). Early engagement with stakeholders required to collaborate on the CMP will ensure these risks are minimised.
- Changing external agency priorities and responsibilities.
- Community expectations regarding expected actions. Transparency in the CMP and community engagement process may help to minimise unrealistic expectations from the community.

There are a number of risks associated with not developing a CMP. These include:

- A lack of understanding of key threats to estuary values and areas exposed to coastal hazards can result in inadequate or ineffective management practices and development controls.
- The lack of an adequate risk management process can result in a diminished ability to effectively evaluate and prioritise management actions - reducing the cost-effectiveness of government efforts and resources.
- A lack of engagement with the local community can result in a lack of support or even opposition amongst the community and key user groups. This can result in a deficit of credibility and trust between CVC and the community and can derail the implementation of future management actions. A lack of engagement can also result in an incomplete understanding of local community values and therefore a misdirection of management effort and resources. Despite this, the level of community support can vary based on the issues experienced by individual community members in different areas, regardless of the level of engagement.
- A lack of contemporary plan to guide management actions and investment of resources to effect good coastal management.

In support of this preliminary business case, it is evident that the benefits of continuing with the development and implementation of this CMP significantly outweigh the alternative financial costs as well as the costs to coastal and estuary values.

Concurrent to the preparation of the CMP, NPWS will continue to develop coastal management strategies for the National Parks and Reserves within the study area (refer Section 7.6).

7.2 Funding

The development of the CMP and subsequent actions are expected to be funded through Council and state government contributions, monetary grants and volunteer works by community members and organisations. Some actions are funded under CVC's normal operating budgets or through existing programs and grants, particularly within the current Delivery Program. CVC operates an annual budget primarily through rates and charges as well as fees, investment revenues, loans, property management and operating grants. It will not be possible for CVC to implement all actions without additional sources of funding. As such, identification of grants and the submission of successful funding applications will be an important component of the CMP and the development stages.

The NSW Government's Coastal and Estuary Grants Program provides technical and financial support to local government to help manage the coastal zone. The program supports coastal and estuary planning projects and the implementation of works identified in certified CZMPs or CMPs. Grant offers are subject to state-wide priorities and availability of funds each financial year.

Funding (at 2:1) is available under 5 funding streams - a planning stream and 4 implementation streams:

- Planning stream: funding is available for planning projects that aim to:
 - Develop a CMP.
 - Transition a coastal zone management plan (CZMP) to a CMP.
 - Undertake investigations and designs or cost-benefit analyses for infrastructure works recommended in a certified CZMP or CMP.
- Implementation streams: funding is available for implementation of actions identified in a certified CZMP or CMP.

CVC will be ineligible for funding under the NSW Governments' Coast and Estuary Grant Program (implementation stream) if it does not have a certified CMP by 31 December 2021. Schedule 3 (Part 2) (4) of the *Coastal Management Act 2016* enables a certified CZMP/EMP to remain valid until the 31 December 2021. After this date, it will cease to be certified. This means that whilst planning work is underway for a new CMP, on-ground implementation of the CZMP continues in accordance with the existing gazetted CZMPs and EMP until 31 December 2021.

Other funding opportunities include the NSW Environment Trust, partnerships with local community groups, research institutions and universities. The Marine Estate Management Strategy also includes targeted projects which may provide useful information for the CMP (Section 5.5).

7.3 Forward Plan

The CMP will set the long-term strategy for the coordinated management of the coastline and relevant estuaries and ensure that the values and benefits of the study area are enhanced and maintained for future generations. CVC will lead the development of the CMP for the Clarence Valley coastline and estuaries and will collaborate with land managers, state government agencies, industry and community representatives to provide effective coastal management outcomes. The CMP for the Clarence Valley coastline and estuaries will include coastal areas managed by CVC including Iluka to Angourie coastline, Brooms Head, Sandon, Minnie Water, Diggers Camp and Woolli coastline and the smaller estuaries (Lake Cakora, Sandon River and Woolli Woolli River). Wooloweyah Lagoon and the Clarence River will be covered in a separate CMP.

The forward plan outlines the next four stages of the CMP process. The requirements for Stages 2-5 of the CMP process for CVC are detailed in the *Coastal Management Manual* and summarised in Sections 7.3.1 to 7.3.4. The CMP will be developed over the next two years. Concurrent to the preparation of the CMP, NPWS will continue to develop coastal management strategies for the National Parks and Nature Reserves within the study area (Section 7.6). There is an opportunity for NPWS to collaborate with Council on CMP studies relevant to NPWS land management responsibilities.

7.3.1 Stage 2 – determine risks, vulnerabilities and opportunities

Stage 2 involves undertaking detailed studies that will help to identify, analyse and evaluate risks, vulnerabilities and opportunities. Studies prepared in Stage 2 provide information to support decision-making in later stages of the planning process. The additional information assists communities to better understand coastal management issues and to analyse and evaluate coastal risks and opportunities.

Stage 2 of the CMP for the Clarence Valley coastline and estuaries will include:

- Continuing engagement with the community and stakeholders.
- Refining understanding of key management issues (where there are knowledge gaps) as described in Section 6.2.3.
- Analysing and evaluating current and future risks (detailed risk assessment) building on the first-pass risk assessment and outcomes of Stage 2 detailed studies.

- Identification of opportunities to reduce risks and enhance the environmental, social and economic values.

Concurrent with Stage 2, CVC will consider whether LEP and DCP controls related to coastal hazards should be updated with any new information available. As part of this process CVC will consider whether to prepare a planning proposal for “housekeeping” amendments to the LEP and DCP and updated mapping and controls will be included at that time.

7.3.2 Stage 3 – response identification and evaluation

Stage 3 involves the identification and evaluation of management options. Stage 3 of the CMP for the Clarence Valley coastline and estuaries will include:

- Development of a strategic approach to risk management: alert, avoid risks, active intervention, planning for change, emergency response.
- Identifying and collating information on management options.
- Evaluating management actions, considering:
 - Feasibility (is it an effective and sustainable way to treat the risks?).
 - Viability (economic assessment).
 - Acceptability to stakeholders.
- Engaging public authorities about implications for their assets and responsibilities.
- Preparing a business plan for implementation - capital and operational costs, distribution of costs and benefits, funding and delivery.

Stage 3 will consider all findings from Stage 1, Stage 2, stakeholder engagement activities and discussions with relevant agencies and land managers. It is envisaged that a large component of this Stage will involve combining and prioritising the remaining incomplete actions from existing management plans as detailed in Appendix E as well as actions for key issues and threats as identified during Stages 1 and 2.

The CEMC may provide a platform for introducing potential management actions and formal consultation will take place with each agency with either a responsible or supporting role for each action. A cost-benefit analysis will be undertaken for any options requiring detailed analysis to determine socio-economic viability (potentially required for options >\$1 million).

7.3.3 Stage 4 – finalise, exhibit and certify the CMP

Stage 4 will involve the preparation of the draft CMP document, review by Council and Government agencies, placement of the draft CMP on public exhibition and consideration of feedback from all stakeholders. CVC and DPIE- EES will then review and if satisfied approve the final CMP for certification and implementation (Stage 5).

The CMP for the Clarence Valley coastline and estuaries will include:

- Coastal management actions (10 years) for CVC and other public authorities where applicable.
- Links to the IP&R framework and land use planning system (LEP, DCP).
- Emergency action sub-plans.

7.3.4 Stage 5 – implementation, monitoring and reporting

The CMP will be implemented by CVC, following certification, in accordance with CVC’s IP&R framework, land use planning system and partnerships. This framework will guide the implementation of the CMP,

ensure all required monitoring and reporting is completed and will provide a framework for the review and assessment of CMP outcomes.

7.4 CMP Engagement Strategy

A shared understanding of the risks and opportunities and stakeholder and community support for resulting actions included in the CMP will be beneficial during implementation phases. A stakeholder engagement strategy for the preparation of the CMP has been developed and is provided in Appendix D. This strategy was developed from the previous stakeholder consultation outcomes and the outcomes/ findings of consultation activities undertaken for this Scoping Study.

The Community and Stakeholder Engagement Strategy describes how CVC will engage with stakeholders during the preparation of the CMP and is consistent with the CVC Community Engagement Policy. The Strategy has been prepared to:

- Identify the context, scope, purpose and organisational commitment to engagement.
- Identify and understand stakeholders and community networks and their interest in the issues and the process, motivations, values and capacity to engage.
- Determine the level of community and stakeholder participation that is appropriate to each stage of the CMP development.
- Describe engagement objectives, opportunities, barriers and risks.
- Identify engagement methods that are suited to different stakeholders and stages.
- Identify the process for implementation, evaluation and review.

Coastal management planning will include community engagement, including with First Nations People, from the outset and will continue to occur throughout the process from development to implementation.

The aim of the strategy is to inform all key stakeholders of the project and provide them with the opportunity to contribute to the development of the CMP through a variety of methods including the CEMC, Clarence Conversations webpage, targeted correspondence to state government agencies and key stakeholders, meetings, teleconferences, information brochures, media releases and drop-in/ information sessions. The key stakeholders targeted as part of this strategy include relevant agencies responsible for the implementation of management actions, Council, businesses, special interest groups and local residents. The stakeholder engagement strategy lists each activity to be undertaken as well as the aim/ objective of the activity, content to be delivered, target stakeholders, delivery method, timing, frequency and who is responsible for delivering the activity.

7.5 CMP Development

CVC will lead the development of the CMP for the Clarence Valley Coastline and Estuaries. CVC will collaborate with land managers, state government agencies, industry and community representatives to provide effective coastal management outcomes. In particular, CVC aims to work closely with NPWS to deliver Stage 2 detailed coastal hazard studies for the entire coastline. CVC will rely on funding from the Coastal and Estuaries Grants Program to ensure affordability of the CMP development. Ongoing stakeholder liaison will be a key component of the CMP development.

Preliminary cost estimates for the entire coastline have been developed for each stage of the CMP development (Table 9). In-kind costs across the life of the CMP (e.g. liaison with internal CVC departments and councillors, compilation and synthesis of relevant council data, fulfilling data requests, coordination with stakeholders and consultants) have not been included. CVC plans to engage a consultant to undertake Stage 2, 3 and 4 as a single package of works.

The Forward Plan (including responsibilities, costs and timing) for Stages 2 – 4 of the Clarence Valley coastline and estuaries CMP is provided in Table 9.

Table 9: Forward Plan for the Clarence Valley coastline and estuaries CMP

CMP Stage and task	Expected outcome	Budget cost estimate ¹		Primary responsibility	Support agencies	Timing				
		Low	High			2020/21	2021/22	2022/23	2023/24	2024/25-2033/34
Stage 1 – context, information review, issues identification, first pass risk assessment										
Preparation of Scoping Study (complete)	Establishes context, identifies issues, risks and knowledge gaps and provides a forward plan for the subsequent CMP stages (this document)	\$70,000	\$70,000	CVC	DPIE-EES, NPWS	8 months				
Consultation (complete)	Refer Stakeholder Engagement Strategy	\$5,000	\$5,000	CVC	DPIE-EES, NPWS, CEMC	Ongoing				
Council adoption	CEMC review, endorsement and Council adoption	-	-	CVC	CEMC	2 months				
Stage 1 total		\$75,000	\$75,000			10 months (July 2020 - April 2021)				

CMP Stage and task	Expected outcome	Budget cost estimate ¹		Primary responsibility	Support agencies	Timing				
		Low	High			2020/21	2021/22	2022/23	2023/24	2024/25-2033/34
Stage 2 – determine risks, vulnerabilities and opportunities										
Coastal hazard assessment ²	Provide continuous hazard mapping along the entire coastline for each planning timeframe (current, 2050 and 2100) with reference to the state-wide exposure assessment, supplemented with local scale assessment where required. Undertake detailed probabilistic analysis of beach erosion, coastal recession and coastal inundation hazards for current and emerging high-risk locations and areas not yet assessed (Whiting Beach, Yamba beaches, Brooms Head, Sandon area and Woolli).	\$130,000	\$200,000	CVC	DPIE-EES, NPWS, DPIE - Crown Lands		6 months			
Review of existing slope instability assessments and monitoring data	Analysis of previous hazard assessments and recent instability monitoring data (where available) to provide a contemporary understanding of the instability risk at Pilot Hill and Cakora Point. Identification of potential management options including ongoing monitoring, additional assessment or remediation.	\$20,000	\$30,000	CVC	DPIE-EES		3 months			

Clarence Valley Coastline CMP Scoping Study - Preliminary Business Case and Forward Plan

CMP Stage and task	Expected outcome	Budget cost estimate ¹		Primary responsibility	Support agencies	Timing				
		Low	High			2020/21	2021/22	2022/23	2023/24	2024/25-2033/34
Assessment of cultural heritage sites, assets and infrastructure at risk	Development of register and mapping of assets (location, use, construction date, condition, level of service, coastal hazard risks and timing) on Council land and Council-managed Crown Land. Identify cultural heritage sites potentially affected by coastal hazards (through cultural heritage mapping where appropriate).	\$30,000	\$40,000	CVC	DPIE-EES, NPWS, DPIE - Crown Lands		2 months			
Detailed risk assessment	Analysis and evaluation of current and future risks (updated preliminary risk assessment).	\$20,000	\$40,000	CVC	DPIE-EES, NPWS, DPIE - Crown Lands		1 month			
Documentation	Documentation, feedback and concurrence	\$5,000	\$10,000	CVC	DPIE-EES, NPWS, DPIE - Crown Lands			2 months		
Stakeholder engagement	Refer Stakeholder Engagement Strategy	\$5,000	\$10,000	CVC	Stakeholders		Ongoing	Ongoing		
<i>Stage 2 total</i>		<i>\$210,000</i>	<i>\$330,000</i>			<i>11 months (October 2021 - August 2022)</i>				

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CMP Stage and task	Expected outcome	Budget cost estimate ¹		Primary responsibility	Support agencies	Timing				
		Low	High			2020/21	2021/22	2022/23	2023/24	2024/25-2033/34
Stage 3 – response identification and evaluation										
Options assessment	Development of strategic response to identified risks, identification and evaluation of management options ³	\$20,000	\$30,000	CVC	DPIE-EES, NPWS, DPIE - Crown Lands			3 months		
Cost-benefit analysis	Detailed assessment of costs and benefits of high risk and complex options (if required) ⁴	-	\$100,000	CVC	DPIE-EES			3 months (if required)		
Business Plan	Development of business plan for implementation - capital and operational costs, distribution of costs and benefits, funding and delivery ⁵	\$5,000	\$10,000	CVC	DPIE-EES			3 months		
Stakeholder engagement	Refer Stakeholder Engagement Strategy	\$5,000	\$10,000	CVC	Stakeholders			Ongoing		
Stage 3 total		\$30,000	\$150,000			4 months (September 2022 – December 2022) with an additional 3 months if a cost-benefit analysis is required				

Clarence Valley Coastline CMP Scoping Study - Preliminary Business Case and Forward Plan

CMP Stage and task	Expected outcome	Budget cost estimate ¹		Primary responsibility	Support agencies	Timing				
		Low	High			2020/21	2021/22	2022/23	2023/24	2024/25-2033/34
Stage 4 – finalise, exhibit and certify the CMP ⁶										
CMP	CMP preparation	\$40,000	\$50,000	CVC	DPIE-EES, NPWS, DPIE - Crown Lands			6 months		
Documentation	Documentation, feedback and concurrence	-	-	CVC	DPIE-EES, NPWS, DPIE - Crown Lands and other relevant agencies				2 months	
CMP exhibition	Public comment	-	-	CVC	-				1 month	
CMP finalisation	Final CMP document	\$0	\$5,000	CVC	DPIE-EES				2 months	
Stakeholder engagement	Refer Stakeholder Engagement Strategy	\$5,000	\$10,000	CVC	Stakeholders			Ongoing	Ongoing	
Stage 4 total		\$45,000	\$65,000			5 months (January 2023 – May 2023)				
Stages 2 – 4 total		\$360,000	\$620,000							

Clarence Valley Coastline CMP Scoping Study - Preliminary Business Case and Forward Plan

CMP Stage and task	Expected outcome	Budget cost estimate ¹		Primary responsibility	Support agencies	Timing				
		Low	High			2020/21	2021/22	2022/23	2023/24	2024/25-2033/34
Stage 5 – CMP implementation										
CMP implementation	Implementation of CMP	TBC ⁵	TBC ⁵	CVC	DPIE-EES					Ongoing

1. Not including CVC or other agency staff costs.

2. NPWS may collaborate with CVC during Stage 2 to deliver coastal hazard assessments for the Parks and Reserves.

3. The budget cost estimate for assessment of options does not allow for detailed assessment (e.g. modelling) of the effectiveness of coastal management actions.

4. Options potentially requiring a CBA include the extension of Brooms Head sea wall. Other options have not yet been identified. Timing assumes the preferred option is the sea wall and a CBA is required.

5. Implementation costs to be outlined in the CMP.

6. Some of the CMP preparation can be undertaken in parallel with Stage 3.

7.6 Potential for Fast-Tracking

Council has the opportunity to fast-track some components of the CMP development as follows:

- A beach management strategy has been prepared for Woolli Beach involving beach scraping/backpassing (in conjunction with other auxiliary measures such as dune stabilisation and revegetation). Trial beach scraping works undertaken in 2019 are considered to be highly successful and effective at providing interim protection to Woolli and are supported by the local community. Due to the success of the trial an additional round of scraping is proposed (with a grant proposal for the works submitted). The beach management strategy is currently considered to be the preferred option to address beach erosion and recession at Woolli.
- Council has commenced the design of an extension to the rock revetment along Brooms Head Foreshore Reserve (an action in the existing Lake Cakora/Brooms Head CZMP). A cost-benefit analysis will be required to confirm whether this is the preferred option to address beach erosion, recession and coastal inundation of this area.

7.7 Coastal Management for National Parks and Reserves

While the CMP for the Clarence Valley coastline and estuaries will document the actions required to manage the whole study area, there are large areas of National Parks and reserves that are managed by NPWS through existing Plans of Management. NPWS has been a key stakeholder in the development of this Scoping Study.

Where appropriate, the CMP development will also consider areas of overlap between CVC and NPWS responsibilities and include combined investigations where this is considered to be cost-effective. For example, the proposed coastal hazard assessment for the entire coastline has benefits in being undertaken as a single study. Following on from this study, NPWS will be provided with sufficient information to undertake the following tasks for areas within Bundjalung and Yuraygir National Parks (within the study area):

- Tasks (similar to stage 2 of the development of a CMP):
 - Coastal hazard assessment (may be undertaken in conjunction with CVC as outlined in Table 9).
 - Development of register and mapping of assets (location, use, construction date, condition, level of service, coastal hazard risks and timing) within Bundjalung and Yuraygir National Parks.
 - Analysing and evaluating current and future risks (detailed risk assessment) building on the first-pass risk assessment and outcomes of Stage 2 detailed studies.
 - Identification of opportunities to reduce risks and enhance the environmental, social and economic values.
 - Continuing engagement with the community and stakeholders including representation on the CEMC.
- Tasks (similar to stage 3 of the development of a CMP):
 - Development of a strategic approach to risk management: alert, avoid risks, active intervention, planning for change, emergency response.
 - Identifying and collating information on management options.
 - Evaluating management actions, considering:
 - Feasibility (is it an effective and sustainable way to treat the risks?).

- Viability (economic assessment).
- Acceptability to stakeholders.
- Engagement with CVC about implications for their assets and responsibilities within and surrounding the National Parks.
- Preparing a business plan for implementation - capital and operational costs, distribution of costs and benefits, funding and delivery.
- Continuing engagement with the community and stakeholders including representation on the CEMC.
- Tasks (similar to stage 4 of the development of a CMP):
 - It is envisaged that the outcomes of the above process will be incorporated in revised Plans of Management for the National Parks and Reserves.

There is also potential for NPWS to collaborate with Council in Stages 3, 4 and 5.

The focus for coastal management within Bundjalung and Yuraygir National Parks will include:

- Understanding current and future coastal hazards and how they impact reserve and coastal values.
- Understanding the impacts of any coastal management works.
- Protection and management of heritage sites including Aboriginal cultural heritage;
- Flora and fauna including endangered ecological communities and threatened species and in particular beach nesting birds, shore birds and marine wildlife.
- Floodplain and estuarine wetlands.
- Riparian areas including issues such as bank erosion.
- Water quality including both beach and estuary areas.
- ICOLL entrance management with a preference for natural opening regimes.
- Management of threats to biodiversity such as pest species, weeds, fire, erosion and inundation.
- Management of reserve infrastructure and built assets, including day use areas, campgrounds, other accommodation and fire trails.
- Management of access to beaches, estuaries and reserve areas.

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GLOSSARY AND ABBREVIATIONS

4WD	Four Wheel Drive/ing
Acid sulfate soils (ASS)	Acid sulfate soils are the common name given to soils containing iron sulfides. When the iron sulfides are exposed to air and produce sulfuric acid, they are known as actual acid sulfate soils. The soil itself can neutralise some of the sulfuric acid. The remaining acid moves through the soil, acidifying soil water, groundwater and, eventually, surface waters.
AHD	Australian Height Datum
Amenity	A desirable or useful feature or facility of a building or place
Aquatic	Living or growing in water, not on land.
CMP	Coastal Management Program
Coastal hazard	Either or a combination of the following: beach erosion; shoreline recession; coastal lake or watercourse entrance instability; coastal inundation; coastal cliff or slope instability; tidal inundation; erosion and inundation of foreshores caused by tidal waters and the action of waves, including the interaction of those waters with catchment floodwaters.
Council	Clarence Valley Council
CSP	Community Strategic Plan
CVC	Clarence Valley Council
CZMP	Coastal Zone Management Plan
DECCW	Former (NSW) Department of Environment, Climate Change and Water (now DPIE)
DCP	Development Controls Plan
DO, Dissolved Oxygen	Oxygen dissolved in the water (oxygen saturation).
DPI	(NSW) Department of Primary Industries
DPIE	Department of Planning, Industry & Environment
DPI Fisheries	NSW Department of Primary Industries – Fisheries
Ecosystem	Refers to all the biological and physical parts of a biological unit (e.g. an estuary, forest, or planet) and their interconnections.
EES	Environment, Energy and Science (a Division of DPIE)
El Niño	A global climate driver which affects extreme rainfall and flooding, hail and storm frequency
Estuarine	Part of the river channel with a mix of fresh water and salt (tidal) water
Foreshore	That part of the shore that lies between the mean high tide mark and the mean low tide mark
GIS	Geographic Information System
Geomorphology	Characteristics, origin and development of landforms.
Ha	Hectares
HAT	Highest Astronomical Tide
Holocene	The current geological epoch which began approximately 11,700 years ago.
Hydrodynamics	The motion of a fluid and interactions with its boundaries
Hydrology	The study of water and its properties, including precipitation onto land and returning to oceans

ICOLL	Intermittently Closed and Open Lake or Lagoon
Inundation	Rising and spreading of water over land
IP&R	Integrated Planning and Reporting
LALC	Local Aboriginal Land Council
La Niña	A global climate driver which affects extreme rainfall and flooding, hail and storm frequency
LEP	Local Environmental Plan
LGA	Local Government Area
Littoral	Related to or near the coastline.
Longshore drift	the movement of material along a coast by waves which approach at an angle to the shore but recede directly away from it i.e. sand moves in the same general direction as the predominant swell direction.
MEMA	Marine Estate Management Authority
MEMS	Marine Estate Management Strategy
MIDO	The Maritime Infrastructure Delivery Office (MIDO) is a joint initiative between Transport for NSW, Maritime and the Department of Planning, Industry and Environment
NPWS	National Parks and Wildlife Service
OEH	Office of Environment and Heritage
Pleistocene	the geological epoch that lasted from about 2,580,000 to 11,700 years ago. The last ice age.
ppt	Parts per thousand (salinity unit)
Quaternary	The current geologic period which began 2.58 million years ago
Riparian	Of, on or relating to the banks of a watercourse
Salinity	The level of salt dissolved in the water
Sedimentation	The deposition or accumulation of sediment
SEPP	State Environmental Planning Policy
SLSC	Surf Life Saving Club
STP	Sewerage Treatment Plant
TARA	Threat and Risk Assessment
Terrestrial	Living or growing on land (not aquatic)
TfNSW	Transport for NSW
TN	Total Nitrogen - the concentration of inorganic ions of phosphorus (predominately HPO ₄ ²⁻ and PO ₄ ³⁻) in water. These ions are available to be used by aquatic biota
TOAC	Traditional Owners Aboriginal Corporation
TP	Total Phosphorous - the concentration of phosphorus in natural or anthropogenic substances that contain, or decompose to produce phosphate ions
Turbid	Cloudy or dirty (not clear)
Turbidity	A measure of the amount of light-attenuating particles in a water body

Appendix A. EXISTING DATA AND INFORMATION

This Appendix provides a summary of existing studies, reports and spatial datasets relevant to coastline management in the study area.

Information	Author	Year	Comments
<i>General</i>			
Coastal Estuary Management Plans 2 nd risk assessment (.xls)	CVC	Jan 2014	A risk assessment of selected CZMP actions from early existing plans including Brooms Head Beach Coastal Study 2001, Brooms Head Emergency Action Sub Plan, Clarence Estuary Management Plan 2003, Woolli Beach Emergency Action Sub Plan, CZMP for Wooloweyah Lagoon 2009, Woolli Woolli River EMP 2009, Yamba Coastline Management Plan 2004. Risk assessment considers impacts and likelihood if an action is not implemented. Impacts assessed include Injury/loss of life, damage to infrastructure & property, Environmental damage/degradation and Financial loss/liability to CVC. A number of extreme risk actions were identified, particularly within the Yamba Coastline Management Plan relating to Pilot Hill.
Certified CZMP action status	DPIE-EES	June 2020	Provides an up-to-date status of all actions from existing certified Clarence Valley Council CZMPs.
Coastal Erosion in New South Wales Statewide Exposure Assessment	OEH	2017	A state-wide assessment of exposure to coastal erosion in NSW. Identifies assets that may be impacted by coastal erosion. Provides a broad-scale overview of the potential for present and future impacts to coastal settlements and communities. The approach uses properties and roadways as a metric for the level of exposure. Identifies areas of Clarence Valley coast that may be exposed to coastal erosion. Provides a map of the coastline and identifies where sandy shorelines are located in close proximity to properties (55, 110, 220 m).
Coastal Emus: Sighting Data Analysis July 2020	CVC	2020	More info at https://www.clarenceconversations.com.au/coastalemus
Climate change rapidly warms and acidifies Australian estuaries	Scanes <i>et al.</i>	2020	Water quality monitoring from over 166 Australian estuaries over 12 years. Results found that estuary temperatures increased by 2.16 °C on average over 12 years, at a rate of 0.2 °C per year. All estuary types, except creeks, showed a significant warming trend over the 12-year study period, there were differences among estuary types. Lagoons warmed the most with temperature increasing in lagoons over the last 12 years by up to 3.65 °C (0.325 °C per year). Rivers were the second fastest and warmed by 0.248 °C year ⁻¹ , followed by Back Dune Lagoons (BDLs, 0.117 °C per year) and lakes (0.0954 °C per year) that warmed at a similar rate to each other. Estuary waters acidified at an average rate of 0.09 pH units. All estuaries were found to be acidifying, with lagoons and creeks acidifying the fastest and lakes the slowest. The response of estuaries to climate change is dependent on their morphology.

Information	Author	Year	Comments
Clarence Catchment Ecohealth Project Assessment of River and Estuarine Condition 2014	Ryder et al	2014	Assesses the health of the Clarence River catchment and the coastal catchments. This project was conducted over a 12-month period (August 2012 to August 2013) covering 88 sites across 37 river systems to contribute to the assessment of the ecological condition of the catchments. Of these sites, eight are located in the study area (Figure 14) with one in Wooloweyah Lagoon, Lake Arragan and Lake Cakora, two in Sandon River and three in Wooli Wooli River. Water chemistry was sampled bi-monthly, freshwater macroinvertebrates were sampled bi-annually in spring and autumn and riparian condition was assessed once in August 2013. Only water chemistry was assessed for the coastal catchments (i.e. Lake Arragan, Lake Cakora, Sandon River and Wooli Wooli River). Results reviewed in Water Quality section.
CVC Biodiversity Strategy 2020 – 2025		2020	Outlines Councils vision for biodiversity within the Clarence Valley and priorities required to fulfil the vision. The plan provides goals and actions that will guide Councils decision making and on-ground actions over the next 5 years.
Two Centuries of Change: A History of Selected Sites on the Iluka Peninsular	Smith, E.	2004	Available from Clarence Regional library. Not reviewed.
NSW Estuary Tidal Inundation Exposure Assessment	OEH	2018	A NSW-wide estuary tidal inundation exposure assessment was undertaken by OEH (2018c) to assess the number of properties and roads potentially affected by future estuary tidal inundation. The assessment was based on 0, 0.5, 1.0 and 1.5 m sea level rise scenarios. Lake Arragan, Sandon River and Wooli River were included in the study. It should be noted that the OEH (2018c) study is a coarse state-wide assessment based on numerous assumptions and limitations. As such its results only provide an indicator of the future level of risk of tidal inundation within each catchment.

Information	Author	Year	Comments
<i>Woody Head</i>			
Woody Head Coastal Hazard Review	DECCW	2012	Provides coastal processes and management background information for Woody Bay. Reviews coastal hazards based on photogrammetry data and geohistoric data. Storm bite erosion volumes and long-term recession rates for Woody Bay and Shark Bay were updated. Presents hazard zones/lines that identify areas that may be at risk from storm erosion and shoreline recession over the 50 and 100-year planning horizons. Woody Bay can expect total recession losses of around 128m (adjacent to campground) and 147m (rest of embayment) by 2050 and 265m and 308m in 2100. Provides comments around the impact of the seawall on erosion at the site. The long-term stability of the Shark Bay tombolo and its impact on the alignment of the shoreline is discussed. A complete disconnection of the tombolo is unlikely however a partial disconnect may occur resulting in in some degree of realignment to the current shoreline. Recommended that that the recession rates, hazard zones, long-term response of the shoreline including the tombolo connection and management options are monitored and reviewed at appropriate intervals.
Interdecadal Foredune Changes along the Southeast Australian Coastline: 1942–2014	Doyle <i>et al.</i>	2019	Assesses multi-decadal fluctuations in foredune morphology at several sites long the NSW coast. One of the study sites is Woody Bay. Provides updated recession rates for Woody Bay. Presents historic aerial photographs of the bay. Results indicated that Woody Bay Beach has receding foredunes, with an average foredunal volume change rate (FVCR) of -6.33 m^3 per m per year, the highest change recession rate of any of the study sites. The foredune width has decreased in width of at a rate of -0.95 m per year and total of -65.64 m since 1942. Both the north and south ends of this system are receding, however, the south is doing this at a much faster rate.
Wave climate, sand budget and shoreline alignment evolution of the Iluka-Woody Bay sand barrier, northern NSW, Australia since 3000 yr BP	Goodwin <i>et al.</i>	2005	A detailed study of the Iluka to Woody Bay coastal morphology including an interpretation of the associated depositional history, with respect to the role of modal wave direction, on shoreline evolution, sand transport paths, sand budgets, headland sand bypassing, and alongshore gradients in longshore sand fluxes. Provides regional setting information including terrestrial morphology, sediments and offshore geology. Details sand budget and coastal processes for Woody bay including sediment budget and coastal processes conceptual diagrams. Concluded that the shoreline recession in Woody Bay is associated with gross changes to shoreline alignment on multi-decadal to centennial time scales, that are driven by changes in mean wave direction, frequency of headland sand bypassing, the connectivity of the longshore sand transport system from compartment to compartment, the net differential in longshore sand fluxes and the frequency of high, incident storm wave energy from the east–north–east.

Information	Author	Year	Comments
<i>Brooms Head and Lake Cakora</i>			
Cakora Point Slope Stability and Risks Assessment	SMEC	2012	Documents slope instability risk around Cakora Headland including impact of hazards on CVC infrastructure, potential contribution of CVC infrastructure to slope hazards, risks associated with slope hazards and treatment recommendations.
Lake Cakora Estuary Processes Study	SMEC	2013	Identifies catchment and estuary characteristics. Provides an estuary condition assessment that discusses estuary health and health pressures and reviews catchment flooding.
Brooms Head Coastal Processes and Hazard Study	SMEC	2013	Reviews and summarises existing information including historical aerial photography, photogrammetry and survey data. Describes coastal processes including wave climate, water levels, wave runup, coastal storms, currents, sediment transport and long-term shoreline changes, geology, climate change aeolian sand transport and entrance stability. Provides a coastal processes model. The study found that the study area is subject to the following hazards: beach erosion, shoreline recession, coastal inundation, climate change, wave overtopping and lake entrance instability.
Brooms Head and Lake Cakora Coastal Management Study	SMEC	2013	Purpose of the report was to gain community feedback on preferred management options prior to the preparation of a CZMP. Provides documentation of Brooms Head history including foreshore rock revetment works, Study area values – community and ecological, Description of foreshore area, Summary of coastal and estuary processes, Coastal hazard assessment, Review of management options including new options suggested by the community and those under older plans.
Brooms Head Beach and Lake Cakora Coastal Zone Management Plan	SMEC	2017	Describes actions to manage priority issues at Lake Cakora and the Brooms Head coastline. The management theme is dominated by 'holding the line' and effectively maintaining the coastal environment and associated values for the Brooms Head community. An implementation schedule with a summary of likely costs for each action are also provided. Provides a summary of coastal and estuary processes, priority coastal management issues, coastal hazards and risks, estuary health status, community uses and key coastal values. Includes an Emergency Action Sub Plan for Brooms Head Main Beach. The CZMP is certified.
Photos – Brooms Head 20/7	CVC	2020	Photos of shoreline where rock revetment is proposed at northern end of caravan park following storm surge event July 2020.

Information	Author	Year	Comments
Brooms Head sea wall concept design	Royal Haskoning	2020	Concept design for the extension of the existing revetment at the northern end of the caravan park and erosion management on the southern bank of Lake Cakora entrance. Considers alternative options and recommends a rock revetment for the caravan park, extension of revetment near the bridge and a rock bag end control structure at the entrance. Provides detailed concept drawings of the proposed works.
Geotechnical Investigation and Coastal Hazard Review	Royal Haskoning	2018	The purpose of this report was to gain an understanding of the local geotechnical conditions at the entrance to Lake Cakora and use this information to undertake a coastal hazard review. Results indicate that shallow layer of gravel and cobbles exists intermittently within the vicinity of the entrance. However, due to its depth and the relatively small gravel sizes this layer is not expected to provide any significant protection against scour during high energy storm conditions. Provides an analysis of historical aerial photography that suggests the stability of the entrance has not changed significantly in the 74-year analysis period. The estimated longshore recession rates due to sediment deficits were estimated to vary between 0.2 and 0.5 m/year for the various beach sections. The estimated storm demand varied from 40 to 220 m³/m for the 100-yr ARI storm. Shoreline recession attributed to SLR was in the order of 13 and 38 m for the 2050 and 2100 planning horizons, respectively. Provides updated hazard lines.
Lake Cakora Estuary Management Plan – Survey Results (Nicholas Whitton)	CVC	2009	Twenty-one surveys were completed, of which were permanent residents of Brooms Head or the surrounding area. Swimming, fishing were the most popular pursuits in the estuary. Bird watching and bushwalking and bait collecting were also popular. Most activities occur all year round. The most used area of the estuary is the entrance. Peace and tranquility was the highest rated value followed by clean swimming water and native plants animals. Respondents believe septic overflows/leaching, Poor water quality, Stormwater and drainage management and Bank erosion are the most significant issues. Respondents were divided on whether or not the Lake Cakora entrance should be opened to the ocean artificially
Concept Design Report for Brooms Head Holiday Park	Integrated Site Design	2017	Concept design for the redevelopment of Brooms Head Holiday Park. Includes changes to number and type of sites, new amenities blocks and caretaker's residence, addition of cabins.
Historical aerial photos			1958, 1967 and 1970

Information	Author	Year	Comments
<i>Wooli</i>			
Wooli Wooli River Estuary Processes Study	WBM	2006	Collates information on Wooli Wooli River including information on: History – including Aboriginal history, European settlement and contemporary Hydrodynamic processes – tidal ranges, velocities, discharges and flushing. Freshwater inflows, groundwater and flooding. Entrance and coastal processes – entrance morphodynamics, tidal delta. Water quality processes Sediment and erosion processes – geology, sediment characteristics, metals and nutrients, sediment transport, bathymetry, aerial photo analysis. Bank erosion assessment including consideration of causes. Ecological processes – estuarine and terrestrial flora and fauna Human influences and considerations Identifies management issues for consideration including bank erosion, implementation of regulations, stormwater pollution, feral animals, navigation, Onsite sewer management, climate change, conservation of threatened ecology. Data gaps were also identified and included groundwater influences, freshwater flows, long term water quality data, detailed ecological data, climate change, actual ASS.
Wooli Wooli River Estuary Management Plan	BMT WBM	2009	Based on the Wooli Wooli River EPS and associated community consultation. Provides a suite of objectives and actions for the management of Wooli Wooli River. The actions are presented under 22 strategies which include implementation responsibilities, a program and costs/funding. Immediate priority actions included Prepare 'Principles for land management and development', Auditing of on-site sewage systems and replacement as necessary, Water quality monitoring, Bank recession monitoring, New speed zones and boating restrictions, Review SIMP zonings, Protect public infrastructure from bank erosion. Documents community consultation outcomes and provides a summary of, estuarine process, estuary values, management issues and climate change impacts.

Information	Author	Year	Comments
Wooli Village Coastline Management Strategy Update and Options Review	WorleyParsons	2010	A review of coastal management options based on hazard information provided in <i>Wooli Beach/ Village Review of Coastal Hazards</i>. Brief summary of coastal values. Compiles previously documented conflicts of use relating to coastal use in the area. Identifies and assesses information on coastal hazards including coastal erosion, shoreline recession, coastal entrance behaviour. Discusses general management options including those had previously been considered. Options moving forward were assessed including levee/revetment and beach nourishment, property acquisition, planning and development controls, land swap/asset relocation and servicing strategy, dune management.
Wooli Beach / Village Review of Coastal Hazards	WorleyParsons	2010	Provides an assessment of coastal hazards for Wooli including short term beach erosion, long term shoreline recession, climate change considerations and entrance stability. Presents coastal hazard lines for 2010, 2050 and 2100.
Investigation of feasibility of utilising sand sources for beach nourishment in vicinity of Wooli, NSW	Royal Haskoning	2015	Investigates the feasibility of using different sources of sand for renourishing Wooli Beach. Reviews existing background information including geology, mineral resources and existing similar studies. Sand replenishment requirements for Wooli Beach are established. Several sites along the coast were visited and sediment samples collected. Sites/options considered in the investigation as a potential sand source included lower Wooli Wooli River estuary, dunes at northern end of Wooli Beach, beach backpassing, Woody Head sand lobe, Wilsons Headland to North Solitary island sand lobe, Cape Byron Sand lobe, offshore greater than 35 metres in depth. Sand compatibility, removal and transport options, zoning/tenure, policy/legislation were assessed and cost estimates provided for each option. The most feasible sand sources for moderate scale nourishment of Wooli Beach are identified as back-passing from the northern portion of the beach supplemented by dry-winning of sand from the adjacent dunes near Wilsons Headland. Further technical information is required to develop the scheme. Planning and policy amendments are required.

Information	Author	Year	Comments
Wooli Beach Coastal Zone Management Plan	Royal Haskoning	2018	Acknowledges the community highly values beach amenity and that there is preference for management responses that preserve beach amenity and provide resilience for the beach and village. Actions aim at reducing coastal hazard risks to assets and public safety and maintain a relatively natural beach. Key actions include: Emergency Action Sub Plan Development controls Community education Beach nourishment scheme and monitoring Beach scraping Summarises and assesses options considered in previous plans.
Photos – Wooli 17/7	CVC	2020	Photos of Wooli Beach following large sea conditions.
Assessment of biological impacts of beach scraping at Wooli Beach, northern NSW	National Marine Science Centre, Southern Cross University	2019	Biological monitoring to assess impacts of beach scraping at Wooli on sand fauna. Ghost crabs were used as the indicator species and their density was estimated using counts of active burrows. Results showed high levels of natural variability in crab abundance at all spatial and temporal scales. Nourishment completely buried all holes but new burrows were evident within three days of scraping. Crab abundance increased with the interval after scraping and was significantly greater at one of the impact sites than in an adjacent control within 84 days of nourishment.
Climate Change Projections for the Wooli Wooli Estuary and Batemans Bay	Macadam et al.	2007	Provides climate change projections for the Wooli Wooli River estuary for the 2030 and 2070 planning horizons. Changes projected include daily maximum and minimum air temperatures, average annual rainfall, extreme rainfall events, average solar radiation, annual dominant wind direction, 1-in-100-year storm surge height and mean sea level. Projections are based on two different climate change models.
Historical aerial photos			1958 and 1970
Wooli Floodplain Risk Management Plan	Patterson Britton & Partners	1999	Describes flood behaviour and levels, flood hazards and a management plan.
Wooli Beach – Beach Scraping for Dune Rebuilding and Public Access Repairs	CVC	2018	REF for the 2019 beach scraping.

Information	Author	Year	Comments
Survey to determine volume of beach scraping – NABE – Wooli Beach	B.W. Saye & Associates	2019	Post survey of 2019 Wooli beach scraping.
Coastal Conference presentation – Wooli Beach Scraping	M. Daley	2019	Presentation on the Wooli beach scraping. Provides timeline, some details and before and after photos.
Post-scrape photos	M. Daley	2019	-
<i>Wooloweyah Lagoon</i>			
Wooloweyah Lagoon Management Strategy	Woodhouse	2001	Documentation of background/catchment information on Wooloweyah Lagoon including water quality monitoring. Identified and assessed impacts on Wooloweyah Lagoon including sewage discharge, development, flood mitigation works, dredging, fishing, agriculture, acid sulfate soils, sandmining and causeway across Micalo Channel. Detailed water quality information available at the time. Provides an assessment of a range of management options. Recommended a range of studies and on-ground works.
Wooloweyah Lagoon Coastal Zone Management Plan	CVC	2009	Provides compiled background information. Identified key management issues for Wooloweyah Lagoon including future development, erosion and sedimentation, environmental flows, navigation, fishing on-site sewage, water quality, acid sulfate soils, bank condition and riparian vegetation, sugar cane, non-sustainable grazing, clearing, cane toads and climate change. Establishes management objectives. Twenty management strategies were identified.
Wooloweyah Lagoon condition assessment	CVC	2009	Provides information on the health of Wooloweyah Lagoon and identifies management issues within the catchment. The study found that turbidity was often above trigger levels. Turbidity in the lake was a function of wind speed, direction and duration. Turbidity was elevated directly behind trawlers in the short term however no long-term influence of trawlers on turbidity could be determined. Nutrient concentrations were found to be highest in Palmers Channel and associated drains. Levels were also elevated in Taloumbi Drain. Recommended that the condition assessment should be repeated every 2-3 years.

Information	Author	Year	Comments
FRDC Project Scope: Clarence Fisheries Productivity Phase 1: Lake Wooloweyah segment	WRL	2019	A project outline of FRDC research on Wooloweyah Lagoon. The primary aim of this research is to link the fisheries productivity with the habitat and hydrodynamics in efforts to maximise fisheries returns/investments. The goal is to provide the science evidence that will underpin the repair of the Clarence fishery productivity. Report due December 2020.
Taloumbi Ring Drain Options Assessment	Engeny	2019	Provides background information on the south west catchment of Wooloweyah Lagoon and Taloumbi Ring Drain, modelling and analysis of flooding impacts of various drain outlet management scenarios and climate change inundation (HAT+ sea level rise) mapping for Taloumbi Ring drain catchment.
Clarence River Fisheries Productivity project update	WRL	2020	Provides a summary of Clarence River Fisheries Productivity project including project overview. Outcomes of study are likely to be very useful for the CMP.
<i>Sandon River</i>			
Sandon River Estuary Processes study	GHD	2011	The aim of the study was to define the baseline conditions of estuary processes. Documents catchment characteristics, estuary morphodynamics, water quality, biodiversity, heritage of the Sandon River estuary. Includes bank erosion and water quality assessment. Bank erosion is mostly natural and water quality is generally good. Detailed comparison of historical aerial imagery. The greatest threat to the estuary is considered to be climate change.
Draft Coastal Zone Management Plan for the Sandon River Estuary	GHD	2012	Builds on the processes study and establishes estuary values as recreational, ecological, scenic, heritage, and socio-economic. Identifies estuary issues including user conflict, entrance and navigation safety, unauthorised activity, erosion and sedimentation, habitat degradation, ecological sustainability, fishing, water quality, land management, population increase and visitor pressure, cultural heritage. Top ranked priority actions include community education, maintain presence of regulatory officers, address entrance erosion, manage access tracks and recreation areas, regular on-site wastewater inspections.
Photos of beach erosion (Marc Daley)			Not available

Information	Author	Year	Comments
Sandon River Estuary Community Values Survey	CVC	2011	Survey of community members. Asks questions related to estuary usage including what, where, when, how often, estuary values, estuary issues and management approaches. Summary of responses: The most popular activities were fishing and swimming however bush walking, bird watching and photography also popular. The lower estuary was the most intensively used section. Many respondents displeased with boat traffic and speed. Commercial industries such as tourism, commercial fishing and aquaculture very unpopular. Preserving air enhancing the natural environment was a popular approach. In general, users of the estuary value the area for its current qualities and appeals and so wish it to remain largely the same.
<i>Yamba</i>			
Clarence River Entrance Model Investigation	Department of Public Works	1970	Study of the development of the entrance of the Clarence River as a deep sea port including establishment of navigation depths at the ring bar, mouth and most suitable location of port areas and facilities.
Yamba Waters. A Summary of the Yamba Waters Coastal Engineering Study	Department of Public Works	1984	Summary of the understanding of coastal processes along the Yamba coast at the time.
Yamba Coastline Management Study – Stages 1 and 2 Draft Coastal Processes and Hazard Definition	DPWS/MHL	2002	Study area includes northern end of Pippi beach, Convent Beach, Yamba Beach and Turners Beach. Describes coastal processes occurring on the Yamba beaches including coastal geomorphology, wind and wave climate, water levels, inundation, currents, rainfall, hydrogeology and sediment transport. Provides a conceptual model of processes. Defines coastal hazards. Provides linear recession setback distances for immediate, 50 and 100-year planning horizons. Landslips behind Yamba and Convent Beach identified as the critical issue. Includes photogrammetric assessment.
Yamba Coastline Management Study – Stage 3 Management Options	DPWS/MHL	2002	Assessed a range of management options for the Yamba beaches. Developed a suite of preferred options. The focus is to address the slope instability with priority given to actions that address this risk. The priority area for these actions is at the northern end of Yamba Beach in the vicinity of the Pacific Hotel. Other general coastal management actions are also included.

Information	Author	Year	Comments
Yamba Coastline Management Study – Stage 4 Draft Yamba Coastline Management Plan	MHL	2003	Summarises management issues including: Dune management and access at Turners Beach Safety of rockface above old Turners beach quarry Protection of surf club Slope instability behind Yamba and Convent beaches Recreational amenity of Yamba and Convent Beaches Dune management and access on Yamba Point tombolo. Presents preferred actions identified in Stage 3.
Yamba Coastline Management Plan Implementation Strategy	Maclean Shire Council	2004	Describes how the Stage 4 management plan is to be implemented. Identifies implementation priority, estimated costs, responsibility and describes how to implement each action.
Whiting Beach Erosion Processes Study	Royal Haskoning	2014	Study of the erosion which has occurred at Whiting Beach and identification of potential, feasible future management options.
Options to Manage Recession of Whiting Beach	Royal Haskoning	2015	A number of potential options to manage recession at Whiting Beach were considered including do nothing, offshore breakwater, T-Piece extension, reinstatement of middle Wall, seawall on Whiting Beach, groyne and beach nourishment. The recommendation is to undertake periodic beach nourishment of Whiting Beach in conjunction with Crown Lands when material from maintenance dredging becomes available. The report also recommended that Council investigate sourcing sand themselves. A potential source identified is between Hickey and Dart Island. A preliminary Review of Environmental Factors for this source has been prepared and it is recommended that Council progress it. It is also recommended that regular beach profile surveys of Whiting Beach are undertaken.

Information	Author	Year	Comments
Coastal Hazard Study for Pippi Beach (Yamba)	Royal Haskoning	2016	Collates and reviews a large range of background information including updated photogrammetry and beach/dune survey data. Provides a description of physical coastal processes and conceptual model of sediment transport. Assessment of beach erosion and dune instability - Storm demand of 170 m³/m adopted. Scour and swash levels of -1 m AHD and 2 m AHD (respectively) were adopted. Assessment of shoreline recession - Recession due to net sediment loss was determined using photogrammetry. Adopted rates are between 0 and 0.15 m/year. Recession due to SLR was calculated using the Bruun Rule and calculated to be 13.6 and 33.6 m at 2050 and 2100 respectively. Assessment of coastal inundation. Coastal cliff and bluff instability risk assessment - Instability of beach and Yamba Point assessed along proposed path route. Delineation of coastal hazard areas – hazard lines mapped using Zone of Slope Adjustment.
Pilot Hill Risk Assessment and Stabilisation	JK Geotechnics	2017	Updates previous slope instability reports on Pilot Hill. Presents a risk analysis for landslides and updates landslide risk zones. Considers a range of slope stabilisation options
Values, Issues and Options Paper – Concept Plan for the Yamba-Angourie Coastal Walk (and drawings)	Gondwana Consulting	2011	Describes values of the Yamba – Angourie area including natural heritage, cultural heritage, scenic and recreational values. Identifies constraints and opportunities for the walk route and design. Presents a range of walk route options and identifies a preferred route.
Yamba coastline Management Plan - Stormwater audit of Pilot Hill	Steven P McElroy and Associates	2011	Provides a review of previous investigations and studies regarding landslips on Pilot Hill. Includes interviews with property owners on history of buildings and slips. Explores sources of groundwater surcharge and concluded that there appeared to be minimal influence from external sources in the high levels of groundwater within the subsoil after rainfall. It was identified that the natural infiltration from the catchment was the most significant source. Several options to minimise the risk of a landslide were assessed including do nothing, continue monitoring, several drainage options and wells and pumps. The preferred option is to construct large diameter slotted concrete drain at bottom of reserve and AG drains within private land and stormwater drain in Marine Parade. Costs to be apportioned to each stakeholder.

Information	Author	Year	Comments
Hydrographs and groundwater level data (2005 – present), Yamba Hill Groundwater Stations	Ground Data Collection Services	May 2020	Pilot Hill groundwater monitoring results.
Clarence Coast Reserves Management Strategy	Maclean Shire Council	2002	The Clarence Coast Reserves are a group of Crown coastal and estuarine Crown reserves managed by the Clarence Coast Reserves Trust. Several of these reserves are situated within this projects study area including: Yamba South Head Park Flinders Park Oyster Cove Foreshore Angourie Iluka Beach Foreshore Wooloweyah Reserve Brooms Head Foreshore Reserve This document provides a management framework for these reserves.
Yamba Floodplain Risk Management Plan and Study	Webb, McKeown & Associates	2008	Describes flood behaviour and risk management measures.
<i>Clarence River</i>			
Clarence Estuary Management Plan	Umwelt	2003	Identifies community values and aspirations for the estuary. Identifies nine key issues grouped into four themes, integrated water cycle management, threats to ecological values, user interactions and overcoming uncertainty and facilitating systemic management. Identifies a range of prioritised actions to address issues.

Information	Author	Year	Comments
<i>NPWS</i>			
Review into the management of deceased whales in NSW	NSW Government	2019	The review's objectives were to: Review whale carcass management approaches across different land managers Investigate risks of whale carcasses attracting sharks and ensure they are addressed in the development of any new procedures Recommend procedures to ensure whale carcasses are managed to minimise community and environmental impacts Identify efficient, effective and consistent operational arrangements to manage whale carcasses along the NSW coast and across different land managers Recommend protocols for community engagement when making management decisions. Fifteen recommendations regarding the management of whale carcasses were made. A key recommendation is that land managers leave deceased whales in situ to decompose naturally, unless the carcass is in an urban or high visitation area.
Management of whale carcasses	NPWS		https://www.environment.nsw.gov.au/topics/animals-and-plants/wildlife-management/management-of-deceased-whales. NPWS provides a central advisory service on the management of whale carcasses. Land managers are responsible for managing deceased whales on the land they manage. Land managers are typically local councils, Crown Lands, DPI – Fisheries and NPWS. Provides checklists and flow charts for the management of whale carcasses.
Broadwater National Park, Bundjalung National Park and Iluka Nature Reserve Plan of Management	NPWS	1997	Documents background information on the National Park and management issues such as cultural heritage, geology/soils, flora and fauna and recreation. Provides a suite of actions to manage Bundjalung National Park. Many actions are relevant to this projects study area.
Bundjalung National Park and Iluka Nature Reserve and Tabbimobile Swamp Nature Reserve Fire Management Strategy	NPWS	2006	Provides guidelines for fire management in Bundjalung National Park.

Information	Author	Year	Comments
Yuraygir National Park and State Conservation Area Plan of Management	NPWS	2003	Documents background information on the National Park and management issues such as cultural heritage, geology/soils, flora and fauna and recreation. Provides a suite of actions to manage Yuraygir National Park. Many actions are relevant to this projects study area.
Yuraygir National Park and State Conservation Area Fire Management Strategy	NPWS	2007	Provides guidelines for fire management in Yuraygir National Park.
Yuraygir National Park - Inventory recording of historic places and landscapes Volume 1: Report	Tuck, D.	2007	Inventory of heritage places and items within Yuraygir National Park. Includes Aboriginal and settler heritage.
There were always people here: a history of Yuraygir National Park	Kijas, J.	2009	Extensive recording of settler and aboriginal perspectives of the historic uses and heritage of Yuraygir National Park.

Name	Source	Year	Description	Comments
SEPP Coastal Mapping	data.nsw.gov.au	Created 19/06/2019	The spatial extent of the SEPP (Coastal Management) 2018	Includes: Coastal Wetlands and Littoral Rainforests Area, Coastal Environment Area, Coastal Use Area, and Coastal Vulnerability Area.
Brooms head hazard 2050	CVC	Date modified by CVC 24/07/2020	Line layer showing the predicted water inundation line from 2050 Mean sea level rise at Brooms head. Line is 2km long from Brooms Head heading north	No attribution

Clarence Valley Coastline CMP Scoping Study - Appendix A: Existing Data and Information

Name	Source	Year	Description	Comments
Brooms head hazard 2100	CVC	Date modified by CVC 24/07/2020	Line layer showing the predicted water inundation line from 2100 Mean sea level rise at Brooms head. Line is 2km long from Brooms Head heading north	No attribution
Brooms head hazard ZRFC	CVC	Date modified by CVC 24/07/2020	No information about this layer. It is an inundation layer of some sort. Need to find out?	No attribution
Brooms head hazard revetment	CVC	Date modified by CVC 24/07/2020	Looks like maybe a line showing a proposed revetment wall of some sort. Currently there's a rock revetment along the beach in some sections. Further information required!	No attribution
Brooms head immediate hazard	CVC	Date modified by CVC 24/07/2020	Presumably, this line shows the extent of inundation in the next 10 years or something? The line follows a similar path to the hazard revetment line. Further information required!	No attribution
CVC potential coastal hazard	CVC	Date modified by CVC 24/07/2020	Polygon layer. Shows full length of Clarence LGA coast. Looks like a buffer area approx. 150m-200m wide showing possible hazard area (Although it doesn't correspond with the Brooms Head Hazard lines? Further information required	No attribution
CVC potential riverbank hazard	CVC	Date modified by CVC 24/07/2020	Polygon layer showing a 150m buffer inland of the edge of the river and lake banks	No information in the attribution
Pippi beach 2050 hazard ZSA	CVC	Date modified by CVC 24/07/2020	Line layer showing the predicted water inundation line from 2050 Mean sea level rise at Pippi beach. Line is 1800 m long	No attribution
Pippi beach 2050 hazard ZWI	CVC	Date modified by CVC 24/07/2020	Line layer showing the predicted water inundation line from 2100 Mean sea level rise at Pippi beach. Line is 1800 m long	No attribution
Pippi beach 2050 hazard ZSA	CVC	Date modified by CVC 24/07/2020	Points layer following Pippi beach 2050 hazard line but are 2.2 metres coastward from the inundation line. Further info required	Survey co-ordinates in ISG-AGD-66
Pippi beach 2100 hazard ZWI	CVC	Date modified by CVC 24/07/2020	Points layer following Pippi beach 2050 hazard line but are 2.2 metres coastward from the inundation line. Further info required	Co-ordinates of points

Clarence Valley Coastline CMP Scoping Study - Appendix A: Existing Data and Information

Name	Source	Year	Description	Comments
Pippi beach immediate hazard ZRFC	CVC	Date modified by CVC 24/07/2020	Presumably, this line shows the extent of inundation in the next 10 years or something? ZRFC = Zone reduced foundation capacity	No attribution
Pippi beach immediate hazard ZSA	CVC	Date modified by CVC 24/07/2020	Line layer showing another immediate hazard line. Unsure what it represents. What are ZSA, ZWI, ?	No attribution
Pippi beach immediate hazard ZWI	CVC	Date modified by CVC 24/07/2020	Points layer showing immediate hazard – ZWI ?	Survey co-ordinates in ISG-AGD-66
Wooli coastal hazard 2013	CVC	Date modified by CVC 24/07/2020	Line layer -See attribution	Wooli 2100 Coastal Hazard Plus SLR Wooli 2050 Coastal Hazard Plus SLR Wooli Immediate Coastal Hazard Line Wooli 2010 Zone Reduced Foundation capacity (ZRFC)
zSa_150_2016_Foreshore	NSW Gov	Received 26/08/2020	Line layer showing extent of foreshore on southern side of Lake Cakora	X, Y
zSa_150_2016_Foreshore_2050	NSW Gov	Received 26/08/2020	Line layer showing extent of foreshore on southern side of Lake Cakora 2050	X, Y
zSa_150_2016_Foreshore_2100	NSW Gov	Received 26/08/2020	Line layer showing extent of foreshore on southern side of Lake Cakora 2100	X, Y
zSa_220_2016_northern Beach	NSW Gov	Received 26/08/2020	Line layer showing extent of Northern Beach foreshore on Northern side of Lake Cakora	X, Y
zSa_220_2016_northern Beach_2050	NSW Gov	Received 26/08/2020	Line layer showing extent of Northern Beach foreshore on Northern side of Lake Cakora 2050	X, Y
zSa_220_2016_northern Beach_2100	NSW Gov	Received 26/08/2020	Line layer showing extent of Northern Beach foreshore on Northern side of Lake Cakora 2100	X, Y
zSA_Cakora_190_2016_LakeEntrance	NSW Gov	Received 26/08/2020	Line layer showing extent of Northern Beach foreshore on Northern side of Lake Cakora 2100	X, Y

Clarence Valley Coastline CMP Scoping Study - Appendix A: Existing Data and Information

Name	Source	Year	Description	Comments
zSA_Cakora_190_2016_LakeEntrance_2050	NSW Gov	Received 26/08/2020	Line layer showing extent of Northern Beach foreshore on Northern side of Lake Cakora 2100	X, Y
zSA_Cakora_190_2016_LakeEntrance_2100	NSW Gov	Received 26/08/2020	Line layer showing extent of Northern Beach foreshore on Northern side of Lake Cakora 2100	X, Y
Yamba hill landslide risk zone	CVC	Date modified by CVC 24/07/2020	Polygon layer showing Landslide risk areas at Yamba coast	Risk Zones ID
Coastal Emu range	CVC	Date modified by CVC 24/07/2020	1 Polygon presumably showing the range of the Emu population in this area – <i>Dromaius novaehollandiae</i>	ID, Scientific name, Taxa, Common name, site id, site name, restricted
Council managed land parcels	CVC	Date modified by CVC 24/07/2020	Polygon layer showing CVC managed parcels	Parks and reserves, Operational, community or Crown etc.
Land Zoning	CVC	Date modified by CVC 24/07/2020	Polygon layer- Clipped Land zoning for coastal area	Usual attributes
NSW spatial Crownland	CVC	Date modified by CVC 24/07/2020	Polygon layer – Crown land parcels	No useful attribution
Onsite sewer managed land parcels	CVC	Date modified by CVC 24/07/2020	Polygon layer showing parcels which have OSSMS	No useful attribution
Pressure sewer rising main	CVC	Date modified by CVC 24/07/2020	Line layer - Pressure sewer rising main	Type of material pipe is made from, pipe location, pipe diameter, Constructed date, Length, A drawing reference number
Sewer rising main	CVC	Date modified by CVC 24/07/2020	Line layer – Rising main for Yamba	Various- as usual
Sewer pump stations	CVC	Date modified by CVC 24/07/2020	Points layer showing location of pump stations – All in and around Yamba	Various- as usual
Sewer main	CVC	Date modified by CVC 24/07/2020	Sewer line going to houses from “Sewer Rising main” for Yamba only	Various- as usual

Clarence Valley Coastline CMP Scoping Study - Appendix A: Existing Data and Information

Name	Source	Year	Description	Comments
Stream order	CVC	Date modified by CVC 24/07/2020	Stream order layer- clipped to 13km inland (approx) from coast within CVC LGA	Stream Order
Vegetation CMA Koala	CVC	Date modified by CVC 24/07/2020	Polygon layer- Contains vegetation type and Koala habitat type	Name eg. Swamp Oak Koala Habitat eg. Primary, Secondary_A etc.
Water pumping stations	CVC	Date modified by CVC 24/07/2020	Points layer- Water pumping stations * 3 Angourie water pump station Minnie waters pump station Wooli water pump station	Other info eg. Building type, Motors used a each
Water reservoirs	CVC	Date modified by CVC 24/07/2020	Points layer showing location of Reservoirs	Attributes for 9 Reservoirs- all coastal
Watermains	CVC	Date modified by CVC 24/07/2020	Line layer showing Yamba water supply	Usual attributes
Aerial	CVC		Not available	
Development Areas/Mapped urban growth	CVC	Provided 7/9/2020		
Whiting beach hazard lines	CVC	Provided 7/9/2020	Not provided	
Catchment areas for estuaries	CVC	Provided 7/9/2020	Using public layer	
Floodplain assets	CVC	Provided 7/9/2020		
Cvc_stormwater_pipes	CVC	Provided 7/9/2020		
Cvc_stormwater_pits	CVC	Provided 7/9/2020		

Clarence Valley Coastline CMP Scoping Study - Appendix A: Existing Data and Information

Name	Source	Year	Description	Comments
Cvc_surface_drainage	CVC	Provided 7/9/2020		
Cvc_surface_drainage	CVC	Provided 7/9/2020		
floodgates	CVC	Provided 7/9/2020		
floodplain_bridges	CVC	Provided 7/9/2020		
floodplain_drains	CVC	Provided 7/9/2020		
levees_and_blocks	CVC	Provided 7/9/2020		
mnc_growth_areas	CVC	Provided 7/9/2020		
riverbank_erosion_area	CVC	Provided 7/9/2020		
rock_protection	CVC	Provided 7/9/2020		
Yamba coastal hazard lines 2050 and 2100	CVC		Included in Pippie_Beach_2050_HazardZWI	
Bank erosion mapping e.g. Sandon river			Not provided	
Beach access points			Not Mapped	
Walking tracks			Not Mapped	
Revetment wall			Not Mapped	
Any other vegetation layers			Not Mapped	
cvc_heritage_conservation_area	CVC	07/09/2020		
cvc_heritage_general	CVC	07/09/2020		
Tidal limits			Got this	

Appendix B. STATUTORY AND PLANNING FRAMEWORK

This Appendix provides a summary of legislation and management plans relevant to coastal and estuary planning.

B1. LEGISLATION

Coastal Management Act 2016

The *Coastal Management Act 2016* communicates the NSW Government's vision for coastal management. The Act reflects the vital natural, social, cultural and economic values of our coastal areas and promotes the principles of ecologically sustainable development in managing these values. The Act establishes requirements for the preparation of CMPs under guidance provided by the Coastal Management Manual.

The legislative and policy framework introduced by recent coastal reforms recognises natural coastal processes and the local and regional dynamic character of the coast and promotes land use planning decisions that accommodate them. The reforms ensure coordinated planning and management of the coast and support public participation in these activities.

The Act provides for the integrated management of the coastal environment of NSW consistent with the principles of ecologically sustainable development for the social, cultural and economic well-being of the people of the state. The Act:

- Establishes high level statutory objectives for integrated coastal management in NSW.
- Defines the NSW coastal zone as being made up of four distinct 'coastal management areas' and sets out specific management objectives for each of those areas.
- Establishes a new independent coastal advisory body, the NSW Coastal Council.
- Requires local councils to embed coastal management within the Integrated Planning and Reporting (IP&R) framework established in the *Local Government Act 1993*. This approach will ensure that coastal management needs inform, and are informed by, councils' overall service delivery, financial and asset management planning responsibilities.
- Provides for public authorities to take into consideration the objectives and processes to achieve integrated management of the NSW coast.

The objects of the Act are to "manage the coastal environment of New South Wales in a manner consistent with the principles of ecologically sustainable development for the social, cultural and economic well-being of the people of the State, and in particular:

- (a) to protect and enhance natural coastal processes and coastal environmental values including natural character, scenic value, biological diversity and ecosystem integrity and resilience, and
- (b) to support the social and cultural values of the coastal zone and maintain public access, amenity, use and safety, and
- (c) to acknowledge Aboriginal peoples' spiritual, social, customary and economic use of the coastal zone, and
- (d) to recognise the coastal zone as a vital economic zone and to support sustainable coastal economies, and
- (e) to facilitate ecologically sustainable development in the coastal zone and promote sustainable land use planning decision-making, and
- (f) to mitigate current and future risks from coastal hazards, taking into account the effects of climate change, and
- (g) to recognise that the local and regional scale effects of coastal processes, and the inherently ambulatory and dynamic nature of the shoreline, may result in the loss of coastal land to the sea

(including estuaries and other arms of the sea), and to manage coastal use and development accordingly, and

- (h) to promote integrated and co-ordinated coastal planning, management and reporting, and
- (i) to encourage and promote plans and strategies to improve the resilience of coastal assets to the impacts of an uncertain climate future including impacts of extreme storm events, and
- (j) to ensure co-ordination of the policies and activities of government and public authorities relating to the coastal zone and to facilitate the proper integration of their management activities, and
- (k) to support public participation in coastal management and planning and greater public awareness, education and understanding of coastal processes and management actions, and
- (l) to facilitate the identification of land in the coastal zone for acquisition by public or local authorities in order to promote the protection, enhancement, maintenance and restoration of the environment of the coastal zone, and
- (m) to support the objects of the Marine Estate Management Act 2014.”

Coastal Management SEPP

The *Coastal Management SEPP* forms part of the broader land-use planning framework in NSW. This is now the key environmental planning instrument for land-use planning in the coastal zone and delivers the statutory management objectives for each of the four coastal management areas that make up the coastal zone:

- CWLRA - Coastal wetlands and littoral rainforests area: support high value biodiversity that are particularly sensitive to development. This management area is defined in the Act as land which displays ‘the hydrological and floristic characteristics of coastal wetlands or littoral rainforests and land adjoining those features. This area focusses on protecting well established and more extensive vegetation communities (as opposed to single trees or isolated stands). The maps include a 100 m proximity area, applying to all land use zones, around coastal wetlands and littoral rainforests. The objectives of the CWLRA within the Act are to:
 - Protect coastal wetlands and littoral rainforests in their natural state, including their biological diversity and ecosystem integrity.
 - Promote the rehabilitation and restoration of degraded coastal wetlands and littoral rainforests.
 - Improve the resilience of coastal wetlands and littoral rainforests to the impacts of climate change, including opportunities for migration.
 - Support the social and cultural values of coastal wetland and littoral rainforest communities.
 - Promote the objectives of State policies and programs for wetlands or littoral rainforest management.
- CVA - Coastal vulnerability area: land which is subject to current and future coastal hazards including beach erosion, shoreline recession, entrance instability, coastal inundation, tidal inundation, slope instability and foreshore tidal erosion. The objectives of the CVA within the Act are to:
 - Ensure public safety and prevent risks to human life.
 - Mitigate current and future coastal hazards.
 - Maintain the presence of beaches, dunes and other natural features.

- Maintain public access, amenity and use of the coast.
- Encourage land use that reduces exposure to hazards, including through siting, design, construction and operational decisions.
- Adopt coastal management strategies that reduce exposure to hazards, in the first instance by restoring or enhancing natural defences such as dunes, and thereafter by taking other action and if taking other action, to:
 - avoid significant degradation or disruption of biological diversity, ecosystem integrity, coastal processes (ecological, biophysical, geological, geomorphological), beach and foreshore amenity, and social and cultural values.
 - avoid adverse offsite impacts, or otherwise restore the land if any impacts are caused by the action to reduce exposure to hazards.
- Maintain essential infrastructure.
- Improve community resilience and reduce reliance on emergency responses
- CEA - Coastal environment area: areas that are characterised by natural coastal features such as beaches, rock platforms, undeveloped headlands, coastal lakes and marine and estuarine waters. The area is made up of estuaries and a 100 m landward area, coastal lakes and lagoons and a 500 m landward area and specified sensitive coastal lakes and lagoons. The coastal management area is mapped upstream to one kilometre beyond the highest astronomical tide. The objectives of the CEA within the Act are to:
 - Protect and enhance coastal environmental values and natural processes of coastal waters, estuaries, coastal lakes, coastal lagoons, and enhance natural character, scenic value, biological diversity and ecosystem integrity.
 - Reduce threats to and improve resilience of these coastal environments, including in response to climate change.
 - Maintain and improve water quality and estuary health.
 - Support social and cultural values of the coastal environments.
 - Maintain the presence of beaches, dunes and natural features of the foreshore.
 - Maintain and improve public access, amenity and use of the coast.
- CUA - The coastal use area: land adjacent to coastal waters, estuaries and coastal lakes and lagoons where impacts of development on the use and enjoyment of the beaches, dunes, estuaries and lakes need to be considered. The area starts at the seaward local government boundary, typically the low water mark and extends to the estuary limit (one km landward of coastal waters, estuaries and coastal lakes). The objectives of the CUA within the Act are to:
 - Protect and enhance the scenic, social and cultural values of the coast by ensuring that:
 - the type, bulk, scale and size of development is appropriate for the location and natural scenic quality of the coast.
 - adverse impacts of development on cultural and built environmental heritage are avoided or mitigated.
 - urban design, including water sensitive urban design, is supported and incorporated into development activities.
 - adequate public open space is provided, including for recreational activities and associated infrastructure.

- the use of the surf zone is considered.
- Accommodate both urbanised and natural stretches of coastline

The SEPP gives effect to the objectives of the *Coastal Management Act 2016* from a land use planning perspective, by specifying how development proposals are to be assessed if they fall within the coastal zone. This becomes relevant to the preparation of the CMP with regards to the intent and description of recommended actions and their intended approval pathways (if required) under the SEPP. For example, under the Coastal Management SEPP, in order for coastal protection works to be undertaken without consent they need to be identified in a certified CMP.

Marine Estate Management Act 2014

The *Coastal Management Act 2016* (s.3(m)) legally supports the objects of the *Marine Estate Management Act 2014*, with the coastal zone forming part of the marine estate. The *Marine Estate Management Act 2014* provides for strategic and integrated management of the whole marine estate – marine waters, coasts and estuaries. The Act does this by:

- Providing for the management of the marine estate consistent with the principles of ecologically sustainable development.
- Establishing two advisory committees, a Marine Estate Management Authority (MEMA) and Marine Estate Expert Knowledge Panel.
- Requiring the development of a Marine Estate Management Strategy to address priority threats identified through the TARA.
- Facilitating the maintenance of ecological integrity, and economic, social, cultural and scientific opportunities.
- Promoting the coordination of government programs.
- Providing for a comprehensive system of marine parks and aquatic reserves.

Crown Land Management Act 2016

The *Crown Land Management Act 2016* commenced on the 1st July 2018. DPIE – Crown Land is responsible for the management of the Crown Land estate in accordance with this act. DPIE – Crown Land may transfer management responsibilities to a reserve trust or to Council. Some areas of Crown land within the study area are under Council Reserve Trust management (refer Section 5.1.1). Under the CLM Act, Council will need to categorise and prepare Plans of Management under the *Local Government Act 1993* for these reserves. Any plans that are prepared will need to be consistent with the CMP.

Actions proposed on public land require an understanding of the boundaries of public land (i.e. survey may be required), and the relevant authorisations and appropriate tenure arrangements from public land managers, in particular, where works are proposed on Crown land not under Council management.

Fisheries Management Act 1994

In NSW, threatened fish (both saltwater and freshwater), their habitat, and threatened marine vegetation are protected under the *Fisheries Management Act 1994*. The *Fisheries Management Act* is administered by the NSW Department of Primary Industries – Fisheries (DPI Fisheries). Under the *Fisheries Management Act*, DPI Fisheries is responsible for ensuring that fish stocks are conserved and that there is “no net loss” of key fish habitats upon which those stocks depend. DPI Fisheries achieves this through regulating recreational and commercial fishing and assessing activities under Part 4 and Part 5 of the *Environmental Planning and Assessment Act 1979* that are located on or adjacent to key fish habitats in accordance with the objectives of the *Fisheries Management Act*, the aquatic habitat protection and threatened species conservation

provisions in Parts 7 and 7A of the *Fisheries Management Act*, and the associated *Policy and Guidelines for Fish Habitat Conservation and Management* (DPI, 2013 Update). Key fish habitats include, but are not limited to, 3rd order and greater freshwater waterways, Coastal Wetlands and tidal waters up to the Highest Astronomical Tide (HAT) level.

Relevant divisions and sections of the *Fisheries Management Act* under which permit and consultation requirements may apply to a range of coastal management activities necessary under the pending CMP include:

- Division 3, Section 199, 200 and 201 dredging and reclamation of water land.
- Division 4, Section 205 harm to marine vegetation.
- Division 8, Section 219 obstruction of fish passage.

A permit to dredge, or to mechanically open an ICOLL entrance is not required under the Act where works are carried out under appropriate Crown land authorisations. However, a permit may be required for harm to marine vegetation and DPI Fisheries should still be notified and consulted with regards to any action with the potential to impact on fisheries or marine vegetation.

Water Management Act 2000

The objects of the *Water Management Act 2000* are to provide for the sustainable and integrated management of the water sources of the state for the benefit of both present and future generations. The Act is administered by the NSW Natural Resources Access Regulator (NRAR), Water NSW and the DPIE - Water. DPIE – Water is accountable for the development and implementation of water sharing plans which allocate water for direct use, extraction and environmental needs. The scoping study area lies within the Water Sharing Plan for the Clarence Unregulated and Alluvial Water Sources area. Specific relevant water sources include:

- Esk River Water Source;
- Clarence Coastal Water Source;
- Wooloweyah Lake Water Source;
- Angourie-Redcliffe and Sandon River Water Source; and
- Wooli River Water Source.

NRAR regulates activities or works on waterfront land or works that may interfere with an aquifer. Relevant approvals under the Act include:

- Aquifer interference approval, i.e. a water licence (other than where exemptions apply or where water is being taken under a basic landholder right) such as may be required for dewatering and groundwater filling during and post construction activities.
- Controlled activity approvals for works on waterfront land (defined as the bed of any river, lake or estuary, and the land within 40 metres of the river banks, lake shore or estuary mean high water mark). Examples include erosion control works, construction of waterway crossings and roads, and depositing extracted material on waterfront land. Public authorities are exempt from requiring a controlled activity approval.
- Water extraction licences.

Native Title Act 1993 (Commonwealth) and Aboriginal Native Land Rights Act 1983 (NSW)

Native title determinations are in effect over a large proportion of the study area (Section 5.1.1 - Figure 45 to Figure 47). Native Title (NCD2015/002) by the Yaegl People #1 was declared in 2015 over areas of the

Clarence River estuary bed downstream of Harwood bridge, including Wooloweyah Lagoon, Whiting Beach and the Clarence River entrance. Native Title (NCD2015/003) by the Yaegl People #2 was declared in 2015 over land in the coastal areas of the Clarence Valley from Shark Bay in the north to South Terrace Wooli in the south and Lawrence in the west. The Registered Native Title Body Corporate (RNTBC) for both determination areas is the Yaegl Traditional Owners Aboriginal Corporation (TOAC).

An Indigenous Land Use Agreement (Yaegl Interim Licences ILUA) is registered for all land and waters that is covered by the above Native Title determination areas. Land use agreement is a Body Corporate agreement with the parties to the agreement being the Minister administering the Crown Lands Act and Yaegl TOAC RNTBC.

Maps of these areas are provided on the National Native Title website at <http://www.nntt.gov.au/Pages/Home-Page.aspx>.

Where actions are proposed on Crown land, consideration of Aboriginal Land Claims lodged under the *Aboriginal Land Rights Act 1983* (NSW) will need to be undertaken. Any works will need to be compliant with the *Native Title Act 1993*.

Other Relevant Legislation

Other legislation relevant to the management of the coast and estuaries include:

- Biodiversity Conservation Act 2016.
- Environmental Planning and Assessment 1979.
- Heritage Act 1977.
- Local Government Act 1993.
- Local Land Services Act 2013.
- National Parks and Wildlife Act 1974.
- State Emergency and Rescue Management Act 1989.
- Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth).

B2. NSW PLANS AND STRATEGIES

Marine Estate Management Strategy (2018)

The *Marine Estate Management Strategy 2018-2028* (MEMS, MEMA, 2018) provides an overarching strategic approach to the coordinated management of the NSW marine estate, i.e. the coastal waters, estuaries, lakes, lagoons and coastal wetlands. The Strategy considers the ten MEMA management principles as well as priority threats for the marine estate as identified in the NSW marine estate threat and risk assessment (TARA, BMT WBM, 2017). The Strategy sets out nine initiatives and a set of associated objectives and key actions to address these priority threats and seeks to balance economic growth, use and conservation of the marine estate. The initiatives comprise:

1. Improving water quality and reducing litter.
2. Delivering healthy coastal habitats with sustainable use and development.
3. Planning for climate change.
4. Protecting the Aboriginal cultural values of the marine estate.
5. Reducing impacts on threatened and protected species.
6. Ensuring sustainable fishing and aquaculture.

7. Enabling safe and sustainable boating.
8. Enhancing social, cultural and economic benefits.
9. Delivery effective governance.

This Scoping Study considers the key state-wide threats as well as priority threats to environmental assets and to social, cultural and economic benefits for the North Region as identified in the TARA. In developing strategies and actions for the CMP, the principles and management initiatives of the MEMS will be considered and any alignment identified.

NSW Maritime Infrastructure Plan 2019-2024

The *NSW Maritime Infrastructure Plan* sets out a strategic and coordinated approach to prioritising and delivering maritime infrastructure in NSW. The aim is to maximise the benefits of investment in maritime infrastructure for recreational and commercial boaters, including the commercial fishing, aquaculture and tourism sectors, and provide certainty to industry. The emphasis of this Plan is on regional ports managed by the state and other significant coastal waterways that support strategically important boating activity amongst commercial fishing and aquaculture businesses, recreational boaters and tourism. The plan identifies key opportunities, emerging trends and user needs of the boating sector and considered waterway user activity, existing infrastructure and broader economic performance at locations along the NSW coast. Key waterways and regional ports identified within the study area include the Clarence River and Wooli River. Key investment locations include the Clarence River. Priority outcomes relevant to the CMP study area in the Clarence River are those related to the entrance including 'Accessible and clearly marked river entrance and navigation channels to provide access to Yamba, Iluka and further upstream to support further economic growth opportunities' and 'breakwaters that enable access to the river entrance.'

Coastal Dredging Strategy

The *NSW Coastal Dredging Strategy 2019 – 2024* outlines waterway user benefits and other expected favourable outcomes, state-wide priority dredging preferences over the next 5 years, environmental and statutory approvals management principles and funding need to maintain healthy and accessible waterways in NSW. The strategy identifies the state government as being responsible for the dredging of navigational channels in key investment locations identified in the Maritime Infrastructure Plan and in navigational channels providing access to state owned maritime infrastructure, while Councils maintain other navigational channels (i.e. local waterways). The strategy identifies dredging in the lower Clarence River, specifically the entrance channels to Iluka and Yamba boat harbours with nourishment potential on Whiting Beach as a key investment location and dredging in Wooli River from the entrance to the town wharf with nourishment potential on Wooli Beach as a priority regional location.

Regional Plans

North Coast Regional Plan 2036

The *North Coast Regional Plan 2036* (NSW Government, 2016) will guide the NSW Government's land use planning priorities and decisions to 2036. The Plan recognises the spectacular environment and vibrant communities of the region. The regional priority identified in the plan for the Clarence Valley and relevant to coastal zone is to identify opportunities to expand nature-based, adventure and cultural tourism by leveraging Clarence Valley's natural and heritage assets. Housing in Yamba is identified to support housing growth.

North Coast Local Strategic Plan

North Coast Local Land Services has developed the North Coast Local Strategic Plan (NCLLS, 2016) to ensure that it is meeting its mission of improving primary production and better management of natural

resources across the North Coast region. The plan outlines a series of strategies through which the four main goals are to be achieved, through the resilience of local communities, improved management of biosecurity, natural resources, agricultural productivity and emergency management (LLS, 2016). The Strategic Plan has a general focus on communities of the catchment and the ecosystem services provided to them by natural resources such as soils and land, native vegetation and aquatic ecosystems.

Relevant regional priorities include:

- Active protection, maintenance and improvement of:
 - Threatened species (e.g. Pied Oystercatcher, Beach Stone Curlew, Eastern Freshwater Cod, Spotted tailed Quoll, Eastern Bristle Bird) and Endangered Ecological Communities (e.g. coastal littoral rainforest, coastal wetlands, coastal themeda headland grassland).
 - Native vegetation extent, corridor connectivity and the condition of natural habitats.
 - Riverine habitat condition and water quality.
 - Coastal floodplain condition.
 - Wetland condition.
 - Estuarine condition.
 - Coastal and marine habitats.
- Supporting Aboriginal people to work on Country.

North Coast Regional Strategic Pest Animal Management Plan (2018-2023)

North Coast Local Land Services has developed the *North Coast Regional Strategic Pest Animal Management Plan (2018-2023)*. The purpose of the plan is to protect the economy, environment and community, through strategic management of the region's pest animals. The plan outlines how government, industry and the community can work together and share the responsibility to prevent, eradicate, contain or manage pest animals to achieve a balance in economic, environmental and social outcomes.

The plan identifies regional priority pest animal species and goals and activities to manage them. Priority species relevant to the CMP study area include Cane Toad, feral cats, wild dogs, Foxes, wild horses and feral pigs.

North Coast Regional Strategic Weed Management Plan 2017-2022

North Coast Local Land Services has developed the *North Coast Regional Strategic Weed Animal Management Plan* to provide a basis for a co-operative and co-ordinated approach to weed management on the North Coast. The plan focuses on managing weeds to improve the region's biosecurity. The vision of the plan is to protect the North Coast's environment, landscape, livelihood, cultural and lifestyle values from weeds by strengthening the sustainability of the natural environment, primary industries, and local communities in the region.

The plan outlines a framework and range of priorities and actions to achieve the plans vision, goals and objectives. The general focus of the plan is about community support and fostering relationship between management partners.

Regional Boating Plan for the Tweed-Clarence Valley Region (2015)

The *Regional Boating Plan for the Tweed – Clarence Region* (TfNSW, 2015) was developed in part to boost the experience of recreational boating within the region as part of a state-wide initiative. The Plan was developed in consultation with Council, key stakeholders and the community (through an online survey).

TfNSW oversees the boating program and is responsible for ensuring the program is progressing, whereas Council is responsible for implementing actions with funding from TfNSW - Maritime.

The Plan identifies region-wide actions for boating safety, access and infrastructure required to be implemented over five years (to 2020) under the *NSW Boating Now* program including navigational aids and better safety signage.

B3. INTEGRATED PLANNING AND REPORTING

The Integrated Planning and Reporting (IP&R) framework is established under Chapter 13 of the *Local Government Act 1993* and is the main mechanism by which councils comprehensively plan for, and report on, their asset management and service delivery responsibilities within a local government area. The *Coastal Management Act 2016* requires that CMPs are given effect through the IP&R framework. This will include performance auditing powers to ensure that programs are appropriately implemented. This means that CMPs and identified coastal management activities are aligned with broader community strategic plans, reflect community priorities and are feasible, financially viable and able to be resourced.

The Clarence Community Strategic Plan (*The Clarence 2027*) was developed after extensive public engagement starting late 2016 and finishing at the end of February 2017. It reflects the community's aspirations and sets the broad parameters that guide decision making until 2027. The delivery program sets out what is to be achieved over four years and the operational plan details projects that are to be completed each year (Figure 50).



Figure 50: Clarence Valley Council's IP&R Framework

Source: CVC (2017a)

Protection of wetlands, natural environment and wildlife' was flagged as a key opportunity for attention in the community consultation undertaken during development of the CSP. Beach access and river access were seen as Council's strengths.

The CSP will assist in guiding the development of the CMP for the coastline and estuaries. The CSP Vision and Mission are:

- Vision: To make the Clarence Valley a community full of opportunity.
- Mission: To plan and deliver services valued by the community.

Within the Environment theme, objectives, strategies and actions relating to coastal management are summarised in Table 10.

Table 10: CSP, Delivery Program and Operational Plan objectives, strategies and actions

Strategies	Actions	KPI/Milestone/ Statistic
Objective 4.1 - To preserve and enhance our natural environment:		
Strategy 4.1.1 Managing our coastal zone, waterways, catchments and floodplains in an ecologically sustainable manner.	Review Council's flood response procedures	Review of Council's Floodplain Manual by June each year
	Prepare and implement riverbank risk plan	Number of projects implemented
Strategy 4.1.2 Promoting sustainable natural resource management.	Support landowners and volunteers to manage Council drains and floodgates	20 landholder visits conducted annually
	Implement adopted coast and estuary management plans	Two priority actions implemented
	Prepare State of Environment Report (SoE)	SoE completed by June 2021
	Implement Weed Action Plan (WAP)	2,500 property inspections completed annually
	Implement the Bush Fire Risk Management Plan	Asset Protection Zones (APZs) and Fire Trails maintained annually
	Promote environmental and biodiversity issues	Undertake two awareness raising events annually
	Support Volunteers to undertake Natural Resource Management (NRM) activities	Liaise with groups and volunteers annually
Objective 4.2 - To foster a balance between development and the environment considering climate change impacts		
Strategy 4.2.2: Plan, resource and respond to natural hazards and disasters taking into account impacts from climate change	Planning for management of natural hazards	Review planning for natural hazards annually
Strategy 4.2.3: Provide efficient and effective solid waste management services which prioritises resource recovery and minimises environmental impacts	Implement initiatives to reduce illegal dumping and littering	Reduction in number of clean-ups undertaken each year

Source: CVC (2020b)

B5. LOCAL PLANS

Local Environmental Plan and Development Control Plans

The Clarence Valley LEP (2011) makes local environmental planning provisions for land in Clarence Valley in accordance with the relevant standard environmental planning instrument under section 3.20 of the *Environmental Planning and Assessment Act 1979*. The aims of the LEP are:

- (a) to encourage and enable the sustainable use, development and management of natural and man-made resources, including agricultural land resources and productive rural lands,*
- (b) to limit dispersed rural settlement,*
- (c) to provide a mix of housing, including affordable housing, to meet the needs of the community,*
- (d) to protect areas of high ecological, scientific, cultural or aesthetic value,*
- (e) to provide adequate access and services to development carried out in accordance with this Plan,*
- (f) to maintain the character of villages and towns,*
- (g) to conserve items and areas of environmental and cultural heritage,*
- (h) to provide a hierarchy of business/retail centres,*
- (i) to identify land for industrial and business development that provides opportunities for employment,*
- (j) to protect key infrastructure and ensure adequate integration of infrastructure and development,*
- (k) to maintain or improve the natural conservation and scenic amenity values of the land, including significant habitat areas and wildlife corridors.*

The LEP includes local provisions for coastal risk planning (Part 7, Clause 7.5 of the LEP):

7.5 Coastal risk planning

(1) The objectives of this clause are as follows -

- (a) to avoid significant adverse impacts from coastal hazards,*
- (b) to enable evacuation of coastal risk areas in an emergency,*
- (c) to ensure uses are compatible with coastal risks.*

(2) This clause applies to land identified as “Coastal Risk” on the Coastal Risk Planning Map.

(3) Development consent must not be granted to development on land to which this clause applies unless the consent authority has considered whether the development -

- (a) is likely to be adversely affected by the impacts of coastal hazards, and*
- (b) is likely to cause detrimental increases in coastal risks to other development or properties, and*
- (c) is likely to alter coastal processes and the impacts of coastal hazards to the detriment of the environment, and*
- (d) incorporates appropriate measures to manage risk to life from coastal risks, and*
- (e) avoids or minimises potential adverse effects from the impact of coastal processes and the exposure to coastal hazards, particularly if located seaward of the immediate hazard line, and*

(f) makes provision for relocation, modification or removal of the development to adapt to the impact of coastal processes, coastal hazards and sea level rise planning benchmarks for New South Wales.

(4) A word or expression used in this clause has the same meaning as it has in the NSW Coastal Planning Guidelines: Adapting to Sea Level Rise (ISBN 978 1 74263 035 9) published by the NSW Government in August 2010, unless it is otherwise defined in this clause.

(5) In this clause, coastal hazard has the same meaning as it has in the Coastal Management Act 2016.

The Coastal Risk Planning Map identifies parts of the coastline at Woolli (Figure 51).

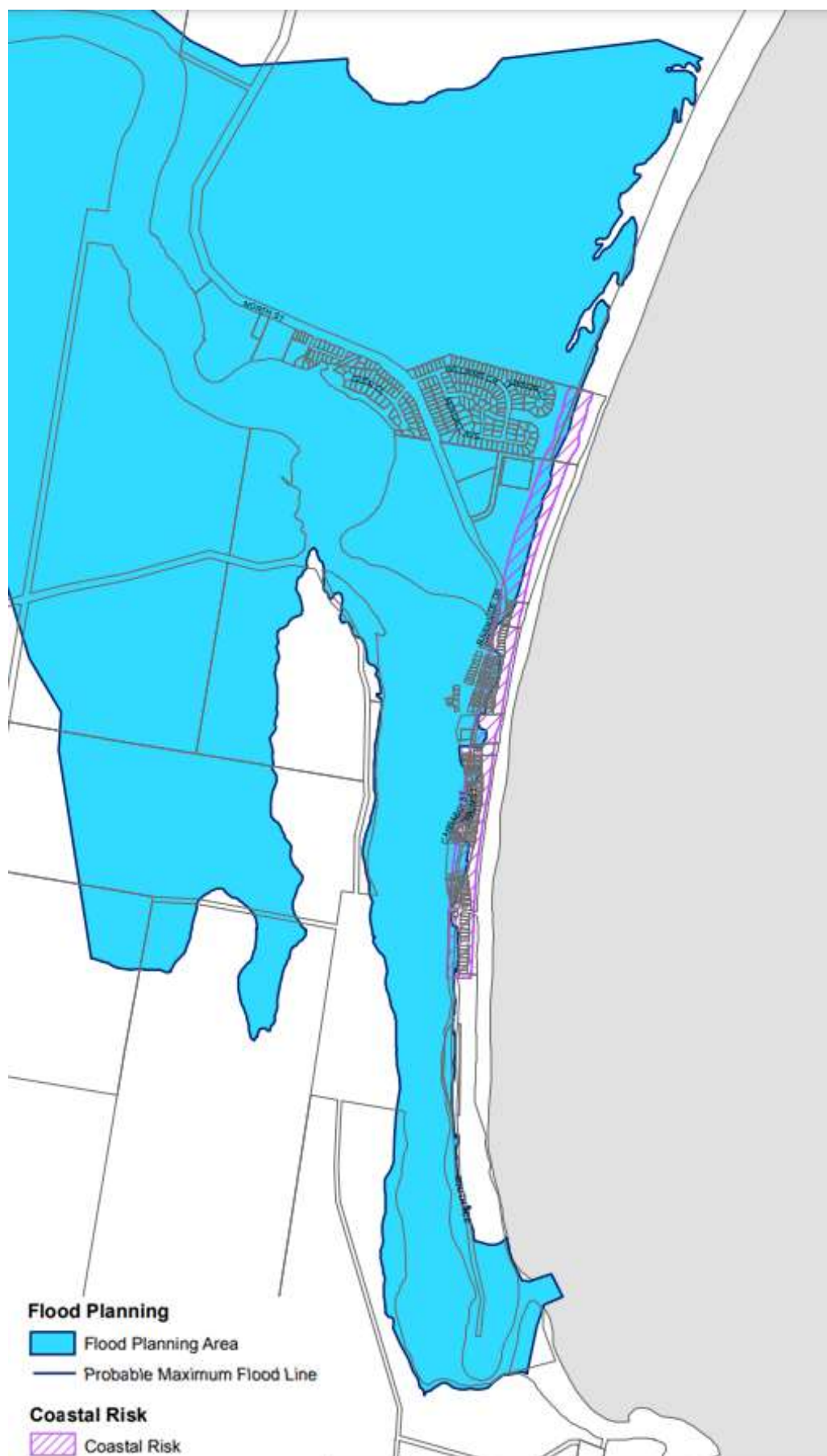


Figure 51: Coastal Risk Planning Map (2011 LEP) Sheet CL1_012F

The LEP also includes local provisions for development on land subject to riverbank erosion (Part 7, Clause 7.6 of the LEP):

7.6 Development on land subject to riverbank erosion

(1) The objectives of this clause are as follows -

(a) to avoid significant adverse impacts on development and the environment as a result of riverbank soil erosion,

(b) to ensure land uses are compatible with riverbank erosion processes and risks.

(2) This clause applies to land identified as “Riverbank Erosion Area” on the Riverbank Erosion Planning Map.

(3) Development consent must not be granted to the carrying out of any development on land to which this clause applies unless the consent authority is satisfied that -

(a) the proposed development is not likely to adversely affect, or be adversely affected by, riverbank erosion, and

(b) the development is designed, sited and will be managed to avoid any adverse environmental impact from exposure to riverbank erosion or, if that impact cannot be avoided, after having taken into consideration feasible alternatives, the development is designed, sited and will be managed to minimise that impact or to mitigate that impact if that impact cannot be minimised, and

(c) there is no immediate threat to any building from riverbank erosion, and

(d) provision has been made for the relocation, modification or removal of the development if required as a result of a threat to the development from riverbank erosion.

The Riverbank Erosion Planning Map does not include any areas of erosion risk within the study area.

DCPs provide detailed planning and design guidelines to support the planning controls in the LEP. The *Residential Zones DCP 2011* requires consideration of the NSW Coastal Policy and *NSW Coastal Design Guidelines* (Coastal Council, 2003). Development in the coastal zone must comply with the principles of the NSW Coastal Policy. Development within the coastal zone in Clarence Valley LEP 2011 requires consideration of a number of matters related to access, impacts on coastal processes and the scenic and visual impacts of proposed development in the coastal zone before granting consent to development. The *NSW Coastal Design Guidelines* must also be considered in design of new buildings and additions in areas within the coastal zone.

Wooli Village Controls (Part V of the Residential DCP 2011 and Part Q of the Business Zones DCP 2020) document the development restrictions that apply within the “Wooli Beach Coastline Management Plan” (Table 11). The *Wooli Coastline Management Plan* (Patterson Britton & Partners, 1997) adopted by Council in 1998 concluded that the coastline at Wooli Beach is in recession and will ultimately pose a risk to existing and possibly new development. Observations of dune scarp position in the time since adoption of the Plan, greater knowledge of climate change issues and impacts (actual and predicted) and new government policy suggest that coastline recession processes have continued and are likely to continue at the same or increased rates in the future. The *Wooli Village Coastline Management Strategy Update and Options Review* (WorleyParsons, 2010b) includes a review of management options for Wooli, based on revised hazard lines determined in the *Wooli Beach/ Village Review of Coastal Hazards* (WorleyParsons, 2010a).

Yamba Hill Controls (Part W of the DCP) do not specifically address the risk of slope instability although the Residential Zones DCP, Business Zones DCP (2020), Industrial Zones DCP (2011) require geotechnical investigations for land subject to land slip/geotechnical hazard.

Table 11: Development restrictions at Woolli (Table V2 of Residential Zones DCP 2011)

DEVELOPMENT	IMMEDIATE ZONE	ADVISORY NOTE
All building works (no exemptions) Major developments. Redevelopments. Major additions. Minor additions.	Not permitted.	Refer to Woolli Beach Coastline Management Plan. This zone is transitional and will impact upon other zones over time.

DEVELOPMENT	50 YEAR ZONE	ADVISORY NOTE
Light weight structures, shed, carport, pergolas, etc. Removable building structures. Single dwelling houses only.	Permitted	Development applications required for all structures. Refer to Woolli Beach Coastline Management Plan.
All other structures Residential and commercial Major new developments Redevelopments. Major additions. Minor additions.	Not permitted.	Refer to Woolli Beach Coastline Management Plan.

DEVELOPMENT	100 YEAR ZONE	ADVISORY NOTE
Residential structures Dwellings and outbuildings. Commercial structures. Major new developments Redevelopments. Major additions. Minor additions.	Permitted.	Development applications required for all structures. Applications to be accompanied by a certification of the foundation design by an engineer with appropriate geotechnical qualifications and experience. Refer to Woolli Beach Coastline Management Plan.

NOTE: Immediate zone, 50 year zone, 100 year zone are those described within the Woolli Beach Coastline Management Plan.

Certified Coastal Zone Management Plans

CZMPs for Wooloweyah Lagoon, Woolli Beach and Brooms Head have been certified by the Minister and Council is implementing actions from these plans.

Coastal Zone Management Plan for Wooloweyah Lagoon (White, 2001a)

A number of management issues were identified from the previous (2001) management strategy, a condition assessment of the lagoon and catchment and consultation with stakeholders. The key issues identified were future development/land use change, erosion and sedimentation, environmental flows, navigation, fishing (commercial, recreational and aquaculture), on-site sewage management, water quality, acid sulfate soils, bank condition and riparian vegetation, sugar cane, non-sustainable grazing, clearing, cane toads and climate change. The long-term aim of the CZMP for Wooloweyah Lagoon is to protect and enhance environmental, economic and social values.

Management objectives are:

- Improve water quality to reduce sediment, nutrient and oxygen demand loads, and to meet performance targets.
- Maintain and improve ecosystem health and biodiversity of the lagoon, estuary, riparian zone and subcatchment.
- Ensure future development and land use change has minimal impact on ecosystem health and reduce infilling of the lagoon.
- Raise community awareness of, and protect areas important to, Aboriginal cultural heritage.
- Manage potential impacts of climate change.

The CZMP includes 20 management strategies with actions to achieve these management objectives.

Wooli Beach Coastal Zone Management Plan (Royal HaskoningDHV, 2018a)

Actions in the Wooli Beach CZMP are aimed at reducing risks to public safety and assets due to the threat from coastal hazards, while seeking to maintain a relatively natural beach without large scale 'hard' engineered works. The threat to human life will largely be managed through implementation of an Emergency Action Sub Plan and community education. Threats to existing development and infrastructure will be managed through existing planning controls and legislation. In the event that development and infrastructure is at immediate risk of collapse due to coastal erosion or recession, it may need to be relocated or removed due to danger to public safety and/or the environment.

A Beach Nourishment Scheme (BNS) comprising periodic sand back-passing and supplementary beach scraping has been included to provide an additional buffer and buy additional time for existing land, built assets and infrastructure identified to be a current or future hazard risk. The BNS is intended to reduce, but not eliminate risk, initially for the southern part of Wooli where private land and assets are at greatest current threat from coastal erosion. This action is not a long-term protective measure and will rely on a monitoring program to understand how these works perform.

A coordinated monitoring program is proposed to enable the success of the BNS to be determined and provide data to indicate when modifications to the BNS may be required through an adaptive management approach. Beach scraping is proposed to supplement the BNS and a range of other complementary management actions are 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 development controls, dune and beach access management, conservation of Aboriginal heritage, services contingency strategy, CZMP implementation and review and trigger actions. Development controls will enable continued use of private land where development is compatible with coastal hazard.

Brooms Head Beach and Lake Cakora Coastal Zone Management Plan (CVC, 2017b)

The CZMP was developed from a number of technical investigations:

- Cakora Point Slope Stability and Risks Assessment (SMEC, 2012).
- Lake Cakora Estuary Processes Study (SMEC, 2013a).
- Brooms Head Coastal Processes and Hazard Study (SMEC, 2013b).
- Brooms Head and Lake Cakora Coastal Management Study (SMEC, 2013c).

The management theme for this CZMP is dominated by 'holding the line' and effectively maintaining the coastal environment and associated values for the Brooms Head community. In a wider sense the management actions in the CZMP aim to retain existing beach amenity, protect the high value public coastal

reserve asset, ensure future development is compatible with coastal hazards and village character, refresh the provision of beach access, continue sustainable management of high conservation values, apply adaptive and responsible management for the coastal erosion hotspot and reducing risk to public safety for Brooms Head Beach, Lake Cakora and the headland, Cakora Point.

To maintain the utility and recreational value of the public reserve it is proposed to extend the existing revetment wall northwards to the Ocean Road Bridge with crest levels consistent with the existing revetment to not unreasonably interrupt views from the Reserve. This CZMP introduces coordinated management of the Lake Cakora, Lake entrance and the foreshore north of Lake Cakora, including the coastal hotspot, for the first time. The CZMP recognises the feedback from owners of private residential land within the hotspot and proposes a geotechnical investigation of the lake entrance area to obtain local data and subsequently determine how local geology may alter the coastal risk, and hence future management, in this precinct. A coordinated monitoring program will document how the coastal foreshore changes in response to oceanic storm conditions over time and this will further inform adaptive management of the coastal environment at Brooms Head.

Other Management Plans

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

The EMP aims to balance the pressures and demands placed on the Wooli Wooli River, both from a human perspective and from an environmental perspective. Existing values of the estuary have been considered, along with issues that have been identified through consultation with the community and through a technical appraisal of the current condition of the estuarine environment. The EMP comprises a suite of short and long-term strategies, which address the needs for future sustainable management of the Wooli Wooli River. State government agencies and other stakeholders have been designated responsibility and authority and have agreed to implement these strategies to the best of their abilities. The EMP principles are:

1. Future management of the Wooli Wooli estuary and catchment shall take an integrated and holistic approach, with due consideration of impacts on the SIMP, Yuraygir National Park, Wooli Crown Reserves system and other areas of high conservation significance.
2. The Wooli Wooli River shall remain a largely unmodified environment and shall maintain healthy, diverse and viable ecosystems.
3. The social, commercial and recreational amenity of the Wooli Wooli River shall be preserved and fostered without compromising the natural values of the estuary.

EMP objectives are:

- Maintain water quality in the Wooli Wooli estuary to meet environmental, social and commercial requirements, through minimising pollutant inputs, including but not limited to, leachate from onsite sewage systems and stormwater runoff from urban areas.
- Maintain the diversity and health of estuarine and fringing habitats of the Wooli Wooli River, and sustainable populations of species dependent on these habitats.
- Rehabilitate existing eroded banks, where necessary and minimise future bank erosion.
- Ensure future development considers capability of land and estuary to support such development.
- Provide sufficient public facilities at appropriate locations around the estuary to allow for the sustainable recreation on the Wooli Wooli River by tourists and residents.
- Restore an appropriate riparian vegetation buffer around the estuary and protect from future degradation.

- To recognise and promote the significance of the Woolli Woolli estuary and surrounding areas to the Gumbayngirr and Yaegl people.
- Provide and encourage safe navigation within areas of the estuary that are utilised for boating, especially in the lower estuary between South Terrace and the ocean.
- Establish appropriate boat access to the Woolli Woolli Estuary in consideration of environmental constraints and social demands.

Management strategies have been developed to help to achieve stated objectives for the Woolli Woolli River. These strategies have been grouped into categories comprising Foreshores, Water Quality, Waterway, Education and Catchment Management. Suggested actions for each strategy have been provided and are detailed within the implementation schedules.

Yamba Coastline Management Plan (MHL, 2003)

Coastal hazards at Yamba primarily relate to slope instability. Assessment of a suite of management options was undertaken and a preferred strategy was developed. The proposed strategy recognises that high capital cost management options may be necessary to alleviate the identified risk. A trial implementation of a specific stabilising strategy is proposed at two sites and a detailed monitoring program will provide more accurate information from which the levels of risk may be refined. Prioritisation of management options will be undertaken based on these findings. Additional management options relating to other coastal hazards and management issues included development controls and planning provisions, dune management, improved access, inspection and maintenance of the seawall at Main Beach and the development of emergency response procedures.

Coastal Zone Management Plan for the Sandon River Estuary (GHD, 2012)

The issues facing the estuary were identified by the CEMC, the Estuary Processes Study (GHD, 2011) and community consultation. The main issues relate to bank erosion and sedimentation, user conflict, population increase and visitor pressures, entrance and navigation safety, unauthorised activity, habitat degradation, land management, ecological sustainability, fishing, water quality and cultural heritage. The overarching aim is to protect the environmental, social and economic values of the estuary. High priority management strategies included:

- Community education.
- Maintain presence of regulatory officers.
- Address entrance erosion.
- Manage access tracks and recreation areas.
- Regular on-site wastewater system inspections.
- Water monitoring
- Initiate and support bush regeneration programs.
- Promote the management of Sandon River estuary.
- Interpretive centre.

B6. NATIONAL PARK PLANS OF MANAGEMENT

The *National Parks and Wildlife Act 1974* requires that a plan of management be prepared for each National Park and Nature Reserve. A plan of management is a legal document that outlines how an area will be managed in the years ahead. Once a plan has been adopted by the Minister no operations may be undertaken within the two National Parks and the Nature Reserve except in accordance with the plan. However, if after adequate investigation, operations not included in this plan are found to be justified, this plan may be amended in accordance with Section 75 of the Act.

The Plans of Management include policies and framework for management relating to:

- Natural and cultural values of the planning area:
 - Landforms, geology, soil and hydrology.
 - Native plants and animals.
 - Cultural heritage.
 - Introduced plants and animals.
 - Fire management.
- Promotion and public use of the planning area:
 - Promotion of the planning area.
 - Recreation opportunities.
 - Scientific use.
 - Management operations.
 - Non-park management activities.

The status of actions in the plans of management is provided in Appendix E.

Bundjalung National Park and Iluka Nature Reserve Plan of Management (NPWS, 1997)

The Plan of Management addressing the Bundjalung National Park (NPWS, 1997) allows for camping and day use at Woody Head and self-reliant backpack camping in the designated areas (Figure 52). Vehicle use of beaches adjoining Bundjalung National Park is restricted to:

- The southern half of Ten Mile Beach between Black Rocks and Shark Bay. Access to Ten Mile Beach is at Black Rocks and at Shark Bay, with both accesses maintained by the NPWS.
- The southern end of Iluka Beach on Iluka Peninsula. Entry to Iluka Beach is provided by CVC at the southern end of the beach.

Vehicles on these beaches are restricted to the intertidal zone and are not permitted above high water mark or onto sand dunes.

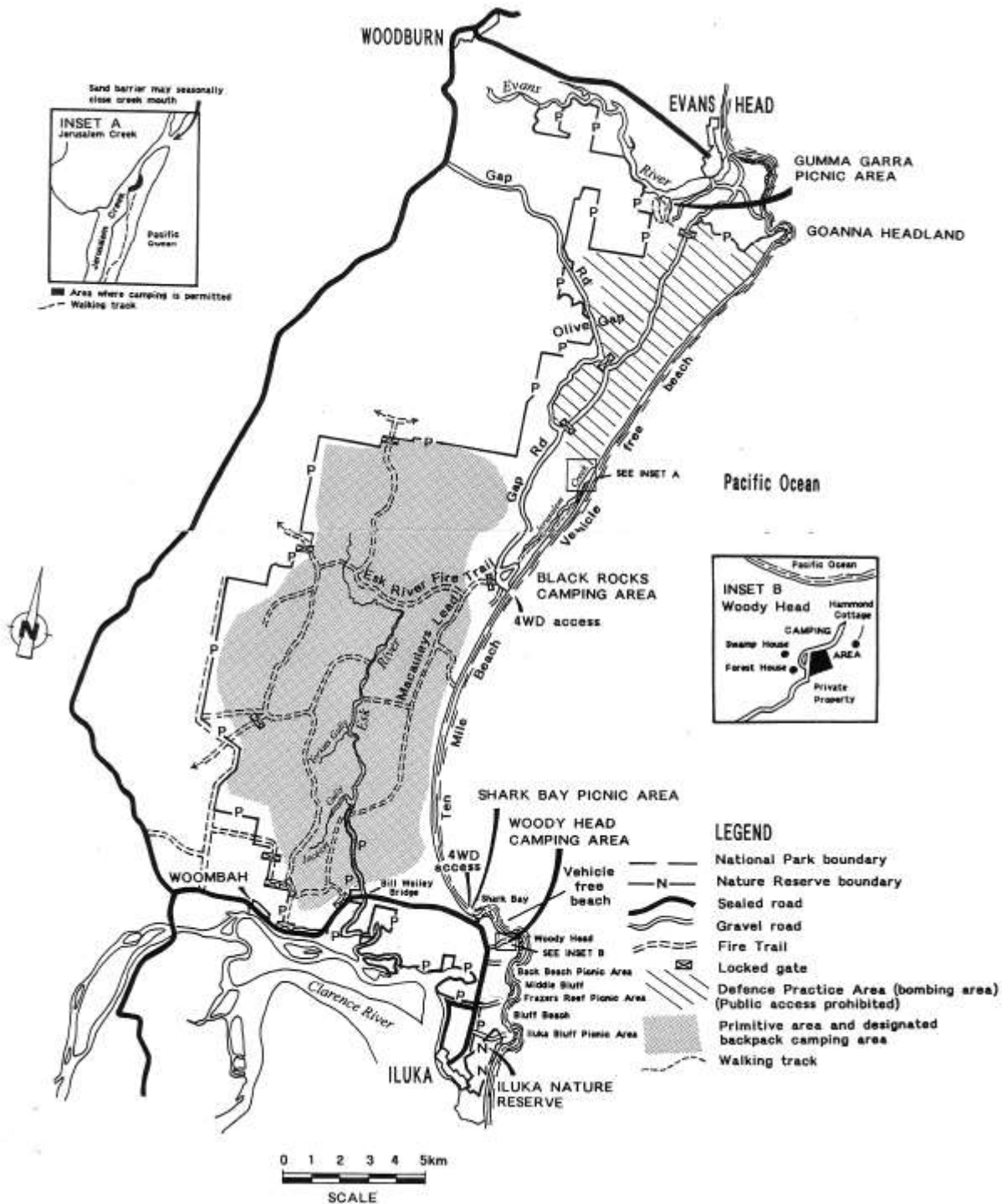


Figure 52: Bundjalung National Park

Source: NPWS (1997)

The Plan recognises that the coast at Woody Head and immediately north is the fastest eroding section of coastline in New South Wales. Erosion of beach and hind dunes will lead to loss of part of the camping ground. While NPWS aims to limit this erosion, the plan recognises that it is impractical to halt the processes of erosion and the recommended strategy is to allow the beach to continue to erode but to direct the erosion away from the camping area as much as possible by the construction of an appropriate structure at the eastern end of Woody Bay.

Yuraygir National Park and Yuraygir State Conservation Area Plan of Management (NPWS, 2003)

There are approximately 17 beaches either wholly or partly within Yuraygir National Park, covering the 65km coastline adjoining the planning area. A number of camping areas which cater for low-key, short-term camping are provided at Sandon River, Red Cliff, Illaroo, Boorkoom and Lake Arragan camping areas in Yuraygir National Park. The fifteen huts at Sandon River (thirteen are on the north side of the river and two on the south side) are privately occupied but the land on which the huts exist is National Park. In 1983 the original permissive occupancies were terminated at the time of dedication of the land as an addition to Yuraygir National Park. Occupancy of the huts is not covered by any lease or licence arrangement.

A number of picnic areas and day walks are also provided in nearby coastal National Parks (Figure 53). Power boats used for recreational purposes are prohibited from Lake Arragan and Lake Cakora. Some beaches are available for controlled use by four-wheel drive vehicles while others will be managed as vehicle-free beaches for those preferring a more passive recreational use or where natural values, such as shorebird habitat, are high. The following walking tracks are located in the planning area:

- The Angourie walking track links Mara Creek Picnic Area in the north with Lake Arragan camping area to the south. This 10km walking track features specially constructed stairs and boardwalks and is one of the most magnificent coastal walks in Australia.
- The Wilsons Headland walking track links the picnic area at Wilsons Headland with the Boorkoom Camping Area. This path runs for 3km along the coast providing panoramic ocean views and a great diversity of wildflowers in the heathlands.
- The Angophora Grove walking track at Illaroo provides links to the walk-in camping area at Rocky Point, Minnie Water village and the campground water supply point.

A canoe launching platform and short access track from the car park to platform is provided at Lake Arragan.

Commercial netting is prohibited within Lake Arragan, Station Creek and the Wooli Wooli and Sandon Rivers. Oyster growing is permitted within special use zones in the Sandon and Wooli rivers. Beach netting has been a commercial activity from beaches adjacent to the planning area between Brooms Head and the Sandon River. Limited opportunistic netting of beaches adjacent to the planning area south of Sandon River occurs from time to time between July and August.

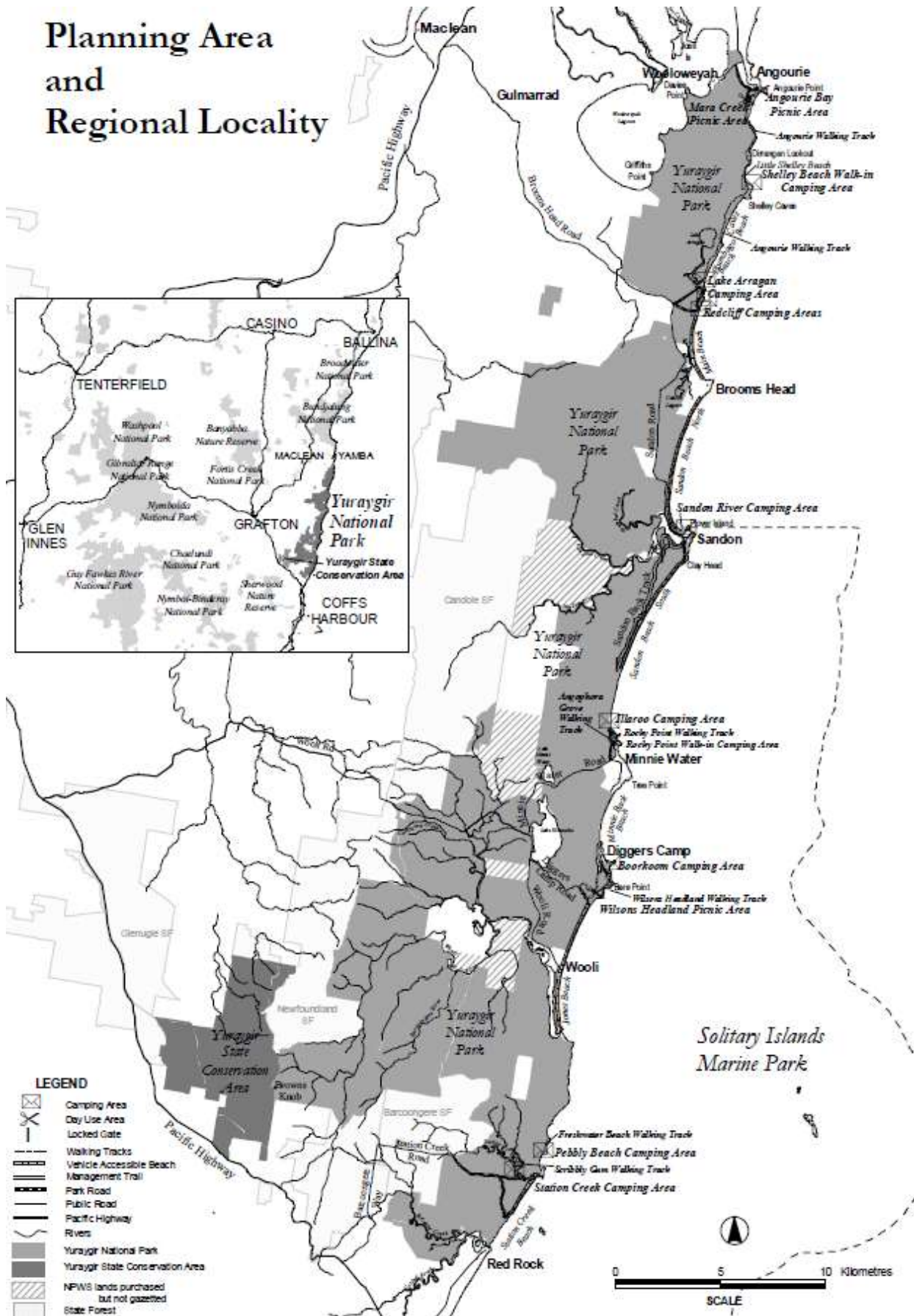


Figure 53: Yuraygir National Park

Source: NPWS (2003)

B7. CROWN RESERVES PLANS OF MANAGEMENT

Most of the beach areas of the study area not within National Park or Nature Reserve is Crown reserve. These Crown reserves are owned by the State but generally are managed by either DPIE - Crown Lands or Council. Under the *Crown Land Management Act 2016*, Council manages Crown reserves as community land under the *Local Government Act 1993*.

The *Clarence Valley Community land, Crown Reserves and other Public Places Generic Plan of Management (2014 – 2023) (CVC, 2014)* establishes a generic policy framework for Council's network of parks and reserves. It provides a broad-based mechanism to address issues common to all parks and reserves concerning management, maintenance, community use and environmental protection. It also provides the community with direction on how Council's parks and reserves can and cannot be used.

Site specific plans contain detailed management strategies that target the unique values of the area, provide for the protection and enhancement of its social, cultural and/or natural attributes, identify likely future pressures and facility/service requirements and outline priorities, actions and work programs for the effective long-term management of the community land or Crown reserve area.

By June 2021 Council will need to prepare Plans of Management under the *Local Government Act* for those reserves where Council is the appointed Crown land manager.

Appendix C. STAGE 1 STAKEHOLDER CONSULTATION ACTIVITIES

This Appendix provides a summary of consultation activities undertaken during the preparation of the Stage 1 Scoping Study.

C1. AIMS AND OBJECTIVES

The aim of the engagement activities in Stage 1 are to:

- Increase community and stakeholder understanding of the new legislative and planning framework.
- Establish strong working relationships with community networks and stakeholders which are built on mutual trust and respect.
- Be clear about the coastal management roles and responsibilities of CVC and public authorities.
- Understand community goals and aspirations for the coastal zone and community views on values, opportunities and priorities.
- Understand community motivations for participation and preferred approaches and processes, to encourage increased community interest and willingness to actively participate in coastal management.
- Increase community and stakeholder understanding of the dynamic nature of coastal processes, risks and opportunities and the need to set long-term objectives.
- Determine the engagement activities that are required during the preparation of subsequent stages of the CMP.

C2. SCOPING STUDY CONSULTATION ACTIVITIES

The stakeholders and consultation activities conducted during Stage 1 of the CMP development are summarised in Table 12. Further detail on the stakeholders is provided in Appendix D.

Table 12: Scoping Study consultation activities

Stakeholder	Opportunities for engagement
Aboriginal Community	• Official notification of the project and request for registration of interest to Yaegl Traditional Owners Aboriginal Corporation (TOAC), Birrigan Gargle, Yaegl LALC and Grafton-Ngerrie LALCs and Aboriginal community groups. • Feedback from Aboriginal representatives was documented and considered in the formulation of this Scoping Study. • Notification of key milestones/project updates and opportunities for future involvement. • Review of Final Draft Scoping Study (public exhibition).
CEMC	• Workshop 1 (July 2020): Confirm the proposed direction of this Scoping Study including interested parties, approaches to stakeholder engagement, data collection, key issues and reporting. • Workshop 2 (November 2020): Preliminary risk assessment and Scoping Study outcomes. • Review of Final Draft Scoping Study.
DPIE-EES, NPWS, SIMPA	• Agencies were key agency stakeholders for this Scoping Study development. • Initial information gathering, site inspections, meetings. • Review of Draft Scoping Study.
Other Government Agencies	• Initial letters were sent to NSW government agencies to introduce the project and request input into the development of this Scoping Study. • Dedicated agency liaison for initial information gathering phases and to explore existing information. • Review of Final Draft Scoping Study (public exhibition).

Stakeholder	Opportunities for engagement
General Community	- Project notification and introduction via direct emails/letters to community groups, business owners, industry representatives and community members. - The Clarence Conversations website included project information including the community survey. The page includes useful links, downloads, a discussion forum and questions page. The webpage will be updated through subsequent stages of the CMP development. - Community survey - used to gain feedback from community members on values, issues and ideas for management. An on-line survey was available between 20 August 2020 and 11 September 2020. The survey was accessed from the Clarence Conversations webpage and the survey link was provided to all community groups and industry groups. Hard copy surveys (Attachment 1) were also made available at Council's offices, libraries and Brooms Head campground and National Parks campgrounds. - Posters advertising the community survey were placed at Council offices, community centres, bowling club, libraries and Brooms Head campground and National Parks campgrounds. NPWS also promoted the survey through the Iluka Community Consultation Group. - Social media - The community survey was also advertised on CVC's Facebook page (24/8/20, 1/9/20 and 9/9/20, Figure 54). The post was also shared by Yamba community groups and the Northern Rivers Times. - Review of Final Draft Scoping Study (public exhibition).
Council	Regular communication, information sharing and collaboration.
Neighbouring Councils	- Consultation with Richmond Valley Council and Coffs Harbour City Council was undertaken in relation to shared sediment compartments and other common issues. - Review of Final Draft Scoping Study (public exhibition).



Figure 54: CVC Facebook post advertising the community survey (24/8/20, 1/9/20 and 9/9/20)

C3. CONSULTATION OUTCOMES

Community Survey

The community survey was open between 20 August 2020 and 11 September 2020. There was a strong response to the survey with 151 on-line and 3 hard copy surveys (154 total surveys) completed. Most of the surveys were completed by individuals over 60 years of age and most (85) respondents live within the study area. Another 41 respondents live in other areas of the Clarence Valley LGA. The results of the survey provide a good snapshot of community opinion about the study area including popular activities and locations of access, current issues, management priorities and the community's vision for the future of the coastline and estuaries. The survey and detailed outcomes are provided in Attachment 1 and 2. Key outcomes of the survey are:

- The most common activities within the study area (>70% of responses) are swimming, walking, wildlife/nature appreciation, picnicking/BBQs and exercise.
- The most popular places to undertake activities are Yamba/Angourie, Wooli and Minnie Water areas.
- The most common attributes valued by respondents (>70% of responses) are scenic beauty, being able to get away from crowds, access to beaches and waterways, environmental value/biodiversity/ecosystems/habitats and clean waterways. These attributes were consistently highly valued across the study area with most respondents also valuing four-wheel drive (4WD) access at Woody Head/Iluka coast and Sandon coast and estuary.
- The three most common concerns were beach erosion/shoreline recession, litter/marine debris and protection of shorebirds/migratory birds. By area, the other common concerns are:
 - Woody Head/Iluka coast: protection of marine animals and threats to cultural heritage.
 - Yamba – Angourie coast (incl. Whiting Beach): weeds, future land use changes.
 - Wooloweyah Lagoon: too much commercial access and loss or degradation of marine vegetation.
 - Red Cliff/Lake Arragan: protection of marine animals and insufficient commercial access.
 - Brooms Head coast and Lake Cakora, Sandon coast and estuary, Minnie Water – Diggers camp coast, Wooli coast and estuary: protection of marine animals.
 - Wooli coast and estuary: climate change/sea level rise.
- Other issues of concern are:
 - Waste from cleaning of fish in Minnie Water Bay.
 - Damage from 4WD access to beaches.
 - Uncontrolled dogs on beaches and in the community.
 - Vegetation clearing and weeds.
 - Illegal (“freedom”) camping.
 - Increased shark activity.
 - Insufficient emergency services access.
 - Increased tourist traffic.
 - Insufficient campground access.
 - Impacts of urban development.
 - Impacts of spear fishing on marine life.

- Overfishing.
- Bushfires.
- Impacts of prawn trawling in Wooloweyah Lagoon.
- Shallowing of Wooli River at the mouth.
- Lack of access to National Parks.
- Dogs in National Parks.
- Inadequate action on coastal protection.
- Impacts of industrial and port development at Yamba.
- Noise and impacts from jet skis at Yamba.
- Lights from fish netting at night in Yamba.
- Vegetation clearing for views in Yamba.
- The three most preferred management approaches are protecting/improving natural biodiversity, protecting marine vegetation and restricting development/land use change. By area, the other preferred management approaches are:
 - All areas: protection of cultural heritage.
 - Woody Head – Iluka coast and Yamba - Angourie coast: public education.
 - Wooli coast and estuary: planning for climate change/sea level rise.
 - Red Cliff/Lake Arragan, Brooms Head coast and Lake Cakora, Sandon coast and estuary: no intervention required.
- The respondents considered that the following other management approaches should be prioritised for funding:
 - Hazard reduction for bushfire protection.
 - Walking/bike access from Yamba to Maclean.
 - Access for people with a disability.
 - Dune revegetation
 - Fishing access to Clarence River.
 - Mitigation of riverbank erosion.
 - Expansion of wetlands.
 - Shade trees (Minnie Water and Yamba main beach).
 - Support for volunteers.
 - Minimising treated effluent flow into river system.
 - Upgrade of public BBQ areas at Yamba.
 - Feral animal control on beaches (e.g. foxes).
 - Management of recreational boating to reduce riverbank erosion (Wooli Wooli River).

The most important attributes of the Clarence coastline and estuaries in 10 years from now are good water quality (clean water/safe to swim), scenic beauty, 'untouched' coast, healthy marine vegetation and abundant wildlife. The respondents' own words for the future vision are shown in Figure 10. The majority of

respondents wanted to retain the natural beauty, ecological values, clean waterways of the study area and maintain stable beaches.

Feedback Collected on the Webpage

The project webpage included an open forum, question and answer page and pin map. Most contributions to the forum and question page were related to the impact of trawlers on seagrass and fish stocks in Wooloweyah Lagoon. Other questions related to the Angourie to Shelley Headland walking track, control of freedom camping, bushfires in Yuraygir National Park, boat launching facilities at Brooms Head and impacts of the Brooms Head rock wall. The pin map was used to identify areas of illegal camping and erosion. There were:

- 788 visits to the webpage.
- 44 participants who downloaded information
- 22 participants who contributed to a tool (pin map, forum, questions).

A summary of responses received on the Clarence Conversations web page is provided in Attachment 3.

Aboriginal Community

The Birrigan Gargle LALC expressed interest in the CMP process and is currently undertaking a project to regenerate land at Pippi Beach.

CVC will continue to liaise with Yaegl TOAC Native Title owners.

State Government Agencies

Feedback from the NSW government agencies is summarised in the following table. A full list of agencies contacted, and their responses is provided in Attachments 4 and 5.

Table 13: Feedback from NSW government agencies during Scoping Study preparation

Agency	Feedback
National Parks and Wildlife Service	Provided status of actions from existing plans and National Parks plans of management and discussion of issues with 4WD access. Provided feedback on preliminary risk assessment outcomes and forward plan.
DPIE-Fisheries	Outlined Fisheries responsibilities under <i>Fisheries Management Act</i> and <i>Marine Estate Management Act</i> , key fish habitat and Marine Park, priority is conservation of key fish habitat and to maintain or improve marine biodiversity within the SIMP. Identified high priority threats within the study area from the Marine Estate Management Strategy (MEMS) and other issues to be addressed in the CMP.
DPIE-Fisheries (SIMPA)	Provided status of actions from existing plans. Advice provided during CEMC meeting and site visit and combined response from DPI. Details of vegetation clearing for camping, camping waste and tarring oyster sticks at Sandon.
Transport for NSW - Roads and Maritime (boating safety)	Outlines TfNSW Maritime role and local considerations. Provided links to information to be addressed in CMP relating to MEMS.
Transport for NSW - MIDO	Noted that dredging will occur in the lower Clarence River with renourishment if surveys and the feedback from stakeholders demonstrate a need. Dredging in the Wooli River is typically a low priority given the small commercial use.

Agency	Feedback
National Parks and Wildlife Service	Provided status of actions from existing plans and National Parks plans of management and discussion of issues with 4WD access. Provided feedback on preliminary risk assessment outcomes and forward plan.
Port Authority	Provided primary activities, priorities, values and issues to be addressed in the CMP. Requested clarification of CMP for Clarence River estuary and sedimentation at bar. Preferred management approach to sedimentation is dredging of the bar.
DPIE - Crown Lands	No formal response but happy to help where required.
Local Land Services	The area and issues are outside LLS core business but would like to be kept informed.
NSW Forestry Corporation	Provided information on protection of catchment values, planning for harvesting operations and monitoring programs.
Heritage NSW (Dept Premier and Cabinet)	Suggested Aboriginal parties to contact.

Local Government

Neighbouring councils (Richmond Valley and Coffs Harbour) were contacted for input into the CMP Scoping Study (refer Attachments 4 and 5). Neither Council is undertaking investigations or planning related to the study area.

Industry and Community Groups

Feedback from the industry and community groups is provided in the following table, Attachments 4 and 5.

Table 14: Feedback from industry and community groups during Scoping Study preparation

Group	Feedback
Clarence Canegrowers Association	Provided information on activities and roles, priorities and preferred management approaches.
Clarence Valley Conservation in Action	Interest in wetlands, impacts of land development and rubbish, cane toads
Protect Woolli	Main issues are sand sourcing, storm response, Scope Street and Braithwaite Lane access way repairs.

Attachment 1: Community Survey

Community Survey for Clarence Valley Coastline Coastal Management Program Scoping Study

A Coastal Management Program (CMP) Scoping Study is currently being prepared to provide a long-term strategy for the management of the Clarence Valley coastline. This Study is being developed by Hydrosphere Consulting on behalf of Clarence Valley Council (CVC) and National Parks & Wildlife Service, with assistance from the NSW Department of Planning, Industry & Environment. The Study will involve the review of existing information and relevant management plans to identify key issues/threats to the study area and highlight knowledge gaps impacting effective management of issues.

This Study is the first stage of a five-part process for the completion of a CMP. The results of this survey will help the project team to understand aspects of the coastline that are considered important by the community, usage patterns, as well as the community's perception of key issues and opportunities for future management.

The survey takes 10-12 minutes to complete and all responses will remain confidential. We appreciate your time in helping to manage this remarkable coastline.

If you would like to do this survey on-line, please go to:

<https://www.clarenceconversations.com.au/clarence-coast-management-plan> or scan the QR code:



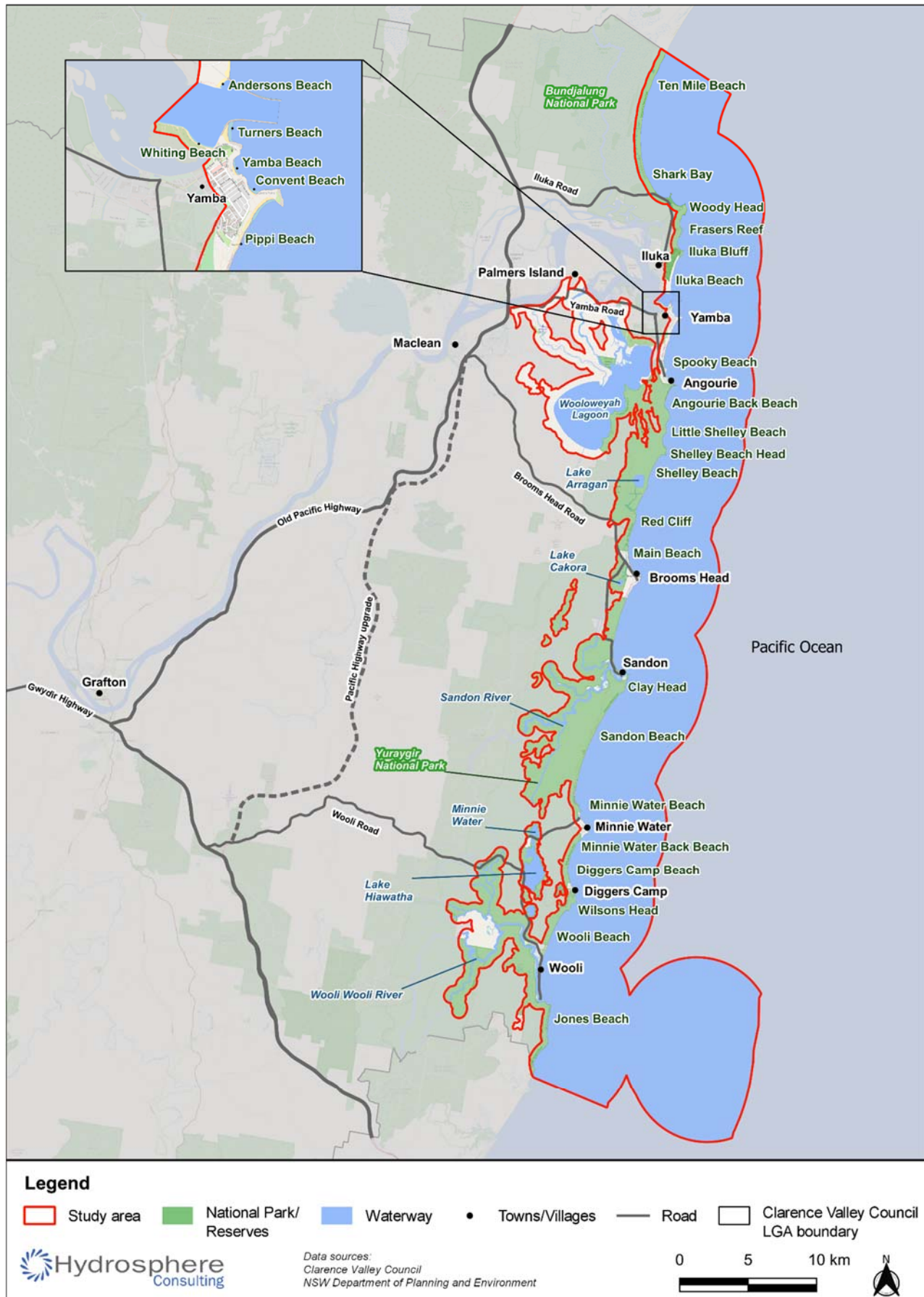
or you can complete a hard copy survey **by Friday 11 September 2020** and then return to:

Peter Wilson
Coast & Estuary Co-ordinator
Clarence Valley Council
50 River St
MACLEAN NSW 2463



Study Area

The study area is shown on the map below (red border) and includes the open beaches, foreshores, coastal waters, estuaries and lagoons of the Clarence Valley Local Government Area excluding the Clarence River estuary. Questions within this survey relate to areas within the study area only.



**1. What are your primary activities at each area of the Clarence coastline and estuary?
(tick any that apply)**

	Woody Head/ Iluka coast	Yamba - Angourie coast (incl. Whiting Beach)	Wooloweyah Lagoon	Red Cliff/ Lake Arragan	Brooms Head coast and Cakora Lagoon	Sandon coast and estuary	Minnie Water - Diggers Camp coast	Wooli coast and estuary
Swimming	☐	☐	☐	☐	☐	☐	☐	☐
Fishing	☐	☐	☐	☐	☐	☐	☐	☐
Surfing/wave riding	☐	☐	☐	☐	☐	☐	☐	☐
Picnicking/BBQs	☐	☐	☐	☐	☐	☐	☐	☐
Walking	☐	☐	☐	☐	☐	☐	☐	☐
Paddling	☐	☐	☐	☐	☐	☐	☐	☐
Children's activities	☐	☐	☐	☐	☐	☐	☐	☐
Motorised water sports	☐	☐	☐	☐	☐	☐	☐	☐
Commercial fishing	☐	☐	☐	☐	☐	☐	☐	☐
Other commercial activities	☐	☐	☐	☐	☐	☐	☐	☐
Wildlife/nature appreciation	☐	☐	☐	☐	☐	☐	☐	☐
Four-wheel driving	☐	☐	☐	☐	☐	☐	☐	☐
Exercise	☐	☐	☐	☐	☐	☐	☐	☐
Camping	☐	☐	☐	☐	☐	☐	☐	☐
Education and cultural experiences	☐	☐	☐	☐	☐	☐	☐	☐
Employment	☐	☐	☐	☐	☐	☐	☐	☐
Dog walking	☐	☐	☐	☐	☐	☐	☐	☐
I don't visit this area	☐	☐	☐	☐	☐	☐	☐	☐

Other (please specify location)

2. Is there anything that you particularly like or value about the Clarence coastline and estuaries? (tick any that apply)

	Woody Head - Iluka coast	Yamba - Angourie coast (incl. Whiting Beach)	Wooloweyah Lagoon	Red Cliff/ Lake Arragan	Brooms Head coast and Cakora Lagoon	Sandon coast and estuary	Minnie Water - Diggers Camp coast	Wooli coast and estuary
Scenic beauty	☐	☐	☐	☐	☐	☐	☐	☐
Cultural heritage value/history	☐	☐	☐	☐	☐	☐	☐	☐
Access to beaches and waterways	☐	☐	☐	☐	☐	☐	☐	☐
Camping/accommodation locations near the coast	☐	☐	☐	☐	☐	☐	☐	☐
Environmental value/biodiversity/ ecosystems/habitats	☐	☐	☐	☐	☐	☐	☐	☐
4WD access	☐	☐	☐	☐	☐	☐	☐	☐
Fishing	☐	☐	☐	☐	☐	☐	☐	☐
Tourism/economic value	☐	☐	☐	☐	☐	☐	☐	☐
Dog beach access	☐	☐	☐	☐	☐	☐	☐	☐
Clean waterways	☐	☐	☐	☐	☐	☐	☐	☐
Being able to get away from crowds	☐	☐	☐	☐	☐	☐	☐	☐
Nothing	☐	☐	☐	☐	☐	☐	☐	☐

Other (please specify)

3. Would you like to explain why you gave the scores to Question 2 above? (please limit to 100 words or less)

5. Based on your observations, do you believe there are any other issues or threats to the Clarence Valley coastline and estuaries? (please limit to 100 words or less)

6. Which of the following management approaches would you prefer to see as the focus of future funding? (Select any that you prefer)

	Woody Head - Iluka coast	Yamba - Angourie coast (incl. Whiting Beach)	Wooloweyah Lagoon	Red Cliff/ Lake Arragan	Brooms Head coast and Cakora Lagoon	Sandon coast and estuary	Minnie Water - Diggers Camp coast	Wooli coast and estuary
Improving water quality	☐	☐	☐	☐	☐	☐	☐	☐
Improving pedestrian access	☐	☐	☐	☐	☐	☐	☐	☐
Improving vehicular access	☐	☐	☐	☐	☐	☐	☐	☐
Improving recreational facilities	☐	☐	☐	☐	☐	☐	☐	☐
Planning for climate change/ sea level rise	☐	☐	☐	☐	☐	☐	☐	☐
Planning for and mitigating flooding impacts	☐	☐	☐	☐	☐	☐	☐	☐
Improving amenity	☐	☐	☐	☐	☐	☐	☐	☐
Protecting/ improving natural biodiversity	☐	☐	☐	☐	☐	☐	☐	☐
Weed removal	☐	☐	☐	☐	☐	☐	☐	☐
Protecting marine vegetation	☐	☐	☐	☐	☐	☐	☐	☐
Addressing beach erosion	☐	☐	☐	☐	☐	☐	☐	☐
Addressing river bank erosion	☐	☐	☐	☐	☐	☐	☐	☐
Improving entrance management	☐	☐	☐	☐	☐	☐	☐	☐
Addressing siltation/shoaling	☐	☐	☐	☐	☐	☐	☐	☐
Protection of cultural heritage	☐	☐	☐	☐	☐	☐	☐	☐
Public education	☐	☐	☐	☐	☐	☐	☐	☐
Restrict development/land use change	☐	☐	☐	☐	☐	☐	☐	☐
Managing dog access	☐	☐	☐	☐	☐	☐	☐	☐
No intervention required	☐	☐	☐	☐	☐	☐	☐	☐

- 7. Are there any other management issues you feel are important and should be prioritised for funding that have not been mentioned? (please limit to 100 words or less)**

- 8. Imagine the Clarence coastline and estuaries in 10 years from now. What are the most important attributes? (Select all that apply)**

- ☐ Good water quality (clean water/safe to swim)
- ☐ Thriving aquatic-based industries (fisheries, oyster aquaculture)
- ☐ Great public access (beach access, walking tracks, boat ramps and other vessel launching sites, improved disabled access etc.)
- ☐ Stable beaches and foreshores (no erosion)
- ☐ Healthy marine vegetation (seagrass, mangroves and saltmarsh)
- ☐ Improved public facilities (playgrounds, lighting, BBQs, toilets, tables, shelters etc.)
- ☐ Scenic beauty, 'untouched' coast
- ☐ Abundant wildlife
- ☐ More space/less crowding
- ☐ Healthy, native vegetation (e.g. no weeds, less cleared areas)
- ☐ An informed community
- ☐ Good camping areas (formalised, well managed)
- ☐ Other (please briefly describe)

- 9. If you would like to use your own words, please describe your vision of the Clarence Valley's coastline and estuaries as you would like to see them in 10 years (please limit to 50 words or less)**

10. In what capacity are you completing this survey?

- ☐ As an individual
- ☐ As a business or government agency
- ☐ As a community group/organisation
- ☐ Please specify

11. Contact details (Optional. We may contact you to discuss your responses. All responses will remain confidential)

Name of individual, business or community group	
Email Address	
Phone Number	

12. What is your age?

- ☐ Under 18
- ☐ 18-39
- ☐ 40-59
- ☐ 60+
- ☐ Prefer not to say

13. Are you..

- ☐ Aboriginal
- ☐ Torres Strait Islander
- ☐ Other
- ☐ Prefer not to say

14. In what suburb do you live?

15. How would you prefer to receive further information regarding this project?

- ☐ Via Council's on-line community engagement portal - Clarence Conversations
- ☐ Via Facebook
- ☐ Directly via email
- ☐ I'd prefer not to receive any more information
- ☐ Other (please specify)

16. And finally, is there any other information you wish to provide to the study team?
Additional comments can be provided here or on the Clarence Conversations webpage.
For further information please go to: <https://www.clarenceconversations.com.au/>

Thank you for taking the time to complete our survey, your support is greatly appreciated.

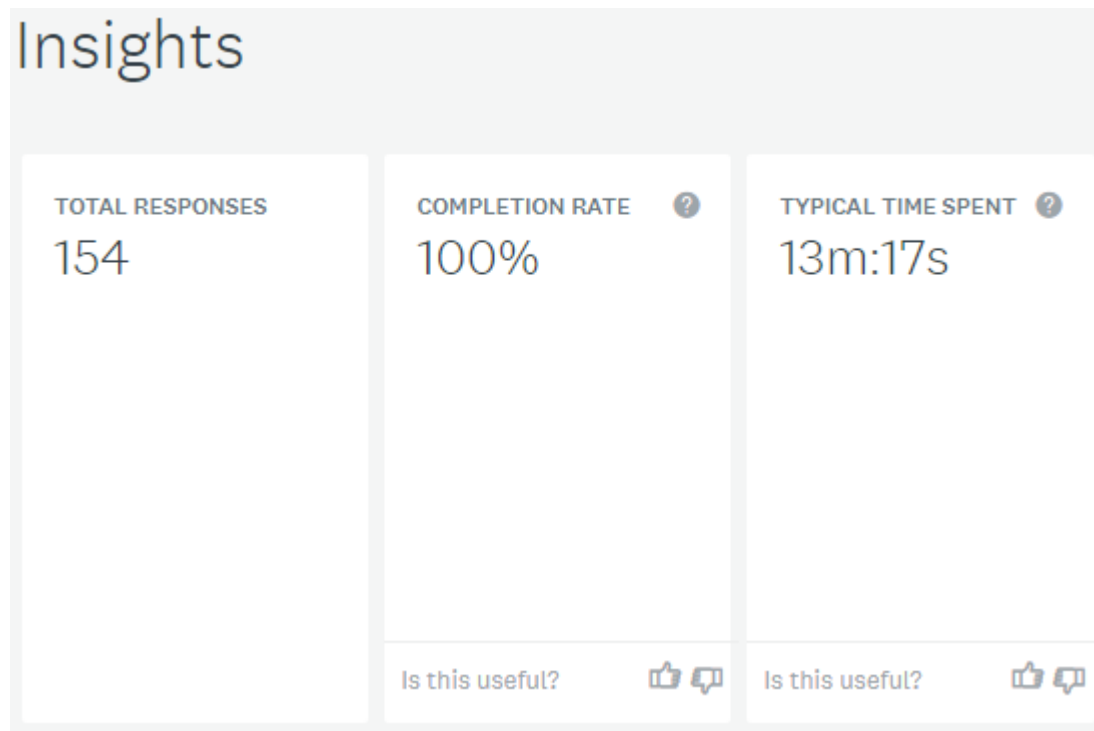
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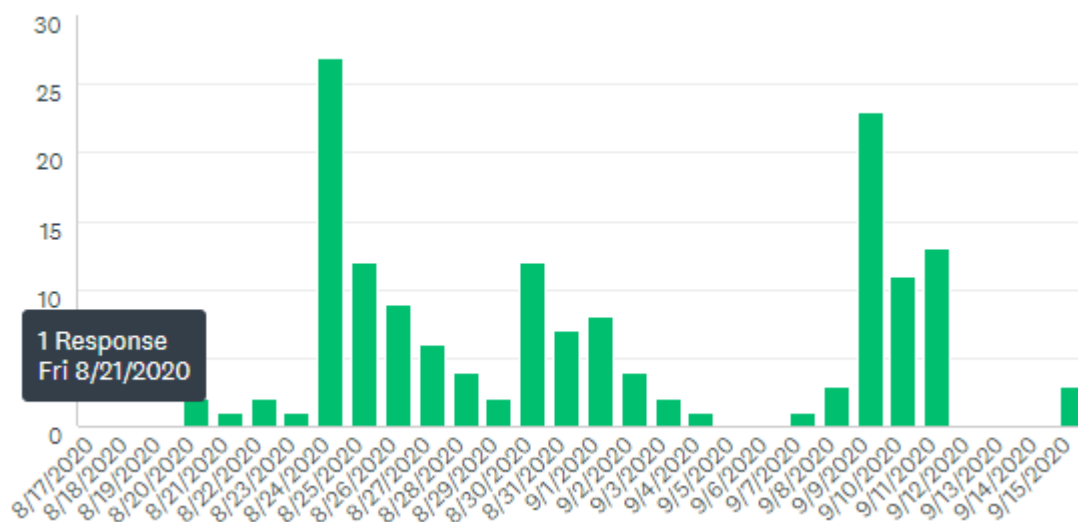
Attachment 2: Community Survey Outcomes

Clarence Valley Coastline and Estuaries - Coastal Management Program Scoping Study

Community Survey Results



Responses (by day)

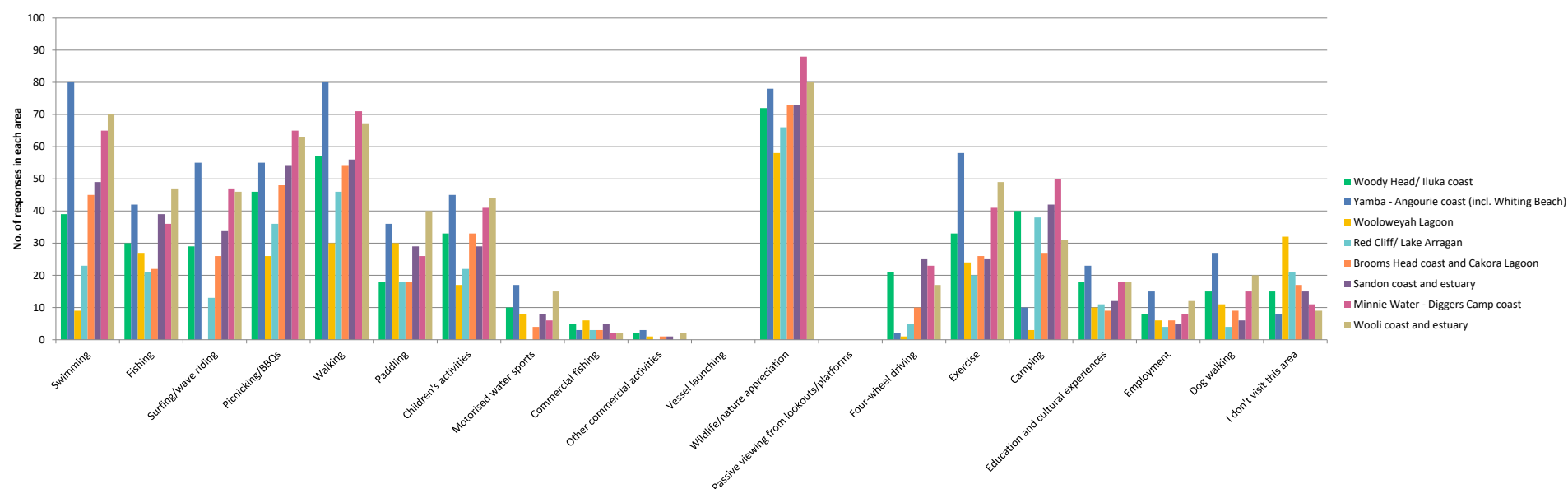


*Hard copy responses were manually entered on 15/9/20 (after the survey completion date).

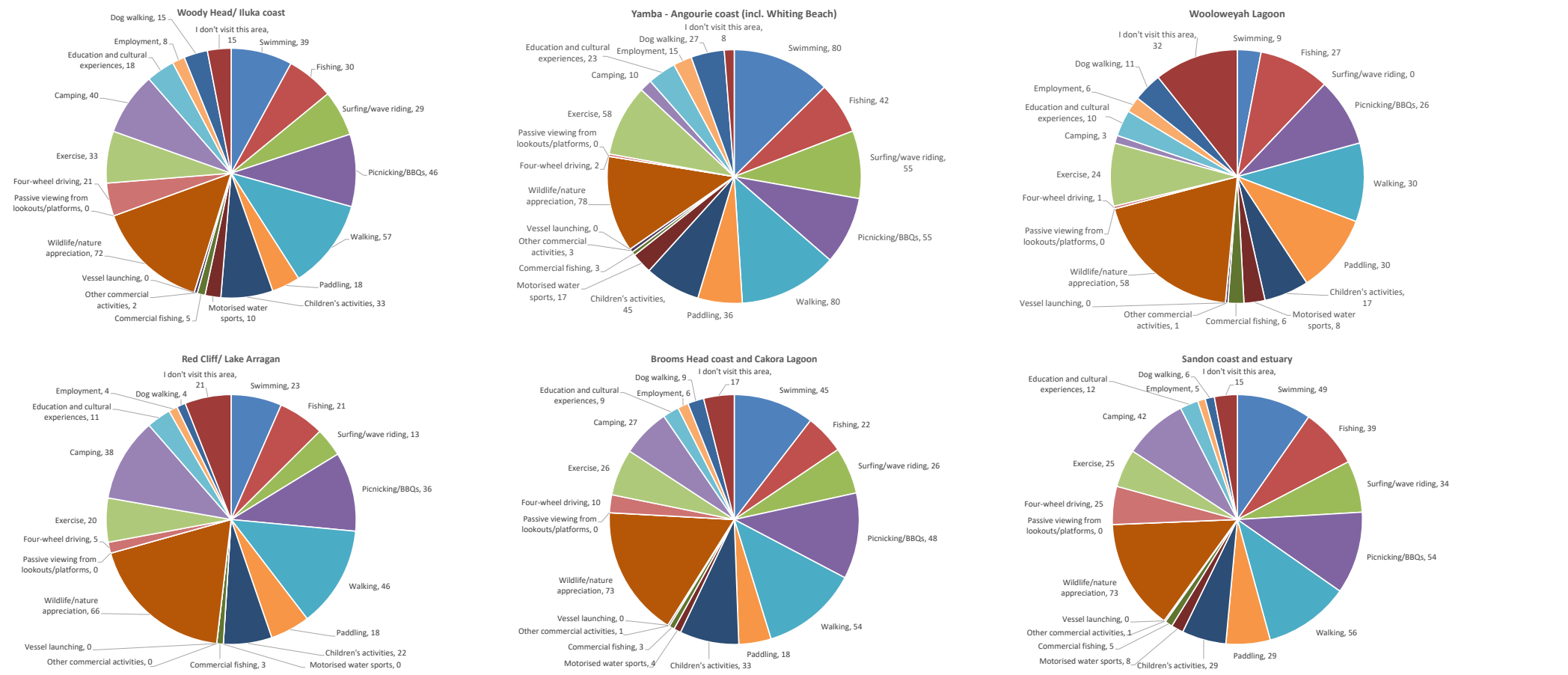
1. What are your primary activities at each area of the Clarence coastline and estuary? (tick any that apply)

	Woody Head/ Iluka coast	Yamba - Angourie coast (incl. Whiting Beach)	Wooloweyah Lagoon	Red Cliff/ Lake Arragan	Brooms Head coast and Cakora Lagoon	Sandon coast and estuary	Minnie Water - Diggers Camp coast	Wooli coast and estuary	Total								
Swimming	27%	39	56%	80	6%	9	16%	23	31%	45	34%	49	45%	65	49%	70	143
Fishing	33%	30	46%	42	29%	27	23%	21	24%	22	42%	39	39%	36	51%	47	92
Surfing/wave riding	30%	29	56%	55	0%	0	13%	13	27%	26	35%	34	48%	47	47%	46	98
Picnicking/BBQs	41%	46	49%	55	23%	26	32%	36	42%	48	48%	54	58%	65	56%	63	113
Walking	41%	57	58%	80	22%	30	33%	46	39%	54	41%	56	51%	71	49%	67	138
Paddling	20%	18	39%	36	33%	30	20%	18	20%	18	32%	29	28%	26	43%	40	92
Children's activities	38%	33	52%	45	20%	17	26%	22	38%	33	34%	29	48%	41	51%	44	86
Motorised water sports	29%	10	50%	17	24%	8	0%	0	12%	4	24%	8	18%	6	44%	15	34
Commercial fishing	71%	5	43%	3	86%	6	43%	3	43%	3	71%	5	29%	2	29%	2	7
Other commercial activities	33%	2	50%	3	17%	1	0%	0	17%	1	17%	1	0%	0	33%	2	6
Vessel launching	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0
Wildlife/nature appreciation	56%	72	61%	78	45%	58	52%	66	57%	73	57%	73	69%	88	63%	80	128
Passive viewing from lookouts/platforms	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0
Four-wheel driving	51%	21	5%	2	2%	1	12%	5	24%	10	61%	25	56%	23	41%	17	41
Exercise	29%	33	51%	58	21%	24	18%	20	23%	26	22%	25	36%	41	43%	49	113
Camping	53%	40	13%	10	4%	3	50%	38	36%	27	55%	42	66%	50	41%	31	76
Education and cultural experiences	43%	18	55%	23	24%	10	26%	11	21%	9	29%	12	43%	18	43%	18	42
Employment	32%	8	60%	15	24%	6	16%	4	24%	6	20%	5	32%	8	48%	12	25
Dog walking	25%	15	46%	27	19%	11	7%	4	15%	9	10%	6	25%	15	34%	20	59
I don't visit this area	35%	15	19%	8	74%	32	49%	21	40%	17	35%	15	26%	11	21%	9	43
Other (please specify location)																	6
Landcare activities - Brooms Head & Lake Cakora																Answered	153
Bare Point to Wilsons Head and Wooli Beach																Skipped	1
Surf Life Saving activities																	
Ten Mile Beach - Walking and Four-wheel driving. Accessed from Black Rocks (walking) or Shark Bay (driving).																	
Landcare and RFS volunteer																	
Research, all estuaries - mangrove ecosystems																	

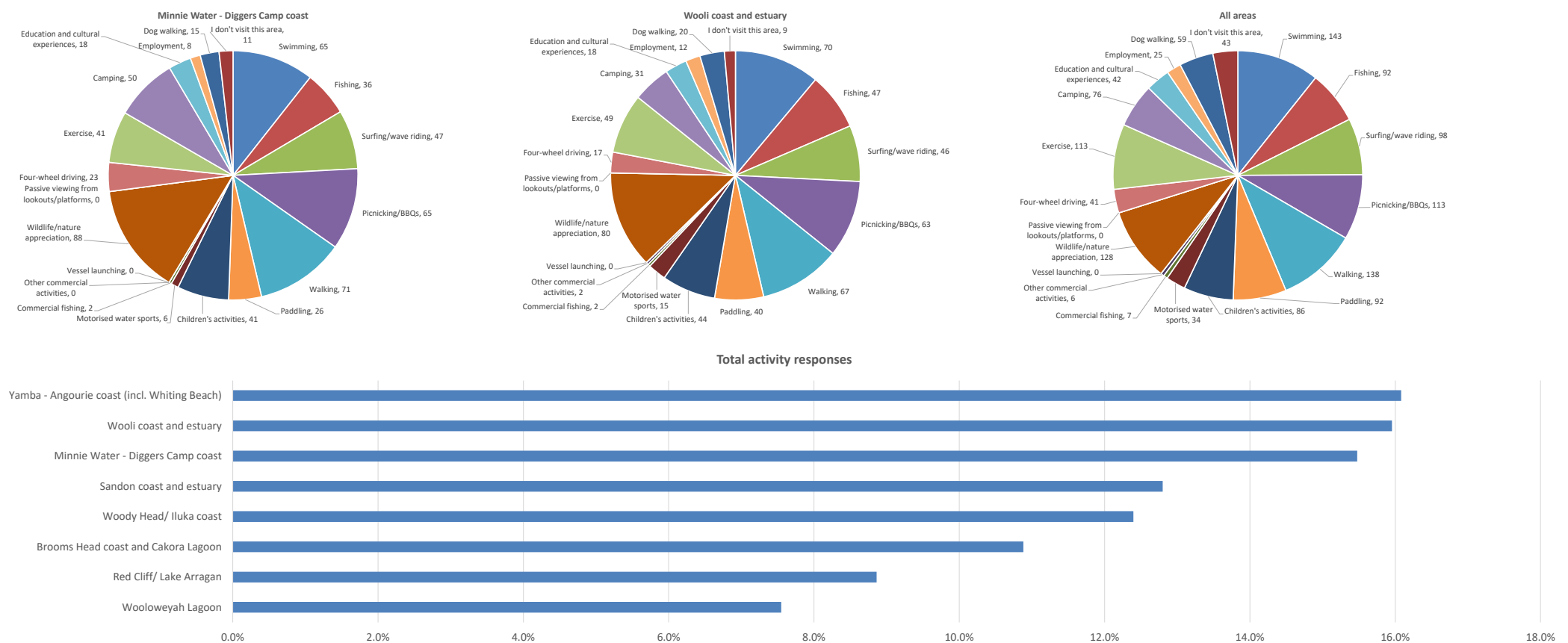
* Percentage results refers to the proportion of responses in each area for each activity



Responses (by area)



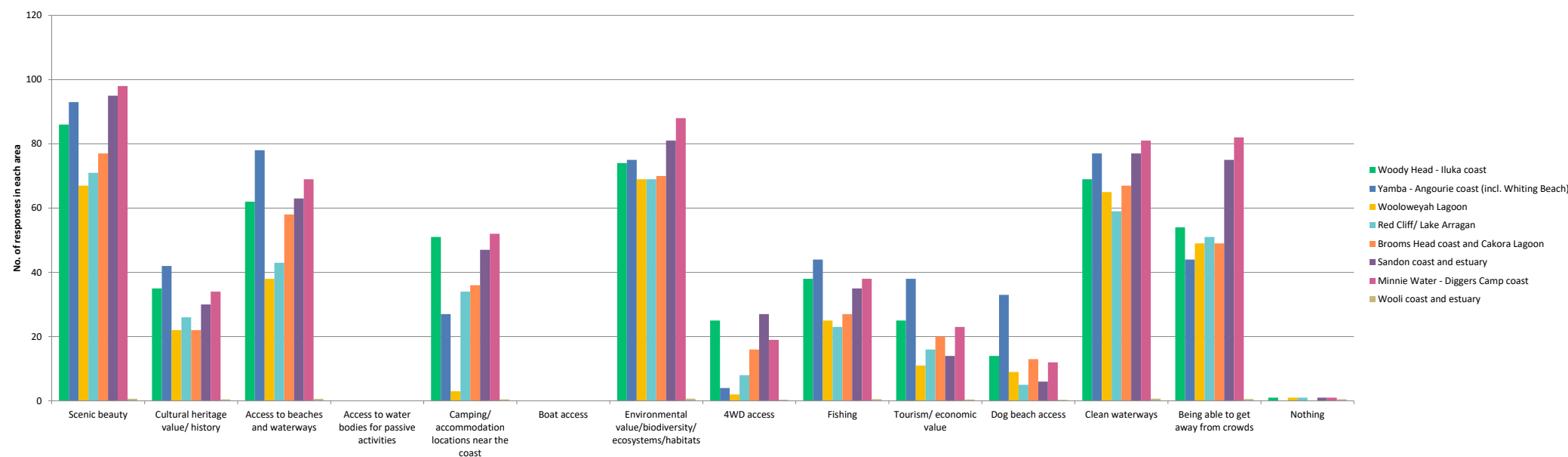
Clarence Valley Coastline CMP Scoping Study - Appendix C: Stage 1 Stakeholder Consultation Activities



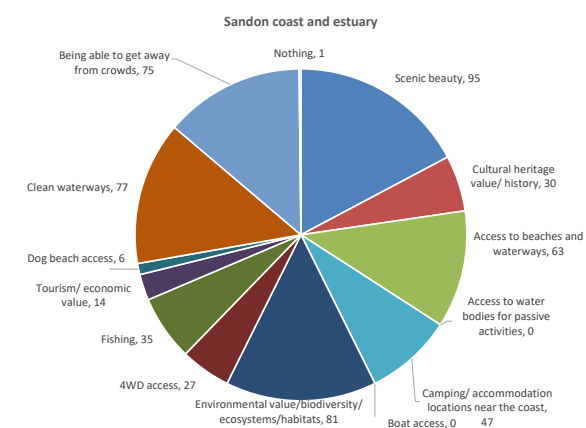
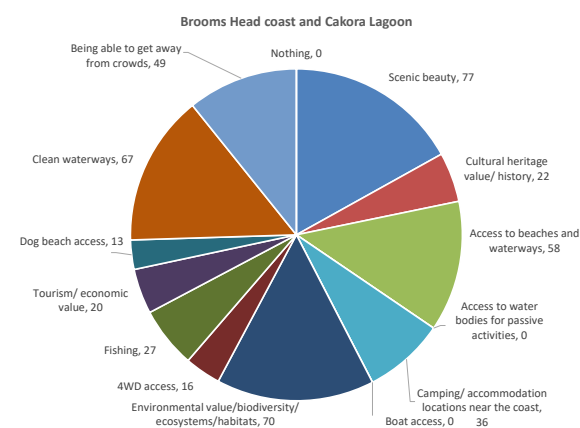
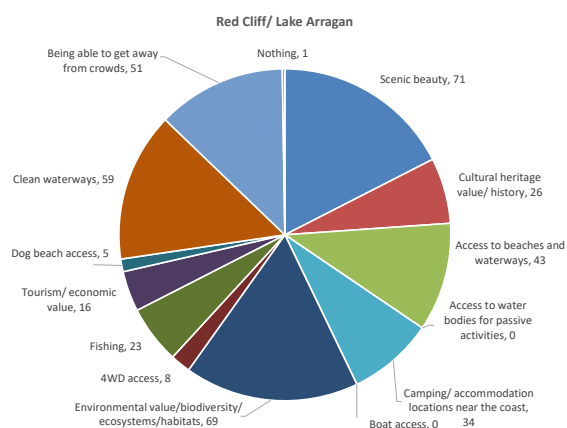
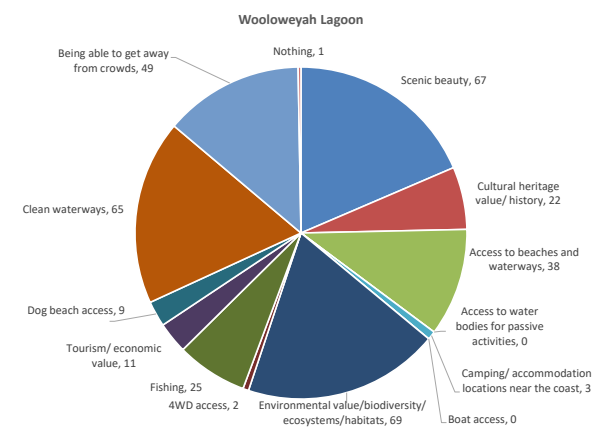
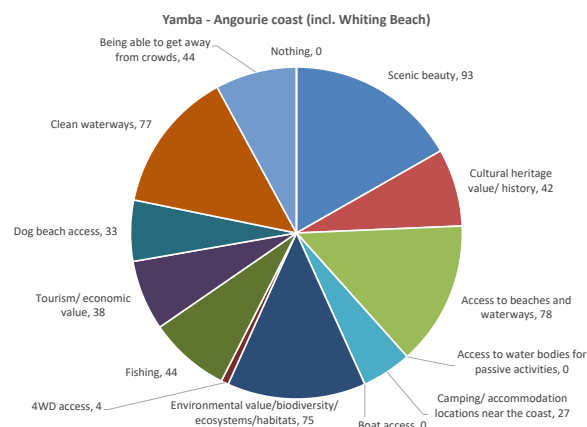
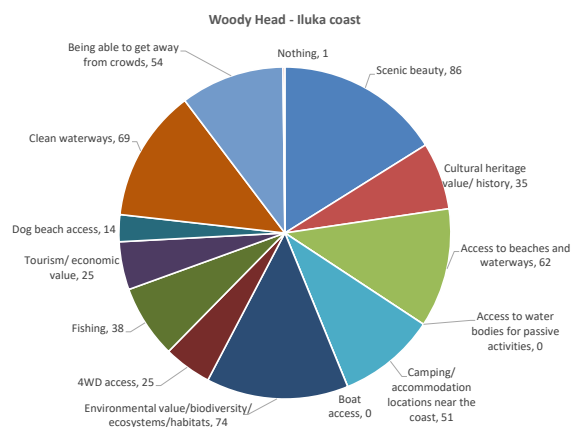
2. Is there anything that you particularly like or value about the Clarence coastline and estuaries? (tick any that apply)

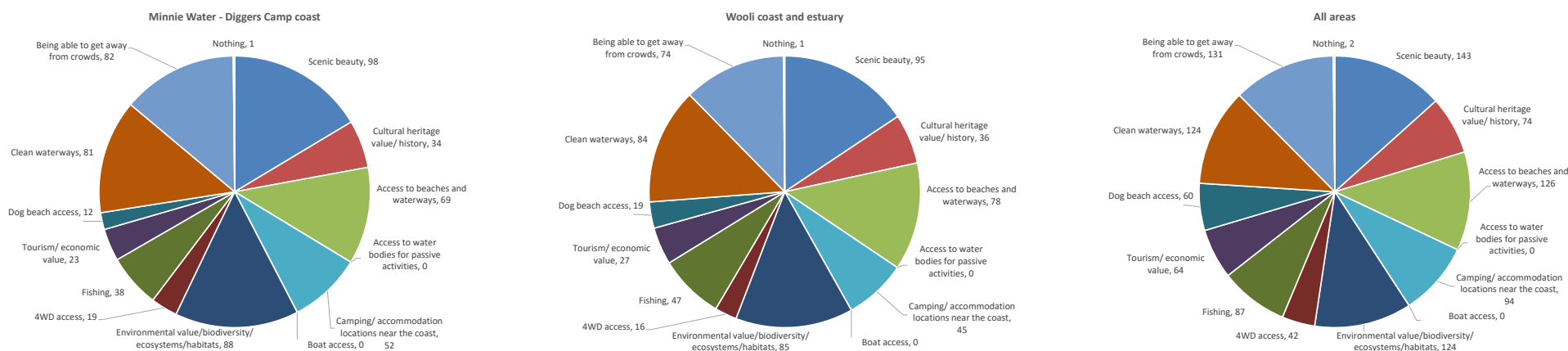
	Woody Head - Iluka coast		Yamba - Angourie coast (incl. Whiting Beach)		Wooloweyah Lagoon		Red Cliff/ Lake Arragan		Brooms Head coast and Cakora Lagoon		Sandon coast and estuary		Minnie Water - Diggers Camp coast		Wooli coast and estuary		Total
Scenic beauty	60%	86	65%	93	47%	67	50%	71	54%	77	66%	95	69%	98	66%	95	143
Cultural heritage value/ history	47%	35	57%	42	30%	22	35%	26	30%	22	41%	30	46%	34	49%	36	74
Access to beaches and waterways	49%	62	62%	78	30%	38	34%	43	46%	58	50%	63	55%	69	62%	78	126
Access to water bodies for passive activities	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0
Camping/ accommodation locations near the coast	54%	51	29%	27	3%	3	36%	34	38%	36	50%	47	55%	52	48%	45	94
Boat access	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0
Environmental value/biodiversity/ ecosystems/habitats	60%	74	60%	75	56%	69	56%	69	56%	70	65%	81	71%	88	69%	85	124
4WD access	60%	25	10%	4	5%	2	19%	8	38%	16	64%	27	45%	19	38%	16	42
Fishing	44%	38	51%	44	29%	25	26%	23	31%	27	40%	35	44%	38	54%	47	87
Tourism/ economic value	39%	25	59%	38	17%	11	25%	16	31%	20	22%	14	36%	23	42%	27	64
Dog beach access	23%	14	55%	33	15%	9	8%	5	22%	13	10%	6	20%	12	32%	19	60
Clean waterways	56%	69	62%	77	52%	65	48%	59	54%	67	62%	77	65%	81	68%	84	124
Being able to get away from crowds	41%	54	34%	44	37%	49	39%	51	37%	49	57%	75	63%	82	56%	74	131
Nothing	50%	1	0%	0	50%	1	50%	1	0%	0	50%	1	50%	1	50%	1	2
Other (please specify)																	7
Surfing, swimming, diving																Answered	152
Every coastal Reserve & adjacent water ways needs to be protected from pollution and development. Emergency Services MUST have access.																Skipped	2
Diggers Camp community missing an allocated off-leash dog beach																	
High value surfing spots.																	
This is one of the most poorly setup surveys I have ever completed																	
Please don't over develop Yamba. Green spaces around all buildings are essential																	
Protection provided by SIMP and Yuraygir NP																	

* Percentage results refers to the proportion of responses in each area for each attribute



Responses (by area)





3. Would you like to explain why you gave the scores to Question 2 above? (please limit to 100 words or less)

Most of the above improve our coastline values

Our children & grandchildren have inherited the COVID-19 world in which whatever your postcode clean air, air you can safely breathe is vital. Along with unpolluted water, uncontaminated soil and species diversity, clean Covid & carbon-constrained air is vital, essential to sustainable life in the long term. Those values I ticked increase one's biophilia. But if you do not experience the natural world, you are less likely to appreciate the value of the natural world. Because a sustainable natural world is made up of our 4 vital needs of clean air, water, soil and species diversity, if you haven't yet grasped the fundamental essential importance of these 4 vital needs, you won't bother to take legal, peaceful steps to replace elected decision makers whose decisions are based on short-term greed, stupidity, ignorance about what is important on Planet A.

The Clarence and it's estuaries are still pristine. I feel privileged being able to experience it in my own back yard but sadly I don't expect it to last

Clarence Valley is the last place on the east coast not trashed and overcrowded. It is spectacular in that it is relatively clean but on the verge of being destroyed. This is the time to take action to protect the biodiversity of this area from human activities.

I love the natural beauty of the river and coastal areas

We love being able to drive onto the beach 🚗 at Minnie or Sandon and go for a surf.

I appreciate the natural beauty of the whole coastline, particularly that it is not highly developed. There are pristine areas that can be accessed and enjoyed with a bit of effort and they haven't been damaged by humans.

That's how I feel

The value of the area is that it is one of the last under-developed places to escape to and appreciate nature and solitude, to get back to basics.

I don't believe 4WD access should be permitted on any beach, and dog walking on beaches is too problematic for beaches attached to NP. I appreciate the coast for its natural and cultural values

This whole coastline has an undeveloped setting with lower numbers of people. The natural features dominate over the developed/built environment. This makes it different to other places like South East QLD and is why it is so unique and beautiful.

The tourism and recreational value of these places is fundamentally based on them not being over exploited and commercial vessels and 4wds not destroying the serenity

Clarence Valley Coastline CMP Scoping Study - Appendix C: Stage 1 Stakeholder Consultation Activities

This coastline is particularly attractive to me and my family for its beautiful headlands and surf beaches/spots
People enjoy the Clarence bc it is NOT over-developed. Please do NOT build on coastal Reserves. There have been 2 known Shark attacks at Wilsons/ Diggers Camp in last 2 years - one fatal. Emergency Services MUST have designated access.
These areas are not overdeveloped and everyone has access to the coastline.
Natural world in this region is the greatest asset. Preservation and conservation of yurigar np is fundamental to retention of unique environment.
All of the beaches in Iluka are pristine and full of wildlife except for one which is main beach it is over run with unleashed dogs they chase all the birds away and leave the beach littered with dog faeces and 4WDS should be banned from Shark Bay they destroy bird habitat and damage sand dunes
A relatively unspoilt section of the NSW coastline, with lower population densities.
We love our coastline
Solitude kayak fishing when trawlers are not working the lake when there are trawlers working they turn over mud from the bottom and it lands on any marine vegetation.
Areas that provide easy access and facilities for families are our favourite. We enjoy walking through national parks and appreciating our natural heritage & surrounding areas.
Dog access is another big one for us.
You have mentioned nothing of our river systems however. More Foreshore walks would be beneficial.
Speaks for itself
Natural beauty is the most important part of these places and why we choose to live here.
(no scores there just on /off)
I highly value the natural beauty and camping in national parks. I don't want to see our national parks become over managed and should be left natural
I like to be in places for there beauty and tranquility. Left InTheir natural state with a bit of maintenance and clean well cared for facilities.
not enough knowledge to comment on this
Wooloweyah lake needs to be protected red from commercial fishing. It is an absolute disgrace that trawlers still fish this lake with primitive means destroying sea grass habitat and increasing silt load
I value the natural environment and functioning ecosystems above all else.
I enjoy at times recreational fishing.
I value the aspects for all sites in the Clarence but I don't get to visit them all due to access. I've answered based on my experience of that area.
Wooli and Minnie Waters are very special places because they are some of the few remaining coastal towns that are mostly undeveloped and still have the natural beauty of being surrounded by National parks with precious flora and fauna biodiversity, pristine waterways and uncrowded beaches. Wooli, Minnie Waters and Diggers camp have retained the small beach village feel and should be protected for future generations to enjoy .

Wooli is my favourite getaway, we live in QLD and there are many special places out there, but nothing as charming and wild as Wooli. The diversity of wildlife is outstanding. I love getting away from the crowds, enjoying the vastness of the ocean and changing scenery along coastal walks. There are always wildflowers and birds join you along your stroll. If we feel adventurous we can enjoy a pristine dive at the solitary islands or cruise up the beautiful Wooli river in a tinny. The fishing is also a delight. I honestly cannot say enough for the wonderful Wooli coast/estuary and nearby Minnie water/Diggers and Sandon. An example of the charm of Wooli's community is seen in their ongoing care/time and efforts with Camp Quality.
As older people we walk our dogs & swim at these places. Sometimes frustrated by being unable to see more due to National Park restrictions. However we do appreciate responsible use of the coast & river
Beautiful natural locations with clean unspoiled and undeveloped beaches with excellent waves for surfing. Significant areas of Biodiversity and conservation areas. Its appeal and attraction is the nature of the coast where there are places to get away from the over tourism of some parts of the CVC and the Northern Rivers.
The points are self explanatory
Our beaches and waterways are special, and they're also extraordinarily vulnerable. It makes SO MUCH sense – in the short, medium and long economic terms – for us to be vigilant custodians and preserve nature's balance as much as possible.
I appreciate people valuing cultural heritage and I am all for it. To me in the Clarence area it is just not as obvious as say Uluru or Arnhem land and therefore does not attract my attention to any great extent. To me there are small fragments of heritage but no major attraction as say the cultural centre and rock fish traps of Brewarrina with easy viewing and in depth descriptions and history of the area.
They're the things I value most and where I value them.
The natural beauty and environmental habitats in the Wooli area are of concern and future or further development should be minimised to retain it's current state. This include Wooli river waterways, the condition of the local beach and preservation of wildlife habitats.
Wooli is a special place away from the crowds and has a very friendly population
My lack of comments for areas North of Sandon is due to my lack of local knowledge of these areas.
Holiday at Wooli and needs to retain its natural attractions and coastal environment for future generations.
I love Wooli and surround being out of the way and almost untouched by travellers, it's a locals choice
The unspoiled, quiet beach and village, Wooli, which love
There was no score requested. I appreciate the beauty and quiet and unspoiled nature. This is at risk from 4WDs racing all over the beach and sand dunes without concern for walkers and children and wildlife
Enjoy the natural surroundings, low numbers of people, family friendly locations like Wooli estuary and beach.
The natural beauty and wild life of Wooli beach and it's river are astounding. I been visiting this area most of my life - first as a child, then a parent and now I take my Grandchildren there. PLEASE PROTECT WOOLI BEACH FROM EROSION.
The beach remains the major attraction for me. He's a very beautiful part of the world
Variety of body surfing beaches
Cleanliness

Clarence Valley Coastline CMP Scoping Study - Appendix C: Stage 1 Stakeholder Consultation Activities

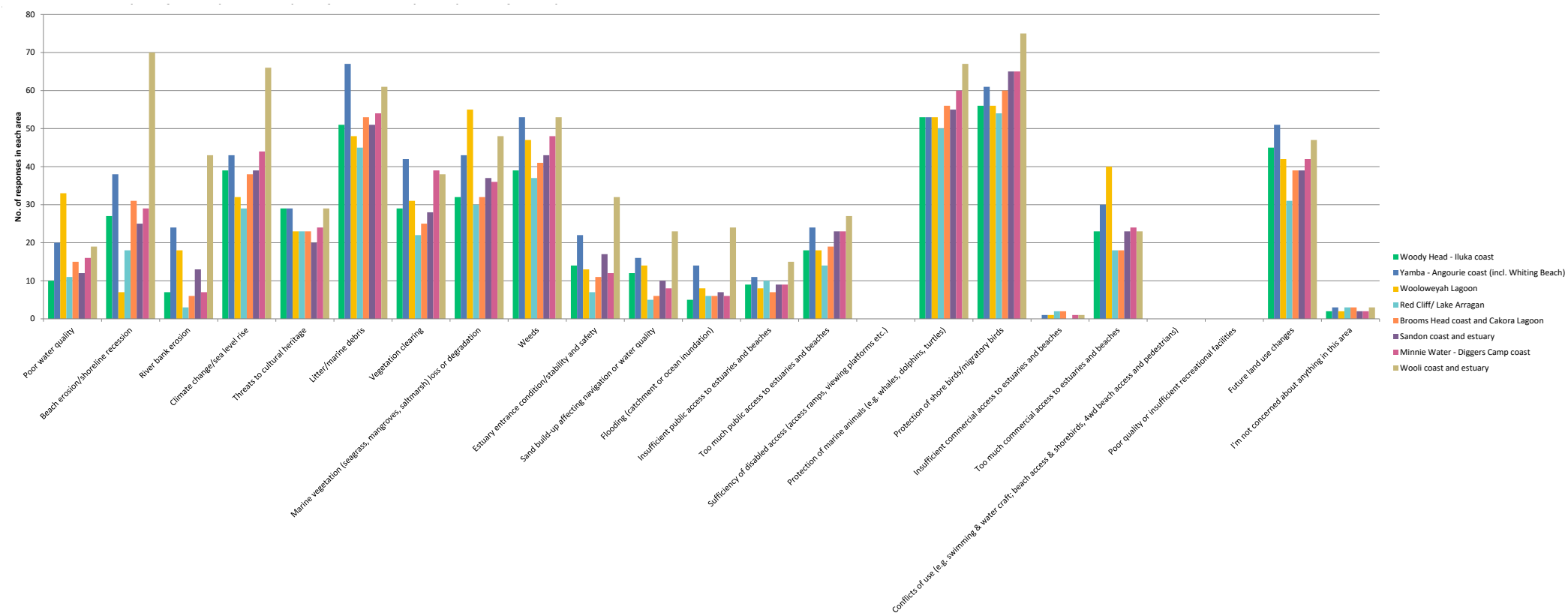
This is not an easy question to answer. I appreciate nature, and to do that the "being able to get away from crowds" question helps in that appreciation. However, there are certain times of the year when some of the more attractive areas, in terms of nature and wildlife appreciation, are ruined by crowds of people, not all of whom have any appreciation for nature, but rather the opportunity to get cheap or even free bush camping.
As a local resident I love the easy access to uncrowded and relatively unspoilt coastal areas. This will be increasingly important as overseas and interstate travel may be restricted in the future.
I love visiting these places for relaxation & natural beauty.
I rarely go to some areas but all are values for their scenic beauty and lack of commercialisation.
Limit car access to Minnie Waters main beach. De s trots fine system and unsafe for beach users
We need to keep all our wonderful areas open to all locals and visitors and stop locking things up and making new rules that keep restricting visitors
The value of these areas is intrinsic to their natural state; without taking care of the environment at ALL of the above, they have no value.
Love what's left of their pristineness. Stop developing Yamba accommodation so we can all enjoy the environment there without more tourists. No high rise please.
I like to spend time in these areas which haven't quite been destroyed by human greed. Although they are on that path.
Our Coastline is special and needs to be protected from development before we loose the natural beauty and the diverse habitats that we have. This coastline is one of the most spectacular on the east coast and needs to be protected from human impacts
Acknowledgement of traditional owners and their care for the land is vital. They did such a good job of being custodians, we need to learn from them.
The place has a rugged beauty that is actually quite fragile. Retention of normal sand drift seems difficult due to training walls on the Clarence
It reflects what I use these area's for and I strongly don't want restrictions put on these that prevent me from enjoying what my family has been for many generations.
I have not rated Lake Wooloweyah as clean due to busy prawns being trawled in the lagoon, destroying seagrass.
Lived at Wooloweyah since 1976, love the village here but hate the fact that, trawlers have effected the lake, re the weed that sustained the flock swans the used to be there
Uncrowded. Good facilities. Great for family and dogs. River and beaches.
Our flora, fauna and natural beauty are the biggest asset of the Clarence Valley
Why does council push tourism so much when the vast majority of locals really prefer untouched natural coastline and no crouds?
We live here so don't need camping facilities. Also 4WD has to be limited to protect are areas.
People need to be able to view the area. Yamba foreshore on the zig-zag path to main beach is embarrassing as the main vista to the town's Main Beach. Dead and dangerous trees, broken paths, lack of aesthetics compared to other coastal towns. Often stinking pool which can be smelt from the Hotel.
Because most is still free to the public to enjoy.
I value high biodiversity and conservation above human access and dog walking however being a dog owner and fisherman still value access at certain areas.
My local beach is a dog beach but I also deeply appreciate all of the national park beaches and estuary.
It is a relaxing area full of natural beauty and serenity

I have only given scores to those areas that I go regularly. If I ever go to the other areas regularly, I would score them as well.
No, thanks.
I am an ecologist who enjoys nature and likes to avoid crowds.
Sandon,surrounded by national Park ensures that certain rules have to be observed. This keeps the area free of development and ensures the environment is protected
As a home owner at the Sandon, I feel it is the natural environment that is most important for protection. The surrounding NP makes this area unique.
Consider the environmental and scenic values of the marked areas are extremely important to the conservation of the Clarence Coast. I recognise there are other locations that I haven't marked but have visited over the years. Clarence Coast is special as fortunately large areas are protected in national parks.
Complex ecosystems with the overlap of tropical and temperate species. Just as the Solitary Islands are at the southern limit for hard corals, the Wooli Wooli River is the most southerly estuary to have all of NSW's mangrove species.

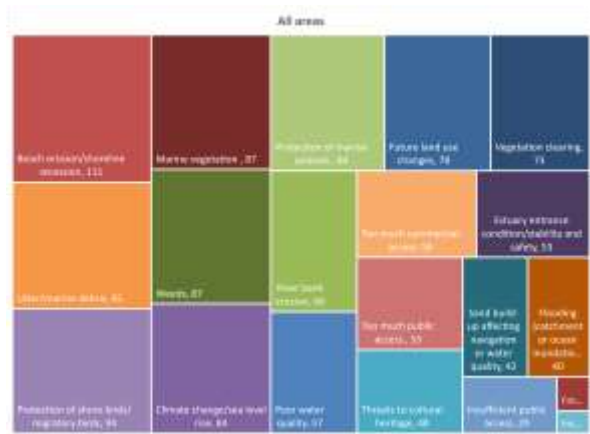
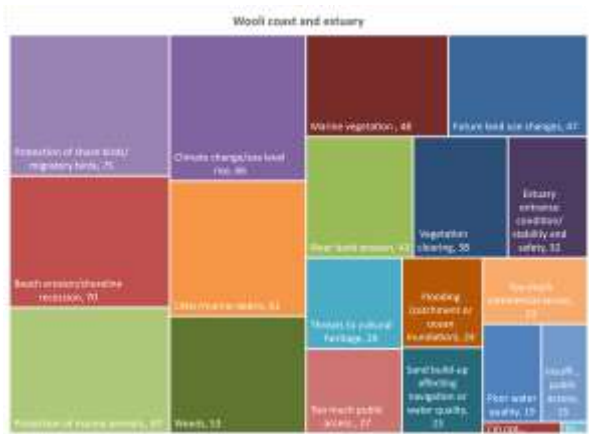
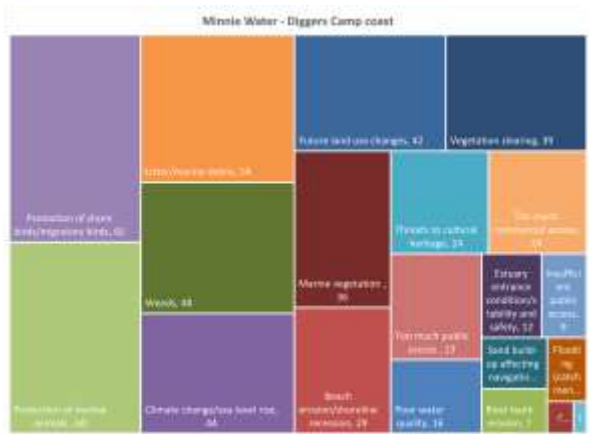
4. Are you concerned about any of the following aspects within each of the coastline areas or estuaries?

	Woody Head - Iluka coast	Yamba - Angourie	Angourie coast (incl. Whiting Beach)	Wooloweyah Lagoon	Red Cliff/ Lake Arragan	Brooms Head coast and Cakora Lagoon	Sandon coast and estuary	Minnie Water - Diggers Camp coast	Wooli coast and estuary	Total							
Poor water quality	18%	10	35%	20	58%	33	19%	11	26%	15	21%	12	28%	16	33%	19	57
Beach erosion/shoreline recession	24%	27	34%	38	6%	7	16%	18	28%	31	23%	25	26%	29	63%	70	111
River bank erosion	11%	7	36%	24	27%	18	5%	3	9%	6	20%	13	11%	7	65%	43	66
Climate change/sea level rise	46%	39	51%	43	38%	32	35%	29	45%	38	46%	39	52%	44	79%	66	84
Threats to cultural heritage	60%	29	60%	29	48%	23	48%	23	48%	23	42%	20	50%	24	60%	29	48
Litter/marine debris	54%	51	71%	67	51%	48	47%	45	56%	53	54%	51	57%	54	64%	61	95
Vegetation clearing	40%	29	58%	42	42%	31	30%	22	34%	25	38%	28	53%	39	52%	38	73
Marine vegetation (seagrass, mangroves, saltmarsh) loss or degradation	37%	32	49%	43	63%	55	34%	30	37%	32	43%	37	41%	36	55%	48	87
Weeds	45%	39	61%	53	54%	47	43%	37	47%	41	49%	43	55%	48	61%	53	87
Estuary entrance condition/stability and safety	26%	14	42%	22	25%	13	13%	7	21%	11	32%	17	23%	12	60%	32	53
Sand build-up affecting navigation or water quality	29%	12	38%	16	33%	14	12%	5	14%	6	24%	10	19%	8	55%	23	42
Flooding (catchment or ocean inundation)	13%	5	35%	14	20%	8	15%	6	15%	6	18%	7	15%	6	60%	24	40
Insufficient public access to estuaries and beaches	31%	9	38%	11	28%	8	34%	10	24%	7	31%	9	31%	9	52%	15	29
Too much public access to estuaries and beaches	34%	18	45%	24	34%	18	26%	14	36%	19	43%	23	43%	23	51%	27	53
Sufficiency of disabled access (access ramps, viewing platforms etc.)	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0
Protection of marine animals (e.g. whales, dolphins, turtles)	63%	53	63%	53	63%	53	60%	50	67%	56	65%	55	71%	60	80%	67	84
Protection of shore birds/migratory birds	60%	56	65%	61	60%	56	57%	54	64%	60	69%	65	69%	65	80%	75	94
Insufficient commercial access to estuaries and beaches	0%	0	25%	1	25%	1	50%	2	50%	2	0%	0	25%	1	25%	1	4
Too much commercial access to estuaries and beaches	41%	23	54%	30	71%	40	32%	18	32%	18	41%	23	43%	24	41%	23	56
Conflicts of use (e.g. swimming & water craft; beach access & shorebirds, 4wd beach access and pedestrians)	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0
Poor quality or insufficient recreational facilities	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0
Future land use changes	58%	45	65%	51	54%	42	40%	31	50%	39	50%	39	54%	42	60%	47	78
I'm not concerned about anything in this area	33%	2	50%	3	33%	2	50%	3	50%	3	33%	2	33%	2	50%	3	6
															Answered	152	
															Skipped	2	

Clarence Valley Coastline CMP Scoping Study - Appendix C: Stage 1 Stakeholder Consultation Activities







5. Based on your observations, do you believe there are any other issues or threats to the Clarence Valley coastline and estuaries? (please limit to 100 words or less)

There is a threat to north end off Brooms Head caravan park because of beach erosion. Need rock wall extended.
Compared to threats posed by our children's ever-growing climate catastrophe, the Covid-19 pandemic is just something we will have to adjust to and change our behaviour. But unlike climate change, the Covid-19 pandemic does not threaten all life on Earth.
There is a potential threat to rivers, estuaries and coastline from potential mining in the Clarence Valley and Coffs Harbour. Any mining near river courses could be the cause of massive threat to the health of rivers and to the sea, threatening tourism, fishing, farming, biodiversity and environment and our way of life. Exploration for mining needs to be stopped as if approved the potential for irreparable damage is a possibility.
overdeveloped land of an industrial nature around Yamba
The continual cleaning of fish in the Minnie Water bay. The concrete "cleaning " bollards were put there illegally and the debris and stench is quite revolting and polluted the bay swimming area!!!
The lagoon at Broomes head needs immediate Sanctuary zoning to protect the delicate marine environment that exists there...Far too many people pillage this area with absolutely no respect for the marine environment.Particularly school holidays...
Sometime between 1016 and 1035, the King of Denmark, England (invaded in 1016), Norway, and Sweden, is claimed as directing the rising tide to: "You are subject to me, as the land on which I am sitting is mine, and no one has resisted my overlordship with impunity. I command you, therefore, not to rise on to my land, nor to presume to wet the clothing or limbs of your master." That just ended with one wet King. Please: Stop approving DA's within the areas the CSIRO claims will be either underwater or regularly inundated by 2100. Engage professional assistance with regard to future construction of rocks and concrete armour for the protection of existing properties. It is my understanding that such constructions only delay the inevitable (at best) and result in more flooding and damage at other locations. History has had one too many wet Kings already, And as with King Cnut (Canute): Council will just end up getting wet and local people will pay the price.
My main concern is 4WD access to beaches (which should be stopped or at the least properly policed for permits) and figuring out how to promote responsible 4WD access to coastal forests - i.e. limit the 4WD club type "rip it up" activities. The other big threat to amenity are uncontrolled dogs on the beaches and in the community. We have lived here 7 years now and I have noticed the increase in large dogs on the beach. My 4 year old daughter is now petrified of dogs from them running up to her on the beach. this is mainly a visitor problem, people coming in and running their dogs on the beach.
Impacts on adjoining waterways and estuaries from large scale development.
Vegetation clearing and weed incursion and urban encroachments
Climate change is a threat to all our coastal sites. The impact of litter is extensive too
Freedom camping likely to swell with highway improvement resulting in human waste pollution and bush trampling
I see the largest threat to what the area has to offer visitors and locals alike are sharks. Specifically, the increase numbers of White Pointers. The recent death, near misses and sightings of White Pointers here and further North has sent a very real chill through all who use the coast. All the research and recent trails at Lennox Head etc. appear to point to a role out of smart drum lines, tag, relocate as a sensible, balanced solution. I fear more deaths and/or severe injuries and a significant decline in tourism are inevitable if no further protections are introduced. Anecdotally, there have been more interactions of surfers & spear/fishermen with White Pointers this winter than is being reported in the media (or anywhere else).

Clarence Valley Coastline CMP Scoping Study - Appendix C: Stage 1 Stakeholder Consultation Activities

CONCERNS: Waste Management & Public Toilets; Emergency Services Access; Tourist Traffic Hazard (on local roads to the coast); Freedom Campers not using designated Natl Pks Campgrounds; please expand Minnie Water campground to cater to population growth and move CVC camping out of residential areas (sell Woolli campground to pay for it);
Woolli is mostly a swamp!! Unsanitary drainage.
The onslaught of coastal development moving down the coast
Building development expansion can put environmental balance at risk unless carefully managed
Dogs are being taken to Bluff Beach and Frazers Reef Beach and Shark Bay chasing all wildlife including Kangaroos and shore birds, Spear fishing at Bluff Beach should be banned with signs in place as this place is a nursery for all marine life and should be protected also there should be a limit on the amount of mullet that is taken by the commercial fisherman
Commercial fishing in lake wooloweyah. Bush fires in overgrown under managed bush land.
Yes, Council needs to fully implement its vehicles on beaches policy. Lack of signs, illegal tracks not closed, vehicles entering closed sections of beaches. Majority of 4wd operators will comply with regulations if they know what they are. Furthermore only 1 Agency needs to manage vehicle use of beaches, which in this Council Area are all on Crown land.
We need to protect our ecosystems as much as we can
Maintaining the coastline and riverbanks with rock work and correct foreshore walks and access to help prevent further damage.
The threat of government making decision to close access down.
Excessive development
Please keep 4wheel drives off the Brooms Head to Red Cliff stretch of beach. When that woman went missing from Lake Arragon camp ground, i realised how much safer it feels not having vehicles along that beach. Back Beach at Brooms Head gets vehicles from Sandon and I never feel entirely safe when walking by myself, if there are 4 wheel drives on the beach.
Prawn trawling Wooloweyah Lagoon
The over use by commercial prawn trawlers in the Wooloweyah lagoon and the destruction caused by this.
growing population need Council to allocate appropriate camping facilities that do not impose on residential areas; long drives to the coast need Caravan and Boat Towing "VEHICLE PULL-OUTS" to allow local traffic to pass < increasing tourist population creating road hazard for local traffic to/from the coast
Making our national parks into caravan parks
Lake Wooloweyah has been depleted of its natural sea grass and abundance of marine life because of the massive amount of over fishing in the lake each year from trawlers dragging their nets on long the shallow bottom
Prawn trawlers need to be banned from lake wooloweyah as they are churning up floor and destroying any chance the lake could have of restoration, considering catch is only used as bait seriously not worth the detrimental damage
Commercial fishing trawling in wooloweyah lake is not sustainable and is destroying a unique habitat
Filling of swampland at west Yamba and building houses leading to increased runoff into the estuary and altering the conditions in Wooloweyah lagoon. Combined with excessive trawling leading to turbidity and destruction of marine habitat for wildlife.
Trawling in lake WOLOWEYAH
I'm concerned about The Shark Bay to Woody Head change in the vegetation and coastline.

The residents of Diggers Camp are a threat to visitors. They don't want anyone else to have access to Diggers Camp.
I feel the Woolli foreshore is at risk of erosion and that ongoing dune rehabilitation is critical to stabilise an adequate foredune to protect this little coastal town. Beach scrapping seemed to help build a small dune in front of the main dune and the native planting seemed to stabilise this first dune and in turn protect the main dune, however, in the case of a significant storm event, that could occur in this years predicted severe weather, these efforts may not be enough. In addition, since the rock wall being installed at the end of the river, it appears the river may be getting shallower, if this could be investigated that would be great.
Mangrove protection from sea level rise.
Ocean acidity due to CO2 absorption.
Over tourism. Lack of management of Freedom Campers within National parks and Crown reserves such as Angourie. Resulting in illegal fires, rubbish, cars on beaches over crowding in the surf zone and resentment from local residents who feel they no longer have a say in how their local area is managed. Too many dogs on beaches outside of regulations threatening shore bird populations and other species.
Mainly beach front erosion.
Lack of access to national parks
I think you'll find a fair few Wooloweyah residents raising concerns about the effects of the Trawlers on the lagoon, and I join my voice to the chorus. It doesn't take a marine biology degree to intuit that the effects of Trawlers dragging the bottom and stirring up mud can only be impactful on the water quality and the decimation of seagrass. The previous report's finding ('wind' caused the seagrass to die off?) is fairly easily debunked I believe. Also, it's a shame the National Park rangers are spread so thin, the liberties people take with their dogs in the Yuraygir NP are outrageous, and the native critters territorial habits are disrupted etc.
Population increase and the management of it.
the threat is already there .National parks shutting up large tracts of coastline creating huge fire hazards and denying public access.
Lack of political will to follow through on coastal protection in future years.
Overdevelopment
I have a house near Woolli beach- it's worrying to see the ocean levels when there are storms
There is ongoing talk of industrialising the Clarence River, such as the Yamba Port and Rail proposal of two years ago, cruise ship access, industrial marine precincts etc. Any development of that sort could prove disastrous to the values I appreciate most.
Also, the approval of a series of major residential developments in recent years, Hickey Street, Iluka, West Yamba, and Gulmarrad will all lead to increased people, motor vehicles, a need for additional supporting infrastructure (Yamba bypass), hospitals, schools, commercial and industrial development, the list is endless. All of this comes at the expense of the natural environment and the values I personally value most.
Yes I live on the river at Yamba. Am concerned with increase in jet ski use - due to noise, speeds, impact on dolphins. Commercial night fish netting in the river is becoming more prevalent- why is this still allowed? Litter is a big problem. Dogs are not being kept off local Yamba beaches. Rangers do not monitor illegal van camping at night - at Pippie, Turners and Main beaches and river sites.
Too many people camping in car parks that's an eye sore and effecting the look of the town. Erosion on Pippie each open to issues and needs to be monitored closely.
yes the greenies locking every thing up.
Commercial fishing in the estuaries removes the bottom of the food chain or the breeding stock.

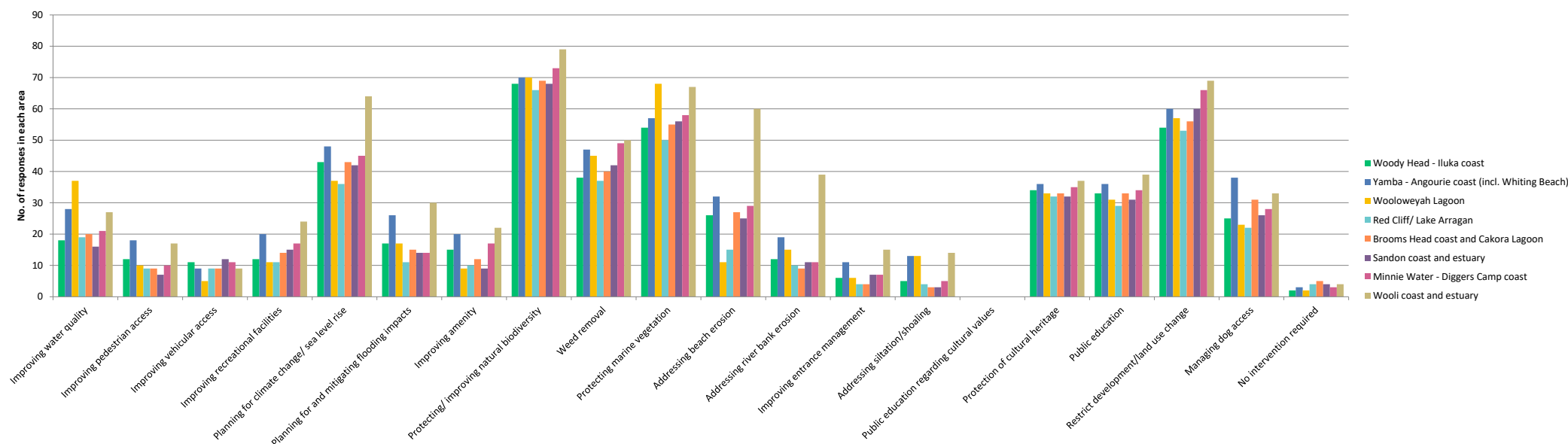
To much locked up national park, let us in to use it
4WD vehicles on beaches a threat to all areas.
Wooloweyah lagoon being destroyed by trawlers.
4wd tourism on beaches and in our national parks and state forests
The frequent mentions of building a port at Yamba capable of hosting cruise ships in the Clarence River disgusts me. These are unregulated polluters with no concern but profit. The people who live in these beautiful areas don't want it, neither should you. It is a very real threat to the biodiversity and health of the ecosystems along the whole coastline.
Over development!
I think the biggest threats to the valley coastline are property's developers and CVC approving these developments
Weed infestation and poor quality/ lack of maintenance of public access points to beach. The public access to whiting beach is poorly designed. Flexible walkways are intended to follow dune contours not be laid after the dune profile has been flattened. Current arrangement has lead to constant sand drift into car park area and ongoing maintenance.
commercial development, changing our coastline into a highrise type area. loss of habitat. allowing large fishing commercial fishing vessels off our coastline
Council need to start planting trees instead of clearing them. Free up the easements so people can plant endemic species and food trees. Stop widening access tracks that destroy the bush heath and vibe. Stop mowing down our heathland.
Coastal dunes and vegetation. Commercial fishing vessels operating on the Clarence river and lake woolowaya should be stopped.
Commercial trawling in lake wooloweyah and weed species surrounding the lake
bitou bush is the most effective way of preventing beach erosion as the nsw soil conservation service implemented this practice with planting between 1946 to 1968. My suggestion is not to remove the bitou bush from the ocean side beach dune to quickly but slowly remove and plant native species from the back side of the dune until satisfactory stabilisation is achieved and then remove the remaining bitou bush
Road widening and tree clearing, invasive weeds,
Apparent effluent drainage onto Minnie
Water main beach and lagoon in times of high rainfall
You need to install more and larger bins at beaches that are not ugly .
the west Yamba development is going to cause major issues re flooding
Not really.
4WD on beaches. Coastal reserves becoming carparks.
Over population! Crouds of bloody tourists!
Clearing for views is a major issue in Yamba.
Loss of sea grass. Vital to water quality and fishing stock

Need to remove noxious weeds on Lighthouse Hill and Yamba Point. Lighthouse hill was once all grassed and public had wonderful views; similarly growth of trees over main beach impeding views.
The area needs more care, such as weed control, fire prevention, more access for the public, too much land locked up.
Yes, I believe there is too much disturbance by people, their vehicles and dogs on threatened migratory bird habitats and feeding grounds. This disturbance is one of the key threatening processes for many species. I have had an idea about creating an artificial floating roost for shorebirds as some conservation groups are doing around the world, would be interested to see if there was any appetite in council to have a look at this?
4WD on national park beaches, why is this allowed? Surely this presents a threat to shorebirds, turtle nests? I am a dog owner and I appreciate a local dog beach but I don't expect every beach to be dog friendly. So why can 4WD access pristine national park beaches?
Yes. Speed limits of vehicles on beaches MUST be policed on a regular basis, as should bans on overnight camping. CC cameras should be fitted at all popular locations so that miscreants can be prosecuted.
With easy road access from the north and south, I believe there will be more people visiting the area. My concern is the area will be affected by illegal camping, litter, dumping; trampling of native vegetation, lack of concern for the environment,
We need a public pontoon at Yamba, like at all other 'ports' up the river.
Nuclear power plant.
The over use of beaches by 4WDs.
Flood mitigation in the Edwards Creek and swamp due to highway upgrade, insufficient easement to allow flood water to recede, and an increase in flood water height in the Townsend area.
The above was confusing? e.g. Weeds are a concern but I am only familiar with extent of weeds at those locations marked. Vegetation clearing & Marine vegetation degradation are concerns but don't know if occurring at the sites??
We have lost our resident and nesting beach stone curlews from the Wooli estuary due to human disturbance and especially unrestrained dogs. Uncontrolled access to the estuary shoreline by 4WD and free camping. Vessel wash. Misuse of river front reserves by adjoining residents.

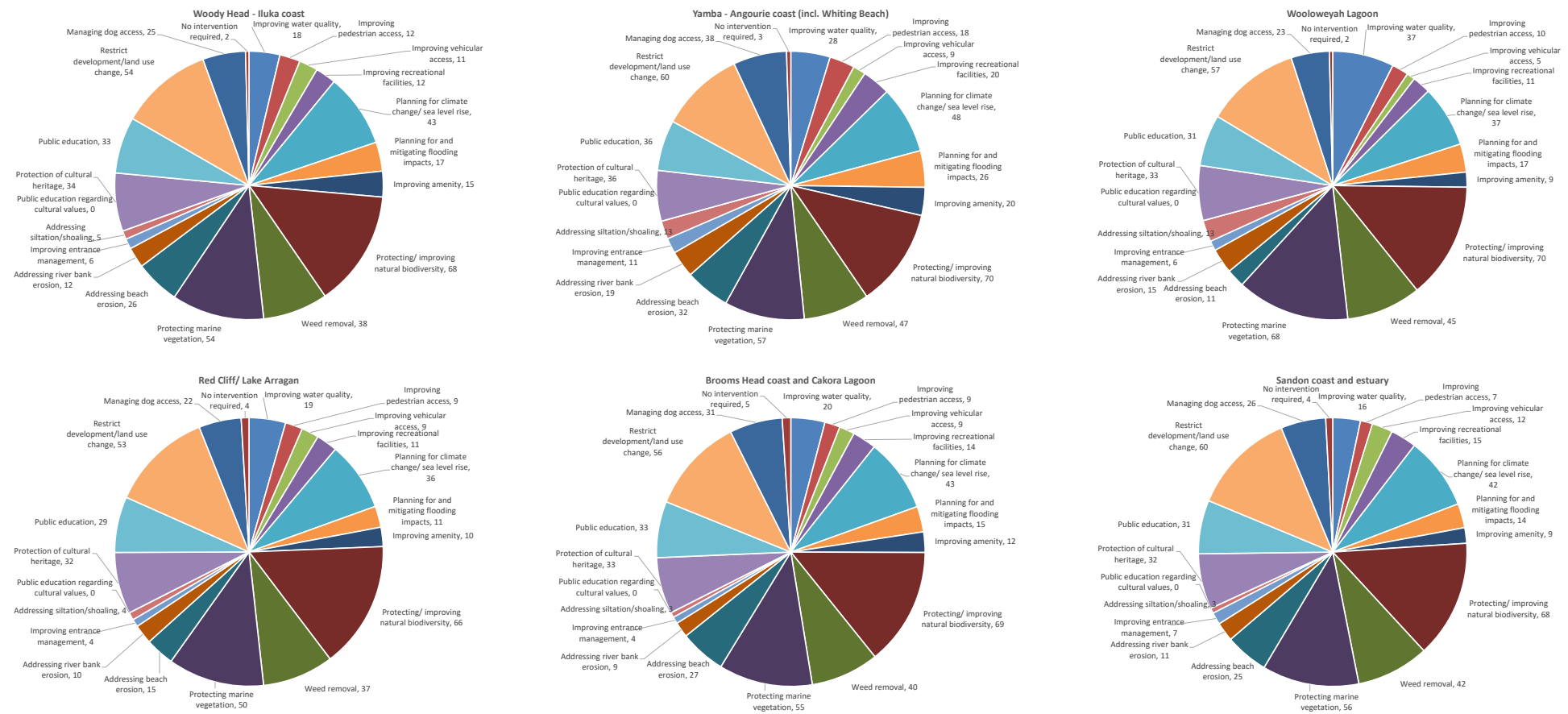
6. Which of the following management approaches would you prefer to see as the focus of future funding? (Select any that you prefer)

	Woody Head - Iluka coast		Yamba - Angourie coast (incl. Whiting Beach)		Wooloweyah Lagoon		Red Cliff/ Lake Arragan		Brooms Head coast and Cakora Lagoon		Sandon coast and estuary		Minnie Water - Diggers Camp coast		Wooli coast and estuary		Total
Improving water quality	30%	18	46%	28	61%	37	31%	19	33%	20	26%	16	34%	21	44%	27	61
Improving pedestrian access	29%	12	44%	18	24%	10	22%	9	22%	9	17%	7	24%	10	41%	17	41
Improving vehicular access	42%	11	35%	9	19%	5	35%	9	35%	9	46%	12	42%	11	35%	9	26
Improving recreational facilities	29%	12	48%	20	26%	11	26%	11	33%	14	36%	15	40%	17	57%	24	42
Planning for climate change/ sea level rise	54%	43	60%	48	46%	37	45%	36	54%	43	53%	42	56%	45	80%	64	80
Planning for and mitigating flooding impacts	35%	17	54%	26	35%	17	23%	11	31%	15	29%	14	29%	14	63%	30	48
Improving amenity	29%	15	39%	20	18%	9	20%	10	24%	12	18%	9	33%	17	43%	22	51
Protecting/ improving natural biodiversity	65%	68	67%	70	67%	70	63%	66	66%	69	65%	68	70%	73	76%	79	104
Weed removal	45%	38	55%	47	53%	45	44%	37	47%	40	49%	42	58%	49	59%	50	85
Protecting marine vegetation	56%	54	59%	57	70%	68	52%	50	57%	55	58%	56	60%	58	69%	67	97
Addressing beach erosion	30%	26	37%	32	13%	11	17%	15	31%	27	29%	25	34%	29	70%	60	86
Addressing river bank erosion	23%	12	36%	19	28%	15	19%	10	17%	9	21%	11	21%	11	74%	39	53
Improving entrance management	24%	6	44%	11	24%	6	16%	4	16%	4	28%	7	28%	7	60%	15	25
Addressing siltation/shoaling	15%	5	39%	13	39%	13	12%	4	9%	3	9%	3	15%	5	42%	14	33
Public education regarding cultural values	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0
Protection of cultural heritage	76%	34	80%	36	73%	33	71%	32	73%	33	71%	32	78%	35	82%	37	45
Public education	61%	33	67%	36	57%	31	54%	29	61%	33	57%	31	63%	34	72%	39	54
Restrict development/land use change	59%	54	65%	60	62%	57	58%	53	61%	56	65%	60	72%	66	75%	69	92
Managing dog access	42%	25	64%	38	39%	23	37%	22	53%	31	44%	26	47%	28	56%	33	59
No intervention required	33%	2	50%	3	33%	2	67%	4	83%	5	67%	4	50%	3	67%	4	6
																Answered	149
																Skipped	5

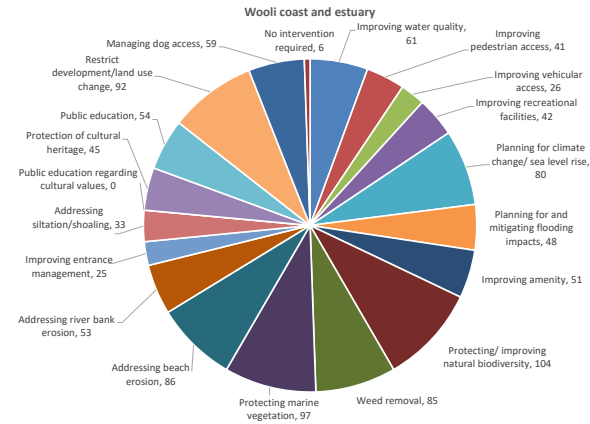
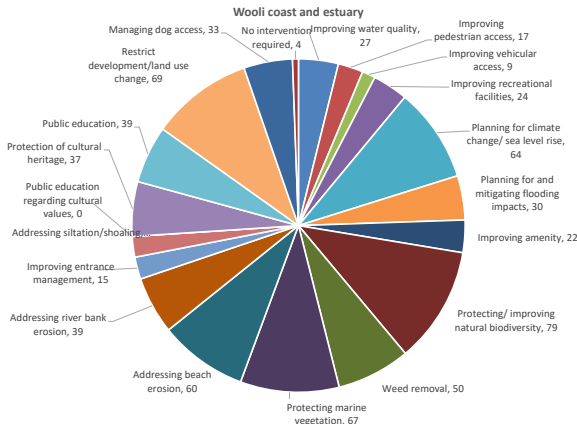
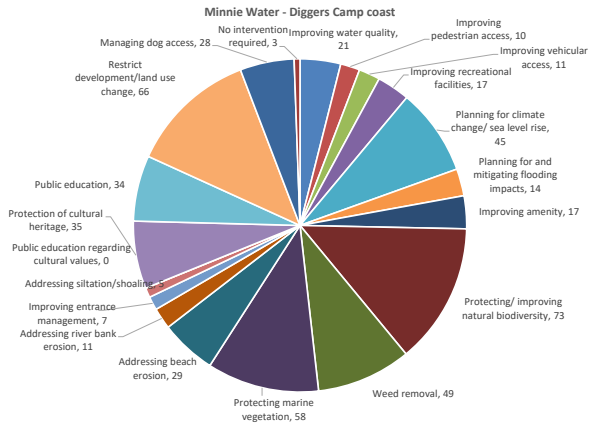
* Percentage results refers to the proportion of responses in each area for each approach



Responses (by area)



Clarence Valley Coastline CMP Scoping Study - Appendix C: Stage 1 Stakeholder Consultation Activities



7. Are there any other management issues you feel are important and should be prioritised for funding that have not been mentioned? (please limit to 100 words or less)

1. Protection of flora and fauna from wild bushfires by regular hazard reduction. 2. Eradication of threats to native fauna e.g. cane toads. 3. Monitoring the height of Lake Cakora to prevent the killing of vegetation (including mangroves) which occurred in 2019/20. Controlled opening supposed to happen to prevent this. 4. Maintenance of stormwater drains.
Adequately address the climate catastrophe
Development around the shoreline needs to handle things first.
Sometime between 1016 and 1035, the King of Denmark, England (invaded in 1016), Norway, and Sweden, is claimed as directing the rising tide to: "You are subject to me, as the land on which I am sitting is mine, and no one has resisted my overlordship with impunity. I command you, therefore, not to rise on to my land, nor to presume to wet the clothing or limbs of your master." That just ended with one wet King. Please: Stop approving DA's within the areas the CSIRO claims will be either underwater or regularly inundated by 2100. Engage professional assistance with regard to future construction of rocks and concrete armour for the protection of existing properties. It is my understanding that such constructions only delay the inevitable (at best) and result in more flooding and damage at other locations. History has had one too many wet Kings already, And as with King Cnut (Canute): Council will just end up getting wet and local people will pay the price.
Restoration of Wooloweyah lake. Particularly seagrasses and mangroves.
enforcing dog control and 4WD access on beaches.
As above, some form of management of White Pointers along the coast needs to be introduced before there are further deaths. Drones are ineffectual because a) they can only cover a fraction of time b) can only be used in good conditions c) cannot see through cloudy water, surface glare, chop, white water d) cannot alert surfers/swimmers if there is a shark e) cannot scare the shark away from surfers/swimmers
Dog access to the beach should be managed and more stringently enforced. Lots of dogs are off-the leash.
There is no designated off-leash dog beach area for Diggers Camp. Illegal campers and community health concerns about primitive camping in residential areas.
Dogs are frequently on National Park land . Education is vital to get owners to refrain taking them into np and onto beaches
Yes, The Brooms Head Village Protection strategy (fire) has some serious omissions & errors in the protection of the most south-eastern section of the village. This needs to be corrected before the next fire from the south. I have met nothing but brick walls from both Crown Lands & RFS on this matter since the Sept 2019 Shark Creek fire ran towards the village.
Walk/bike access from Yamba to Maclean
Lots of cobbles peg weed all over Brooms Head including foreshore. It needs eradicating.

Coastal Roads need increased funding to manage increase in traffic. Find a way for tourists to pay for their road use.
Restricting free campers in lake WOOLOWEYAH , green point and back beach Angourie.
Illegal camping and domesticated dogs in the National Park and on “no dog beaches”. Lack of animal control in towns and villages.
Access for people with a disability.
Simple signage on access to Pippi beach .. arrow to right “Dog area” arrow to left “No dogs allowed on beach”.
Over tourism. With the highway open we are now part of the hinterland of Southern Queensland. The impacts of which need to be managed so that the over use of our natural areas and natural resources are not degraded by population pressures. Management plans need to be informed, realistic and achievable. The protection of the Biodiversity of this region is recognised as a part of the future of the CVC.
Our region is on the radar and doesn't need promotion but rather management and protection.
Sorry to be a broken record, but addressing the trawler / seagrass situation in the Wooloweyah Lagoon in a fair, long-sighted, consultative and transparent manner would be hugely appreciated by an entire community and then some.
In terms of public education, I would like to see regular posts to educate the public on general coastal care. Just things we as public can do to maintain a balanced coastline
Vehicle access (4WDs) to the Wooli beach should be banned to limit damage and erosion caused by these vehicle. Also consideration should be given to banning dogs from the village to limit the impact on birds and wildlife/
Stop 4wd access from houses to the mouth.Restrict to north of the mouthy
Tree planting where Yuraygir National Park interfaces with dunes. Continue and expand planting of trees, coastal flora on beach dunes.
Better access for anglers Oyster Channel & Clarence River
I just want to clarify my response to the "Managing dog access" item above. By managing dogs access, I'm preferring to see a total ban of dogs on beaches.
I think 4WD access should be decreased in some areas. Council and Maritime need to work better with residents and industry to mitigate river bank erosion. There does not seem to be a plan. The mangrove foreshore areas on the river need better management especially those being degraded by increased residential development. I don't want to see more recreational infrastructure for example playgrounds, caravan park upgrades. Visitors come here to get away from the urban/city environment, to enjoy the more laid back nature of the Clarence.
Development in Yamba is ruining its future
Open up more national parks
Expansion of wetlands
Replanting shade trees in Minnie Water beach reserve around surf club and to the northern end of main beach
Looking after volunteers, employing locals in the small towns and villages as caretakers for their local bush and coastal environments.
Minimising treated effluent flow into the river system
Been mentioned but what a poor selection of public bbq areas around yamba. So much open space that's just bare grass. Put more tables and chairs and plant native bird attracting tress that also provide shade and a few free bbqs.

Back beach Angourie and green point free campers. Dogs on back beach
Murals on ugly toilet blocks would look better , more bins , notice boards for snorkeling with warnings of currents and pictures of wild life
No
Visitor management
Just get rid of our pro-any-development council!
Start planning for retreat for sea level rise.
Lack of implementation of previous management plans. Lack of scientific basis to planning.
People are still spearfishing around the protected zone in Yamba, spearing undersized fish.Need for closer monitoring by fisheries. Rangers need to be more vigilant with dogs on non-dog beaches.
I think priotise a healthy functioning ecosystem then commercial activities will benefit in the long term.
the Sandon has a beautiful natural environment lets keep it that way
Feral animal control on beaches, e.g foxes. Restrict 4WD on beaches.
Better management of recreational boating on the Wooli Wooli River to reduce river bank erosion and resulting sedimentation caused by vessel wash.

8. Imagine the Clarence coastline and estuaries in 10 years from now. What are the most important attributes? (Select all that apply)

Answer Choices	Responses	
Good water quality (clean water/safe to swim)	86.39%	127
Scenic beauty, 'untouched' coast	84.35%	124
Healthy marine vegetation (seagrass, mangroves and saltmarsh)	77.55%	114
Abundant wildlife	77.55%	114
Healthy, native vegetation (e.g. no weeds, less cleared areas)	74.83%	110
Stable beaches and foreshores (no erosion)	65.99%	97
An informed community	57.14%	84
Great public access (beach access, walking tracks, boat ramps and other vessel launching sites, improved disabled access etc.)	50.34%	74
More space/less crowding	43.54%	64
Good camping areas (formalised, well managed)	42.86%	63
Thriving aquatic-based industries (fisheries, oyster aquaculture)	42.18%	62
Improved public facilities (playgrounds, lighting, BBQs, toilets, tables, shelters etc.)	36.05%	53
Other (please briefly describe)	17.69%	26
	Answered	147
	Skipped	7
Abundant flora		
No mining near our catchment areas.		
No 4WD on the beaches		
In 10 years from now it would be great to observe that there has been no more people killed or hurt by White Pointer shark attacks.		
Move primitive camping away from homes. Upgrade Woolli & Diggers Headland to MVHP camp area where waste is properly managed.		
Vehicle access to most areas.		
Active & well supported volunteer groups throughout.		
Focus on recreational fishing and the income generated		
A need for easier access for other marine vessels; boards, kayak, canoes etc not just coastal but river systems		
Camping areas need to have amenities for community health. Cannot have camping areas with waste water dumping. DO NOT DEVELOP COASTAL PARKS, LEAVE NATURAL: Clarence is appreciated for undeveloped coastlines.		
Clean		
A vision for the future only needs to look back into the past. What we see there is what we want. The reason people live and visit the area is its obvious simplicity. Far enough away from SE Queensland to be a weekend 'getaway' and a real holiday for those travelling north in summer and winter. Not another Byron Bay or Gold Coast but a coast whose identity is based on a respect for nature and community.		
Improve boat ramp at Woody head		
No vehicle access to the beach and no dogs.		
STOP THE NATIONAL PARKS MONEY GRAB .JUST TO ENTER NATIONAL PARKS NOT JUSTIFIED.		
No 4WDs unless they have a disabled sticker		
Surfers camping Angourie. Rustic camping Hickey IslandSe		
Keep the environment as natural as possible.		
Living on harmony with nature		
Less free camping		
Protection in lagoons , marine sanctuaries		
Get rid of development/tourism!		
Development housing etc with an ocean view		
Run off from over development outside the prescribed area also negatively impacts water quality.		
Clearing of pandanus palms on Convent Beach. These have become overgrown and a fire hazard similarly main beach area.They have only been here since the 90's.Prior to that only a couple of Pandanus found in Yamba.		
The public have better use of the land and less locked up.		



9. If you would like to use your own words, please describe your vision of the Clarence Valley's coastline and estuaries as you would like to see them in 10 years (please limit to 50 words or less)

Genuine attempts being made to see that climate change is at long last being addressed so that of the developed nations we are no longer right at the back of the pack in efforts to address climate change. Our potential for renewables' use, sustainable transportation & housing & growing more local "clean & green" food could make us a world leader.
Preserved and healthy
Pristine
to get back to where this river and coast was prior to colonisation as much as possible
No vehicles on the beaches
Sometime between 1016 and 1035, the King of Denmark, England (invaded in 1016), Norway, and Sweden, is claimed as directing the rising tide to: "You are subject to me, as the land on which I am sitting is mine, and no one has resisted my overlordship with impunity. I command you, therefore, not to rise on to my land, nor to presume to wet the clothing or limbs of your master." That just ended with one wet King. Please: Stop approving DA's within the areas the CSIRO claims will be either underwater or regularly inundated by 2100. Engage professional assistance with regard to future construction of rocks and concrete armour for the protection of existing properties. It is my understanding that such constructions only delay the inevitable (at best) and result in more flooding and damage at other locations. History has had one too many wet Kings already, And as with King Cnut (Canute): Council will just end up getting wet and local people will pay the price.
It could become famous for sighting birds. and other marine life such as turtles.
A place that is affordable for all to enjoy and learn about the natural and cultural values. Stunning natural scenery dominates over the built environment and time slows down and stands still on this beautiful coastline.
Well resourced park policing to control and educate hi
Mostly more of the same. The area has huge potential for tourism provided it is managed in a sustainable and intelligent manner (not an extension of Byron Bay...). This can only be achieved if the ocean, which is of course the main attraction, is safe to all who use it.
Dont build on the coastal Reserves and Parks.
To be left as close to the original conditions from pre colonisation
No further building development. Manage with existing levels and insist on protection of natural environment as primary consideration
More wildlife less dogs
Better enforcement of protecting our natural resources, as in 10 years, they will be under greater pressure from both harvesting (fisheries) and increases in visitation (landscapes)
I would like to see well managed water ways so we can all appreciate and try to restore the river and lake the way we grew up with.
Less urban development, more preservation of natural environment. Keep our coastal areas from becoming the next Byron Bay or Gold Coast!

Clarence Valley Coastline CMP Scoping Study - Appendix C: Stage 1 Stakeholder Consultation Activities

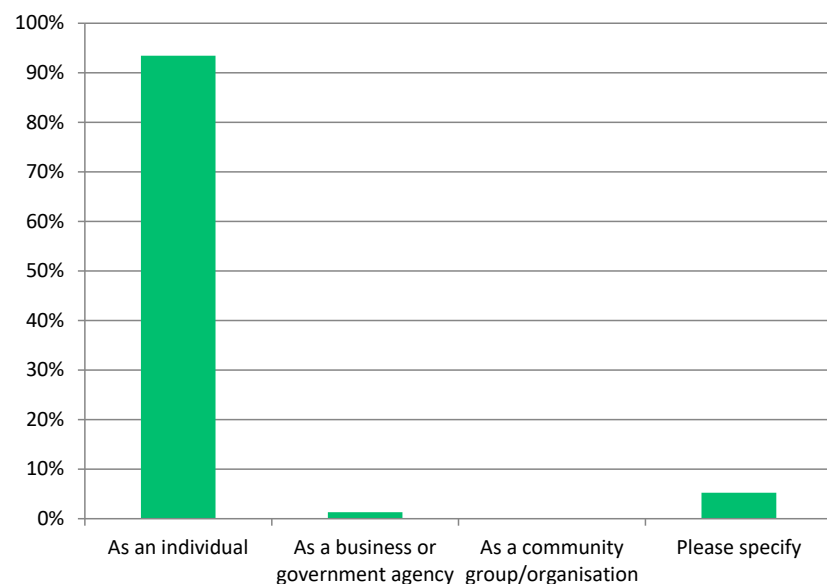
Healthy natural diverse environment. Abundant wildlife. Cultural heritage honoured. A place for children to have a healthy lifestyle and see native species in natural setting
Pristine waters, beautiful erosion free beaches.
Thriving with flora and fauna. Protected from overuse.
NO PARK FURNITURE DEVELOPMENT. Structures detract from the natural ambience of the Clarence Coast.
What I would like to see is our coastline protected and left in its most natural state I feel that that is what people come here for to get away from the hustle and bustle. Our facilities definitely need an up grade and weed management is a must. Keep it beautiful and quiet and the tourists will keep coming. Turn it into Bryon bay/ Gold Coast and people will find somewhere else to go pretty quick smart.
As natural as possible
Keeping beaches stable, protected natural environment, and pristine waterways. Limiting development to areas already more developed like Yamba, and keeping the beauty and character of the small beach villages like Minnie Waters, Wooli and Diggers camp as they are with no high rise or unit complexes. Keeping the National parks protected and accessible.
I would love to see Wooli/Minnie Water and Sandon remain as untouched as possible, with prioritisation of healthy waterways, ecosystems, national parks, marine parks and state forests. This in turn will protect the magnificent and often rare animals and plants that call this coastline home. Dune stabilisation and planning ahead to protect these special towns and communities will ensure these wild areas continue to delight and educate tourist around our natural environment.
Attraction of tourists due to natural habitats
Healthy and abundant with marine animals and birds. A balance between land use and conservation. Uncrowded waves on all our beaches for locals and visitors.
Clear of evasive weeds and a stable beach front.
The year is 2030, Council's decision to withhold leases for the copper mine have paid huge dividends. In fact their long-sighted vision to create dedicated sanctuaries and nurseries where nature could thrive have been held up as a paragon of management, and the CV has become the poster child for low impact adventure tourism. It's (sniff) beautiful! x
About right as it is now including the population.
Same as above
Full access to national parks. Look after water quality.
Pristine rivers, healthy ocean, beaches protected from erosion.
I would like to not worry about beach erosion over the next 10 years and doing something now that would prevent this
Would love to see it maintained as the natural, untouched wonder of northern NSW. Oceans, rivers, marine life, birdlife, fauna and flora protected and encouraged to expand. No commercial building developments or housing developments. Restricted development. Visitors come to the region to enjoy the natural beauty of the ocean, rivers and national parks. Would love to see that preserved, maintained and expanded.
I would like to see controlled development and stable beaches and estuaries.
Better shark mitigation Strategies
Same but improved public access and facilities

The same
I think my answers have said it all
I would like to see the Northern headland at Diggers Camp remain clear of vegetation. This is a very important meeting place for locals and visitors to meet and view the ocean, this is particularly important for older people who are unable to access other viewing platforms. Also important for shark spotting since the beach is not patrolled. Tourists love to enjoy and photograph the spectacular view from the headland.
Promotion of clean natural environment. Restrict further urban development. Restrict number of power boats and fishing in the river, Restrict use of 4WDs on beaches. This is an area of great natural beauty - lets keep it that way!
Open national park
Expansion of natural areas especially wetlands, seagrass beds. Better stormwater & farm runoff management. Trawlers out of Wooloweyah Lagoon & Lagoon be formally recognised & managed as a nursery. Less human impact. More camping less buildings. More trees - shade & nesting for seabirds. Weeds managed. Shore bird protection. Lobby for carbon price on wetlands.
Protected from overfishing and unsuitable industrial and commercial development
Good water quality. Controlled development in terms of residential growth and medium density housing
Pristine, accessible and all low rise. Clean beaches would be fabulous and would have to be dive by council. Accessibility to good seafood a MUST.
No more high density housing developments in West Yamba
A second road into Yamba to ease congestion at peak periods. Commercial fishing on the Clarence river and lake woolowaya stopped. Better policing of illegal campers
Lake wooloweyah, no more trawling
How they were ten years ago 😊
I would like to see Minnie water lagoon have more protection status as a breeding zone . If you want to see why look at FB page , “ what’s in the bay at Minnie water “
controlled development
Leave alone.
Clean natural environment supported by sustainable development.
Fewer people, better infrastructure
Built up area at iluka with ocean view
I would like to see it's natural beauty and diversity celebrated and promoted. Our major industries should work to achieve this outcome. Planning should protect us from overdevelopment especially where flooding is an impact.
Leave it as it is currently except address the danger of dead trees, get rid of the weeds and improve the aesthetics.
More people using them.
Better water quality (less agricultural run off and river bank erosion), great fish habitats (marine veg and artificial habitats), well protected shorebird and managed shorebird roosts and feeding grounds, less vehicles on beaches.

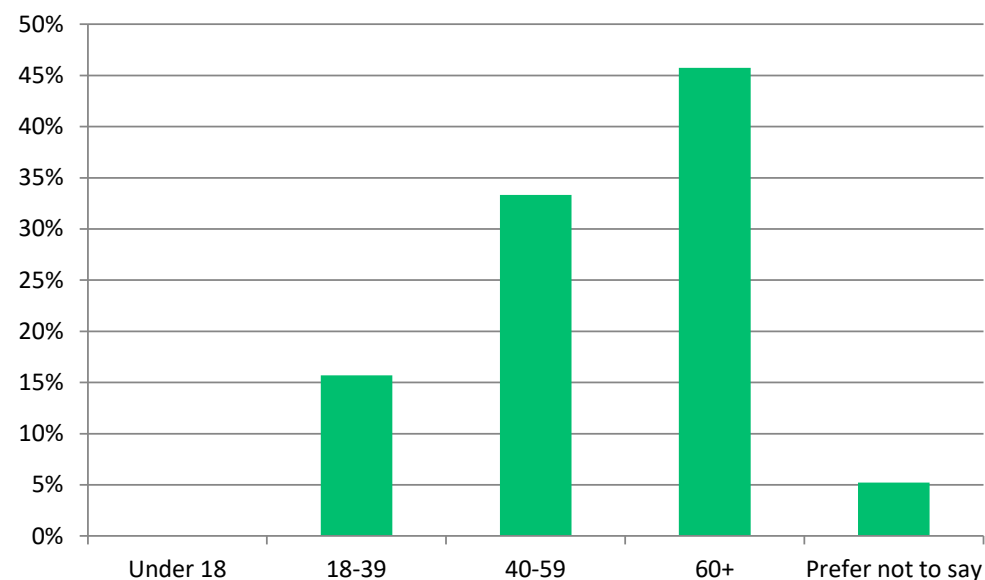
Pristine unspoilt lonely beaches and estuaries.
Pristine, protected,
I would like to see the natural attributes of the coastline protected and where necessary rehabilitated.
Its a beautiful natural coast line leave it alone!!!
Maintaining the natural environment so that residents and visitors enjoy an area preserved from development.
For the lower Wooli estuary, controlled access to preserve riparian vegetation, salt marsh and mangroves to help maintain a healthy estuary system. Shore birds, and especially the traditional nesting pairs of pied oyster catchers and beach stone curlews still here. A change in recreational activities to more passive use of the estuary. All mangrove species still present.

10. In what capacity are you completing this survey?

Answer Choices	Responses	
As an individual	93.46%	143
As a business or government agency	1.31%	2
As a community group/organisation	0.00%	0
Please specify	5.23%	8
	Answered	153
	Skipped	1
Resident of Wooli		
lifetime Clarence resident		
Long-time resident of over 30 years.		
As a property owner		
Resident		
Resident		
I am a resident and have completed the survey as an individual, however I am a volunteer with Landcare and have a strong awareness of the weed problem.		
house owner and landcare coordinator		

**12. What is your age?**

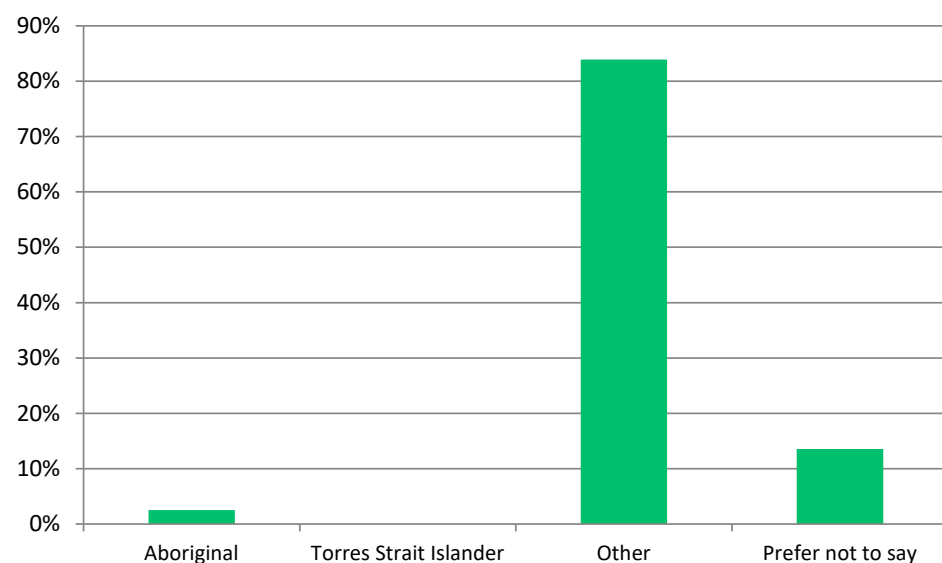
Answer Choices	Responses	
Under 18	0.00%	0
18-39	15.69%	24
40-59	33.33%	51
60+	45.75%	70
Prefer not to say	5.23%	8
	Answered	153
	Skipped	1



Question 11 includes personal details which have not been reported for privacy reasons.

13. Are you..

Answer Choices	Responses	
Aboriginal	2.50%	3
Torres Strait Islander	0.00%	0
Other	84.17%	101
Prefer not to say	13.33%	16
	Answered	120
	Skipped	34

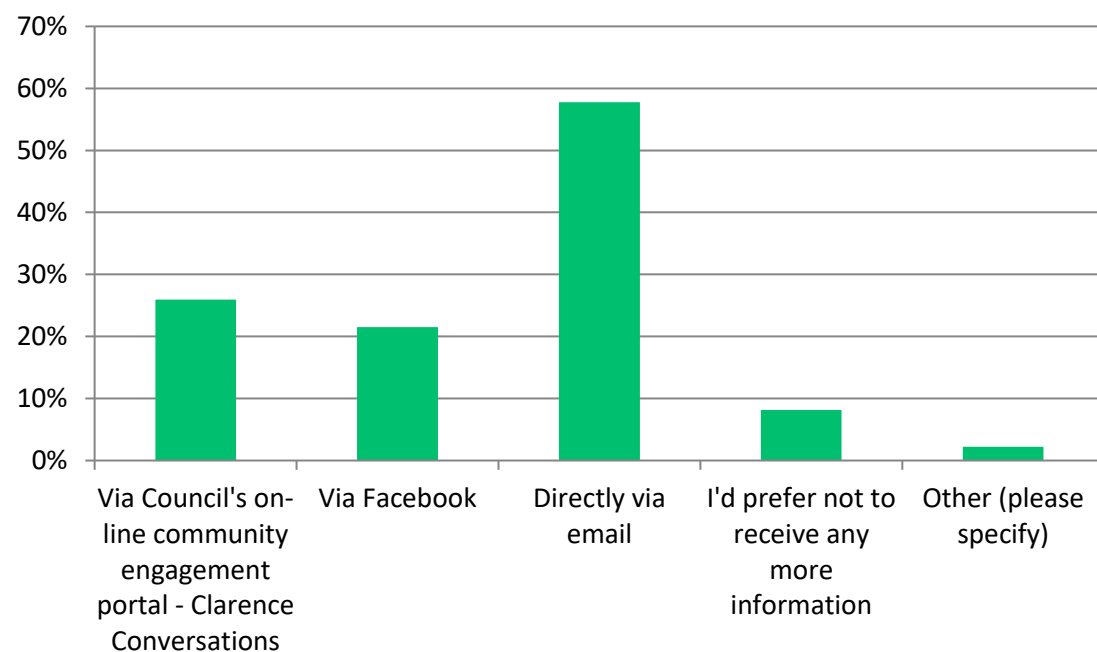


14. In what suburb do you live?

Response	No.	Response	No.
Postcode supplied	9	Lawrence	1
Angourie	3	Lismore	1
Armidale and Wooli	1	Maclean	5
Ashby	2	Minnie Water	7
Banyabba	1	Mororo	1
Born in Maclean, living in USA	1	Newrybar	1
Bowral	1	Nimbin	1
Brooms Head	6	Paddington	1
Casuarina	1	Palmers Channel	1
Chatsworth	1	Palmers Island	1
Chatsworth Island	1	Sandon	2
Clarenza	1	Shannondale	1
Clunes	1	South Grafton	2
Corindi Beach	1	Tucabia	2
Coutts Crossing	2	Waterview Heights	1
Diggers Camp	4	Woombah	1
Glenugie	2	Woodford Island	1
Grafton	9	Wooli	13
Gulmarrad	3	Wooloweyah	17
Hawthorn, Victoria	1	Yamba	23
Iluka	7	Yeronga	1
Innisfail	1	Responses	145
Kungala	1		
		No.	%
Within study area		85	59%
Within LGA but not in study area		41	28%
Outside LGA		19	13%
All responses		145	100%

15. How would you prefer to receive further information regarding this project?

Answer Choices	Responses	
Via Council's on-line community engagement portal - Clarence Conversations	25.93%	35
Via Facebook	21.48%	29
Directly via email	57.78%	78
I'd prefer not to receive any more information	8.15%	11
Other (please specify)	2.22%	3
PO mail	Answered	135
Post or newspaper articles	Skipped	19
Fafebook		



16. And finally, is there any other information you wish to provide to the study team? Additional comments can be provided here or on the Clarence Conversations webpage. For further information please go to <https://www.clarenceconversations.com.au/>

I wish to add to the mode of notification to the community in regards this Scoping Study. We the residents do not use the public amenities on which the notice was posted and many do not use social media either. If we as part of the study area are not made aware of such studies, how can we have input into it?

Another issue is the time frame set for completing the survey. We were made aware of study on 2/9/20 and hard copy to be lodged by 11/9/20.

Thank you for giving the public the opportunity to participate in 2020 with a little 20/20 vision for a more sustainable future for our children, still too young to vote in their future & for the world's non-voting species that never have a vote in the future. Our children still too young to vote are only 20% of our population; but our children are 100% of the future. The future is what we adults choose.

If any mining were allowed near our river systems it could have a massive impact on our rivers, estuaries and coastline. There are currently mining exploration applications in place for nearly 400 square kilometres which could threaten all of the areas in the above survey.
For further information please see Facebook page for Clarence Catchment Alliance.

Sometime between 1016 and 1035, the King of Denmark, England (invaded in 1016), Norway, and Sweden, is claimed as directing the rising tide to:
"You are subject to me, as the land on which I am sitting is mine, and no one has resisted my overlordship with impunity. I command you, therefore, not to rise on to my land, nor to presume to wet the clothing or limbs of your master."
That just ended with one wet King.
Please:
Stop approving DA's within the areas the CSIRO claims will be either underwater or regularly inundated by 2100.
Engage professional assistance with regard to future construction of rocks and concrete armour for the protection of existing properties.
It is my understanding that such constructions only delay the inevitable (at best) and result in more flooding and damage at other locations.
History has had one too many wet Kings already,
And as with King Cnut (Canute):
Council will just end up getting wet and local people will pay the price.

Great work and looking forwards to seeing this important project completed to help protect our coastline for future generations!

I have concerns also about the erosion of the river bank as well, I was shocked when I saw the damage, campers setting up for days and camp fires along the river and the rubbish.
Why have the bollards not been replaced?
Vehicles are also driving over the dirt mound into the BBQ area at the bay, I have seen them do this with no regard for anyone there or the environment.
Vehicles are also still turning right clearly marked "no right turn" at the beach access across from the river to go all the way down to the wall where the gate is still closed and drive over the dunes at the wall.
Two 4wd a couple of weeks ago turned right and were parked right up on the dunes that are suppose to be protected.
The dunes are no longer there.
Dogs off lead running amok and harassing other people and dogs, the signs at both accesses are clearly marked dogs be on lead, then there is the dog and human waste not being picked up which in the past 2 months has increased exponentially.
Tracks and clearings are being made along the river bank from the bay past the damaged boat ramp.
The council need to start some sort of policing if they insist on continuing to promote Woolli as a holiday destination, for tourism, and money, as I fear that at this rate there will be almost nothing left.
The visitors coming here are destroying and disrespecting Woolli.
Woolli does not have enough to accommodate huge amounts of holiday makers while protecting the surrounding environment.
Woolli is a small community and needs to be protected and feel safe.
We obviously need more signs, information on erosion etc etc, on all the above issues in holiday places and throughout the community.

...did I mention Smart Drum Lines?! Thanks for listening. It is great that these questions have been asked. All the best, Angus
Ensure emergency services access for the coast. Esp in surfing locations. Helicopter access essential
Thanks for the opportunity to provide my comments and my plea for some attention to the issues that have persisted for too long @ Brooms Head, (fire mgt & 4wd mgt on Back Beach).
In over 50 years of use of Lake Wooloweyah, I have noticed a great decline in marine bird life and sea grass beds.
Impact of population growth on communities is a concern. 30 years ago locals only in holiday areas, but in 2020 Clarence coast is over-whelmed with inter-state & international tourists. Their waste, their impact on the community health resources, their impact on the natural environment and their impact on the local roads & traffic need to be managed. They need to pay. Suggest Road Tolls for non-local residents to address their impact on our Rates.
Thanks for your work in keeping our coastline's natural beauty and accessible to our community.
We live in Cleveland QLD, but recently purchased a small holiday house at Wooli. We appreciate the work we have seen done, and thank you for your ongoing efforts.
Hey thanks heaps for the work you do. People are quick to complain but slow to recognise the amazing work Council do, day on, day out. So... thanks!
If beach scraping at Wooli beach proves as effective as it promises to be, expensive sourcing of sand from near the Northern end of the beach could be reconsidered.
The community at Wooli has worked hard to get the beach scraped and are continually doing everything they can to re do this to make sure Wooli beach remains beautiful and accessible for people visiting Wooli..
In recent weeks the beach at Wooli appears to be eroding again. The artificial reef at Narrow neck on the Gold Coast seems to work well in preventing this sort of problem.
Wooloweyah lagoon needs monitoring regarding sea grass. The findings need to be clearly distributed to community.
Would also appreciate more work done on the Angourie Shelly beach walk - the fires were a year ago and finding should have been sought to rebuild boardwalks etc...would have provided jobs at this time
I lived in Minnie for 20 years from the early 80's and have seen widespread and thoughtless clearing of native reserves to provide views for some residents. This is still occurring. I would like to see replanting of large native trees in our coastal reserves.
I don't believe the land parcels that get given to the aboriginal people to "look after" should be sold for profit.
Keep tourism development OUT!
Illegal camping is becoming a big issue. The sheer numbers involved mean there is increasing damage. Council needs to do much better.
There has been many hundreds of thousands of dollars spent since the 70's starting with the hydrology engineering consultants regarding Yamba's coastline and this has not led to anything of significance beside the piezometers being regularly read. Visitors to Yamba are appalled with the lack of work and upkeep of the Main Beach area. The safety issue is of great concern.
I hope this survey only provides ideas that will keep the coast line natural. please no development

Additional information was provided via email separately to CVC (Condition of Lake Wooloweyah)

We call on Council to improve their management of Lake Wooloweyah (also known as Wooloweyah Lagoon) and reverse the loss of seagrass and marine habitat.

On Sunday 27 September we enjoyed Kayaking on the Lake. Before leaving the water my husband took a photo as I stretched out after the paddle. When the photo was downloaded it showed the clarity of the water. This is after the lake has been closed to trawling for the winter months.

It was a windy day following on several such and we had paddled through considerable chopiness caused by wind over the lake. Observing the water quality under these



conditions has confirmed our belief that serious turbidity is inflicted on the lake by trawlers rather than wind. During the months of closure we have observed that much of the lake bed is visible, at greater depths than this photo.

Council is the responsible body for management of this area of the Clarence estuary. In 2009 the Plan of Management had several recommendations to protect

seagrass, including mapping, conducting a seagrass study, a bathymetric survey, investigations into no go zones and research into modifying commercial fishing gear. Not one has been implemented.

Council identified turbidity as an issue affecting seagrass, however excused turbidity on wind, based on their water quality research of 2008/2009 that omitted five months of data! Over the eleven years since that Plan of Management we have been concerned by the deterioration of Lake Wooloweyah.

Seagrass has now disappeared. Birdlife has declined. Ten years ago I could count above 100 Black Swans on the lake. The highest count was 129 birds. So far this year I have counted 73 swans. We have not seen Spoonbills, Egrets or Whimbrels.

This week the Lake will open to trawling **two months earlier than the river** and the entire fleet will be concentrated on the lake. The lake bed will be scoured which will be clearly visible on Google Earth, sediment churned and the lake will darken. Water temperatures will increase. The lake which is largely less than 600mm in depth will be trawled end to end. Only the most shallow sections will be spared.

Poor management hurts all stakeholders and there are many. Apart from the prawning industry there is the Wooloweyah community, the Yaegl community, National Parks and recreational fishers. However there are also the Osprey, Brahminy Kites, Darters and Terns still regularly fishing the lake. Today we had the pleasure of Kayaking with dolphins, also seeking their food as well as many small stingrays and hopefully crabs and lots of fish species beyond the mullet, which are jumping vigorously at the moment. There were several recreational fishers bobbing about hoping to catch their meals too.

From this week there will likely be commercial trawlers after relatively low value bait prawns. Fisheries are only concerned with prawn numbers. This is the only metric by which the lake gains a slight respite from dredging, for that is the effective result of trawling. The lake is closed to trawling over the winter months, not to give the lake time to recover but to protect prawn stock.

Lately water clarity has been excellent but despite our searching in the northern extent we have found no evidence of seagrass. There are limited areas of what we believe may be Eel Grass (see picture) along the extreme edges of the lake.



Council, Fisheries and the Department of environment have failed in their duty of care to the Wooloweah Lagoon catchment and waterway which, according to Council's own website, "is of significant social and economic benefit to the community, has high ecological values, and is listed on the 'Directory of Important Wetlands in Australia.' "

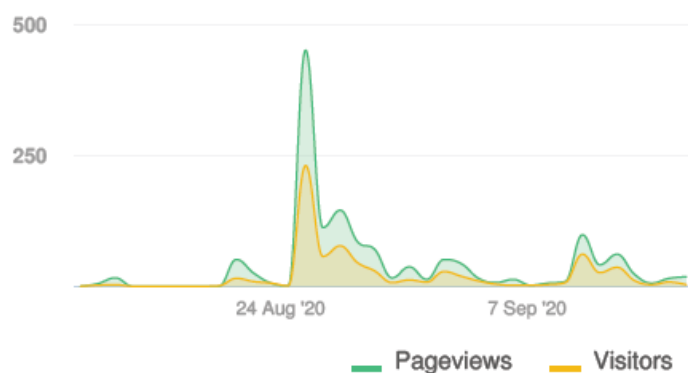
When will Council undertake meaningful investigation, impose science based restrictions and undertake enforcement of it responsibilities?

Attachment 3: Clarence Conversations web page engagement

Project Report:

Clarence Valley Coastline Coastal Management Program

Visitors Summary

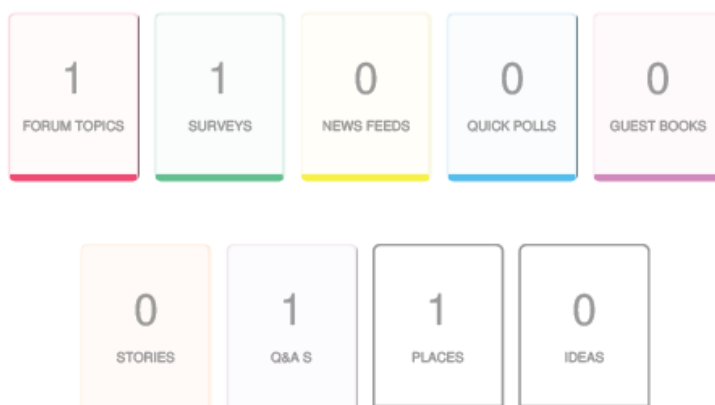


Highlights

TOTAL VISITS	788	MAX VISITORS PER DAY	230
NEW REGISTRATIONS	20	ENGAGED VISITORS	22
		INFORMED VISITORS	193
		AWARE VISITORS	628

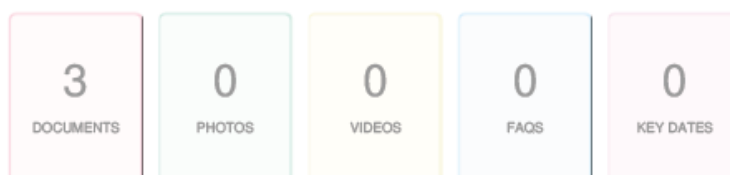
Aware Participants	628	Engaged Participants	22		
Aware Actions Performed	Participants	Engaged Actions Performed	Registered	Unverified	Anonymous
Visited a Project or Tool Page	628				
Informed Participants	193	Contributed on Forums	12	0	0
Informed Actions Performed	Participants	Participated in Surveys	0	0	0
Viewed a video	0	Contributed to Newsfeeds	0	0	0
Viewed a photo	0	Participated in Quick Polls	0	0	0
Downloaded a document	44	Posted on Guestbooks	0	0	0
Visited the Key Dates page	0	Contributed to Stories	0	0	0
Visited an FAQ list Page	0	Asked Questions	5	4	0
Visited Instagram Page	0	Placed Pins on Places	1	0	0
Visited Multiple Project Pages	145	Contributed to Ideas	0	0	0
Contributed to a tool (engaged)	22				

ENGAGEMENT TOOLS SUMMARY



Tool Type	Engagement Tool Name	Tool Status	Visitors	Contributors		
				Registered	Unverified	Anonymous
Forum Topic	Open forum...	Published	90	12	0	0
Qanda	Questions here...	Published	115	5	4	0
Place	Coastline and estuary places that are important to you	Published	3	1	0	0

INFORMATION WIDGET SUMMARY



Widget Type	Engagement Tool Name	Visitors	Views/Downloads
Document	Fact Sheet - Coastal protection works & management-2018-04	27	30
Document	Clarence coastline CMP study area.png	26	26
Document	Overview of coastal management in NSW	13	13
Document	deleted document from	2	2

Open forum...

Contributor	Comments	Comment Details			
		Agrees	Disagrees	Replies	Votes
M.	I would like trawlers to be banned from Lake Wooloweyah	3	0	1	3
Project Team (response to M.)	Thank you for your comments regarding Lake Wooloweyah. This scoping stage of the Coastal Management Program is obtaining issues that the community raise. Your concerns will be included in future stages of the program for discussion and consideration.	0	0	0	0
N.O.	I would like some focus placed upon lake wooloweyah and the loss of seagrass over the last ten years. I would like to know why trawlers are allowed in the lake 2 months prior to being allowed in the river? I'm not against commercial fishing though giving the entire fleet access to the lake in October and November places incredible stress on the shallow lake causing high turbidity levels linked to seagrass loss.	4	0	2	4
Project Team (response to N.O.)	Thank you for your comments regarding Lake Wooloweyah. This scoping stage of the Coastal Management Program is obtaining issues that the community raise. Your concerns will be included in future stages of the program for discussion and consideration.	0	0	0	0
N.	Trawling Lake Wooloweyah must stop they are raping it	2	0	1	2
Project Team (response to N.)	Thank you for your comments regarding Lake Wooloweyah. This scoping stage of the Coastal Management Program is obtaining issues that the community raise. Your concerns will be included in future stages of the program for discussion and consideration.	0	0	0	0
G.L.	I would like to see Council develop a Plan of Management that is based on relevant science and is implemented. Loss of sea grass is a world wide issue and critical in an estuary that is important for fishing. The Lake is less than 1m in depth in most areas and plumes of silt follow in the trawlers wake. Yet for two months all trawlers are concentrated in this area. Water quality plummets cutting off sunlight that is vital to seagrass.	5	0	2	5
Project Team (response to G.L.)	Thank you for your comments regarding Lake Wooloweyah. This scoping stage of the Coastal Management Program is obtaining issues that the community raise. Your concerns will be included in future stages of the program for discussion and consideration.	0	0	0	0

Clarence Valley Coastline CMP Scoping Study - Appendix C: Stage 1 Stakeholder Consultation Activities

Contributor	Comments	Comment Details			
		Agrees	Disagrees	Replies	Votes
C.	Some focus on the issues with the loss of sea grass in the lake would be nice.	4	0	1	4
Project Team (response to C.)	Thank you for your comments regarding sea grass in Lake Wooloweyah. This scoping stage of the Coastal Management Program is obtaining issues that the community raise. Your concerns will be included in future stages of the program for discussion and consideration.	0	0	0	0
P.	According to the scientists that create the magazine Seagrass Watch, lakes such as Wooloweyah are ideal habitats for seagrasses. These seagrasses become the breeding ground for fish, mangroves and much marine life. Seagrasses are very susceptible to water turbidity and urban run-off. I know this from being a nominated seagrass watch volunteer, tracking and studying seagrass for some 18 months in the Hervey Bay region of QLD. Seagrasses are blue carbon repositories. They absorb and hold carbon dioxide from the atmosphere and as such help reduce global warming. Can we afford to allow the raping of our lake to continue by trawlermen/women who care little about seagrasses as they drag their nets across the lake. Lastly, what of the prawns and mullet to name just two species that breed in this lake. When do they get a chance to populate properly with a deminishing food supply due to the lakes muddy depleting flora on its bottom...	2	0	1	2
Project Team (response to P.)	Thank you for your comments regarding sea grass in Lake Wooloweyah. This scoping stage of the Coastal Management Program is obtaining issues that the community raise. Your concerns will be included in future stages of the program for discussion and consideration.	0	0	0	0

Clarence Valley Coastline CMP Scoping Study - Appendix C: Stage 1 Stakeholder Consultation Activities

Contributor	Comments	Comment Details			
		Agrees	Disagrees	Replies	Votes
S.B.	I have lived at Lake Wooloweyah for 20 years and utilised it recreationally for the same period. Anecdotally I have witnessed the loss of minimal seagrass in protected areas not within the reach of trawlers to the eventual decimation of all grasses. The other notable decline has been the oysters that grow on the mangroves in the chanel that intertwine the sand islands of the lake. My observations over the years has noticed some remnants of seagrass in pockets before the start of prawn trawling to no seagrass in those areas by January of that season. Water quality and clarity is a noticeable issue during the trawling season. Sad to sea the demise of this precious natural ecosystem for commercial gain.	1	0	1	1
Project Team (response to S.B.)	Thank you for your comments regarding sea grass in Lake Wooloweyah. This scoping stage of the Coastal Management Program is obtaining issues that the community raise. Your concerns will be included in future stages of the program for discussion and consideration.	0	0	0	0
M.F.	Dear council, i hope you are local then you would understand. I used to fish and explore the magnificent wonders of the lake in wooloweyah as a kid to now. When i was 16 it was alot easier to catch dinner. Nowadays going to the same places doong the same tricks its hard and alot of the time nothing. I dont see the whiting jump like they used to. If youve spent time in the lake its very clear somethings changing the while ecosystem. I feel fignusted when i see trawlers tearing up the bottom.... I feel terrible when i drive my boat up palmers channel and count over 30 commercial vessels big and small. Im not a expert but i know how much its changed in my short time, i am 26 now. Ten years and its gone from great to horrible embarrassing to see the same terrible fishing and leases are granted. Will we stop it when there is no life left?	1	0	1	1
Project Team (response to M.F.)	Thank you for your comments regarding Lake Wooloweyah. This scoping stage of the Coastal Management Program is obtaining issues that the community raise. Your concerns will be included in future stages of the program for discussion and consideration.	0	0	0	0

Clarence Valley Coastline CMP Scoping Study - Appendix C: Stage 1 Stakeholder Consultation Activities

Contributor	Comments	Comment Details			
		Agrees	Disagrees	Replies	Votes
F.F.	Wooloweyah Lake will provide enhanced breeding conditions for the estuary as a whole if managed appropriately. Consideration should not only be given to numbers of trawlers and the season length, but also to 'zoning' which allows for selective management of all fishing practises throughout the complex range of habitat areas.	0	0	1	0
Project Team (response to F.F.)	Thank you for your comments regarding Lake Wooloweyah. This scoping stage of the Coastal Management Program is obtaining issues that the community raise. Your concerns will be included in future stages of the program for discussion and consideration.	0	0	0	0

Q and A

Q&A Question	Contributor	Admin Response Details	
		Response Type	Admin Response
When will the Angourie to Shelley Headland walking track be completed, specifically the Mara Creek bridge?	Nick	Private Answer	Hi Nick, the advice from NPWS is that the track and bridge should be complete in the new year, hopefully around February. Peter
When does free camping stop .? Why isnt their proper designated places for free campers . When do reserves get better protection for local wildlife ? When will the no camping signs go back up ?	Meichelle.	Private Answer	Hi Meichelle, Council has freedom camp working party considering issues, from the working party the 'no parking' signs have been implemented in high impact areas, and two additional rangers employed to assist in the management. Council resolved to exclude Freedom camp locations within 10km of coastline due to sufficient cover of holiday parks, locations are available at Maclean, Lawrence, Grafton. If you require further information please contact David Sutton at Council, 6643 0200. Peter
Lake Wooloweyah....how can we better rehabilitate the health of the lake. ?Noted degradation and loss of sea grass beds over the past 25 years.	Gillian	Private Answer	Thank you for your comments regarding sea grass in Lake Wooloweyah. This scoping stage of the Coastal Management Program is obtaining issues that the community raise. Your concerns will be included in future stages of the program for discussion and consideration.
Why wasn't there a impact study done on the brooms head beach before all the rock was dumped to form a wall, all it's done is caused more erosion to the beach causing huge problems for boats launching and retrieving when all the rock is exposed surely there could have been a better way. The parking bay at the ramp is totally inadequate if parked with a boat trailer on the trailer sticks out over the road so it's rendered useless for that purpose	Dean	Private Answer	Hi Dean, There have been a number of different studies and engineering designs completed for the rock wall at Brooms Head. Erosion will tend to occur wherever the wall terminates, unfortunately due to the high costs of construction, these walls are typically done in stages. I've passed on your comments regarding the parking bay. Peter.

Clarence Valley Coastline CMP Scoping Study - Appendix C: Stage 1 Stakeholder Consultation Activities

Q&A Question	Contributor	Admin Response Details	
		Response Type	Admin Response
Why doesn't Brooms Head have the proper boat launching facilities as other places in the Clarence Valley	Dean	Private Answer	Hi Dean, there are launching facilities available at Brooms Head. The water conditions limit the type of facilities suitable for the site. Peter
Dear CVC, I have moved to live in Wooloweyah from Victoria 20 months ago and have watched with amazement that prawn trawlers have been working within 200m of the Wooloweyah lake foreshore (I have pictures if you need evidence). I have noticed very turbid water conditions after they passed. In Corio bay (Geelong) where I lived this sort of fishing was banned and now the seagrass beds are returning to their natural state with mussel and oyster farming now flourishing. I cannot understand why it is still going on so close to such a beautiful village Commercial Scallop 2018 - fish.gov.au https://www.fish.gov.au/report/162-Commercial-Scallop-2018 Dredging for Commercial Scallops in Port Phillip Bay ceased in 1997. A single licence was issued for the take of Commercial Scallop in a new Port Phillip Bay Dive Scallop Fishery in 2013. A survey conducted in 2014 estimated that the total harvestable biomass of Commercial Scallops within fishable areas of Port Phillip Bay was 3 629 t [DEPI 2014].	Craig	Private Answer	Thank you for your comments regarding sea grass in Lake Wooloweyah. This scoping stage of the Coastal Management Program is obtaining issues that the community raise. Your concerns will be included in future stages of the program for discussion and consideration.
I'd love to complete the survey but there is no link on this page	Alan	Public Answer	The survey link is at the end of the introductory text. You may need to click on 'continue reading' if all the text is not showing, Or try this link Survey.
I think NSNPs have missed a huge opportunity post the Bushfires particularly in Yuragyr National Park. An amazing opportunity to communicate and engage – update the community on plans, timeframes, resilience measures etc, yet one year on zero communication, zero updates, zero plans, zero timeframes, everything simply remains closed without comment.	George	Private Answer	Hi George, This is probably a matter you could take up directly with NPWS. Peter

Q&A Question	Contributor	Admin Response Details	
		Response Type	Admin Response
I think NSWNP's have missed a huge opportunity post the Bushfires particularly in Yuragyr National Park. An amazing opportunity to communicate and engage – update the community on plans, ask for input, timeframes, resilience measures etc, yet one year on zero communication, zero updates, zero plans, zero timeframes, everything simply remains closed without comment.	George	Private Answer	Hi George, you should speak directly with NPWS regarding your concerns. Peter
Boat launching facilities at Brooms head I know there is a ramp there but how come we don't have a proper deep water launching area so damage is prevented from launching around rock when there is no sand on the beach and at Christmas holidays when there are people swimming in the area of launching and retrieving your boat it adds to a predicament that's going to cause problems some one will end up getting injured or seriously hurt .	Dean	Private Answer	Hi Dean, If you would like to discuss further or have an idea how we could build a deep water launching area on the beach, please give me a call on 6641 7358. Peter
Wooloweyah Lagoon has a management plan that needs renewing. There are many significant issues effecting the health of this important system of the Clarence. Will lumping the lagoon in with the whole coastal plan mean even less gets done to protect our waterways.	Ros	Public Answer	Thank you for your question. The NSW coastal management legislation requires prioritisation of all issues and management responses across the LGA. Council will prepare a Scoping Study for the remainder of Clarence River estuary in 2021. The resulting issues and actions across the LGA coast and estuaries will then be prioritised. Wooloweyah Lagoon is included in this Scoping Study due to the significant community interest at this time.

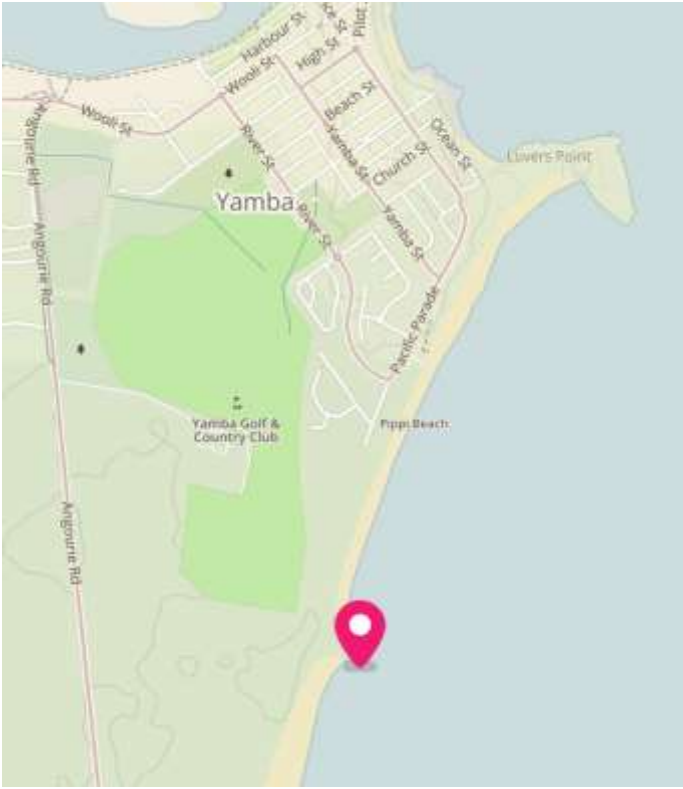
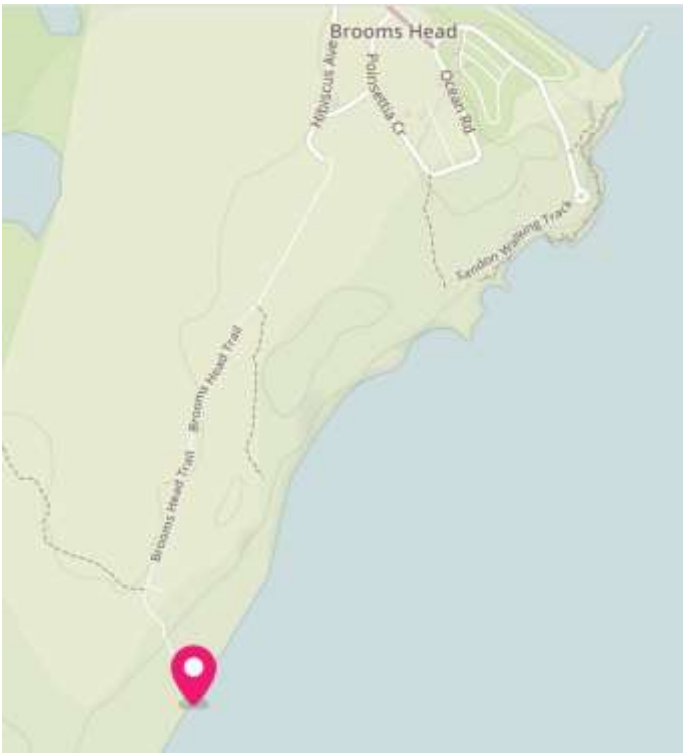
Clarence Valley Coastline CMP Scoping Study - Appendix C: Stage 1 Stakeholder Consultation Activities

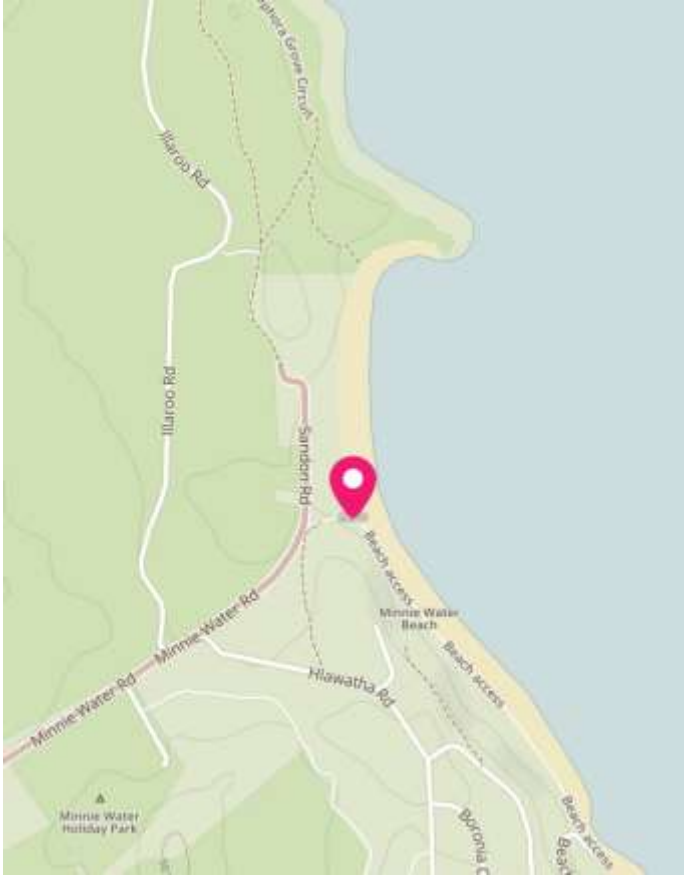
Q&A Question	Contributor	Admin Response Details	
		Response Type	Admin Response
Why is there absolutely zero patrols of campers in the national park? Back beach carpark, Green point, The point and Spooky beach just to name a few, are regularly camped at, which wouldn't necessarily be a problem, however, the horrific state it's left in is a huge problem. Garbage and faeces is regularly left everywhere. As a local, I am yet to ever see, or hear of anyone seeing any employee of council managing these areas. Please advise why this is STILL an ongoing issue? Why is there not simply a camera at the entrance and exit to charge campers, if you're not going to ensure patrols? There are a variety of simple and affordable options, why have none been actioned?	Rose	Private Answer	Council's Open Spaces section have provided the following in relation to your inquiry. Angourie back beach car park and the National Park is managed by the NSW National Parks and Wildlife Service, please contact this land manager for information on what actions they are implementing to manage camping, garbage and faeces in these areas. These issues will be acknowledged in the CMP Scoping Study. No Parking signage has been installed and pre-dawn patrols are being undertaken by Council rangers at Green Point, Angourie Point, and Spooky Beach. From the implementation of the management approach a number of parking infringement notices have been issued. The patrols occur sporadically and unannounced in response to observations of vehicles parking contrary to the 'no parking' signage. Due to safety of our staff the occupants of the vehicles are not disturbed and no physical ticket left. We have found that patrols have been effective in limiting numbers but not completely prohibiting the activity, in response Council has endorsed the employment of 3 additional Rangers to increase our capacity to undertake patrols. We hope with additional resources we may be able to further limit the activity to manage camping, garbage and faeces in these areas.

Coastline and estuary places that are important to you...

Contributor	Comment
Reece	issue with illegal camping on beach - need regular Ranger patrols



Contributor	Comment
Reece	issue of illegal access onto beach through Ngaru Village
	 A map of the Yamba coastal area. The map shows several streets including Harbour St, Wood St, High St, Beach St, Church St, Ocean St, Yamba St, and Pacific Parade. A large green area represents the Yamba Golf & Country Club. A red location pin is placed on the beach near the intersection of Pacific Parade and the coastline. Other labels include Lovers Point and Pippa Beach.
Reece	issue of erosion caused by inappropriate vehicle access
	 A map of the Brooms Head coastal area. The map shows streets including Hibiscus Ave, Polaris Ct, and Ocean Rd. A red location pin is placed on the beach near the intersection of Hibiscus Ave and the coastline. Other labels include Brooms Head Trail, Brooms Head Trail, and Enderby Walking Track.

Contributor	Comment
Reece	issue of erosion in front of surf club
 This map shows the coastline of Minnie Water. Roads labeled include Illaroo Rd, Sinden Rd, Minnie Water Rd, and Hiawatha Rd. A red pin is placed on the beach area near Sinden Rd, indicating a location of concern for erosion. Other features include Minnie Water Holiday Park, Minnie Water Beach, and several beach access points. The terrain is shown with green for land and blue for water.	
Reece	issue of erosion along access points to the river
 This map shows a section of the coastline with a river. A red pin is placed on the bank near a road labeled 'S. Telford' and 'Volunteer Marine Reserve'. The map also shows 'Minnie Water River' and 'Minnie Water River' flowing into the sea. The terrain is shown with green for land and blue for water.	

Attachment 4: Stakeholder contact register

Clarence Valley Coastline Coastal Management Program Scoping Study: Stakeholder Register

Organisation	Contact Name	Position	Response received	Summary of response	Other correspondence
Local Government					
Richmond Valley Council	Craig Rideout		20/8/20	Craig is the appropriate contact. RVC has not committed to doing anything more on the Evans Head CZMP as the old plan experienced difficulties in seeking to get Ministerial certification of the Plan. The (true) southern extent is National Park and it is unlikely RVC would investigate the southernmost 17km of coastline. <u>There is a component in the EH CZMP which has mapped likely future coastal hazard in the township.</u>	
Coffs Harbour City Council	Kyran Crane	Coast and Environment Officer	20/08/2020	No activities within study area, just share sediment compartment. Priorities include environmental protection in line with the objectives of CHCCs developing CMPs. Key values include water quality, biodiversity, catchment coast, coast and estuary health, recreational enjoyment, commercial interests. Issues that need to be addressed include catchment land use (impacting WQ), bank erosion, unsealed roads in catchment, urbanisation in environmentally sensitive areas, climate change mitigation.	
NSW Government					
National Parks and Wildlife Service	John Kennedy	Team Leader - Rangers Clarence Area	27/8/20	Provided status of actions from CMPs, PoM status, discussion of issues with 4WD access	
DPIE-Fisheries	Jonathan Yantsch	Fisheries Manager, Aquatic Ecosystems (North Coast)		Response from Fisheries in David Greenhalgh email 3/9/20. Outlined Fisheries responsibilities under FM Act and MEM Act, key fish habitat and Marine Park, priority is conservation of key fish habitat and to maintain or improve marine biodiversity within the SIMP. Identified high priority threats within the study area from MEMS and other issues to be addressed in the CMP. See also estuary general fishery restrictions/regs https://www.dpi.nsw.gov.au/fishing/closures/commercial/estuary-general-fishery-closures/clarence-river2 <u>Suggested contacting Darren Hale re commercial trawling</u>	Also info from Darren Hayle re Lake Wooloweyah fishery.
DPIE-Fisheries (SIMP)	David Greenhalgh	Project Officer - Marine Assessments	19/8/2020	Provided status of actions from existing plans. Advised he has nothing more to add over and above what was discussed during CEMC meeting and site visit. See combined response from DPI	
DPIE-Fisheries (SIMP)	Nicole Strehling	Manager Solitary Islands Marine Park	-		
Transport for NSW - Roads and Maritime (boating safety)	Anna Sedlak	Boating Safety Office	9/11/2020	email from Regional Manager Northern. outlines TfNSW Maritime role and local considerations. Refer also https://www.sydneycostalouncils.com.au/wp-content/uploads/2020/03/FAQ-local-government.pdf	
Transport for NSW	Fiona Gaffney		-		
Transport for NSW	Luke Tucker	Boating Safety Officer	-		
Port Authority	Michael Read	Marine Pilot Regional	9/04/2020	Letter in email from Jagjeet Shergill. Requested clarification of CR estuary and sedimentation at bar. RC responded 7/9/20	
DPIE - Crown Lands	Derek van Leest	Team Leader	-		
DPIE - Crown Lands	Catherine Knight	Coastal management specialist		email received 4/9 - no formal response but happy to help where required.	contacted CK 4/9. hadn't read email but will respond with others in Crown Lands. Dave Hopper now at MIDO (seawalls and dredging etc)
DPIE - Crown Lands	Silas Sutherland	Manager North Coast Region	-		
Local Land Services	Nigel Blake	Senior Land Services Officer	29/09/2020	No input to offer. The area and issues are outside LLS core business.	
NSW Forestry Corporation	Peter Walsh	Soil and Water Specialist	4/09/2020	Letter from Elizabeth Fowler (email)	Map emailed 14/08/2020
Heritage NSW (Dept Premier and Cabinet)			28/8/20	Suggested interested parties - see also email from Leeanne Kennedy, CVC 4/9/20	
Aboriginal Groups					
Yaegl Traditional Owners Aboriginal Corporation	Dianne Chapman		-		Followed up 27/8. Response coming from NTS Corp. Called again 28/9/20 and left message with Lance to pass on to Dianne. CVC (Leeanne Kennedy) also emailed YTOAC 20/10/20.
NTSCorp	George Tonna	Land Tenure and Notifications Officer	-		
Birrigan Gargle LALC			13/08/2020		Emailed 29/9 requesting info on regen site and offering to meet up.
Yaegl LALC	Noeline Kapeen		-		
Grafton-Ngerrie LALC			-		
Bayrulgil Square Cooperative Society	Scott Monaghan		-		Letter posted
Burra Waj Ad	Dave Walker		-		Letter posted
Durahrwa Training and Development Corporation	Andrew Hegedus		-		Letter posted
Ulungundahi Art and Culture Gallery			-		Letter posted
Wdjri Myral Elders Aboriginal Corporation			-		Letter posted
Yurrandgi	Marcelle and Anthony Tonkin		-		

Clarence Valley Coastline Coastal Management Program Scoping Study: Stakeholder Register

Organisation	Contact Name	Position	Response received	Summary of response	Other correspondence
Industry Groups					
Clarence River Fishermens Cooperative	Danielle Adams	General Manager	-		Follow-up phone call and email 6/11/20. No response
Clarence Canegrowers	Peter Rose	Industry Representative	4/09/2020	Email/letter from Brendan Reeves (office@). Activities and roles, priorities and management approach	
Clarence Canegrowers			-		
Community Groups/Representatives					
CEMC rep (Angourie)	Imelda Jennings		-		
CEMC rep (Gulmurrad)	Peter Maslen		-		
CEMC rep (Brooms Head)	Kevin Sheehan		-		
CEMC rep (Harwood Marine)	Ross Roberts		-		
CEMC rep (Councillor)	Greg Clancy		-		
Clarence Valley Conservation Coalition			-		
Clarence Landcare	Debbie Repschlager	Coordinator	-		
Clarence Valley Conservation in Action	Jan Armstrong		13/08/2020	Interest in wetlands, impacts of land development and rubbish, cane toads	
Sandon River Environmental Alliance	Brian & Sue Whitelaw		-		
Wooli Dunecare	Nick Hill		-		
Wooloweyah Landcare	Carolyn Eddy		-		
Iluka Landcare	David Lohde		-		
Angourie Community Coastcare	John Webber		-		
Brooms Head Landcare	Rhonda Tetley		-		
Diggers Camp Dunecare	Rhonda James		-		
Yamba Landcare	Barbara Whale		-		
Yuraygir Landcare	Dennis Milne		-		
Yamba Surf Lifesaving Club		Secretary	-		
Angourie Boardriders			-		
Valley Watch	Ros Woodward		-		
Protect Wooli	Bruce Bird	President	27/8/20	Main issues in email - sand sourcing, storm response, access repairs	
Protect Wooli	Peter Dunn	Vice President	27/8/20		
Marine Rescue	Iluka Yamba		-		
Marine Rescue SES	Wooli Mark Somers	Deputy Commander Northern Zone	-		
Yamba District Chamber of Commerce			-		
Iluka Chamber of Commerce			-		
Wooli Chamber of Commerce			-		
Ratepayers Association of Iluka			-		
Yamba Triathlon			-		
Grafton District Anglers Club			-		
Port of Yamba Yacht Club			-		

Attachment 5: Written responses

OUR REF: C20/513

3 August 2020

Ms Robyn Campbell
Hydrosphere Consulting
PO Box 7059
BALLINA NSW 2478
Via email: robyn@hydrosphere.com.au

Dear Ms Campbell

Re: DPI Fisheries input into the Clarence Valley Coastline Coastal Management Program Scoping Study

I refer to your letter of 12 August 2020 seeking input from DPI Fisheries on the development of the Clarence Valley Coastline Coastal Management Program (CMP) Scoping Study.

DPI Fisheries administers the *Fisheries Management Act 1994* (FM Act) and is responsible for ensuring that fish stocks are conserved and that there is “no net loss” of key fish habitats upon which they depend. Consistent with those objectives, DPI Fisheries is also responsible for promoting viable commercial fishing and aquaculture industries, quality recreational fishing opportunities and the continuation of Aboriginal cultural fishing.

DPI Fisheries also administers the *Marine Estate Management Act (MEMA) 2014*. The act provides for the strategic and integrated management of the whole marine estate which includes marine waters, coasts and estuaries. It does this by:

- Management of the marine estate consistent with the principles of ecologically sustainable development;
- Facilitating the maintenance of ecological integrity, and economic, social, cultural and scientific opportunities;
- Providing for a comprehensive system of marine parks and aquatic reserves.

The Act is supported by regulations that set out the rules for managing the marine estate and marine parks, and an aquatic reserve notification is in place with management rules for aquatic reserves:

Key fish habitat and the Solitary Islands Marine Park

Key fish habitat is defined within the DPI Fisheries *Policy and guidelines for fish habitat conservation and management (Update 2013)* (DPI Fisheries P&G) (http://www.dpi.nsw.gov.au/data/assets/pdf_file/0005/634694/Policy-and-guidelines-for-fish-habitat.pdf). With respect to the area encompassed by the proposed scoping study (the study area), key fish habitat includes all tidal land below highest astronomical tide; rivers, estuaries and ICOLLS; Coastal Wetlands; marine vegetation; and the freshwater water bodies of Minnie Water and Lake Hiawatha.

Key fish habitats are those habitats that are crucial to the survival of native fish stocks. The abundance and diversity of fisheries resources, including key fish habitat, are subject to

both aquatic and terrestrial influences. Some, like cycles of flood and drought, are natural processes whereas others are the result of human activity. The degradation of aquatic habitat is a major threat to the abundance and diversity of native fishes in NSW. As such, a primary objective for conserving fish stocks is to conserve the habitats that fish are dependent upon for survival. A priority of DPI Fisheries for this Coastal Management Program will be for the conservation of key fish habitats.

The study area also encompasses the Solitary Island Marine Park (SIMP) which extends along the coastline from Muttonbird Island in the south to Plover Island in the north. It includes the tidal reaches of estuaries and seaward to the 3 nautical mile mark offshore. The park only includes tidal water over Crown Land estate and does not include tidal waters located above private title. As such, a priority for DPI Fisheries for this Coastal Management Program will be to maintain or improve marine biodiversity within the SIMP by ensuring healthy riparian vegetation, good water quality and healthy marine vegetation are maintained or improved.

Key issues within the study area

DPI Fisheries partners with other agencies in working toward achieving the NSW State Government's vision for the NSW marine estate, that being:

"A healthy coast and sea, managed for the greatest wellbeing of the community, now and into the future."

To achieve this, the NSW Government released the NSW Marine Estate Management Strategy 2018-2028 (MEMS) (<https://www.marine.nsw.gov.au/marine-estate-programs/marine-estate-management-strategy>). DPI Fisheries and other government agencies are currently working on a range of projects, under the nine initiatives of MEMS, to address priority threats and risks to the environmental assets and the social, cultural and economic benefits that are derived from the marine estate.

Priority threats to the marine estate have been identified through a rigorous threat and risk assessment (TARA) process (<https://www.marine.nsw.gov.au/marine-estate-programs/threat-and-risk-assessment>), and these priority threats and risks, and the projects being undertaken to address these threats and risks, should be considered during the development of the subject CMP.

Some of the high priority threats within the subject area include:

- Urban stormwater discharge, agricultural diffuse source run-off and other sources of water pollution;
- Estuary entrance modifications (particularly within ICOLLs);
- Clearing of riparian and adjacent habitat including wetland drainage; and
- Climate change stressors.

For further information on the nine initiatives and the various project being undertaken under these initiatives, please visit the NSW Marine Estate web page:

<https://www.marine.nsw.gov.au/marine-estate-programs/marine-estate-management-strategy>.

Other specific issues that require consideration as part of the CMP development include:

- Foreshore bank erosion within estuaries and the need to utilise softer, more environmentally sympathetic designs to address erosion.

- Beach erosion on Woolli Beach and methods of protecting the village of Woolli from coastal processes.
- Isolated pockets of erosion such as Woolli Woolli River downstream of the boat ramp, Sandon Village, Nip Welsh Park and Diggers Camp Beach.
- Apparent decline in sea grass, particularly in the Sandon River and possibly the Woolli Woolli River.
- Damage to mangroves along the Woolli Woolli River where mangroves are removed to improve views and to access boat moorings, and where mangroves are damaged as a result of small boats being dragged through the intertidal zone to the foreshore.
- Responsibility for managing whale carcasses.

DPI Fisheries looks forward to working with Hydrosphere and Clarence Valley Council on the development of the CMP.

If you have any further enquiries please contact me on 02 6626 1375 or jonathan.yantsch@dpi.nsw.gov.au.

Yours sincerely



Jonathan Yantsch
Fisheries Manager, Coastal Systems (North Coast)
Aquatic Environment, Primary Industries NSW

11 September 2020
Our Ref: OTS20/06684

Ms Robyn Campbell
Project Manager
Hydrosphere Consulting

robyn@hydrosphere.com.au

Dear Ms Campbell

Transport for NSW's submission on the Clarence Valley Coastline Coastal Management Program Scoping Study.

Transport for NSW (TfNSW) welcomes the opportunity to comment on the Clarence Valley Coastline Coastal Management Program (CMP) Scoping Study.

As part of the CMP process, we wish to highlight our broad range of functions and responsibilities to promote safe, responsible and sustainable use of NSW waterways as set out by the legislations.

TfNSW's maritime role

Transport for NSW leads the development of a safe, efficient, integrated transport system that keeps people and goods moving, connects communities, and shapes the future of our cities, centres and regions.

This includes initiatives to improve waterway safety, access and sustainability for all NSW waterway users. Our approach is articulated through the NSW Government's Maritime Safety Plan 2017-2021, Maritime Infrastructure Plan 2019-2024 and Marine Estate Management Strategy 2018-2028.

TfNSW regulates navigable waterways in NSW which includes matter such as:

- infrastructure planning and funding through grant programs such as Boating Now
- on-water compliance and enforcement
- on-water management and consulting with users on proposed changes
- dredging
- managing hazards and obstructions
- improving amenity
- managing environmental impact of boating activity
- managing conflicting activities

We work closely with NSW Government agencies to ensure a coordinated approach to management of the NSW marine estate. As a statutory member of the Marine Estate Management Authority that is responsible for the *Marine Estate Management Act 2014*, we have shared responsibilities to deliver the statewide [Marine Estate Management Strategy 2018-2028](#) (the Strategy).

Local government authorities are strongly encouraged to consider initiatives outlined in the Strategy when developing CMPs using the [one page guide - Ideas for integrating the NSW Marine Estate Management Strategy with your Coastal Management Program](#), and the [Marine Estate Management Strategy FAQ for local government](#).

Local considerations

As the managing authority for the NSW Government's maritime infrastructure, TfNSW's portfolio include Yamba and Iluka coastal harbours, the Clarence River and Wooli River breakwaters, and training walls within the scoping study area. In particular, TfNSW has a significant role in informing, supporting and promoting safe, responsible and sustainable use on NSW waterways, and this includes the Clarence Valley Coastline.

We are committed to working with local councils to promote safe and sustainable waterway usage in line with community expectations, and support sharing waterways with the existing and emerging users.

TfNSW also operates and maintains ferries at Ulmarra and Lawrence, which are dry docked periodically for maintenance at Ashby Dry Dock.

There are also several bridge assets within the Clarence Valley lower river systems that are operated and maintained by TfNSW. The more significant of these bridge structures are located at Grafton, Maclean, Harwood and Mororo.

We have the expertise and adopt an evidence-based approach to identify areas of concern, potential hazards, and implement strategies to minimise impacts on access and safe navigation. We also provide advice on usage and planning, as well as technical support and guidance for boating infrastructure projects and other maritime facilities.

TfNSW supports consultation with the traditional landowners as part of the CMP development process.

TfNSW requests the opportunity to provide comment and input throughout the CMP process. Please refer correspondence to Vicky Sisson as the main point of contact.

Yours sincerely



Vicky Sisson
Director Northern Region
Regional and Outer Metropolitan
Transport for NSW

FREQUENTLY ASKED QUESTIONS FOR LOCAL GOVERNMENT

Marine Estate Management Strategy FAQ for local government

Marine Estate Management Authority

WHAT IS THE MARINE ESTATE?

The marine estate is all coastal waters of NSW from the Queensland border to the Victorian border and out to three nautical miles. It includes estuaries to their tidal limits, coastal wetlands and lands immediately adjacent to, or in the immediate proximity of NSW coastal waters including beaches, dunes, headlands and rock platforms.

WHAT IS THE MARINE ESTATE MANAGEMENT STRATEGY?

The [Marine Estate Management Strategy](#) (Strategy) is a framework for the NSW Government to coordinate the management of the marine estate over the next ten years. The Strategy identifies actions to address [statewide priority threats](#) to the marine estate. The NSW Government has allocated \$45.7 million to implement Stage 1 of the Strategy in the first two years.

The Marine Estate Management Authority (the Authority) is comprised of four agencies with responsibilities in marine estate management: Department of Primary Industries (DPI); Department of Planning, Industry and Environment – Energy, Environment and Science (DPIE-EES); Department of Planning, Industry and Environment – Planning and Assessment (DPIE-PA); and Transport for NSW (TfNSW).

The Authority developed the Strategy following significant input from stakeholders, including local government, peak interest groups and the broader community. Some MEMS actions will occur in specific locations along the coast such as natural oyster reef restoration in Port Stephens. Other actions will have benefits across NSW, such as a Marine Estate Education Strategy or the application of a risk-based framework for water quality in estuaries.

HOW HAS LOCAL GOVERNMENT BEEN INVOLVED IN DEVELOPING THE STRATEGY?

The Authority has engaged with local councils since the early stages of the development of the Strategy. Many councils are also actively engaged in delivering the actions. The Authority sought feedback from councils in:

- 2014 - to inform the draft statewide threat and risk assessment (TARA) and potential management responses in the Strategy
- early 2017 - on the draft TARA itself
- mid-2017 - on the development of the draft Strategy
- late 2017 - on the draft Strategy itself.

Since its release in August 2018, staff implementing the Strategy, have been liaising with council staff to identify partnerships, plan projects and ensure they are relevant to, and complement council programs where possible.

DOES THE STRATEGY HAVE FUNDING FOR LOCAL GOVERNMENT PROJECTS?

The Strategy Stage 1 is not a grants program and therefore local councils cannot apply directly for funding under the Strategy actions (the exception is the Boating Now Program in Initiative 7, as Transport for NSW provides funding to Councils for the delivery of maritime infrastructure via a grants program).

Council input into the development of the Strategy has helped the Authority identify actions to address the statewide priority threats. These actions are included in the Strategy, and are being delivered, or will be delivered, in partnership with local government.

The Authority will work with councils to identify how each council's future work programs (via Coastal Management Programs currently under development) aligns with the Strategy. This will help the Authority to develop and implement collaborative projects for the Strategy in Stage 2.

HOW AND WHERE IS THE STRATEGY BEING IMPLEMENTED?

The [Implementation Plan](#) for Stage 1 (to June 2020) outlines how the NSW Government will deliver the initiatives and actions in a coordinated and streamlined way. You can also view a [map](#) of current projects in each local government area.

HOW DOES THE STRATEGY AND TARA LINK WITH COASTAL MANAGEMENT PROGRAMS?

Council Coastal Management Programs (CMPs) are strongly aligned with improving outcomes for the marine estate. CMPs are required to support the objectives of the *Marine Estate Management Act 2014*. The development and implementation of the Strategy and CMPs are bound by legislation and both rely on a risk-based approach (Figure 1). As councils develop their CMPs through their five stages (Figure 2), they should consider:

- the [TARA](#) - which is a key resource for considering priority threats on estuaries and coastal and marine areas during preparation of CMP Scoping Studies

- aligning CMP actions with the initiatives and actions in the Strategy
- outcomes and key learnings from projects piloted in Strategy Stage 1 to help inform the design and implementation of local management actions (including those in CMPs)
- data collected to monitor and evaluate Strategy outcomes (for example water quality data) which can inform CMP delivery.

WHO CAN I CONTACT FOR MORE INFORMATION?

Authority agency representatives are located in four coastal regions along the NSW coast. For more information on how to integrate Strategy actions into CMPs your first point of contact is your nearest regional Authority agency representative (Figure 3).

If you require information, please contact the program leaders:

- Nicola Johnstone, DPI (Strategy)
nicola.johnstone@dpi.nsw.gov.au
- Louisa Clark, DPIE – EES (Strategy)
louisa.clark@environment.nsw.gov.au
- Michelle Fletcher, DPIE – EES (CMPs)
michelle.fletcher@environment.nsw.gov.au

Strategy and CMPs are bound by legislation

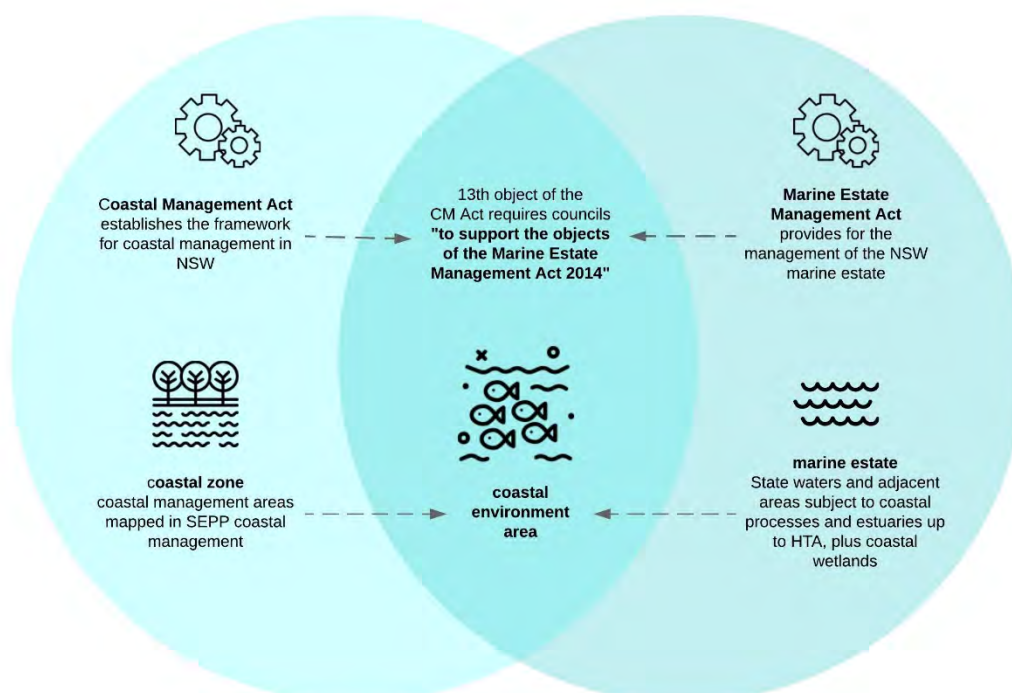


Figure 1. The Strategy and CMPs are bound by legislation



Ideas for integrating the NSW Marine Estate Management Strategy with your Coastal Management Program



1. Scoping

- Consider regional priority threats from the TARA in first pass risk assessment
- Refer to TARA evidence base and background reports to inform knowledge gaps
- Include MEMA public authorities in your stakeholder engagement strategy
- Link with relevant pilot studies / initiatives



2. Determine risks, vulnerabilities and opportunities

- Where sensible, use consistent terminology for threat, value and benefit categories to the TARA
- Consider using / modifying likelihood, consequence and tolerance tables adopted in the TARA
- Link with relevant pilot studies / initiatives (see, for example: [this infographic](#))



3. Identify and evaluate options

- Consider feasibility, viability and acceptability of MEM Strategy actions for inclusion in your CMP
- Review progress and outcomes of pilot studies undertaken elsewhere that relate to your priority threats
- Look for other opportunities to integrate with MEM Strategy



4. Prepare, exhibit, finalise and adopt the CMP

- Document partnerships with MEMA Agencies
- Submit CMP for certification (Minister may seek advice by NSW Coastal Council that includes MEEKP Reps)



5. Implement, monitor, evaluate and report

- Integrate with MEM Strategy monitoring happening in your area
- Public Authorities (including those represented on MEMA) to have regard to certified CMPs
- MEM strategy actions that also are included in CMPs may be eligible for coastal program grants



Acronyms and Links

CMP - Coastal Management Program
<https://www.environment.nsw.gov.au/topics/water/coasts/coastal-management/framework>

MEEKP - Marine Estate Knowledge Panel

MEMA - Marine Estate Management Authority

TARA - Threat and Risk Assessment
<https://www.marine.nsw.gov.au/key-initiatives/threat-and-risk-assessment>

Figure 2. Integrating the Strategy with CMPs

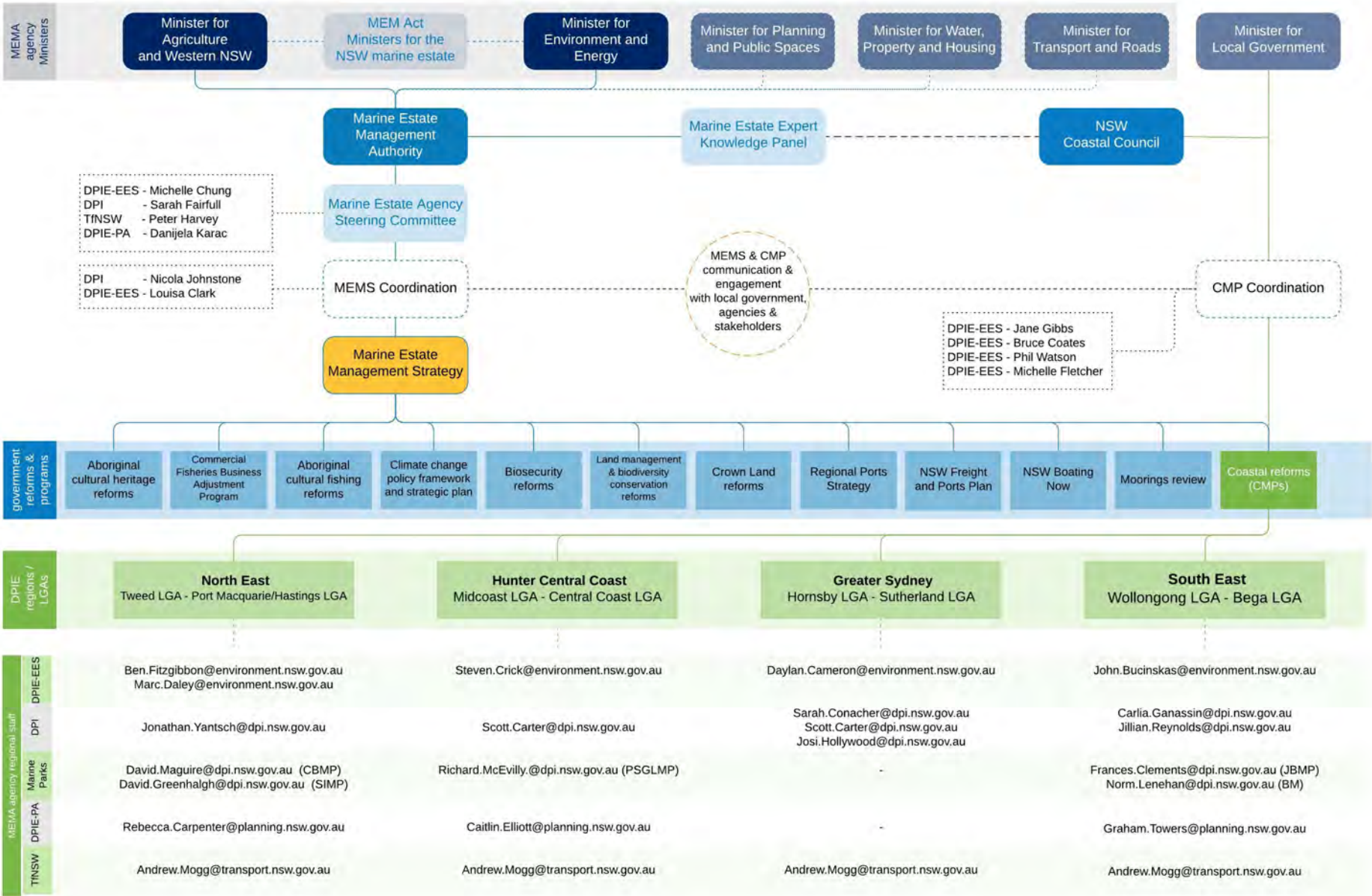
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Disclaimer: The information contained in this publication is based on knowledge and understanding at the time of writing (May 2019). However, because of advances in knowledge, users are reminded of the need to ensure that information upon which they rely is up to date and to check currency of the information with the appropriate officer of the Department of Primary Industries or the user's independent adviser.

Strategy and CMP integration

Figure 3. Strategy and CMP integration and contacts



F2020/00439

Clarence Valley Coastline Scoping Study Team
Hydrosphere Consulting
PO Box 7059
Ballina NSW 2478

robyn@hydrosphere.com.au

Dear Ms Campbell

Thank you for the opportunity to engage with Clarence Valley Shire Council's Coastal Management Program. Forestry Corporation of NSW (Forestry Corporation) has a range of measures and programs in place to protect catchment values in coastal State forests and I have provided some background on these below.

The protection of catchment values when harvesting occurs in coastal State forests is maintained through the operation of the Coastal Integrated Forestry Operations Approvals (CIFOA) granted under the *Forestry Act 2012*.

Planning for harvesting operations is carried out in accordance with the requirements of the CIFOA which is administered by the Environment Protection Authority (EPA). Through the CIFOAs, harvesting is strictly regulated under an approval which prescribes the conditions under which harvesting and roading operations may be carried out so as to mitigate soil erosion and to protect the aquatic environment from pollution. It is based on empirical evidence drawn from scientific studies throughout the world as well as a number of catchment studies carried out within the coastal strip of NSW. Its efficacy is tested through regular auditing by the EPA and Forestry Corporation.

In addition, there is also a large body of scientific evidence from both Australia and overseas that shows that timber harvesting which complies with environmental protection prescriptions poses a much lower risk to water quality than many other land uses.

Forestry Corporation has adapted its forest management techniques to reflect world's best practice. It has done this by implementing management practices shown to be effective through research by organisations such as the Cooperative Research Centre (CRC) for Catchment Hydrology (now E-Water CRC), CSIRO and universities. In addition, as part of a continuous improvement framework, Forestry Corporation is committed to monitoring the effects that its activities may have on the environment, including aquatic habitats and water sources.

Consistent with both their management objectives and the relevant environmental legislation, Forestry Corporation has put in place a comprehensive, mandatory water quality monitoring program in a selected sample of NSW native forests. The aim of the water quality monitoring program is to determine whether licensed forestry activities have an identifiable impact on water quality and if so, to quantify the level of that impact. Results of the program have consistently shown that Forestry Corporation's activities do not have a significant adverse impact on water quality, and that the likelihood of impacts is greatly reduced in catchments where timber harvesting is conducted on only a small proportion of the catchment at any time.

Further, Forestry Corporation has implemented procedures and systems as part of its Environmental Management System (EMS) and has received independent certification (ISO 14001), a measure of world's best practice. Part of the EMS involves the auditing of various elements, especially targeting those elements that have greatest potential for environmental harm. Forestry Corporation has also been certified as compliant with the internationally accredited Australian Forestry Standard, a measure of world best practice in forest management. Such certifications ensure that NSW State forests continue to be sustainably managed and environmentally protected and provide solid evidence of the high environmental standards achieved in the catchment of the lake from which your products are marketed.

We welcome the opportunity to engage with you further during the development of this plan and would be happy to provide further detail to assist you in your understanding of our role in maintaining catchment health. Please contact Dr Peter Walsh, Soil and Water Specialist, on 0427 247 837 if you require further information on any aspect of our work in the catchment or any additional details in relation to this letter.

Yours sincerely

A handwritten signature in black ink, appearing to read 'P Walsh', written in a cursive style.

Dr Peter Walsh
Soil and Water Specialist

Robyn Campbell
Project Manager, Clarence Valley Coastline Scoping Study Project Team
Hydrosphere Consulting
PO Box 7059
Ballina NSW 2478

By email: robyn@hydrosphere.com.au

Dear Robyn,

Clarence Valley Coastline Coastal Management Program Scoping Study

Thank you for providing Port Authority of New South Wales (**Port Authority**) with the opportunity to provide input into the preparation of a Coastal Management Program (**CMP**) Scoping Study for the Clarence Valley coastline. In response to your request for feedback to the development of the CMP, our comments are as follows:

Your agency's primary activities and roles within the study area

1. Located at the mouth of the Clarence River in northern New South Wales, the Port of Clarence River, Yamba is Australia's easternmost sea port (**Port of Yamba**) and is managed by Port Authority. The Port of Yamba services the whole Northern Rivers and New England regions, including the towns of Grafton, Maclean, Ballina, Lismore, Casino and Coffs Harbour.
2. Port Authority's interest in the CMP is primarily connected to its role as the Harbour Master for the Port of Yamba. In this role, Port Authority's responsibilities specifically relate to navigation, pilotage, and marine traffic management, to provide for continuous safe and efficient access to the Port of Yamba.
3. In Port Authority's role at the Port of Yamba, it notably also surveys, monitors and shares information of the depths of the channels and berthing boxes to port users to aid the safe movement of the variety of commercial ships utilising the Port of Yamba, in accordance with requirements under the Port Safety Operating Licence (**PSOL**) under the *Ports and Maritime Administration Act 1995*.

Your agency's priorities within the study area

4. As stated in point (2), maintaining continuous safe and efficient access to the Port of Yamba is a key priority for Port Authority, including but not limited to, the designated port waters (as defined in Schedule 1 of the *Ports and Maritime Administration Regulation 2012*), safety of the river bar and the maintenance of the breakwater at the mouth of the Clarence River.

YAMBA

PO Box 143
Yamba NSW 2464
T: 61 2 6646 2002

NEWCASTLE

PO Box 663
Newcastle NSW 2300
T: 61 2 4985 8222

SYDNEY

PO Box 25
Millers Point NSW 2000
T: 61 2 9296 4999

PORT KEMBLA

PO Box 89
Port Kembla NSW 2505
T: 61 2 4275 0100

EDEN

PO Box 137
Eden NSW 2551
T: 61 2 66461596

Key values of the study area

5. Port Authority's key values of the study area are driven by the activities undertaken at the Port of Yamba, and its importance within the region as a designated port, as stated in points (1-3).

Issues that need to be addressed in the coastal management program

6. Within the letter requesting Port Authority input into the development of the CMP, Figure 1 illustrates the study area for the CMP Scoping Study. Although, the letter states "areas to be included in the study area are defined in the Coastal Management SEPP", the Clarence River estuary has not been included, and therefore is not consistent with the land application area under *State Environmental Planning Policy Coastal Management 2018 (Coastal Management SEPP)*.

Port Authority requests clarification on this inconsistency, and if the Clarence River estuary should be included, Port Authority may wish to provide further feedback regarding upstream erosion and potential downstream sedimentation issues at the Port of Yamba, which may create insufficient and unsafe navigation channel depths and additional dredging requirements.

Preferred management approaches to these issues

7. As stated in point (6), should downstream sedimentation issues within the Port of Yamba boundaries be considered within the remit of the CMP Scoping Study, a preferred management approach could be a maintenance dredging program for the bar and inner bar of the Clarence River Estuary, if required. Maintenance dredging would facilitate the continued safe navigation and passage of vessels to the Port of Yamba ensuring adequate underkeel clearance requirements.

The CMP could also consider upstream erosion control measures as part of its scope to both protect riparian land around the river and its tributaries as well as reduce the sediment load carried into the river and the Port.

Should you request any further detail on the matters raised in this letter, please do not hesitate to contact myself (JShergill@portauthoritynsw.com.au).

Yours sincerely,



Jagjeet Shergill
Environmental Planner

4 September 2020

3rd September 2020

Robyn Campbell
Clarence Valley Coastline Scoping Study Project team
Hydrosphere Consulting
PO Box 709
Ballina NSW 2478

RE: Clarence Valley Coastline Coastal Management Program Scoping Study

Dear Robyn,

In response to your letter dated 12th August 2020, please see our input for the proposed study.

Canegrowers activities and roles within the study area

Sugarcane is grown adjacent to the following waterways in the study area: Palmers Channel, Wooloweyah Lagoon, Micalo Channel and Romiaka Channel.

Sugarcane has been cultivated on the Clarence floodplain since the late 1860s and is a significant industry for the region. The cultivation of sugarcane has persisted for so long, due to its relative resilience to floods.

Many sugarcane farmers in these areas have been trained by CVC to be accredited Floodgate Operators. They are active in aiding the exchange of salty water into some of the drains. This exchange of water reduces the possibility of acid sulphate issues, aids in keeping the drains weed free and promotes fish passage.

Priorities within the study area

Although sugarcane is relatively resilient to flooding, prolonged waterlogging can be detrimental to crop survival and yield. The extensive network of drainage works that were initiated subsequent to the floods of the 1950s has aided in the efficient removal of floodwaters from the floodplain, which has been positive for all agricultural pursuits on the floodplain including sugarcane.

It is our priority to ensure that the floodplain drainage network is maintained. It is pleasing to see that CVC have tripled the budget for drainage infrastructure maintenance for this financial year.

Of concern is the poor state of the ring drain around Wooloweyah Lagoon and the associated radial outlets.

Preferred management approaches to these issues and key values

As an industry we are proactive in working with all levels of Government to ensure that agreed upon outcomes can be achieved. Our preference is to be self-regulating (with an adequate oversight mechanism) if possible. For the last 20 years we have been successfully managing acid sulphate soils under a self-regulation framework agreed to with all councils in the NSW Sugarcane growing regions.

Consequently, if the study identifies any issues that involves the sugarcane industry, we would appreciate the opportunity to be self-regulating.

Yours Faithfully,

Ross Farlow 
President Clarence Cane Growers Association

Reference: DOC20/688557

Ms Robyn Campbell
Hydrosphere Consulting
robyn@hydroshere.com.au

RE: Request for information on Aboriginal stakeholders for proposed Coastal Management Program Scoping Study for the Clarence Valley coastline

Dear Ms Campbell

Thank you for your email of 21 Aug 2020 about Aboriginal cultural heritage consultation for the above matter within the Clarence Valley local government area. I appreciate the opportunity to provide input and apologise for the delay in responding.

Please find enclosed a list of known Aboriginal parties for Clarence Valley local government area (Attachment 1) that we consider likely to have an interest in the proposal. Note this is not an exhaustive list of all interested Aboriginal parties. Receipt of this list does not remove the requirement for a proponent/consultant to advertise the proposal in the local print media and contact other bodies and community groups seeking interested Aboriginal parties, in accordance with the 'Aboriginal cultural heritage consultation requirements for proponents 2010' (the CRs).

We would also like to take this opportunity to remind the proponent and consultant to ensure that consultation is fair, equitable and transparent. If the Aboriginal parties express concern or are opposed to parts of or the entire project, we expect that evidence will be provided to demonstrate the efforts made to find common ground between the opponents and the proponent.

If you have any questions about this advice, please do not hesitate to contact me via rosalie.neve@environment.nsw.gov.au or 02 6659 8221.

Yours sincerely



Rosalie Neve
Aboriginal Heritage Planning Officer
Aboriginal Cultural Heritage Regulation - Northern
Heritage NSW
Department of Premier and Cabinet

28 August 2020

Appendix D. STAKEHOLDER ENGAGEMENT PLAN

This Appendix provides a stakeholder engagement plan for the CMP development stages 1 to 5.

D1. INTRODUCTION

The *Coastal Management Act 2016* requires councils to consult with the community and stakeholders before adopting a coastal management program (CMP). Part A of the coastal management manual includes statutory provisions and mandatory requirements relating to community and stakeholder engagement.

This engagement strategy has been prepared in accordance with:

- The *Coastal Management Act 2016* and related Guidelines for community and stakeholder engagement in preparing and implementing a CMP (NSW Government, 2018).
- Clarence Valley Council's Community Engagement Policy (2018).

The engagement strategy provides a staged approach, aligning with the five-stage process for preparing a CMP (Figure 55). An evaluation framework is also provided and it is envisaged that the strategy will be reviewed and revised on a stage-by-stage basis, particularly on conclusion of Stage 4.

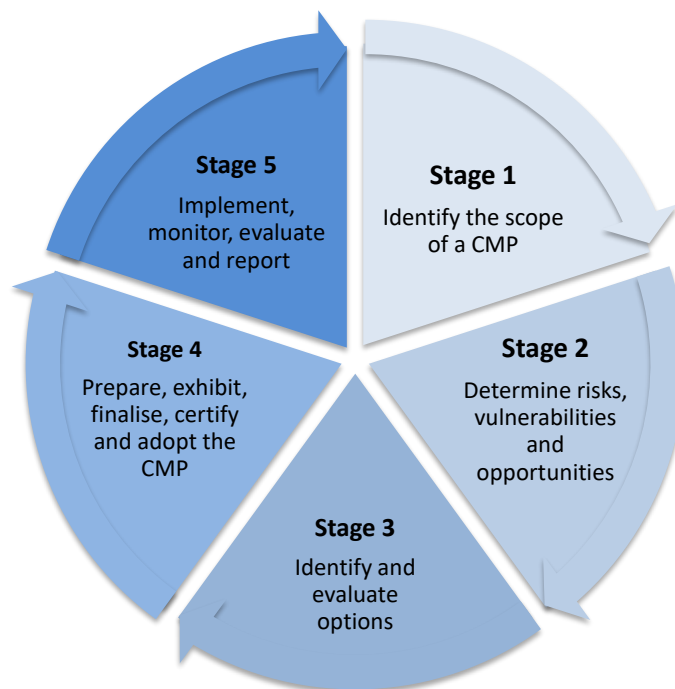


Figure 55: Five stage process for developing a coastal management program

Source: Adapted from OEH (2018)

D2. APPROACH TO ENGAGEMENT

The approach to engagement follows the International Association for Public Participation (IAP2) engagement spectrum and CVC Community Engagement Strategy (Figure 56). The levels of engagement in the CVC Community Engagement Strategy are “Inform”, “Consult” and “Empower”. The consultation approach during Stage 1 of the CMP process will primarily be “Inform” as information is being sought from the community and other stakeholders. There will be a movement to the right of the IAP2 Spectrum in subsequent stages as the community and other stakeholders become involved in the CMP and there are opportunities to Empower particularly in Stage 5.

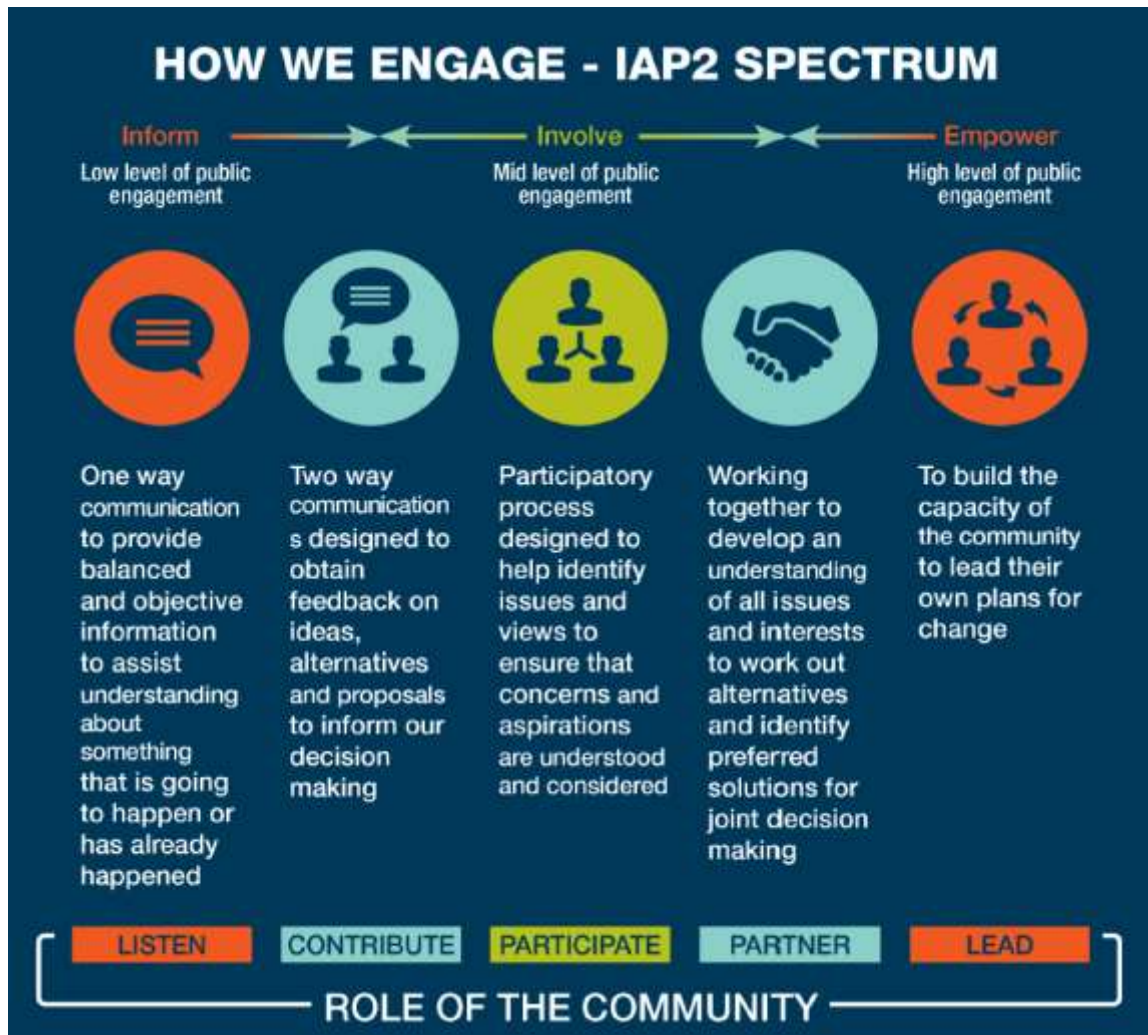


Figure 56: IAP2 Spectrum

Source: CVC (2018)

D3. STAKEHOLDER ANALYSIS

There are four broad categories of stakeholders for the CMP:

- Aboriginal groups.
- Local community.
- Business/commercial groups.
- Local Government.
- NSW Government agencies.

Community Profile

Information on the Clarence Valley local government area (LGA) community has been analysed and reported from Census data by .id (2020) and is summarised in the following sections. Data has been presented for the study area where available.

The estimated resident population of CVC LGA was 51,662 in 2019. The resident population increased by 991 people (0.65% p.a.) since the 2016 Census. From 2011 to 2016, the LGA population increased by 1,005 people (0.4% p.a.).

The largest changes in the age structure in this area between 2011 and 2016 were in the age groups:

- Seniors (70 to 84) (+1,200 people).
- Empty nesters and retirees (60 to 69) (+1,186 people).
- Parents and homebuilders (35 to 49) (-833 people).
- Secondary schoolers (12 to 17) (-557 people).

Data from the 2016 Census are shown in the following table.

Table 15: Population of the CVC LGA

Population group	2016 data	2016 (% of LGA population)
Usual resident population	50,671	-
Males	25,140	49.6%
Females	25,530	50.4%
Aboriginal and Torres Strait Islanders	3,214	6.3%
Australian citizens	45,574	89.9%
Eligible voters (citizens aged 18+)	36,048	71.1%
Population over 15	42,364	83.6%
Employed population	17,558	91.0%
Overseas visitors (enumerated)	191	-
Main coastal population centres (within the study area) ¹		
Iluka	1,718	3.4%
Yamba	6,076	12.0%
Angourie	222	0.44%
Wooloweyah	406	0.80%
Micalo Island	34	0.07%
Palmer's Island	458	0.90%
Palmer's Channel	119	0.23%
Taloumbi	106	0.21%
Brooms Head	212	0.42%
Sandon	11	0.02%
Minnie Water	237	0.47%
Diggers Camp	18	0.04%
Wooli	414	0.82%
Coastal zone	10,031	19.8%

Source: .id (2020)

1. State Suburbs (2016 Census)

The median age in the LGA was 49 in 2016, an increase of 3 years since the 2011 Census. Compared to regional NSW, there was a lower proportion of people in the younger age groups (0 to 17 years) and a higher proportion of people in the older age groups (60+ years). Overall, 20.2% of the population was aged between 0 and 17 and 34.0% were aged 60 years and over, compared with 22.1% and 27.2% respectively for regional NSW.

Aboriginal and Torres Strait Islanders made up 6.3% of the LGA population (3,214) in 2016, which is 0.6% higher than regional NSW and 2.9% higher than the NSW population.

The top five ancestries in the LGA were:

- Australian (22,776 people or 44.9%).
- English (21,499 people or 42.4%).
- Irish (6,247 people or 12.3%).
- Scottish (5,861 people or 11.6%).
- German (2,300 people or 4.5%).

In combination these five ancestries account for 58,683 responses in total or 115.80% of all responses.

Analysis of the religious affiliation of the population of the LGA in 2016 compared to regional NSW shows that there was a lower proportion of people who professed a religion and a similar proportion who stated they had no religion. Overall, 62.8% of the population nominated a religion and 26.7% said they had no religion. The largest single religion in the area is Anglican, with 25.7% of the population or 13,037 people as adherents.

In 2016, 90.3% of the population spoke English only and 2.1% spoke a non-English language. The dominant language spoken at home, other than English is German, with 0.2% of the population, or 91 people speaking German at home.

In 2016, 42.0% of households owned their dwelling, 24.4% were purchasing and 24.0% were renting, compared with 35.5%, 28.6% and 26.5% respectively for regional NSW. There were a total of 24,829 private dwellings in the LGA with 20,235 separate houses, 2,766 medium density dwellings, and 231 high density dwellings. In addition, there were 1,112 caravans/cabins/houseboats in the area.

In June 2018, the median house valuation in the LGA was \$388,787, \$351,657 lower than the median house valuation for New South Wales.

The size of the labour force in 2016 was 19,296, of which 7,731 were employed part-time and 9,431 were full time workers with 1,738 people unemployed (looking for work, over 15). The three most popular industry sectors were:

- Health Care and Social Assistance (2,710 people or 15.4%).
- Retail Trade (2,062 people or 11.7%).
- Accommodation and Food Services (1,620 people or 9.2%).

Coast-based employment sectors are not specifically identified although 6.4% of people were employed in agriculture, forestry and fishing, 9.2% in accommodation and food services and 1.6% in rental, hiring and real estate services.

There was a lower proportion of people earning a high income (those earning \$1,750 per week or more) and a higher proportion of low-income earners (those earning less than \$500 per week) than in regional NSW.

The Clarence coastline areas are used by a wide portion of the community and visitors for various activities including camping, relaxation, recreation and nature appreciation. Council, in conjunction with Australian Lifeguard Services, provides a beach patrol service to Clarence Valley beaches during the NSW and

Queensland School Holidays. A beach access wheelchair is available for free use on the beaches of Yamba, Angourie, Brooms Head, Woody Head and Iluka. Four-wheel drive beach access is available at some beaches (with restrictions).

Aboriginal Groups

The study area is of significant importance to the Aboriginal community and cultural sensitivities and specific management measures need to be considered in the CMP. The Clarence coastal areas are situated within the Yaegl nation and the Yaegl People's Native Title area and hold significant cultural value to Aboriginal people. The CMP will recognise the significance of the area and include strategies to protect cultural heritage values and continuing traditional use.

Community Groups

Community groups that are active in the study area are listed in the following table.

Table 16: Key community groups in the study area

Category	Group
Environment	Clarence Valley Conservation Coalition
	Clarence Landcare Incorporated
	Clarence Valley Conservation in Action
	Sandon River Environmental Alliance
	Wooli Dunecare
	Wooloweyah Landcare
	Iluka Landcare
	Angourie Community Coastcare
	Brooms Head Landcare
	Diggers Camp Dunecare
	Yamba Landcare
	Yuraygir Landcare
	Valley Watch
	Protect Wooli
Emergency services	Marine Rescue – Iluka/Yamba
	Marine Rescue – Wooli
	Yamba Surf Life Saving Club
Recreation	Angourie Boardriders
	Wooli Sports Club Inc
	Yamba Triathlon
	Wooli Sports Club Inc
	Grafton District Anglers Club (Yamba)
	Port of Yamba Yacht Club

Category	Group
Surf Life Saving	Yamba Surf Life Saving Club
Service Clubs	Rotary Club of Yamba Inc.
	Country Womens Association (CWA) – Yamba Branch
	Rotary Club of Iluka-Woombah Inc.

Business and Industry Groups

Business/industry groups that are active in the study area are listed in the following table.

Table 17: Key commercial/business groups in the study area

Category	Group
Business and Industry	Clarence River Ferries
	Oyster Growers
	Clarence River Fishermen's Cooperative
	Clarence Canegrowers
	Yamba District Chamber of Commerce
	Iluka Chamber of Commerce Inc.
	Wooli Chamber of Commerce
	Ratepayers Association of Iluka

NSW Government Agencies

NSW Government agencies with management roles and responsibilities across the CMP study area are:

- Department of Planning, Industry and Environment (DPIE) cluster:
 - Environment, Energy and Science (EES):
 - Biodiversity and Conservation.
 - National Parks and Wildlife Service.
 - Department of Regional NSW:
 - North Coast Local Land Services (NCLLS).
 - Department of Primary Industries (DPI) – Marine Parks.
 - DPI – Fisheries.
 - DPI – Forestry.
 - Planning and Assessment.
 - Crown Lands.
- Department of Premier and Cabinet:
 - Heritage NSW.
- Transport for NSW (TfNSW):
 - Maritime.

- Maritime Infrastructure Delivery Office.
- Department of Community Services and Justice:
 - NSW State Emergency Service (SES).
 - Resilience NSW.
- Marine Estate Management Authority (MEMA) – Department of Regional NSW (DPI), DPIE (EES and Planning and Assessment), Transport for NSW.
- Port Authority of NSW.

The NSW Coastal Council provides independent expert advice to the Minister administering the *Coastal Management Act 2016* on coastal planning and management issues.

Local Government

CVC stakeholders include:

- Mayor and councillors.
- General Manager, Director (Works and Civil), Director (Corporate Governance) and Director (Environment, Planning & Community) and Management Team.
- Council staff – Civil Services, Water Cycle, Open Spaces and Facilities, Community & Industry Engagement and Environment, Development & Strategic Planning.
- Coast and Estuary Management Committee (CEMC) – provides advice to Council in achieving integrated, balanced, responsible and ecologically sustainable development of the Clarence Valley's coasts and estuaries by:
 - Developing and implementing Management Plans.
 - Initiating and overseeing coastline and estuary management processes.

The CEMC includes representatives from Council, state government authorities and the community, including:

- Six community representatives/groups.
- DPIE - EES Group.
- NPWS.
- DPI – Fisheries.
- North Coast Local Land Services.
- DPI – Marine Parks (Solitary Islands Marine Park).
- DI - Crown Land.
- Transport for NSW – Maritime.
- Two CVC Councillors.
- Council managers.

Richmond Valley Council and Coffs Harbour City Council are also local government stakeholders as neighbouring councils with shared sediment compartments and other common issues.

Elected Representatives

- Federal Government – Kevin Hogan, Member for Page, NSW,

- State Government – Chris Gulaptis, Member for Clarence.

D4. PREVIOUS STAKEHOLDER CONSULTATION ACTIVITIES

The consultation outcomes documented in previous management plans for the study area included:

- Brooms Head/Lake Cakora (SMEC, 2013) – 2009 survey:
 - The most important values associated with Lake Cakora were peace and tranquillity, clean swimming water and native animals and plants
 - Recreational fishing and bait collection are popular activities.
 - The most significant issues identified were septic overflows/leaching, poor water quality, stormwater and drainage management and bank erosion.
- Sandon River estuary (GHD, 2012) – 2009 survey:
 - The recreational value of the Sandon River estuary is especially important to visitors and residents. Recreational activities in the estuary include fishing, picnicking, camping, photography, snorkelling, bird watching, bush walking, swimming, canoeing/kayaking and boating. Access to the foreshore and waterway, clean swimming water, peace and tranquillity and the provision of recreation were ranked as extremely important values by the majority of survey respondents.
 - Native plants and animals of the Sandon River estuary were ranked as extremely important by the majority of survey respondents. The water quality of the Sandon River for swimming was the most important value identified in the community survey.
 - The heritage value of the Sandon River estuary was rated as extremely important by most survey respondents.
 - The socio-economic value of the Sandon River estuary was indicated by views to the water being identified as extremely important and important by the majority of survey respondents. The economic value of the estuary was appreciated by the CEMC but income from the estuary and its tourism potential ranked low in terms of importance to visitors in the community survey.
 - The majority of survey respondents rated the following issues as extremely important:
 - Bank erosion.
 - User conflict.
 - Habitat degradation.
 - Entrance and navigation safety.
 - Unauthorised activity in the sanctuary zone.
 - Forestry land management.
 - Ecological sustainability.
 - Population increase.
 - Visitor pressure.
 - National Park management.
 - Overfishing.
 - Poor water quality.

- Cultural heritage.
 - Sedimentation.
 - Septic system management.
 - Stormwater management.
- Wooli Wooli River estuary (BMT WBM, 2009) – 2004 survey:
 - Shorefishing, swimming and boat fishing were the most frequent responses on activities undertaken in the estuary.
 - The majority of respondents (>70%) listed waterway access, clean water, foreshore access, and peace and tranquillity as the highest values of the estuary.
 - The highest rated issues of concern (>70%) were entrance navigation and safety, protection of oyster industries and poor water quality.
 - Dredging was the most popular management option suggested by respondents.

Further detail on the survey outcomes is provided in Attachment 1.

Consultation activities undertaken during Stage 1 of the CMP development are discussed in Appendix C.

D5. ENGAGEMENT PLAN

Stakeholder Involvement

Involvement in each stage of the CMP development (refer Figure 55) for the various stakeholder groups is summarised in Table 18. The level of engagement should be reviewed at the commencement of each stage of the project, based on the outcomes of previous stages. In most cases, the engagement level will be different for the different parts of the study area.

Table 18: Engagement levels for key stakeholder groups

Stakeholder	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
<i>Aboriginal people</i>					
Yaegl Traditional Owners	Inform, Involve	Inform, Involve, Empower	Inform, Involve, Empower	Inform, Involve, Empower	Empower
LALCs	Inform, Involve	Inform, Involve	Inform, Involve	Inform, Involve	Inform, Involve
<i>Local Government</i>					
Clarence Valley Council	Inform, Involve	Inform, Involve, Empower	Inform, Involve, Empower	Inform, Involve, Empower	Empower
CEMC	Inform, Involve	Inform, Involve, Empower	Inform, Involve, Empower	Inform, Involve, Empower	Inform, Involve
Richmond Valley Council	Inform	Inform, Involve	Inform, Involve	Inform	-
Coffs Harbour City Council	Inform	Inform, Involve	Inform, Involve	Inform	-
<i>State and Federal Government members</i>					
Members of Parliament	-	Inform, Involve	Inform, Involve	Inform	-
<i>State Government agencies</i>					
DPIE – EES	Inform, Involve	Inform, Involve	Inform, Involve	Inform, Involve	Inform, Involve
NPWS	Inform, Involve	Inform, Involve, Empower	Inform, Involve	Inform, Involve	Inform, Involve
DPI - Marine Parks	Inform, Involve	Inform, Involve	Inform, Involve	Inform, Involve	Inform, Involve
DPI - Fisheries	Inform, Involve	Inform, Involve	Inform, Involve	Inform, Involve	Inform, Involve
DI – Crown Land	Inform, Involve	Inform, Involve	Inform, Involve	Inform, Involve	Inform, Involve
MEMA	Inform, Involve	Inform, Involve	Inform, Involve	Inform, Involve	Inform, Involve
Heritage NSW	Inform, Involve	Inform, Involve	Inform, Involve	Inform, Involve	Inform, Involve
TfNSW - Maritime	Inform, Involve	Inform, Involve	Inform, Involve	Inform, Involve	Inform, Involve
SES	Inform, Involve	Inform, Involve	Inform, Involve	Inform, Involve	Involve
Resilience NSW	Inform, Involve	Inform, Involve	Inform, Involve	Inform, Involve	Involve
Port Authority of NSW	Inform, Involve	Inform, Involve	Inform, Involve	Inform, Involve	Involve

Stakeholder	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
<i>Other groups</i>					
Community groups	Inform, Involve	Inform, Involve	Inform, Involve	Inform, Involve	Inform, Involve
Business and industry groups	Inform, Involve	Inform, Involve	Inform, Involve	Inform, Involve	Inform, Involve
<i>Individuals</i>					
Residents/ landowners	Inform, Involve	Inform, Involve	Inform, Involve	Inform, Involve	Inform, Involve
Visitors	-	Inform, Involve	Inform, Involve	Inform, Involve	Inform, Involve
Community members	Inform, Involve	Inform, Involve	Inform, Involve	Inform, Involve	Inform, Involve

Engagement Tools

A summary of engagement tools is provided in the following table.

Table 19: Engagement tools

Engagement tool	Approach	Target Audience	Content and key messages	Outputs
Monthly meeting (CVC Cultural Heritage Officer, Yael TOAC and Council representatives)	Direct and regular engagement with Yaegl TOAC	Yaegl TOAC	Engagement at particular stages and project implementation	Documented meeting outcomes
CMP webpage – Clarence Conversations	Establish a webpage for project information and a portal for feedback to be maintained throughout project.	- CEMC. - General community. - Community groups. - Business/ industry groups. - Aboriginal people.	Provide information on the project, issues, risks and threats.	Website analytics
Webpage tools (e.g. Forum, Questions, Pin map)	Allow opportunities for feedback and input		Encourage input and feedback on issues, risks, threats and management options	Website analytics
Community survey	Targeted consultation		Encourage input and feedback on values, issues, risks and threats	Survey analytics
Clarence Community News	Articles in newsletter at key stages of the project		Provide information on the project progress and opportunities for involvement	-
Direct emails/ letters	Targeted consultation		Encourage input and feedback on issues, risks, threats and management options	Written responses

Engagement tool	Approach	Target Audience	Content and key messages	Outputs
Social media (Facebook, Twitter)	Promote opportunities for feedback and input		Advertising of key project stages e.g. community survey	Documented responses
Workshops	Targeted consultation	- CEMC - Community groups. - Business/ industry groups. - Government agencies	Identify values, issues and potential management responses	Documented meeting outcomes
Site meetings	Targeted consultation	- Government agencies. - Aboriginal representatives. - Community groups.	Identify values, issues and potential management responses	Documented meeting outcomes (where culturally appropriate)
Community meetings /information sessions	Targeted consultation	General community	Present opportunities for feedback and input	Documented outcomes
Pop ups (e.g. at community markets)	Targeted consultation	General community	Present opportunities for feedback and input	Documented outcomes

Engagement Plan

The engagement tools will be used at various stages of the CMP development to engage with the identified stakeholders, promote the preparation of the CMP and obtain feedback and input into the development of the CMP (Table 20).

Table 20: CMP Stakeholder Engagement Plan

Stage	Stage 1 – identify the scope of the CMP	Stage 2 – determine risks, vulnerabilities and opportunities	Stage 3 – identify and evaluate options	Stage 4 – prepare, exhibit, finalise, certify and adopt the CMP	Stage 5 – implement, monitor, evaluate and report
CMP content	Identify stakeholders and prepare stakeholder profile. Review existing information about stakeholder perspectives to help set the focus and priorities of subsequent stages of the CMP.	Explore risks, vulnerabilities and opportunities of coastal management. Explore different perspectives on coastal risk management.	Identify and evaluate opportunities to address coastal risks for relevant coastal management areas, consistent with management objectives.	High involvement stakeholders (e.g. CEMC) participate in the detailed process of finalising a plan.	Active community participation in implementation of CMP actions where relevant. Active community participation in monitoring and review of CMP implementation.
Engagement intent	Bring all interested parties on board early to share information and ideas (before decisions are made).	Empower community and stakeholders with knowledge to contribute to decisions in subsequent stages. Share information equitably among stakeholders	Share the decision-making dilemma. Establish a process that will be used to choose between options, incorporating community preferences and criteria.	Gain community confidence and support for decisions that are in the documented CMP	Maintain community support for and commitment to the CMP, especially among those directly involved in, or impacted by the implementation
Level of community influence on decisions	Council retains decision making about the scope of subsequent stages and will incorporate community input	Council retains decision making. Community and stakeholders may contribute to detailed studies on issues of concern and participate in risk assessment and evaluation.	Council, stakeholders and community collaborate to identify the full range of potential responses to manage coastal vulnerabilities and to evaluate options.	Council retains decision making about the CMP. Community involvement and feedback refine actions in the CMP to address risks considered unacceptable by the community.	Council retains decision making but will look to the community for advice, innovation and resources to improve implementation of the CMP actions.

Stage	Stage 1 – identify the scope of the CMP	Stage 2 – determine risks, vulnerabilities and opportunities	Stage 3 – identify and evaluate options	Stage 4 – prepare, exhibit, finalise, certify and adopt the CMP	Stage 5 – implement, monitor, evaluate and report
Engagement outcomes	- Stakeholders and the community understand how they can be involved in the preparation of a CMP. - Establish working relationships built on mutual trust and respect - Understand community goals, aspirations, values and priorities. - Understand community motivations to participate in planning and implementation. - Help community understand dynamic nature of coastal processes and the need to set long-term objectives. - Increase community understanding of the new legislative and planning framework. - Determine the engagement activities that are required during the preparation of subsequent stages of the CMP.	- Shared understanding of risks and opportunities over different timeframes, and the range of actions that could address different risks. - A shared understanding of the varied perspectives about coastal management within the community. - Council understands the community's 'attitude to risk' - Community and stakeholders understand vulnerabilities, risk and opportunity studies, including technical aspects such as scenarios for sea level rise, hazards and impacts. - Increased community trust of technical information based on their involvement and understanding of assumptions and limitations.	- Strong working partnerships. - Managers within council aware of coastal hazards, threats, risks and vulnerabilities, opportunities and actions relevant to their responsibilities and potential conflict with other council priorities. - Public authorities contribute to identification and evaluation of management options, are aware of responsibilities and accept the adaptive nature of the CMP. - Council understands stakeholder views about cost-benefit distribution, willingness to pay and potential trade-offs. - Robust options, understood by all stakeholders in terms of risks, cost and benefits.	- Community and stakeholder support for actions and priorities in the CMP. - Increased awareness about funding options and how CMP implementation will be integrated with council's Resourcing Strategy and Delivery Program under IP&R. - Public authorities accept roles and responsibilities in the CMP.	- Community understanding of how CMP will be implemented through the IP&R framework and land use planning system and by other public authorities. - Community informed about progress on actions. - Community is aware of the effectiveness of actions in terms of changes to coastal risk profile, coastal condition and community satisfaction. - Continue partnership with community by creating opportunities for community involvement in implementing, monitoring, evaluating and reporting effectiveness of CMP.

Stage	Stage 1 – identify the scope of the CMP	Stage 2 – determine risks, vulnerabilities and opportunities	Stage 3 – identify and evaluate options	Stage 4 – prepare, exhibit, finalise, certify and adopt the CMP	Stage 5 – implement, monitor, evaluate and report
Engagement Tools					
Yaegl TOAC	- Direct emails/letters. - Community survey.	Monthly meeting (progress of project, specific studies and outcomes).	- Monthly meeting (progress of project, specific studies and outcomes). - Site meetings or workshops as required to discuss potential options.	- Monthly meeting (progress of project, specific studies and outcomes). - Site meetings or workshops as required to discuss management approach.	- Monthly meeting (progress of project, specific studies and outcomes). - Site meetings or workshops as required to discuss implementation.
CEMC	Two workshops – initial introduction and preliminary Scoping Study outcomes.	Two workshops – study scope and outcomes (depending on timing).	Workshop – feedback on options (depending on timing).	Workshop – feedback on management approach (depending on timing).	Workshops – ongoing feedback on implementation.
Government agencies (in addition to involvement through CEMC)	- Meetings – initial introduction, preliminary Scoping Study outcomes. - Requests for input on management, issues and values (ongoing). - Site visits.	Site meetings or workshops as required.	- Requests for input on management options as required. - Site meetings or workshops as required to discuss potential options.	- Requests for input on management approach as required. - Site meetings or workshops as required to discuss management approach.	-
General community	- CMP webpage – Clarence Conversations and webpage tools. - Community survey. - Social media (Facebook, Twitter).	- CMP webpage – Clarence Conversations and webpage tools. - Clarence Community News (depending on timing of publication).	- CMP webpage – Clarence Conversations and webpage tools. - Clarence Community News (depending on timing of publication).	- CMP webpage – Clarence Conversations and webpage tools. - Clarence Community News (depending on timing of publication). - Information session. - Social media (Facebook, Twitter).	- CMP webpage – Clarence Conversations and webpage tools. - Social media (Facebook, Twitter). - Clarence Community News (depending on timing of publication). - Pop-ups

Stage	Stage 1 – identify the scope of the CMP	Stage 2 – determine risks, vulnerabilities and opportunities	Stage 3 – identify and evaluate options	Stage 4 – prepare, exhibit, finalise, certify and adopt the CMP	Stage 5 – implement, monitor, evaluate and report
Community groups	• CMP webpage – Clarence Conversations and webpage tools. • Direct emails/letters. • Community survey.	• CMP webpage – Clarence Conversations and webpage tools (e.g. Forum, Questions, Pin map).	• CMP webpage – Clarence Conversations and webpage tools. • Direct emails/letters, site meetings or workshops with local/specific groups as required to discuss potential options.	• CMP webpage – Clarence Conversations and webpage tools.	• CMP webpage – Clarence Conversations and webpage tools.
Business/industry groups	• CMP webpage – Clarence Conversations and webpage tools. • Direct emails/letters. • Community survey.	• CMP webpage – Clarence Conversations and webpage tools (e.g. Forum, Questions, Pin map).	• CMP webpage – Clarence Conversations and webpage tools. • Direct emails/letters, site meetings or workshops with local/specific groups as required to discuss potential options.	• CMP webpage – Clarence Conversations and webpage tools.	• CMP webpage – Clarence Conversations and webpage tools.
Other Aboriginal groups	• Direct emails/letters. • Community survey.	• CMP webpage – Clarence Conversations and webpage tools (e.g. Forum, Questions, Pin map).	• CMP webpage – Clarence Conversations and webpage tools. • Direct emails/letters, site meetings or workshops with local/specific groups as required to discuss potential options.	• CMP webpage – Clarence Conversations and webpage tools.	• CMP webpage – Clarence Conversations and webpage tools.

Source: Adapted from NSW Government (2018)

D6. EVALUATION

At the completion of each CMP stage, the engagement activities will be reviewed to assess their effectiveness in achieving the engagement objectives and reaching the target stakeholders. The review will consider:

- Number of visitors to the project webpage and use of webpage tools.
- Number of participants at meetings and information sessions.
- The level of awareness of the community and other stakeholders.
- The level of engagement with Aboriginal groups and State Government agencies.
- The level of concern within the community and whether these concerns have been addressed.
- The general messages received from the stakeholders (favourable or unfavourable).

Based on the review, the engagement plan will be amended for subsequent stages if required.

Attachment 1: Results of Previous Community Surveys

Results of Previous Community Surveys

Sandon River

A community survey undertaken in 2011 relating to Sandon River (CVC, 2011) found that:

- Sandon residents and visitors utilise the entire area for various outdoor recreational activities. The most popular are water-based activities like swimming and fishing which utilise both the river and the ocean. Terrestrial activities are also popular including bush walking, bird watching and photography in the Yuraygir National Park which surrounds the village.
- The area of the river from below the village to the fork was by far the most intensively used by respondents. Fishing, swimming, boating and bait collecting were very popular in the area. This popularity resulted in many respondents being displeased with the volume and speed of boat traffic near the village and campgrounds and suggesting restrictions on both.
- Commercial industries such as tourism, commercial fishing and aquaculture (oyster leases) were very unpopular in Sandon. Many respondents indicated they would like to have these activities removed from the Sandon River to make way for purely recreational purposes.
- The suggestions respondents made as to how to improve the area were centred on preserving or enhancing the natural environment. The vast majority did not wish to see anymore expansion of the village and/or campground only improvements to their management.
- These results show that users of Sandon/Sandon River value the area for its current qualities and appeals, and wish it to remain largely the same. They would like to see the area better preserved through environmental protection initiatives and enhanced through various restrictions on visitation, vehicles and boating.
- The majority of people in Sandon are there on holidays (82%) with only 11 of the 60 respondents to this survey being permanent residents. Most visitors choose to stay in Sandon rather than a day visit. Most were staying in a holiday home (41%) which they or a relative owned and only a few respondents were actually renting a home (8%). Campers make up the second largest proportion of holiday makers in Sandon (32%).
- Visitors to Sandon are generally from NSW (74%) with Queensland residents making up the bulk of the remainder (22%). Only one respondent came from outside these two states. Residents and visitors to Sandon enjoy outdoor recreation in the area all year round. Summer is the most popular time of the year, followed by spring and Easter. Winter is by far the least popular season.
- Residents and visitors to Sandon place very high importance on the natural qualities of the area. Clean swimming water was seen to be the most valuable, closely followed by access to the waterway and along the foreshore and peace and tranquillity. A large proportion of respondents saw economic values of the estuary like income opportunities and tourism potential as being of very little importance to them.
- The most important feature of Sandon is the river. Respondents rated issues of water quality and sustainability of the estuary as having the greatest importance, which also included septic leaching/overflows, illegal activities in sanctuary zones and the degradation of estuarine habitats. Little value was placed on the protection of the aquaculture/oyster industry.
- A large proportion of respondents made suggestions of how to better protect the Sandon River and its local environment. These included the management of nutrient loads in the estuary, banning further clearing and preventing riverbank erosion. Boating and vehicle restrictions were also popular suggestions which included time and speed limitations on boating in the river and limiting beach access to vehicles. Limits on visitors/population were suggested a number of times with respondents

obviously happy with the small, quiet nature of the village. The exclusion/removal of commercial activities was again suggested several times.

Lake Cakora

In April 2009 CVC undertook a *Resident and Visitor Values Survey (Lake Cakora)*, where questionnaires were distributed and made available throughout the community. The questionnaire contained a series of questions to gauge information on how respondents used and valued the lake environment and resident's and visitor's opinions of what management strategies could be used to better manage the lake. Of the 21 respondents 13 of those were permanent residents of Brooms Head or lived in the directly surrounding area.

The survey results showed that the respondents were divided on whether or not the Lake Cakora entrance should be opened to the ocean artificially. The survey also found that the general consensus was that sewage or more specifically leaking septic systems were affecting the water quality in Lake Cakora (CVC, 2009).

The community survey found that (CVC, 2009):

- Persons occupying permanent accommodation at Brooms Head made up the majority of the responses, with 61% of surveys being completed by full time residents. Visitors or non-permanent residents returned 39% of surveys. Persons occupying their own holiday accommodation or accommodation owned by a relative comprised approximately 19% of responses, with camping/caravanning or motor homing visitors making up 14%.
- Two (2) permanent residents put forward suggestions that indicated to Council that there was wildlife in the area. One respondent put forward that Little Terns, Pied Oystercatchers, Ospreys and Sea Eagles use the lake to feed and nest. The other respondent suggested that the lake is a nursery for Eastern King and School prawns.
- Respondents were given a list of several recreational activities and asked to indicate what activities they pursued, how often and at what time of the year. Swimming (19%) topped the list for overall popularity and frequency particularly in the daily and monthly time frames. Other traditional pursuits of fishing (shore-based 12% and boat-based 8%) and bait collecting (approximately 10%) were conducted by respondents at a reasonably high rate. A very high percentage of the activities carried out by the respondents included bush walking (11%) and bird watching (11%).
- Many of the activities occur all year round (38%). There is also much more activity occurring throughout Autumn, with 18% of the activity occurring then compared to 22% of activities occurring in Summer, Spring and Winter combined. This suggests that the Easter period is quite a busy time for the Brooms/Lake Cakora area. The higher percentage of activities occurring all year round could be indicative of the high number of respondents that are Brooms Head residents.
- The locations where recreational pursuits are undertaken typically results in greater pressure on the Lake Cakora estuarine system from users in some way. A significant amount (43%) of recreational activity is carried out in Zones 3 (the area containing the Lake Cakora entrance) and 7 (the mouth of the lake and the surrounding area). Zone 3 is a very popular location for swimming in particular. Approximately 10% of overall activity nominated by respondents is swimming within Zone 3. Zone 7 is a very popular spot for beach-based activity and swimming in particular. Zone 2, which includes a large section of the lake just in from the entrance, has a much higher rate of bait collection than all other zones. Persons pumping yabbies are commonly observed just upstream of the bridge adjacent to the southern shoreline. There is very low level of activity in Zone 5 because of its location more distant from the beachfront and heavy vegetation cover.
- Peace and tranquillity received the highest amount of responses in the 'Extremely Important' category with 14 (8.9%) out of a possible 18. Clean swimming water and native animals and plants had the next highest amount of 'Extremely Important' responses with 13 each (8.3%). These results

indicate that the respondents want the Brooms Head/Lake Cakora area to remain undeveloped. Clean swimming water only had responses in the two (2) highest categories, 'Fairly important' (5) and 'Extremely important' (13). The results show that the respondents want clean swimming water in the area and believe it is a very important issue.

- The respondents believe septic overflows/leaching, poor water quality, stormwater and drainage management and bank erosion are the most significant issues (in descending order). The issues which do not register as very important to the respondents include protection of European heritage sites, National Park land management and conflicts between different users of the estuary.
- Suggestions to improve or protect the Lake Cakora ecosystem included:
 - Artificial opening of the Lake Cakora entrance: Five respondents suggested the mouth of Lake Cakora be artificially opened (when necessary) to solve all of its problems. Some respondents also suggested that building groynes would stabilise the Lake Cakora entrance and allow water to flow in and out freely. There are also three respondents that said the Lake entrance should not be opened because it would change the natural processes.
 - Repair and resolve issues regarding septic overflow and runoff: eight respondents suggested that many septic systems are leaking into the lake and this problem should be fixed. In particular the Brooms Head Bowling Club and Council operated caravan park on the beachfront were mentioned seven times in survey responses. All respondents who mentioned the sewage issue said there was sewage leaching into the lake and in some cases onto the beach.
 - Construct a better stormwater drainage system throughout the village: A number of the respondents reported problems with the current stormwater drainage system in Brooms Head and they believe that this could have detrimental effects on the lake.
 - Educate residents and visitors: Two respondents suggested that some form of educational material could be used to inform both residents and visitors of the lake and its environmental issues.
 - Monitor the lake more rigorously: The monitoring of Lake Cakora on a more regular basis was a suggestion put forward by two respondents.
 - Manage lakeside vegetation: A few suggestions were put forward to clear vegetation from near the lake to make sure no timber could fall into the lake and rot, causing the water to become more stained.
 - No vehicular access to the lake: Two respondents reported in the survey that motorcycles sometimes use the lake when water levels are low. They suggested that the Council and police do more patrols there to ensure this does not happen.
 - Other suggestions: Some other suggestions include no development near the lake and the banning of hand netting of prawns in the lake.
- In response to the question "Why should the lake be artificially opened?", most responses (64%) indicated poor water quality, followed by odours (12%, flooding private land (8%, flooding houses (8%) and Other (8%, relating to problems with marine life). The houses north of the bridge were mentioned in a number of surveys as being under threat from flooding, particularly if the lake is not artificially opened. On the other hand, a number of respondents who claimed they were residents of Brooms Head for a number of years stated in their surveys that flooding of the lake does not occur.

Appendix E. STATUS OF MANAGEMENT ACTIONS

This Appendix outlines the status of relevant management actions from previous relevant management plans. All management actions have been allocated a status (i.e. complete, not complete, ongoing, not commenced, unknown). The status of 'ongoing' refers to the nature of the action requiring constant implementation (i.e. weed & pest management) while 'commenced' indicates that the action is currently being completed or in some cases will be completed following the outcome of another action or external factor.

Existing Coastline Management Plans prepared by CVC:

- *Brooms Head and Lake Cakora Coastal Zone Management Plan (2017).*
- *Draft Coastal Zone Management Plan for the Sandon River Estuary (2012).*
- *Draft Woolli Beach Coastal Zone Management Plan (2018).*
- *Woolli Woolli River Estuary Management Plan (2009).*
- *Coastal Zone Management Plan for Wooloweyah Lagoon (2009).*
- *Draft Yamba Coastline Management Plan (2003) and Implementation Strategy (2004).*

Related studies:

- *Options to Manage Recession of Whiting Beach, Yamba (2015)*
- *Technical Report 3 Risk Assessment and Stabilisation for Pilot Hill Yamba, NSW (2017).*

NPWS Plans of Management:

- *Yuraygir National Park and Yuraygir State Conservation Area Plan of Management (2003).*
- *Broadwater National Park Bundjalung National Park and Iluka Nature Reserve Plan of Management (1997).*

Marine Estate Management Strategy.

Not commenced - No progress has been made toward completing this action. Not started.

In progress - Progress is being made toward completing this action. Work has started and is currently being undertaken.

Ongoing - Works are undertaken to fulfill this action periodically, as required or a part of an ongoing works/maintenance program.

Incomplete - Progress has been made toward completing this action however progress has halted and unlikely to continue. Work started or was being undertaken but has stopped (eg. funding finished).

Complete - Work towards fulfilling this action is complete. Action is complete, no further work/action required.

Ref.	Type of Action	Management Strategy	Action	Rank	Priority	Timeframe	Status	Comments	Cost (at year of plan preparation/ implementation)	CVC Responsible?	Other Stakeholders Responsible/Involved	Other information
Brooms Head and Lake Cakora Coastal Zone Management Plan (2017)												
1.1	Investigation		Undertake Geotechnical Investigation in Lake Entrance precinct		High	2016-2017	Completed		\$60,000	Yes	OEH	Documented in Royal Haskoning (2018). Supports coastal hazard mapping (updated).
2.1	Revetments		Extend Foreshore Reserve Revetment at north end of Brooms Head Reserve to southern bridge abutment.		High	2017-2020	In progress	Design and environmental assessment underway.	\$350,000	Yes	OEH	Draft concept design available.
2.2	Revetments		Maintain Foreshore Reserve Revetment		Medium	Ongoing - when required	Ongoing	Undertaken as required. Last works undertaken circa 2015.	average \$7,000/yr	Yes		Some repairs required
2.3	Revetments		Retain existing Ocean Road revetment		High		Incomplete	Subject to outcomes from Geotech investigation and environmental assessment.		Yes	CCRT, OEH	Ocean Road revetment is located in from the houses on the northern side of Cakora Lagoon entrance. CMP to consider whether to carry this action forward.
3.1	Emergency Planning		Review Emergency Action Sub-Plan		High		Complete		5,000	Yes	SES,OEH	
3.2	Emergency Planning		Implement EASP		Very High		Ongoing	Existing plan implemented as required.	Staff time \$1000/review and advertising	Yes	SES, NSW Police	
4.1	Dune/natural area management		Control weed and pest species		High	Ongoing	Ongoing	Ongoing on NPWS and CVC managed land	\$5000/yr	Yes	NPWS, Crown Lands, LLS, DuneCare	Holiday park staff can be involved. Works programs undertaken as per VMP by NRM team.
4.2	Dune/natural area management		Implement Brooms Head Reserve Vegetation Management Plan		Medium	Ongoing	Ongoing		grant funding opportunities sought - \$5000	Yes	Crown Lands	Holiday park staff can be involved. Works programs undertaken as per VMP by NRM team. Suggest this action take priority over previous action - more prescriptive. Significant vegetation reduction along Holiday Park frontage, requirement for urgent program to increase integrity of community. Council suggest that this should be a high priority action.
4.3	Dune/natural area management		Dune Revegetation & Rehabilitation		Medium	Ongoing	Ongoing		NRM Staff time	No	Landcare	
4.4	Dune/natural area management		Implement Yuraygir National Park Plan of Management		Medium	Ongoing	Ongoing	NPWS is implementing multiple strategies within the POM, in terms of pests, weeds, threatened species management, fire management, public access, recreation and education.		No		
5.1	Development Controls		Update CVLEP with Coastal Risk map		High	2017-20	Not commenced		Staff time	Yes		Consider need for inclusion in CM SEPP mapping and planning proposal. Ensure local controls are consistent with SEPP.
5.2	Development Controls		Development Control Plan		Medium	2017-20	Not commenced		Staff time + \$2000 for advertising	Yes		As 5.1 above.
5.3	Development Controls		Floor level - Apply minimum floor level for new/ redevelopment		Medium	2017-20	Not commenced		Staff time	Yes		As 5.1 above.
5.4	Development Controls		Development footprint - new development should not occur seaward of existing development of coastal hazard lines		Medium	2017-20	Not commenced		Staff time	Yes		As 5.1 above.
5.5	Development Controls		Building and development standards - New development/ redevelopment within coastal hazard areas to be subject to development controls to ensure compatibility with current & future coastal hazards.		Medium	2017-20	Not commenced		Staff time	Yes		As 5.1 above.
5.6	Development Controls		Existing development - When substantial renovation occurs promote house retrofitting to suit coastal hazards & coastal character.		Medium	2017-20	Ongoing		Staff time	Yes		As 5.1 above.
6.1	Stormwater management/control		Implement management actions contained in CVCs review of Brooms Head Caravan Park effluent management		High	2017-20	In progress	New OSSM - recently completed planning & design phase, will go to tender once funds are confirmed.	Unable to cost accurately without details of actions.	Yes	Caravan park operators	
6.2	Stormwater management/control		Ensure existing domestic onsite effluent management systems are performing as per designed		Medium	2017-20	Ongoing	On-going programmed inspections.	Staff time	Yes		
6.3	Stormwater management/control		Opportunities for the provision of reticulated sewerage to Brooms Head are investigated by Council as part of its rural villages sewerage investigation.		Medium	2016/17	Complete	At its meeting of 21 February 2012 Council resolved (Resolution 13.002/12) to request the State Government include Brooms Head on a priority ranking for sewerage financial assistance. In the statewide risk ranking issued by DPIE on 09/04/20 Brooms Head was given a risk score of "1" which is the lowest risk score and so is unlikely to receive any financial assistance as the available funds can only be used on projects with a risk score of "5".	\$50,000	Yes		Strategic Business Plan (GHD, 2018) states: This issue is being addressed through the risk assessment and monitoring program in the Onsite Wastewater Management Policy. The sewerage SBP proposes that CVC undertake investigations for providing future sewerage to currently unsewered villages. The Brooms Head caravan park on-site system is currently being upgraded, however it will still operate above its design capacity during peak loads.

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7.1	Entrance management		Implement artificial breakout of Lake Cakora entrance during swimming season for recreational purposes if lake water level has reached 1.6m AHD without breaking out naturally. The location of the pilot channel to be determined in association with preparation of a review of environmental factors for implementation of this action. Install fixed gauge adjacent to Ocean Rd Bridge to monitor Lake water levels.		High	2017-20	Not commenced	Gauge needs installing, REF required regarding proposed action.	\$20,000	Yes	OEH	
8.1	Education		Coastal hazard community education program. Advise residents/ caravan park visitors of actions to be taken in a coastal storm emergency.		Very high	Dependent of frequency of major storm events	Not commenced		Staff time	Yes	SES	As 3.1 and 3.2 above.
8.2	Education		Distribute information/review and install/replace signage to educate community (including visitors) on ecological values, risks to public health & safety		High regarding public risk, moderate for others	Ongoing	In progress	Active program in place evidenced by interpretational signage at multiple locations. Information also provided online at NPWS website.	Staff time and signage costs	Yes	Landcare, NPWS	
8.3	Education		Provide planning advice on Section 149 Planning Certificates to advise of coastal hazards & the adopted CZMP.		High	Ongoing	Complete		Staff time	Yes		Will require additional consultation as part of planning proposal.
9.1	Access management		Realign & formalise tracks at Cakora Point away from potentially unstable areas. Inspections of all slopes which are subject to impacts from coastal processes by a suitably qualified geotechnical practitioner (min 1 in 5yrs). Install fencing where tracks within 2m of slope.		High	2017-20	Not commenced		\$30,000	Yes		
9.2	Access management		Ensure current level of public access is maintained or improved. Review number & location of beach access ways. Perform localised beach scraping at access points after storm events to allow beach access.		Medium	2017-20	Not commenced		??	Yes	Crown Lands	
9.3	Access management		Upgrade beach access - east of Prawn Farm site. The pedestrian bridge over Lake Cakora east of the prawn farm be repaired and made safe by the prawn farm licensee. The beach access east of the pedestrian bridge be upgraded as part of any development of recreational facilities or assets on the Crown Land west of the pedestrian bridge.		Medium	2017-20	Not commenced		\$70,000	Yes	Prawn farm licensee, Crown Lands	
9.4	Access management		Ocean road Reserve - Maintain current access to reserve adjacent to northern bridge abutment.		Medium	2016	Ongoing		Staff time	Yes		
9.5	Access management		South of bridge - Determine locations for provision of public beach access in northern foreshore reserve in conjunction with design and construction of extension of foreshore revetment.		Medium	2017-20	In progress	Refer to Park masterplan	Inconjunction with extension of revetment	Yes		Access included in seawall concept design.
9.6	Access management		Yuraygir Coastal Walk - Maintain track markers through the reserve		Medium	2016	Ongoing	The Yuraygir Coastal Walk is a significant tourist attraction, with significant infrastructure, including walking track, bridges, lookouts, boardwalks, signage, etc. Significant resources (staff, materials and contracted works) are required to maintain it. Current interpretive signs and track markers due for replacement - seek grant funding opportunities - \$5000	Staff time	Yes	NPWS	
9.7	Access management		4WD access to Brooms Head Beach to be managed in accordance with CVCs Beach Access and Vehicles on Beaches Policy.		Medium	2016	Ongoing	Gate in place. Access currently restricted to boat launching only.	Staff time	Yes		
10.1	Monitoring and reviews		Pre and post storm season monitoring of revetments to provide better understanding of trends of revetment change, wall integrity and level of protection offered by revetments.		High	Ongoing	Incomplete	No recent surveys	Combined with beach profile monitoring	Yes	OEH	
10.2	Monitoring and reviews		Pre & post storm season beach profiling to enable storm demand volume to be better estimated. Monthly recording of sand levels at monitoring poles at both sides of Lake Cakora entrance. Pre-storm survey to occur at end of winter (Sep). Post-storm subject to events but no later than May.		Medium	Ongoing	Incomplete	No recent surveys	\$67,000	Yes	OEH, CCRT, Landcare	
10.3	Monitoring and reviews		Assessment of future tidal inundation to be incorporated into future revisions of the CZMP consistent with relevant NSW Government CZMP Guidelines at time of review.		Low	2021	Not commenced.		-	Yes		Review of coastal hazards to be an action in CMP, Stage 2.
10.4	Monitoring and reviews		Establish a sub-Committee of CVCs Coast and Estuary Management Committee to supervise implementation of the CZMP following certification.		High	2017-20	Not commenced.		Staff time	Yes		

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10.5	Monitoring and reviews		Review of Coastal Zone Management Plan (CZMP) and transition to a Coastal Management Program (CMP)		Low, High in 2021	2021	In progress		\$100,000	Yes		Increased budget required. Expected funding 2:1.
11.1	Compliance Issues		Improve compliance/ enforce penalties for: -unauthorised vehicle access around Lake Cakora, -4WDing contrary to CVC policy or driving over dune vegetation, -littering.		Medium	Ongoing	Ongoing	Need suitable program in place. Gate installed as per review of beach access policy 2018.	Staff time	Yes	NPWS, Crown Lands	
11.2	Compliance Issues		Remove unauthorised low rock groyne east of boat ramp.		Low	2018	Not commenced		Staff time + \$1,000	Yes		Cost estimate incorrect, additional funding required, groyne only exposed when sand level low making access difficult, value of removing groyne questionable .
12.1	Foreshore Facilities		Relocation of public facilities including amenities, caravan park office, and public building residence are relocated landward at the end of their serviceable life or when substantially modified, or made to be compatible with the coastal risk.		Low	2017-2026	Ongoing		-	Yes		Need to review holiday park redevelopment concept design to ensure it complies.
12.2	Foreshore Facilities		Maintain, replace & improve foreshore facilities such as boat ramp, fish cleaning tables, & picnic & recreation facilities consistent with community adopted CVC Asset Management Plan (AMP).		Low	2017-2026	Not commenced	Community have requested a new fish cleaning facility near existing boat washing area. Investigating NSW Fisheries grant & design.	-	Yes		
12.3	Foreshore Facilities		New buildings constructed within the Brooms Head Coastal Foreshore Reserve to be located outside coastal hazard zone or as far landward as practical or compatible with the coastal risk.		Low	2017-2026	Not commenced		-	Yes		Need to review holiday park redevelopment concept design to ensure it complies. Could be covered by CM SEPP inclusion of hazard mapping.
13.1	Beach Amenity		Periodically remove debris (kelp & other) from beach and lagoon area to reduce odour, impact on beach amenity and maintain public safety.		Low	2016-2026	Ongoing		Staff time + \$1,000	Yes		Recommend permit system (from DPI Fisheries?) be put in place to allow collection of marine vegetation by authorised contractors.
13.2	Beach Amenity		Minor Sand Nourishment - Excess sand extracted from nearby marine or terrestrial environments from dredging or other public infrastructure projects should be deposited onto Brooms Head Beach adjacent to the lagoon at the southern end of the beach where sand is compatible.		Low	Opportunistic	Ongoing/ Opportunistic		Opportunistic	Yes, in conjunction with other stakeholders undertaking the dredging.		No opportunities currently identified.

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Draft Coastal Zone Management Plan for the Sandon River Estuary (2012)												
E3	Ecological	Educate residents and visitors about protecting estuarine ecosystems	Identify interesting facts about the estuarine communities within the estuary. Develop a community education campaign that may include signage, interpretive walks, guided tours, newspaper articles, information brochures etc. Implement the education campaign.		Very High	2012-13 - Ongoing	Not commenced	SIMP no longer have an education officer to do this work. NPWS would be happy to contribute.		No	NPWS, SIMPA, DPI-Fisheries	Action is consistent with community feedback in 2020.
R3	Regulatory	Maintain presence of Regulatory officers	Schedule regular licencing visits for all agencies. Implement visits.		Very High	Ongoing	Ongoing	Ongoing compliance by SIMPA particularly around the mudcrab season. Ongoing on NPWS managed land .		Yes	NPWS, SIMPA, DPI-Fisheries, TfNSW	
S2	Socio-economic	Addres entrance erosion	Obtain funding for a wave penetration and unconsolidated sediment assessment. Undertake assessments. Implement recommendations.		Very High	2013-14	Not commenced		\$20,000	Yes		Could be included in updated coastal hazard assessment.
R1	Recreational	Manage access tracks and recreation areas	Identify priority sites. Determine the improvements required. Attract funding for the improvements. Implement improvements. Maintain improvements.		Very High	2012-13	SIMP - Not started NPWS - Ongoing CVC - Ongoing	SIMP - Do not have any responsibility with regards to access track establishment or maintenance. Perhaps a consent role if a bridge is needed. NPWS - Ongoing, NPWS maintains a network of roads and trails for public access and management access purposes. CVC - Mowing contract for village area and APZ managed by NRM team; access track maintenance within NPWS estate supported by NRM team.	\$5,000	Yes (NPWS Lead)	NPWS, SIMPA, Crown Lands	
E7	Ecological	Regular on-site wastewater system inspections	Identify priority sites. Develop and consistent inspection program. Record inspections in a database or GIS system. Amend the relevant Development control plan and other pertinent Council plans, strategies or policies to require appropriate levels of treatment.		Very High	Ongoing	Ongoing	NPWS - Not NPWS core business CVC - On-going programmed inspections south side of the estuary. North side of the estuary is NPWS controlled and managed	-	Yes	NPWS	
E6	Ecological	Implement a water quality monitoring program	Review the existing water quality monitoring program to identify any problems. Identify suitable site, parametersand timing to provide the information required e.g. suitability for swimming, aquatic life, sources of pollution etc. Establish amonitoring protocol with details on sites, parameters, sampling frequenct, quality control, recording and reporting. Develop a database for storing the results possibly with links to GIS that could graphically display the information for display in the CVC website. Review the monitoring program results to assess the extent fo the problem, what management actions are required or if they have been effective.		High	2013-14 and ongoing	Incomplete	No involvement by SIMP. Possibly be able to contribute to data via fish assemblage surveys. Not NPWS core business	\$5,000/program	Yes	SIMPA, DPI-Fisheries, NPWS	Two sites within the Sandon River estuary were included in the Ecohealth water quality monitoring program.
E2	Ecological	Initiate and support bush regeneration programs	Identify priority sites. Implement regional pest and weed management plan. Co-ordinate a group of volunteers or include the sites in CVC and/or NPWS bush regeneration routine. Undertake the revegetation works. Mointor the revegetation works and undertake maintenance if required.		High	2013-14 and ongoing	Ongoing	NPWS has a pest and weed management program on NPWS managed lands. Managed by NRM team on CVC land.	\$5,000/year	Yes	NPWS(lead)	
S3	Socio-economic	Promote the management of Sandon River estuary	Investigate and promote land ownership boundaries and arrangements. Install signage as appropriate.		High	2013-14	Not commenced.	CVC	\$5,000	Yes	NPWS(lead), SIMPA(lead), Crown Lands	
S1	Socio-economic	Interpretive centre	Assess the existing signage. Consult Sandon River ratepayers association. Determine the additional messages required. Design interpretive centre. Install interpretive centre. Remove old signage.		High	2013-14	Ongoing	NPWS has an interpretive program.	\$10,000	Yes	NPWS(lead), SIMPA(lead), DPI, CVC	
S4	Socio-economic	Maintain CV CEMC	Ensure all relevant stakeholders are invited to join the CV CEMC. Hold regular committee meetings i.e. at least quarterly.		High	Ongoing	Ongoing		-	Yes	NPWS, OEH, DPI, SIMPA	
E4	Ecological	Feral animal control	Maintain regulatory activities relating to dogs. Prepare and distribute information material relating to dogs in the estuary. Develop feral animal eradication program - sies, methods, timing etc. Organise participants - CVC, OEH etc. Gain approvals, licences etc. Undertake works.		Medium	2014-15 and ongoing	Not commenced	Need to differentiate between "wild dogs" and domestic dogs. Suggest Joint program coordinated by LLS as needed. CVC lead on council managed lands. NPWS on NPWS managed lands	\$20,000/program	Yes	NPWS (lead)	Dog management and foxes was raised by community as a concern in 2020.

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E5	Ecological	Collection and disposal of rubbish	Identify priority site for rubbish collection. Identify source of rubbish pollution. Determine if the clean up will be Council or community based. Organise participants. Undertake the works. Record the amount and type of rubbish removed. Dispose of rubbish appropriately. Identify sites for additional bins (including recycling). Install bins (and signs for recycling bins). Prepare and disseminate relevant educational/information material.		Medium	2014-15 and ongoing	Not commenced	CVC lead on council managed lands. NPWS on NPWS managed lands	\$5,000	Yes	NPWS	Litter was raised as an issue by community (2020).
S5	Socio-economic	Monitor stability of the beach barrier	Monitor beach barrier width using aerial photographs every 5-10 years. If the beach barrier width deteriorates or assets are at risk, obtain funding for detailed Coastal processes Study to assess wave run-up and flooding. Undertake assessment. Implement recommendations.		Medium	2015-16 and ongoing	Not commenced	Need to define scope and responsibility.	\$20,000	Yes	NPWS(lead)	Could be included in updated coastal hazard assessment.
R2	Recreational	Maintain boat ramps	Assess the existing facilities. Determine the maintenance actions required. Obtain necessary approvals e.g. SIMPA, if maintenance works required below Mean High Water Mark. Maintain where necessary.		Medium	2014-15	In progress	Approval to begin work on the ramp is to be granted soon. NPWS managed lands are above MHW. NPWS would contribute in discussion on this issue and support funding application to undertake the works.	\$10,000	Yes	NPWS (lead), CVC, TfNSW, Crown Lands, SIMPA	
H1	Heritage	Educate the community on the heritage value of the estuary.	Consult the LALC on the information, sites and values they would like the community to learn about. Identify interesting sites and stories that relate to the heritage of the estuary. Preparation of a heritage study for Sandon Village and catchment would assist. Design and install signs. Develop and implement other educational activities or information such as guided walks, information brochures etc. Involve the local indigenous community wherever possible.		Medium	2014-15 and ongoing	Not commenced	Need to clarify responsibility	\$10,000	Yes	NPWS	Also involve Native Title owners.
E8	Ecological	Assess and upgrade stormwater controls in developed areas	Review potential stormwater hotspots. Develop appropriate management solutions. Implement controls.		Low	2014-15	Not commenced	Need to clarify responsibility	\$10,000 (not incl. controls)	Yes	NPWS	
R4	Recreational	No increase in campsites and development potential	Maintain number of campsites in NPWS campground. The number of dwellings in Sandon village to be restricted to those permitted under current planning and zoning provisions.		Low	2015-16	Ongoing	Ongoing campground management by NPWS.	\$5,000	Yes	NPWS	To be addressed through coastal hazard mapping and inclusion in CM SEPP.
R5	Recreational	Review Crown Land tenure and governance within Sandon village	Review land tenure. Consult community. Determine and implement appropriate action.		Low	2014-15	Not commenced	Need to clarify responsibility	-	Yes	Crown Lands (lead)	Crown land mapping shows Sandon Reserve (in front and behind houses) is Council managed crown land for public recreation.
R1	Recreational	Monitoring of biological indicators	Review biological monitoring program undertaken previously and in other local catchments. Establish a monitoring protocol with details of sites, parameters, sampling methods, sampling frequency, quality control, recording and reporting. Ideally this would be similar to others in the region. Develop a database for storing the results with links to Council GIS that could graphically display the information and be placed on the CVC website. Implement the monitoring program for a 12-month pilot period. Review the monitoring program based on the pilot period effectiveness and costs. Refine the program, if necessary, and then implement permanently.		Low	2015-16 and ongoing	Incomplete	NPWS willing to contribute to process on NPWS managed lands. Sandon River not included in Ecohealth monitoring	\$4,000/site	Yes	NPWS, SIMPA, DPI-Fisheries (lead)	Only two sites within the Sandon River estuary were included in the Ecohealth water quality monitoring program. Not sufficient to fulfill this action?
E9	Ecological	Assess and manage seepage from landfills	Identify locations of previous landfills. Assess all landfills in the village for evidence of soil or groundwater contamination. Develop and implement remedial actions.		Low	2016-17	Not commenced.	NPWS willing to contribute to process on NPWS managed lands	\$30,000	Yes	NPWS	

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Draft Wooli Beach Coastal Zone Management Plan (2018)												
MS1		Beach Nourishment Schem (BNS) - Pre-implementation	Detailed design of BNS (including sand back-passing and supplementary beach scraping)		High	2019-20	In progress	Study underway.	\$20,000 CVC/ \$20,000 OEH application submitted to OEH	Yes		
MS1		Beach Nourishment Schem (BNS) - Pre-implementation	Implement beach scraping works for southern 800 metres of Wooli village frontage		High	2018 - 2019	In progress	Initial nourishment (15,000 m³ complete).	\$50,000 (CVC/CCPA) / \$50,000 (OEH)			
MS1		Beach Nourishment Schem (BNS) - Pre-implementation	Design and obtain approvals for beach scraping swale infill works adjacent to original Wooli village		High	Scraping swale infill works to be undertaken when the beach profile displays a low swale adjacent to the main dune and a higher berm level at the front of the beach	Completed		\$7,500 CVC / \$7,500 OEH application submitted to OEH and CVC staff time not costed			
MS1		Beach Nourishment Scheme (BNS) - Pre-implementation	Environmental impact assessment		High	2019 - 2020	Completed	CVC (2018)	\$40,000 CVC/ \$40,000 OEH application submitted to OEH			SCU (2019) assessment of biological impacts of beach scraping.
MS1		Beach Nourishment Schem (BNS) - Pre-implementation	Approvals documentation		High	2019 - 2020	Completed		CVC staff time not costed			
MS1		Beach Nourishment Schem (BNS) - Pre-implementation	Detailed funding plan over likely life of BNS		High	2018 - 2020	Not commenced		CVC staff time not costed			To be included in CMP
MS2		BNS Implementation	Implement beach nourishment and beach scraping campaigns		High	2018 and up to every 5 years thereafter	In progress		CVC/ OEH/ benefiting landowners			To be included in CMP
MS3		BNS Monitoring	Nearshore wave and current monitoring		High	2020-2022 (continuous)	Not commenced		\$25,000 CVC/ \$25,000 OEH			
MS3		BNS Monitoring	Sand tracing		High	2020-2022 (2-3 campaigns/ yr)	Not commenced		\$150,000 CVC/ \$150,000 OEH			
MS4		Routine Beach camera monitoring	Beach camera monitoring		High	Ongoing - to be reviewed post beach nourishment	Incomplete	Water tower monitoring ceased. Some drone monitoring undertaken.	Not costed		CCPA	
MS4		Routine Beach camera monitoring	Beach surveys (including beach pole monitoring)		High	Ongoing post storm with current frequency to be reviewed post beach nourishment	Ongoing		Not costed		CCPA	
MS4		Routine Beach camera monitoring	Photogrammetry		High	2018 and every 1-2 years thereafter	Ongoing	Current study/ OEH provided info.	Not costed		OEH	
MS4		Routine Beach camera monitoring	Offshore wave data collection		High	Ongoing	Not commenced		Not costed		OEH/MHL	Could be included in updated coastal hazard assessment.
MS4		Routine Beach camera monitoring	LiDAR (alternative to photogrammetry)		Low	2018 and 1-2 years thereafter (if photogrammetry unavailable)	N/A		Not costed		LPI	
MS5		Emergency Management	Implement EASP and review periodically (e.g. post storm event)		Very High	Review when hazard lines and risk assessments are updated and in accordance with process in EASP	Ongoing		Not costed	Yes		
MS6		Community education	Update community on CZMP implementation and coastal management matters relevant to Wooli		Very High	Ongoing	Ongoing	CCPA	Not costed	Yes		Community engagement throughout CMP stages 1-5.
MS6		Community education	Encourage landowners to manage their assets to reduce, where practical, the risk from current and future coastal hazards and coastal management matters relevant to Wooli		Very High	Ongoing	Ongoing		Not costed	Yes		Update of coastal hazard mapping and potential inclusion in CM SEPP.

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MS7		Planning and development controls	Amend coastal risk planning map to be consistent with 2100 hazard line in WP (2010a).		High	2018 - 2019	Not commenced		Not costed	Yes		As 5.1 above.
MS7		Planning and development controls	Update information on Planning Certificates		High	2018 - 2019	Complete. Will need to be again updated when the coastal risk planning map in the CVLEP is updated.		Not costed	Yes		As 5.1 above.
MS7		Planning and development controls	Subdivisions or LEP amendments that propose to increase intensity of development seaward of the 2100 hazard line are discouraged		High	Ongoing	Ongoing		Not costed	Yes		As 5.1 above.
MS7		Planning and development controls	Prepare and implement revised development control provisions for Wooli to more effectively implement Clause 7.5 of the CV LEP 2011.		High	2018 - 2019	Not commenced		Not costed	Yes		As 5.1 above.
MS7		Planning and development controls	Review Sea Level Rise Policy		Medium	When new data is available, when State Government policy changes and/or as specified in the Policy	Not commenced		Not costed	Yes		
MS8		Town Services and Contingency Strategy	Plan for relocation/ modification/ redesign of utilities etc potentially at risk		Medium	2021	Not commenced		Not costed	Yes	Telstra and other providers	
MS9		Beach and Dune management	Suitable sand from Wooli Wooli River to be placed on Wooli Beach		Low	If/ when dredging required for safe navigation	Opportunistic	Opportunistic - Erosion occurring along Wooli Wooli River shoreline, question viability of dredging and placing on beach?	Not costed	Yes	Crown Lands	
MS9		Beach and Dune management	Beach and dune rehabilitation, revegetation and weed control		High	Ongoing (note plans/ programs may need review following implementation of BNS)	Ongoing		Not costed	Yes	CCRT, Dune Care, SIMPA	SIMP granted consent for recent beach scraping. Effects on ghost crabs was also conducted. CVC recommend development of Vegetation Management Plan - CVC to take lead with Crown Land to fund dune rehabilitation including weed control
MS10		Beach Access Management	Minor and localised beach scraping at, and maintenance of, formal beach accessways		High	Ongoing (when public safety is unacceptable and sufficient sand is on the beach)	Ongoing	No current budget identified for beach scraping works, 2020/21 budget includes renewal of access steps, design to consider change to sand depth to maintain access.	Not costed	Depends on location		
MS10		Beach Access Management	Install fencing to direct pedestrians to formal accessways and rehabilitate informal 'private' tracks		Medium	2018 (with beach scraping project) and ongoing in conjunction with specific projects	In progress	Education required to inform adjoining landholders of impacts of illegal access point	Not costed	Depends on location		
MS10		Beach Access Management	Manage vehicle access		High	Ongoing	In progress	Updated Beach Access Policy 2018 - installation of gate at breakwall. Need to consider options for beach access control along South Terrace and One Tree.	Not costed	Depends on location		
MS11		Conservation of Aboriginal sites	Protect/ conserve known and unknown middens etc		High	Ongoing	Ongoing		Not costed	Depends on location		
MS12		CZMP Implementation and Review	Supervision of BNS implementation by sub-committee of CVC Coast and Estuary Management Committee		High	After certification of CZMP	Ongoing		staff/public authority/ volunteer time not costed	Yes		
MS12		CZMP Implementation and Review	Revise/ update CZMP		Medium	Once actions are implemented, if significant issues arise (including if BNS is ineffective) or by December 2021 to transition to a CMP (whichever occurs first)	In progress		Not costed	Yes		Transition to CMP
MS12		CZMP Implementation and Review	Prepare a revised coastal hazard study		Low	Part of future CMP preparation	Not commenced		\$25,000 CVC / \$25,000 OEH	Yes		Potential CMP Stage 2 action

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MS13		Trigger Actions	If the BNS is deemed to be no longer feasible then investigate other actions, such as geotextile groynes and/ or additional beach nourishment		Low	If BNS trigger point reached (i.e. less than 155,000 m ³ of sand in front of southern part of original village) or BNS determined not to be feasible due to available resources or other logistical reasons.	N/A		cost dependent on design	Yes		

Ref.	Type of Action	Management Strategy	Action	Rank	Priority	Timeframe	Status	Comments	Cost (at year of plan preparation/ implementation)	CVC Responsible?	Other Stakeholders Responsible/Involved	Other information
Wooli Wooli River Estuary Management Plan (2009)												
C-1	Catchment Management		Prepare 'Principles for land management and development'	1	Very High	Immediately - 12-18 months	Not commenced		Minimal	Yes	DECC, DPI-Forests	
WQ-2	Water Quality		Auditing of on-site sewage systems and replacement as necessary	2	High	Immediately - 12-18 months	Ongoing	On-going annual programmed inspections and audits by DPI Shellfish program.	Minimal	Yes		
WQ-5	Water Quality		Water quality monitoring	3	High	Immediately - 12-18 months	Incomplete	SIMPA does not undertake water quality monitoring. No ongoing water quality undertaken by CVC. Three sites within the estuary were included in the Ecohealth program.	\$5,000 p.a.	Yes	Oyster farmers, DECC, SCU, SIMPA	
F-3	Foreshore		Review EPIs to protect riparian vegetation	4	Very High	Short - 1-3 years	Not commenced		Minimal	Yes	DECC-NP, DoP	
F-4	Foreshore		Bank recession monitoring	5	Medium	Immediately - 12-18 months	Not commenced		\$5,000 p.a.	Yes	DECC, Landholders	Could be included in updated coastal hazard assessment.
W-2	Waterway		New speed zones and boating restrictions	6	Medium	Immediately - 12-18 months	Unknown		Minimal	Yes	Maritime Authority	Status to be checked with TfNSW
W-1	Waterway		Review SIMP zonings	7	Medium	Immediately - 12-18 months	In progress	Management planning review process currently underway. No finalisation date available.	Minimal	Yes	DECC, SIMPA, DPI-Fisheries	
E-5	Education		Guided tours and excursions	8	High	Short - 1-3 years	Completed	No education officer available to carry out this work. Marine park agent program was run which involved engagement with school children. Continue to provide user guides (paper and electronic) as well as other fish related information.	\$10,000-\$20,000	Yes	DECC, SIMPA, DPI, LALC, CMA	
E-2	Education		Brochures to community and visitors	9	High	Short - 1-3 years	Not commenced		\$20,000	Yes	NRCMA, DECC, DPI, LALC, SIMPA	
C-2	Catchment Management		Identify and conserve aquatic & terrestrial habitat areas	10	High	Short - 1-3 years	Not commenced		Minimal	Yes	DECC, CMA, SIMPA, DPI-Fisheries, DoP	
F-1	Foreshore		Protect public infrastructure from bank erosion	11	Low	Immediately - 12-18 months	Not commenced		\$5,000 for audit, \$150k for each bank stabilisation	Yes	Lands, DECC, SIMPA	
WQ-1	Water Quality		Develop and implement stormwater management strategy	12	Medium	Short - 1-3 years	Not commenced		\$20,000 to develop strategy, approx \$200k for works	Yes	Developers	
E-1	Education		Signage at boatramps and along foreshore	13	Medium	Short - 1-3 years	Not commenced		\$20,000	Yes	NRCMA, Maritime Authority, DECC, LALC	
WQ-4	Water Quality		Prepare Emergency Action Plan for spills etc	14	High	Medium - 3-5 years	Not commenced		Minimal	Yes	DECC, RTA, SES, NSW Fire Brigade, NSW Maritime, SIMPA	
E-4	Education		School kits	15	High	Medium - 3-5 years	Complete	Marine estate agents program run with schools.	\$20,000	Yes	SIMPA, DECC, DPI, CMA, LALC, DEET	
WQ-3	Water Quality		Commence investigations into centralised sewage treatment	16	High	Medium - 3-5 years	Complete	Council resolved 18/07/17 (Resolution 15.129/17) - "Not proceed further with sewerage Wooli." In the statewide risk ranking issued by DPIE on 09/04/20 Wooli was given a risk score of "1" which is the lowest risk score and so is unlikely to receive any financial assistance as the available funds can only be used on projects with a risk score of "5".	\$50,000 feasibility study, \$1-2m STP	Yes	DECC	
F-2	Foreshore		Revegetate foreshores and riparian zone while enabling adequate opportunities for public access to the River	17	High	Medium - 3-5 years	Not commenced	SIMP not involved except for consent or consultation role. Have guided and assisted Solitary Islands Marine Park Resort to install rock fillets rather than revetment.	\$5,000 p.a. minimum	Yes	Private & public landholders, CMA, SIMPA, DECC-NP	significant erosion adjacent/ along South Terrace (high pedestrian access) and Olen Close Reserve
W-4	Waterway		Maintain a watching brief on studies and statutory management of outboard motors on waterways and encourage boating public to use low emission outboard motors	18	High	Medium - 3-5 years	Not commenced		Minimal	Yes	DECC-EPA, Federal Government	
W-5	Waterway		Renew, rationalise and install recreational facilities	19	Low	Short - 1-3 years	Not commenced	SIMP do not have any responsibility with regards to this. Waterway not 'land' managed by Council, waterway recreation facilities to be implemented by Waterways or other third party	minimum \$50,000	Yes	SIMPA, Maritime Authority, DPI-Fisheries, Lands, Community, DECC	
E-3	Education		Detailed boating map	20	Low	Short - 1-3 years	Complete		\$5,000 design, printing etc, \$5,000 p.a. updating	Yes	Maritime Authority, SIMPA, commercial boat hire operators	
W-3	Waterway		Install movable channel markers / buoys	21	Low	Short - 1-3 years	Complete	In far lower estuary.	\$5,000	No	Maritime Authority, SIMPA	
W-6	Waterway		Dredge navigation channels as required, and \$ permitting	22	Low	Medium - 3-5 years	Not commenced		\$500,000 per dredge	Yes	Dept Lands, DECC, DPI-Fisheries, SIMPA, Maritime Authority	

Ref.	Type of Action	Management Strategy	Action	Rank	Priority	Timeframe	Status	Comments	Cost (at year of plan preparation/ implementation)	CVC Responsible?	Other Stakeholders Responsible/Involved	Other information
Coastal Zone Management Plan for Wooloweyah Lagoon (2009)												
WQ-1	Water Quality		Reduce nutrient loads of runoff and receiving waters within the catchment		High	Short-medium (1-5 years)	Ongoing		Capital - \$100k-\$500k, maintenance \$10k-\$100k	Yes	Landholders, NRCMA, DECCW	
WQ-2	Water Quality		Implement regular water quality and condition asesment monitoring for the lagoon, channels, drains and creeks		Low	Medium-long (3-10 years)	Incomplete	Ecohealth project had a site in the Lake	Capital <\$100k, maintenance/extension \$10k-\$100k	Yes	DECCW, NRCMA, SCU, UNE, Landcare	
WQ-3	Water Quality		Implement water quality improvement actions for priority drains and their catchments		Medium	Medium (3-5 years)	Ongoing	A number of tidal gates installed.	Capital - \$100k-\$500k, maintenance \$10k-\$100k	Yes	NRCMA, cane industry, graziers	
WQ-4	Water Quality		Reduce sewage impacts on waterways		High	Medium (3-5 years)	Ongoing	Inspections undertaken. Ebb-tide release constructed in 2015 means treated effluent from Yamba STP no longer discharged to the Lake.	Maintenance/extension-<\$10k	Yes	Landholders	
B-1	Biodiversity		Identify and prioritise riparian areas for rehabilitation and regeneration		High	Medium-long (3-10 years)	Incomplete		Capital - \$100k-\$500k, maintenance \$10k-\$100k	Yes	Landholders, DECCW, NRCMA, WetlandCare Aus, Landcare	
B-2	Biodiversity		Encourage cane toad control		Medium	Short (1-3 years)	Ongoing	Undertaken by local volunteers with assistance from agencies and CVC	Capital <\$100k, maintenance/extension \$10k-\$100k	Yes	DECCW, NRCMA, cane industry, graziers, landholders	
B-3	Biodiversity		Identify and prioritise wetland/floodplain habitats for rehabilitation		Medium	Short (1-3 years)	Ongoing	Main priority is salt marsh wetland surrounding ring drain.	Capital - \$100k-\$500k, maintenance \$10k-\$100k	Yes	Cane industry, graziers, WetlandCare Aus, NRCMA, DECCW, Industry & Investment NSW, Landcare	
B-4	Biodiversity		Implement and encourage uptake of best management practice actions for agricultural activities in the catchment		High	Short-long (1-10 years)	Ongoing		Capital - \$100k-\$500k, maintenance \$10k-\$100k	Yes	Cane industry, graziers, Land & Property Mgt Authority, NRCMA, DECCW, Industry & Investment NSW	
B-5	Biodiversity		Develop and implement a shorebird management plan for the Clarence Estuary		High	Immediate-short (1-3 years)	Complete	Implementaion ongoing.	Capital - variable, maintenance/extension <\$10k	Yes	Land & Property Mgt Authority, NRCMA, DECCW, WetlandCare Aus	
B-6	Biodiversity		Decommission the Taloumbi ring drain and levee		Low	Long (5-10 years)	In progress	Hydrodynamic study completed of Ring drain and surrounding catchment .	Capital >\$500k, maintenance \$10-\$100k	Yes	Land & Property Mgt Authority, Cane industry, graziers, WetlandCare Aus, NRCMA, DECCW, Industry & Investment NSW, Landcare	
B-7	Biodiversity		Seagrass management and protection		High	Short-medium (1-5 years)	In progress	Seagrass study project by Southern Cross University endorsed by CEMC.	Capital - \$100k-\$500k, maintenance \$10k-\$100k	Yes	Industry & Investment NSW, DECCW (bathymetric survey), professional fishermans association, NRCMA	
ES-1	Erosion & sedimentation		Reduce bank erosion along Palmers, Micalo and Oyster Channels		High	Medium (3-5 years)	Incomplete	Efforts were made at least one site however were ineffective.	Capital - \$100k-\$500k, maintenance \$10k-\$100k	Yes	Land & Property Mgt Authority, NRCMA, DECCW, landholders, NSW Maritime, Professional Fishermens Assoc	
ES-2	Erosion & sedimentation		Improve navigability of Palmers Channel		High	Short (1-3 years)	Complete	Dredging occurred in 2011.	Capital - \$100k-\$500k, maintenance <\$10k		Land & Property Mgt Authority, DECCW, Regional Development Aus, Professional Fishermens Assoc	
ES-3	Erosion & sedimentation		Improve environmental flows		Medium	Medium (3-5 years)	Ongoing	Shallow Channel opened in 2008, some improvement with Micalo Bridge 2019.	Capital - \$100k-\$500k, maintenance \$10k-\$100k	Yes	Land & Property Mgt Authority, DECCW, Regional Development Aus, Professional Fishermens Assoc, NRCMA, landholders	
FD-1	Floodgates & drains		Improve water quality, fish passage and habitat in drains		High	Medium (3-5 years)	Ongoing	A number of tidal gates and winches installed.	Capital - \$100k-\$500k, maintenance \$10k-\$100k	Yes	Industry & Investment NSW, DECCW, landholders	
D-1	Development		Control of urban growth areas		High	Ongoing	Ongoing	Urban growth areas defined in MNC Regional Growth Strategy (March 2009). Superceded by North Coast Regional Plan.	Maintenance/extension-<\$10k	Yes	DoP	
P-1	Planning		Zone Woolooweyah Lagoon as "W1 Natural Waterway in the revised Clarence Valley LEP in accordance with the NSW planning reforms LEP Standard Template		High	Short (1-3 years)	Completed	Lagoon is zoned W1 in CVC LEP2011	Maintenance/extension-<\$10k	Yes		

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P-2	Planning		Incorporate a foreshore buffer around Woollooweyah Lagoon to allow for ecosystem processes and expected response to future environmental change		High	Medium (3-5 years)	Completed	Most of the Lagoon foreshore is zoned E1 and E2 in the CVC LEP2011	Maintenance/extension-\$10k-\$100k	Yes	Land & Property Mgt Authority, landholders	
C-1	Cultural		Aboriginal Heritage management		High	Ongoing	Ongoing		Maintenance/extension-<\$10k	Yes	DECCW	
SL-1	Climate change		Incorporate and make provision for potential impacts of climate change in planning instruments, development controls and environmental assessments		Medium	Immediate-short (1-3 years)	Completed	CVC Climate Change policy adopted 18/5/2010 (amended 19/3/13). CVC LEP2011 Clauses 5.5 & 7.3. Council is currently developing a climate change action plan.	Capital - variable, maintenance/extension \$10k-\$100k	Yes	DECCW, Cane industry, graziers, Land & Property Mgt Authority, landholders	

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Draft Yamba Coastline Management Plan (2003) and Implementation Strategy (2004)												
A	Geotechnical strategies	1	Audit existing private & public surface and subsurface drainage as part of a stormwater management study			Immediate	Incomplete	Stormwater audit performed in conjunction with groundwater monitoring program. II	\$50,000 capital \$10,000 ongoing	Yes	Landowners	
A	Geotechnical strategies	2	Improvements to all surface water drainage measures			Immediate	Not commenced		\$100,000 capital, \$10,000 ongoing	Yes	Landowners	
A	Geotechnical strategies	3	Further investigations of existing foundation conditions			Immediate	Not commenced		\$50,000.00	Yes		
A	Geotechnical strategies	4	Groundwater monitoring & investigation - detailed monitoring program covering at least 3 significant rainfall events			Immediate	Complete		\$100,000-\$250,000	Yes	landowners, State Govt	
A	Geotechnical strategies	5	Stabilisation of the steep upper slopes by either flattening of the steeper slopes or soil nailing			Short Term	Not commenced		\$50,000-\$600,000	Yes	landowners, State Govt	
A	Geotechnical strategies	6	Provision of subsurface drainage by trench drains and/or inclined drains at the toe			Short Term	Not commenced		\$860,000 capital, \$18-\$32k ongoing	Yes	landowners, State Govt	
A	Geotechnical strategies	7	Reclassification of the Landslide Risk Zones (LRZs) following the monitoring program			Long Term	Complete	To commence on completion of groundwater monitoring program	To be evaluated	Yes		
B	Coastal Hazard & Planning Strategies	1	Develop emergency response procedures			Immediate	Not commenced		To be evaluated	Yes		
B	Coastal Hazard & Planning Strategies	2	Investigate options for relocating Yamba Surf Club			Immediate	Partially complete	Surf Club has prepared plans for a surf club on Turners Beach	To be evaluated	Yes	YSLC	
B	Coastal Hazard & Planning Strategies	3	Inspection & maintenance to the seawall at Main Beach (toe wall)			Short Term	Complete	Maintenance carried out on an ongoing basis	\$230,000 capital, \$9k ongoing	Yes	State Govt	
C	Development Controls and planning provisions	4	Undertake a compliance check of relevant development consents and building approvals			Short Term	Not commenced		In-house by Council	Yes		
C	Development Controls and planning provisions	5	An audit of the structural adequacy of works within the identified risk zones			Short Term	Not commenced		N/A - landowners expense	Yes	Landowners	
C	Development Controls and planning provisions	6	Monitor building activities within the identified risk zones			Short Term	Ongoing		In-house by Council	Yes		
C	Development Controls and planning provisions	7	Introduce LEP controls to; (a) Identify the landslip risk zones. (b) Require development consent for all but minor development within the landslip risk zones. (c) Require that the potential risk of slope instability be considered in determining a development application. (d) Require that determination of a development consent have regard to the impact of such development on the visual and landscape character of the coastal foreshore area. (e) Require development consent for dwelling houses within the identified stormwater catchment area for Main Beach and Convent Beach. Alternatively, develop a Master Plan to introduce the above controls (a) to (e) and amend the Maclean LEP 2001 to require that the Master Plan provisions be considered in determining a development application.			Short Term	Not commenced	Specific LEP provisions have not been developed for the Main Beach / Convent Beach stormwater catchment	In-house by Council	Yes		
C	Development Controls and planning provisions	8	Review the exempt and complying development provisions of the Maclean LEP 2001, to ascertain suitability within the identified landslip risk zones and the stormwater catchment area			Short Term	Not commenced		In-house by Council	Yes		
C	Development Controls and planning provisions	9	Formulate a Development Control Plan (DCP) for the stormwater catchment area for Main Beach and Convent Beach. The DCP to identify for the various landslip risk zones and other lands the following; (a) Engineering and geotechnical requirements. (b) Drainage and stormwater assessment study requirements. (c) Drainage and stormwater connection requirements. (d) Foundation requirements. (e) Permissible site coverage and /or floor space ratios for development. The DCP could also include controls on building heights, setbacks, landscaping, parking , privacy, overshadowing, visual impacts, building forms, etc.			Short Term	Not commenced	General DCP geotechnical and stormwater provisions apply, but no specific provisions have been developed for Main Beach / Convent Beach stormwater catchment	In-house by Council	Yes		
C	Development Controls and planning provisions	10	Develop a stormwater management plan for the study area and a contributions plan for drainage works, in conjunction with the Department of Infrastructure, Planning and Natural Resources. This will help identifying priority areas for improving stormwater drainage and capital works programming.			Short Term	Not commenced	Can't commence until completion of stormwater audit	In-house by Council	Yes	Dept of Lands	

Ref.	Type of Action	Management Strategy	Action	Rank	Priority	Timeframe	Status	Comments	Cost (at year of plan preparation/ implementation)	CVC Responsible?	Other Stakeholders Responsible/Involved	Other information
C	Development Controls and planning provisions	11	Review standard conditions of development consent relating to engineering, geotechnical provisions and stormwater			Short Term	Not commenced		In-house by Council	Yes		
C	Development Controls and planning provisions	12	Provide advice on Section 149 Certificates to the effect that the properties within Yamba identified at risk (in the Jeffery and Katauskas report) are at risk and include advice regarding any controls or development prohibitions Council has resolved to implement.			Short Term	Complete	Advice is included on the relevant section 149 certificates	In-house by Council	Yes		
D	Dune Management	13	Continue dune management throughout the study area, with a focus on weed eradication and native regeneration. Additional works to include; (a) Fencing of the dunes at Turners Beach. (b) Incorporate tracks around Yamba Point in the local heritage trail. (c) Provide signs indicating sites of cultural interest.			Long Term	Not commenced		\$15,000.00	Yes	CCRT, community groups	CMP to determine whether (a) remains necessary - dunes are covered in bush and relatively inaccessible as is.
D	Improved Access	14	Reopen Marine Parade, to provide road access to Main Beach			Long Term	Complete	Road from carpark to Main Beach is open	Part of \$30k budgeted for all Improved Access actions	Yes	CCRT	
D	Improved Access	15	Improve disabled access onto and around Main Beach and provide disabled access to the rock pool at Main Beach.			Long Term	Incomplete	Master Plan project planned for Yamba Main Beach, plan to consider improved access, plan to seek funding to complete improvements	Part of \$30k budgeted for all Improved Access actions	Yes	CCRT	
D	Improved Access	16	Maintain disabled access along the southern Clarence breakwater.			Long Term	Not commenced	Need to determine whether the current condition of the walkway meets disabled access standards	Part of \$30k budgeted for all Improved Access actions		Dept of Lands	
D	Improved Access	17	Provide steps from Turners Beach onto the breakwater and upgrade access from the car park onto the Turners Beach.			Long Term	Incomplete	Access from carpark to beach has been upgraded. No steps from southern breakwater	Part of \$30k budgeted for all Improved Access actions	Yes	Dept of Lands	
D	Improved Access	18	Maintain access around Yamba Point.			Long Term	Not commenced	Land Management to be assessed, areas not managed by Council.	Part of \$30k budgeted for all Improved Access actions	Yes	CCRT	
D	Improved Access	19	Provide ongoing maintenance of the pathways to Convent Beach and Pippie Beach			Long Term	Ongoing	Ongoing, 2 access tracks between convent and pippi upgraded 2017.	Part of \$30k budgeted for all Improved Access actions	Yes	CCRT	
D	Improved Access	20	Upgrade access from Pacific Parade to Pippie Beach.			Long Term	Completed	Master Plan project planned for Pippi Beach, plan to consider improved access, plan to seek funding to complete improvements.	Part of \$30k budgeted for all Improved Access actions	Yes		
D	Improved Access	21	Provide safety fencing, top and bottom of quarry, at headland adjacent to Turners Beach.			Long Term	Not commenced	Current fencing at top of headland is post & wire, fencing at bottom is log i.e. not safety fencing	Part of \$30k budgeted for all Improved Access actions	Yes	CCRT	
E	Beach NABE (Nature Assisted Beach Enhancement)	22	Undertake NABE (as appropriate) for Yamba and Convent Beaches			Short Term	Complete	NABE undertaken periodically	\$2,000.00	Yes	State Govt	
F	Beach Nourishment	23	Undertake nourishment works at Main and Convent Beaches on an opportunistic basis, as suitable sources become available, rather than on a routine basis. An assessment of sand suitability would be required before nourishment.			Long Term	Ongoing	Nourishment is undertaken when sources are available	\$166,000.00	Yes	State Govt	
	Exisiting Infrastructure	24	Council should advise utilities such as Country Electricity, Telstra and water suppliers of the landslide risk zones identified in the Yamba Coastline Management Plan.			Short Term	Not commenced		In-house by Council	Yes		

Action	Priority	Timeframe	Status	Source of Info	Comments	Comments
Yuraygir National Park and Yuraygir State Conservation Area Plan of Management 2003						
Liaise with, and maintain, a cooperative approach with local government and other government authorities to manage and maintain the natural setting of the catchment and waterways.	High		Ongoing	John Kennedy	NPWS often liaises with CVC, DPIE and other agencies to discuss issues of mutual concern. The CVC Coast and Estuary Management Committee is an example of such a forum. NPWS and DPIE (Fisheries) Officers regularly liaise regarding illegal activities of mutual interest.	
Past mineral sands mining restoration works will be monitored and where necessary further maintenance and protection undertaken.	Low		Ongoing	John Kennedy	A large percentage of the coastal weed work that is undertaken by NPWS in the Clarence Valley is related to the control of Bitou Bush, originally introduced as a sand dune stabiliser for areas sand-mined for mineral sands.	Estimate at least \$300K per annum invested (salaries, contract, equipment and resources)on the Yuraygir and Bundjalung coastlines within the scope of this CMP.
Existing pit toilets will be replaced with toilets using modern non-polluting technologies.	High		Completed	John Kennedy	New technologies are continually monitored and reviewed	
A priority list for research and monitoring for rare and endangered and other significant species will be established.	Medium		Completed	John Kennedy	The SOS (Save Our Species) Program is the current method for prioritising threatened species recovery and conservation. Examples include Threatened Shorebird Monitoring and conservation program and various programs to promote threatened coastal species including Sophorae tomentosa and Themeda grasslands	
Cooperative programs for the protection of important wildlife habitats and threatened species will be identified and initiated.	High		Ongoing	John Kennedy	The SOS (Save Our Species) Program is the current method for prioritising threatened species recovery and conservation. Examples include Threatened Shorebird Monitoring and conservation program and various programs to promote threatened coastal species including Sophorae tomentosa and Themeda grasslands.	
Programs for the protection of the little tern colonies and the coastal emu population will continue with the assistance of community groups.	High		Ongoing	John Kennedy	CVC conducting coastal emu sighting project. NPWS monitors and records emu sightings.	
Continue to support local Landcare, Dunecare and other volunteer groups.	Low		Ongoing	John Kennedy	NPWS works closely with a number of LandCare Groups, including groups at Iluka and Yamba.	
An ongoing large-scale fox control program for the planning area will be conducted.	High		Ongoing	John Kennedy		
Feral pig control will be carried out.	Medium		Ongoing	John Kennedy		
A wild dog management plan for the planning area and adjoining lands will be prepared	Medium		Ongoing	John Kennedy	Ongoing in consultation with LLS, now responsible for wild dog management plans.	
Conduct regular cane toad distribution surveys during summer months. Community involvement in the annual "Cane Toad Roundup" will be maintained. A community education campaign will continue.	High		Ongoing	John Kennedy	Significant Cane Toad work is currently being carried out by Land Care, including NPWS managed lands.	
Cattle and horses present within the planning area will be removed.	High		Ongoing	John Kennedy	NPWS currently seeking participation from other stakeholders, including CVC, RMS and Forest Corp.	
The abundance and distribution of introduced plant and animal species will continue to be monitored and mapped where possible.	High		Ongoing	John Kennedy		
Cultural heritage assessments will be prepared in consultation with local Aboriginal communities.	High		Ongoing	John Kennedy		
Collaborate with relevant Aboriginal stakeholders about the interpretation of Aboriginal cultural heritage.	High		Ongoing	John Kennedy		There were always people here: a history of Yuraygir National Park report
Sites and places of historic value will be researched and recorded, and where appropriate, protected and interpreted.	Low		Ongoing	John Kennedy		The Yuraygir National Park Inventory recording of historic places and landscapes report
Develop and implement conservation plans to protect, and where appropriate interpret, Slovenski's Statue and Buchanan's Hut.	Medium		Ongoing	John Kennedy	Slovenski's statue has had fencing and interpretive signage installed. Unfortunately Buchanans Hut was destroyed by wild fire.	Buchanans Hut is within the Scoping Study study area
Undertake a cultural heritage assessment of the Sandon huts located within Yuraygir National Park	Medium		Ongoing	John Kennedy		
Interpretive information will continue to be provided at facilities and in association with walking tracks to promote understanding and enjoyment of natural and cultural features.	Medium		Ongoing	John Kennedy		
Interpretation signs and displays along selected walking tracks will be maintained and upgraded where necessary.	Medium		Ongoing	John Kennedy		
Interpretation facilities within villages adjacent to the planning area and within local tourist centres will be maintained and upgraded where possible.	Medium		Ongoing	John Kennedy	Significant investment in online information (NPWS website) and the provision of information via the National Parks app.	
Guided educational activities will be conducted during peak visitor periods.	Medium		Ongoing	John Kennedy	Reduced in recent years.	
The impacts of visitor use will be monitored and where necessary, measures will be taken to protect natural and cultural features.	High		Ongoing	John Kennedy		
Maintain, and if necessary, upgrade the park road system.	High		Ongoing	John Kennedy		
The Sandon 'backtrack' will be gated and keyed access restricted to Sandon Village residents.	High		Completed	John Kennedy		
Recreational use of camping and picnicking areas will be monitored. Where such use is causing unacceptable environmental impact or unacceptable conflict with other visitors to the planning area, it may be modified, restricted or prohibited.	High		Ongoing	John Kennedy		
Measures will be implemented to protect significant stands of horse-tailed oak, shorebird habitat and the dune systems.	High		Ongoing	John Kennedy		
Increased law enforcement will be supported by signage to ensure the protection of significant habitat and sensitive dune areas.	High		Ongoing	John Kennedy		
Vehicular access to Illaroo Camping Area will be redirected from the present access to an upgrading of the existing fire trail to the west of Minnie Water village through Yuraygir National Park subject to appropriate environmental and cultural assessment.	Medium		Completed	John Kennedy		
Vehicular access to the Sandon-Illaroo Beach will be redirected via an access trail to the north of the present camping area and onto the beach subject to appropriate environmental and cultural assessment.	Medium		Completed	John Kennedy		
Subject to appropriate environmental and cultural heritage assessment, an additional northern camping node specifically for group camping may be constructed at Illaroo camping area if demand for the additional capacity can be demonstrated.	Medium		Completed	John Kennedy		
Shelley Beach walk-in campsite will be a fuel stove only area and campfires will not be permitted.	High		Completed	John Kennedy		
The impact of vehicles on beaches approved for vehicular use will be monitored.	Medium		Ongoing	John Kennedy		
The access trail to Minnie Water Back Beach will be maintained as a management trail and access for emergency vehicles but public vehicle access will not be permitted.	High		Ongoing	John Kennedy		
Actively discourage vehicles from using the section of Sandon Beach adjacent to the Illaroo Camping Ground south of the beach access point.	Medium		Ongoing	John Kennedy		
Seek to incorporate the inter-tidal zone into the park where it adjoins the planning area.	Medium		Not progressed.	John Kennedy		
Signposting and interpretation of the walking track system will be reviewed and upgraded to indicate the appropriate use of tracks.	Low		Ongoing	John Kennedy		
Improvements to the walking access from Lake Arragan to Shelley Beach will be investigated and may be undertaken.	Low		Ongoing	John Kennedy		

Action	Priority	Timeframe	Status	Source of Info	Comments	Comments
Manage and maintain the Lake Arragan track and platform to provide safe and environmentally responsible access for non-powered watercraft.	Medium		Ongoing	John Kennedy		
Manage and maintain the Red Cliff lookout.	Medium		Ongoing	John Kennedy		
A register of all non-park uses and facilities will be maintained and all unlicensed non-park uses and facilities identified.	Medium		Ongoing	John Kennedy	Generally removed or licenced / permitted.	
Review the occupation and management arrangements of the Sandon huts and develop a process to address these issues into the future.	High		In progress	John Kennedy	Licencing/ permitting actions in progress	
Identify and resolve legal implications of hut occupation on national park and ensure compliance with relevant health, safety, environmental and building standards.	High		In progress	John Kennedy	Licencing/ permitting actions in progress	
Broadwater National Park Bundjalung National Park and Iluka Nature Reserve Plan of Management 1997						
Implementation of a beach access permit system	High		Incomplete	John Kennedy		
Provide appropriate 4WD access to Ten Mile Beach.	Med		Ongoing	John Kennedy		
Seal roads on the Iluka Peninsula.	Med		Partial completion	John Kennedy	The road into Woody Head has been sealed.	
Expand car parking and picnic facilities at Bluff Beach.	Med		Completed	John Kennedy		
Maintain existing boat launching facilities at Woody Head.	Low		Ongoing	John Kennedy		
Install a "code of conduct" sign for fishers at Woody Head.	High		Completed	John Kennedy		
Provide three additional cabins at Woody Head	Low		Completed	John Kennedy		
Control bitou bush and asparagus fern.	High		Ongoing	John Kennedy		
Exclude all fires from the littoral rainforest.	High		Ongoing	John Kennedy		
Build a walking track and viewing platform at Iluka Bluff.	Med		Completed	John Kennedy		
Research/monitoring of pied oyster catchers	High		Ongoing	John Kennedy	SOS shorebird monitoring program	
Research into the impact of vehicle use of the intertidal zone	High		Ongoing	John Kennedy	Research encouraged. 4WD access to beaches is highly political.	
Provide day use facilities at specified locations.	High		Completed	John Kennedy		
Prepare and implement a control plan for pest plants and animals.	High		Ongoing	John Kennedy		
Control and eradication of weeds.	High		Ongoing	John Kennedy		

Type of Action	Action/Recommendation	Status	Source of Info	Comments	CVC Responsible?	Other Stakeholders Responsible/Involved	Other information
Options to Manage Recession of Whiting Beach, Yamba (2015)							
Recommendation	Periodic beach nourishment campaigns are carried out at Whiting Beach in conjunction with NSW Crown Lands	Ongoing/ Opportunistic	CVC	Undertaken when maintenance dredging of navigation channels occurs nearby.	Yes	Crown Lands	
Recommendation	Investigate the potential for dredging and beach nourishment of Whiting Beach that it would fund. Sand between Hickey and Dart Islands a potential source	Not commenced	CVC		Yes		
Recommendation	The preliminary Review of Environmental Factors outlined in Haskoning Australia (2015) is further progressed to ensure that the option of dredging between Hickey Island and Dart Island and placement of the dredged sand on Whiting Beach can proceed when required.	Not commenced	CVC		Yes		
Recommendation	Regular monitoring (surveying) of beach profiles along Whiting Beach should also be undertaken to enable regular updating of measured recession rates and assessment of the effectiveness of beach nourishment.	Not commenced	CVC		Yes	Crown Lands	
Recommendation	Obtain aerial photography of Whiting Beach and Hickey Island at least every few years to assist in assessing rates of recession.	Not commenced	CVC	Aerial photography probably available and not sourced yet.	Yes		
Recommendation	Obtain hydrographic surveys of the channels surrounding Hickey Island at least every few years to assist in assessing sink areas for sand being lost off Whiting Beach.	Not commenced	CVC	Potential that periodic TfNSW bathymetric surveys of the river could provide the necessary data if sourced.	Yes		
Recommendation	Raise elevation of the north-western end of the track at Hickey Island to reduce the risk of oceanic inundation propagating along the track.	Not commenced	CVC		Yes		Still gets inundated by rainfall periodically. Becoming an intermittent wetland. May need a boardwalk?
Technical Report 3 Risk Assessment and Stabilisation for Pilot Hill Yamba, NSW (2017)							
Onground works	Formalised groundwater drainage stabilisation scheme for LRZ1a and LRZ1b including: - Trench drains through the lower foreshore slopes to keep the toe of the slope well drained, - Subsoil drains drilled back into the hillside to reduce the risk of groundwater level rises. - Auditing of all drainage, and - Improvements to subsurface water drainage.	Not commenced			Yes		
Onground works	Construct trench drains through the lower foreshore slopes, as well as auditing of drainage and surface water drainage improvements for zones LRZ1c and LRZ2.	Not commenced	CVC		Yes		
Monitoring	Replace inclinometer 1C	Not commenced	CVC		Yes		
Monitoring	Install additional inclinometer	Not commenced	CVC		Yes		
Monitoring	Ongoing Inclinometer monitoring is recommended on at least a yearly basis, and if a rainfall event greater than a 1 in 10 year event for any period occurs.	Ongoing	CVC		Yes		
Monitoring	Consideration could be given to the use of real time inclinometer monitoring.	Not commenced	CVC		Yes		
Monitoring	Groundwater monitoring should continue and we suggest that the current period of three months for downloading of the data be continued.	Ongoing	CVC		Yes		
Monitoring	Rainfall analysis be continued on at least an annual basis to update probabilities for rainfall events	Ongoing	CVC		Yes		

Type of Action	Action/Recommendation	Status	Source of Info	Comments	CVC Responsible?	Other Stakeholders Responsible/Involved	Other information
Onground works	All individual lots upgrade their surface and subsurface drainage - Absorption trenches should be made redundant and all stormwater should be directed to sealed pipes for controlled discharge. - Individual lots should have their effluent and stormwater pipes checked for leaks (such as by pressure head testing). Any leaks should be repaired. Checking of drainage on each lot should be carried out at a frequency of not greater than 5 yearly. - Surface drainage should also be formalised to reduce overland flows and erosion during high intensity rainfall events.	Incomplete/ Ongoing	CVC	As new development consents are issued the opportunity to get roofwater discharged to the street drainage system is pursued. Plus geotechnical assessment often required.	Yes	Landowners	
Monitoring	Audit be carried out by a qualified engineer on each lot to identify any individual cut or fill batters or retaining walls. The stability and adequacy of batters and retaining walls should be assessed and recommendations given for any remedial measures or for further investigations.	Not commenced	CVC		Yes	Landowners	
Monitoring	Adopt revised rainfall alert warning levels.	Complete	CVC		Yes		
Monitoring	Undertake Main beach and northern convent beach risk assessments.	Not commenced	CVC		Yes		

Marine Estate Management Strategy Actions

Stage 1 of the MEMS (ending June 2020) focused on addressing the most severe threats to the health of the marine estate, particularly water pollution, which was identified as the greatest threat to the marine estate by the NSW community and through the evidence-based TARA in 2017. Building on the foundations laid in Stage 1, Stage 2 commenced on 1 July 2020 and is supported by an Implementation Plan for (2020-2021). Some Strategy management actions have included pilot projects in Stage 1 in specific locations along the NSW coast. Other management actions have state-wide benefits, such as the application of a Risk-based Framework for water quality in estuaries and their main tributaries. MEMA has prepared a status report for local government initiatives (MEMA, 2020) which identified the actions relevant to the study area and issues raised in this Scoping Study:

- Action 1.4 - Implement a targeted marine litter campaign and establish a Marine Litter Working Group:
 - A targeted marine litter campaign across NSW, supported by targeted campaigns in local litter hotspots. Campaign materials are publicly available to support community and local government action research and information on the effects of marine debris, to inform the development of priority actions for reducing marine litter.
 - Research has identified marine litter priorities and informed the development of marine litter campaigns that raise awareness of the impact of litter on the marine estate and change behaviours.
- Action 1.5 - Develop monitoring, reporting and performance indicators for water quality actions, and incorporate them and key knowledge gaps:
 - As part of the Strategy EES is continuing state-wide water quality monitoring in estuaries, building on state-wide monitoring programs that have been underway since 2007. The monitoring program includes a core set of state-wide indicators designed to assess aquatic ecosystem health. The program is designed to assess water quality at a scale reflecting overall condition of an estuary, incorporating the cumulative impact from pressures, and the cumulative benefit from management actions and improvements. EES is working collaboratively with local government to increase the spatial and temporal scale of the monitoring where required, and to include additional indicators to assess locally specific issues. As part of Stage 2, EES will be working closely with a number of additional councils to develop their own monitoring programs, which use the state-wide program and core indicators as a foundation.
 - Data from the monitoring program has been used to develop NSW specific guideline values for water quality indicators based on estuary type, following the principles outlined in the National Water Quality Management Framework. The guideline values provide a benchmark to compare observed data, highlighting systems with poor water quality where community values are not being met which may require further research and management intervention.
 - The data generated supports the implementation of the risk-based framework by assessing the status of key community values are being met and enabling monitoring to show whether management actions are protecting community values. The data is used in the calculation of report card grades that easily communicate information on aquatic ecosystem health to assist communities to understand the condition of their estuaries.

- Action 2.1 - Assess and manage cumulative and legacy impacts for estuary entrance modification and dredging:
 - Conceptual work method statements for practical design features that can be incorporated into maintenance and upgrade works at existing training walls to maximise aquatic habitat and recreational values. Development of guidelines highlighting ways for breakwater owners to maximise the benefits from breakwaters and minimise the impacts. An audit of existing breakwater features to determine sites where multi-use and eco features have been incorporated is largely complete. The audit found the diversity of structures and their site-specific nature limited the opportunity to develop standard drawings. Instead, draft guidance notes for breakwater maintenance project managers have been prepared.
 - An audit of commercial dredging activities undertaken on Crown land within estuaries and on ocean beaches. A Crown land audit of commercial dredging and extraction approvals has been largely completed. Recommendations arising from the audit to contemporise DPIE Crown Lands' processes for issuing and managing commercial dredging and extraction licences will be developed.
- Action 2.2 - Assess and manage cumulative and legacy impacts on foreshore development and land use change in the coastal zone:
 - An update to the Coastal Design Guidelines for NSW (2003) to illustrate how an urban design approach can inform development designs and layouts that are more sensitive to the unique natural and urban characteristics of coastal places in NSW, and to guide decision-making about legacy infrastructure in coastal areas. This project involves an update to the Coastal Design Guidelines for NSW, which will include a consideration of issues arising from legacy infrastructure in coastal areas. A review of the 2003 NSW Coastal Design Guidelines has now been completed, which included undertaking a gap analysis based on the current legislative framework and best practice in urban design. This review is being used to inform the updated Guidelines.
- Action 2.3 - Develop and implement a state-wide policy for the management of coastal Crown lands (including submerged lands) in collaboration with local government Coastal Management Programs in priority areas:
 - A draft policy and guidelines have been developed in consultation with marine estate agencies. This policy aligns the management of Crown land with the NSW coastal management framework.
- Decisions made in accordance with the Coastal Management Program and planning framework to improve coordination in assessment and compliance. Estuary-wide foreshore management strategies that reduce red tape for proposals consistent with the strategies. Developing estuary wide Domestic Foreshore Structure Strategies will guide and streamline future applications for domestic developments along foreshores (such as pontoons and boat ramps) within estuaries throughout NSW. The development of Domestic Foreshore Structure Strategies are being undertaken by DPI Fisheries in partnership with an Interagency Working Group consisting of DPIE Crown Lands, EES, NRAR, TfNSW, and DPIE PA. Domestic Foreshore Structure Strategies will utilise a robust, repeatable and defensible mapping process to assess the entire foreshore of an estuary against the relevant policy and legislation of the partner state agencies.
- Estuary-specific intertidal marine vegetation management strategies aim to improve management of the threats and risks that are cumulative, take some time to become evident, and are remote from the activity. The strategies will direct management plans to maximise resilience, address key threats and facilitate rehabilitation opportunities. A spatial modelling methodology has been developed to model macrophyte potential now and in the future. The model was initially applied to the Richmond

and the Tweed estuaries to inform planning and management decisions, via marine vegetation strategies, to maximise the values these systems provide.

- A collaboration with the University of Wollongong to undertake a first pass assessment of blue carbon storage, preservation, generation and permanency for NSW is due for completion by the end of 2020.
- Bank management strategies that reduce red tape for proposals and prioritise environmentally friendly approaches. The development of Bank Management Strategies will be undertaken by DPI Fisheries in partnership with an Interagency Working Group consisting of DPIE Crown Lands, EES, NRAR, TfNSW, and DPIE Planning and Assessment:
 - Development of Bank Management Strategies will incorporate an investigation into causes and types of estuarine bank erosion and a review of existing best management practice bank treatment options. It will then match common types of erosion with preferred best management practice treatment methodologies, with the outcome of this step being the creation of a decision support tool.
 - The decision support tool will be a robust, repeatable and defensible tool which will be applied to the relevant estuary to create a Bank Management Strategy. The resulting Bank Management Strategy, which will consist of online mapping and an explanatory companion document, will provide a strategic, upfront guide that specifies the best practice erosion control treatment method for a particular segment of foreshore within the estuary. This Bank Management Strategy can be used by land owners proposing erosion control treatment works and assessing agencies to determine the most environmentally friendly erosion control treatment approach.
- Action 2.4 - Re-establish resilient coastal floodplains and connectivity within coastal catchments:
 - A collaborative, multi-agency approach to coastal and floodplain management that investigates options to address the complex approvals process and provides for improved economic, social and environmental resilience across these landscapes.
 - The interagency working group is meeting regularly and considering a variety of options to reduce the complexity of coastal floodplain infrastructure management, balanced with improved water quality outcomes, through regulatory change. This is a statewide internal government process considering a range of works approval path scenarios, with variables such as land tenure, infrastructure ownership, project proponent, zoning (such as Coastal SEPP) and landscape/water quality risk. Agencies involved in the project include DPIE Water, DPIE Crown Lands, DPIE PA, DPI Fisheries, NRAR and EES (EPA, Biodiversity Conservation).
- Action 3.1: Enhance mapping of estuarine communities (such as saltmarsh and mangroves) to identify those communities most at threat from sea level rise expected under climate change scenarios and use this information to model areas of land suitable for retreat and those that should be prioritised for protection. Apply this information in decision making:
 - Maps indicating the vulnerability of tidal wetlands to sea level rise and method for prioritising sites for potential future protection.
- Action 3.5 - Research and monitor the effects of climate change on the marine estate to fill knowledge gaps and inform future management actions, focusing on marine biodiversity and coastal communities. This action will be integrated into the Marine Integrated Monitoring Program:
 - Subtidal monitoring of key marine habitats has been completed for the entire state.

Appendix F. RISK ASSESSMENT AND GAP ANALYSIS

F1. METHODOLOGY

The following methodology was applied to complete Risk Assessment and Information Gaps Analysis.

Risk Assessment

- Review of current knowledge and information available on the study area to highlight key issues, values and assets within the coastal zone and estuaries.
- Assess the risk of each issue to values and assets. This involved considering the priority risks identified in the *Threat and Risk Assessment (TARA) for the Marine Estate* (BMT WBM, 2017). The risk assessment process identifies credible risks, the likelihood of the risk event occurring given existing controls, the consequences to environment, social and economic values, public safety and benefits should the event occur and applies a risk rating. The risk assessment is consistent with AS/NZS ISO 31000: *Risk Management – Principles and Guidelines*. The methodology uses the risk assessment process outlined in Table 21, Table 23 and Table 24 which uses qualitative scales to assess the risk of identified issues impacting the values and assets of the study area under current management practices (based on the framework adopted for the TARA for the Marine Estate).
- The consequence of each threat considered potential impacts as listed in Table 22.
- The likelihood of each threat was based on existing studies and observations where available.
- The risk assessment evaluates the current day risk and also considers how the risk level likely to change in the future (i.e., over 20, 50 and 100 years). This includes assessment of it how factors such as climate change, increasing development pressures and population increase will impact these risks. Where available, future risk levels have been assigned based on the projected hazard mapping and data for these risks. In other cases, a qualitative assessment has been undertaken considering the expected future changes.
- The first-pass risk assessment considers the risk to values from categories of issues and key threats for each location.
- The assessment typically focusses on the detrimental, rather than the beneficial impacts of the threat, unless otherwise indicated. Should later stages of the CMP focus further on particular threats, the beneficial aspects, or opportunities associated with those threats will be further assessed.
- In all circumstances, the potential highest consequence level to any asset or value was used for the assessment.

Table 21: Qualitative measures of consequence or impact

Consequence	Description
Catastrophic	Significant on-going and/or permanent negative impacts on the environmental, social or economic values, and where these values are endangered either permanently or irreversibly.
Major	Substantial measurable and/or ongoing negative impacts on the environmental, social or economic values.
Moderate	Measurable and/or on-going negative impacts on the environmental, social or economic values.
Minor	Discernible and/or temporary negative impacts on the environmental, social or economic values.
Insignificant	No or barely discernible negative impacts on the environmental, social or economic values.

Source: Adapted from MEMA (2015)

Table 22: Potential impacts of each threat

Threat category	Potential impacts
Coastal hazards	Loss of beach and foredune Degradation or loss of assets and infrastructure Unsafe or loss of access to beach Increased frequency of flooding and inundation Loss of dune vegetation Migration of estuarine and riparian vegetation communities Loss of amenity Public safety risks Reduced tourism value Damage to cultural heritage sites Council liability and legality issues Related social and economic factors
Bank erosion	Bank instability Loss of land Erosion to and loss of riparian and estuarine vegetation and habitat Siltation Degraded water quality Navigation hazards Aquaculture/ oyster degradation Reduced amenity Reduced tourism value Council liability and legality issues
Threats to biodiversity	Reduced habitat availability Loss of biodiversity Water quality impacts Reduced amenity Reduced stabilising dune vegetation Increased erosion risk Increased nutrient load to estuary Fauna mortality Risks to shorebird and turtle nesting Displacement of native species Alteration of fauna habitats Reduced recruitment of native riparian vegetation Poor water quality Related social and economic factors

Threat category	Potential impacts
Water quality	Suspended solids Sedimentation Nutrient export High biological oxygen demand Eutrophication Fertiliser/pesticide contamination Faecal contamination Shellfish/aquaculture contamination, oyster industry closures.
Shoaling and estuary hydraulics	Siltation Navigational impacts Boating safety Community perception/satisfaction Tourism
Litter and marine debris	Odour and public safety Reduced amenity Micro-plastics Ingestion by marine animals Smothering and entanglement of seabirds and marine fauna
Use and access – pedestrian, waterways, vehicles	Restricted public access Public safety risks Reduced amenity Reduced tourism value Erosion Damage to incipient dune Noise disturbance User conflict Construction of unauthorised access points Conflict between campers, day trippers, residents and land managers
Governance	Complex mix of landowners/managers Lack of alignment of plans/policies Lack of collaboration, cooperation and resource support Differing opinions, values, policies and management approaches Conflict and delays in implementing management approaches
Heritage	Loss of or damage to items of heritage significance or cultural heritage values Lack of protection of Aboriginal/Native Title rights.
Amenity	Public safety risks Odour Visual impacts Reduced tourism value.

Table 23: Qualitative measures of likelihood under current management practices

Likelihood	Description
Almost certain	A very large certainty that this will occur in this situation within the timeframe.
Likely	Expected to occur in this situation within the timeframe.
Possible	Some clear evidence exists to suggest this is possible in this situation within the timeframe.
Unlikely	Uncommon, but has been known to occur elsewhere. Expected to occur here only in specific circumstances within the timeframe.
Rare	Never reported for this situation, but still plausible within the timeframe.

Source: Adapted from MEMA (2015)

Table 24: Qualitative risk estimation

Likelihood	Consequence				
	Insignificant	Minor	Moderate	Major	Catastrophic
Almost certain	Minimal	Low	Moderate (Mod)	High	High
Likely	Minimal	Low	Moderate (Mod)	High	High
Possible	Minimal	Minimal	Low	Moderate (Mod)	High
Unlikely	Minimal	Minimal	Minimal	Low	Moderate (Mod)
Rare	Minimal	Minimal	Minimal	Low	Moderate (Mod)

Gap Analysis

- Identification of knowledge gaps related to each issue.
- The assessment of the importance of resolving each knowledge gap to allow for effective future management of the issue, using the scale outlined in Table 25.
- The allocation of a timeframe for resolution of knowledge gaps, i.e. immediate, short term (1-2 years), medium term (3-5 years) and long term (5-10 years and beyond).
- Recommendations for Stage 2 assessment or management requirements for the CMP to address knowledge gaps with an immediate priority for resolution. Knowledge gaps with a longer-term priority for resolution will be addressed through Stage 5 (CMP implementation).

Table 25: Importance of knowledge to management of the coastal zone and estuaries

Priority	Description
Low	This knowledge is not required for management decisions/ actions/ planning – academic interest only.
Moderate	The knowledge would improve the effectiveness of management.
High	Management action required within the timeframe of this CMP cannot proceed effectively without this knowledge.
Unknown	Unknown importance of knowledge for management decisions/ actions/ planning.

F2. ASSESSMENT AND ANALYSIS

The management issues and threats affecting the study areas and results of the preliminary risk assessment and gap analysis are provided in Table 26.

Table 26: Threats, preliminary risk assessment and knowledge gaps

Threats (use, activity or stressor) and location	Source	Management responsibility	Current management approach	Present day risk			Future Risk			Assessment of Knowledge Gaps		Recommendation for additional studies*
				Consequence	Likelihood	Current Risk	20-year	50-year	100-year	Knowledge/gap	Priority for Resolution	
T1 - Beach erosion												
Ten Mile Beach	-	NPWS	-	Minor	Almost certain	Low	Low	Low	Low	Coastal hazards have not been assessed in detail.	Unknown	BNP1 - Coastal hazard assessment and mapping (NPWS).
Shark Bay	DECCW (2012)	NPWS	-	Mod	Almost certain	Mod	High	High	High	Coastal hazards were reviewed in 2012 but should be reassessed.	High	WH1 - Coastal hazard assessment and mapping (NPWS)
Woody Bay		NPWS	Rock protection/ seawall and artificial dune, adaptive management (extension north as required), asset relocation, signage.	Major	Almost certain	High	High	High	High			
Iluka area (Bluff Beach, Back Beach)	-	NPWS	-	Minor	Almost certain	Low	Low	Low	Low	Coastal hazards have not been assessed in detail.	Mod	BNP1
Iluka Beach	-	CVC managed Crown land, Crown land	-	Minor	Almost certain	Low	Low	Low	Low			IL1 - Coastal hazard assessment and mapping (CMP Stage 5)
Andersons Beach		Crown land	Sea wall	Mod	Possible	Low	Low	Low	Low			
Whiting Beach	Royal HaskoningDHV (2015)	CVC managed Crown land	Beach nourishment (initial campaign), geobags	Mod	Almost certain	Mod	High	High	High	Coastal hazards were documented in Royal HaskoningDHV (2015).	-	Potential inclusion in LGA coastline hazard assessment.
Turners Beach	MHL (2003)	CVC managed Crown land, Crown land	-	Minor	Almost certain	Low	Low	Low	Low	Coastal hazards were documented in MHL (2003) but should be reassessed.	High	Y1 - Coastal hazard assessment and mapping (CMP Stage 5)
Yamba Main Beach		CVC managed Crown land, Yamba SLSC	Seawall in front of surf club, planned relocation of SLSC	Mod	Likely	Mod	Mod	High	High			
Convent Beach		Residents, CVC managed Crown land	-	Minor	Possible	Minimal	Low	Mod	Mod			
Pippi Beach	Royal HaskoningDHV (2016)	CVC managed Crown land, Crown land	-	Minor	Almost certain	Low	Low	Mod	Mod	Coastal hazards have been assessed. Current, 2050 and 2100 hazard lines have been mapped (Royal HaskoningDHV, 2016).	-	-

Threats (use, activity or stressor) and location	Source	Management responsibility	Current management approach	Present day risk			Future Risk			Assessment of Knowledge Gaps		Recommendation for additional studies*
				Consequence	Likelihood	Current Risk	20-year	50-year	100-year	Knowledge/gap	Priority for Resolution	
T1 - Beach erosion (continued)												
Barri Beach	-	Crown land	-	Minor	Possible	Minimal	Low	Low	Low	Coastal hazards have not been assessed in detail.	Unknown	A1 - Coastal hazard assessment and mapping (CMP Stage 5)
Spooky Beach	-	CVC managed Crown land, Crown land	-	Mod	Possible	Low	Low	Low	Low	Coastal hazards have not been assessed in detail.	Unknown	A1
Angourie area (Angourie Point Beach, Back Beach, Little Shelley Beach, Shelley Beach, Plumbago Beach, Red Cliff)	-	NPWS, Crown land	-	Minor	Possible	Minimal	Low	Low	Low	Coastal hazards have not been assessed in detail.	Unknown	YNP1 - Coastal hazard assessment and mapping (NPWS).
Brooms Head (Main Beach)	CZMP (SMEC, 2017), Geotechnical Assessment (Royal HaskoningDHV, 2018b), community consultation	NPWS, Crown land	-	Mod	Almost Certain	Mod	Mod	High	High	Coastal hazards have been assessed. Current, 2050 and 2100 hazard lines have been mapped (Royal HaskoningDHV, 2018b).	-	Potential inclusion in LGA coastline hazard assessment.
Lake Cakora (Ocean Road properties)		Residents	EASP, Ocean Road revetment (ad hoc, erodible),	Major	Almost Certain	High	High	High	High	Coastal hazards have been assessed. Current, 2050 and 2100 hazard lines have been mapped (Royal HaskoningDHV, 2018b). EASP requires review and update to comply with 2019 guidelines.	-	B1 - review and update of EASP (CMP Stage 4). Potential inclusion in LGA coastline hazard assessment.
Lake Cakora entrance		CVC managed Crown land, Crown land		Mod	Almost Certain	Mod	High	High	High	Coastal hazards have been assessed. Current, 2050 and 2100 hazard lines have been mapped (Royal HaskoningDHV, 2018b). Potential loss of sandy beach use due to planned sea wall extension has not been addressed. EASP requires review and update to comply with 2019 guidelines.	Mod	B1 B2 - Cost-benefit analysis and distributional analysis for seawall extension (CMP Stage 3). Potential inclusion in LGA coastline hazard assessment.
Brooms Head (foreshore reserve)		CVC managed Crown land, Crown land	EASP, foreshore reserve revetment, design of extension of sea wall in progress. vegetation management, localised beach scraping after storm events, monitoring.	Mod	Almost Certain	Mod	Mod	Mod	Mod			

Threats (use, activity or stressor) and location	Source	Management responsibility	Current management approach	Present day risk			Future Risk			Assessment of Knowledge Gaps		Recommendation for additional studies*
				Consequence	Likelihood	Current Risk	20-year	50-year	100-year	Knowledge/gap	Priority for Resolution	
T1 - Beach erosion (continued)												
The Sandon	-	NPWS, Crown land	-	Mod	Likely	Mod	Mod	High	High	Coastal hazards have not been assessed in detail.	Unknown	YNP1
Sandon River campground	-	NPWS	-	Mod	Likely	Mod	Mod	High	High		High	S1 - Coastal hazard assessment and mapping (NPWS and CVC CMP Stage 2)
Sandon Village		Residents, CVC managed Crown land	Ad hoc revetment	Mod	Likely	Mod	Mod	Mod	Mod			
Sandon Beach	-	NPWS	-	Minor	Possible	Minimal	Low	Low	Low		Mod	YNP1
Illaroo campground	-	NPWS	-	Mod	Possible	Low	Mod	High	High		Mod	A1
Minnie Water Beach	-	CVC managed Crown land	-	Mod	Possible	Low	Mod	Mod	Mod		Mod	YNP1
Minnie Water Back Beach	-	NPWS	-	Mod	Possible	Low	Mod	Mod	Mod			A1
Diggers Camp	-	CVC managed Crown land	-	Mod	Possible	Low	Low	Low	Low		Mod	A1
Wooli Beach (north) – Yuraygir National Park	WorleyParsons, (2010), Royal HaskoningDHV (2018a), community consultation	NPWS	Beach and dune rehabilitation, revegetation and weed control	Minor	Likely	Low	Mod	High	High	Coastal hazards have been assessed and current, 2050 and 2100 hazard lines were mapped in (WorleyParsons, 2010) but should be reassessed.	Unknown	YNP1
Wooli village (original)		Residents, CVC managed Crown land	Beach nourishment scheme, beach and dune rehabilitation, revegetation and weed control, EASP	Major	Almost Certain	High	High	High	High	Coastal hazards have been assessed and current, 2050 and 2100 hazard lines were mapped in (WorleyParsons, 2010) but should be reassessed. Success of the BNS is unknown. Post-nourishment beach surveys and photogrammetry are ongoing. EASP requires review and update to comply with 2019 guidelines.	Mod	W1 - Coastal hazard assessment and mapping (CMP Stage 2). W2 - Monitoring of beach profile, near shore wave and current monitoring, sand tracing, beach camera monitoring, offshore wave data collection (CMP Stage 2 and ongoing). W3 – review and update of EASP including response to storm damage (CMP Stage 4).
Wooli Beach (south)		CVC managed Crown land	Beach and dune rehabilitation, revegetation and weed control	Mod	Almost Certain	Mod	High	High	High	Coastal hazards have been assessed and current, 2050 and 2100 hazard lines were mapped in (WorleyParsons, 2010) but should be reassessed.	Mod	W1
Jones Beach		NPWS, Crown land	-	Mod	Almost Certain	Mod	Mod	Mod	Mod		Mod	YNP1

Threats (use, activity or stressor) and location	Source	Management responsibility	Current management approach	Present day risk			Future Risk			Assessment of Knowledge Gaps		Recommendation for additional studies*
				Consequence	Likelihood	Current Risk	20-year	50-year	100-year	Knowledge/gap	Priority for Resolution	
T2 – Shoreline recession												
Ten Mile Beach	-	NPWS	-	Minor	Likely	Low	Low	Low	Low	Coastal hazards have not been assessed in detail.	Unknown	BNP1
Iluka Road (Shark Bay)	DECCW (2012)	CVC, NPWS	-	Mod	Likely	Mod	High	High	High	Coastal hazards were reviewed in 2012 but should be reassessed.	High	WH1. WH2 - Asset register and risk assessment (road and services) (NPWS)
Shark Bay	DECCW (2012)	NPWS	-	Mod	Likely	Mod	High	High	High			WH1
Woody Bay		NPWS	Rock protection/ seawall and artificial dune, adaptive management (extension north as required), asset relocation, signage.	Major	Almost certain	High	High	High	High			
Iluka area (Bluff Beach, Back Beach)	-	NPWS	-	Minor	Possible	Minimal	Minimal	Low	Low	Coastal hazards have not been assessed in detail.	Mod	BNP1
Iluka Beach	-	CVC managed Crown land, Crown land	-	Mod	Possible	Minimal	Minimal	Low	Low		Mod	IL1
Andersons Beach	-	Crown land	Sea wall	Mod	Possible	Low	Low	Low	Low			
Whiting Beach	Royal HaskoningDHV (2015)	CVC managed Crown land	Beach nourishment (initial campaign)	Mod	Almost Certain	Mod	Mod	High	High	Coastal hazards were documented in Royal HaskoningDHV (2015).	-	-
Turners Beach		CVC managed Crown land, Crown land	-	Minor	Possible	Minimal	Low	Low	Mod	Coastal hazards were documented in MHL (2003) but should be reassessed.	High	Y1
Yamba Main Beach		CVC managed Crown land, Yamba SLSC	Seawall in front of surf club	Mod	Possible	Low	Mod	High	High			
Convent Beach	MHL (2003)	Residents, CVC managed Crown land	-	Minor	Possible	Minimal	Low	Mod	Mod			
Pippi Beach	Royal HaskoningDHV (2016)	CVC managed Crown land, Crown land	-	Minor	Likely	Minimal	Minimal	Mod	Mod	Coastal hazards have been assessed. Current, 2050 and 2100 hazard lines have been mapped (Royal HaskoningDHV, 2016).	-	-

Threats (use, activity or stressor) and location	Source	Management responsibility	Current management approach	Present day risk			Future Risk			Assessment of Knowledge Gaps		Recommendation for additional studies*
				Consequence	Likelihood	Current Risk	20-year	50-year	100-year	Knowledge/gap	Priority for Resolution	
T2 – Shoreline recession (continued)												
Barri Beach	-	Crown Land	-	Minor	Possible	Minimal	Minimal	Low	Low	Coastal hazards have not been assessed in detail.	Unknown	A1
Spooky Beach	-	CVC managed Crown land, Crown land	-	Mod	Possible	Low	Low	Low	Low			
Angourie area (Angourie Back Beach, Little Shelley Beach, Shelley Beach, Plumbago Beach)	-	NPWS, Crown land	-	Mod	Possible	Low	Low	Low	Low	Coastal hazards have not been assessed in detail.	Unknown	YNP1
Brooms Head (Main Beach)	CZMP (SMEC, 2017) and Geotechnical Assessment (Royal HaskoningDHV, 2018b)	NPWS, Crown land	-	Minor	Almost Certain	Low	Mod	High	High	Coastal hazards have been assessed. Current, 2050 and 2100 hazard lines have been mapped (Royal HaskoningDHV, 2018b).	-	Potential inclusion in LGA coastline hazard assessment.
Lake Cakora (Ocean Road properties)		Residents	Ocean Road revetment (ad hoc, erodible), localised beach scraping after storm events, design of extension of sea wall in progress.	Major	Almost Certain	High	High	High	High			
Lake Cakora entrance		CVC managed Crown land, Crown land		Mod	Almost Certain	Mod	High	High	High			
Brooms Head (foreshore reserve)		CVC managed Crown land, Crown land	Foreshore reserve revetment, vegetation management, localised beach scraping after storm events, monitoring.	Mod	Almost Certain	Mod	Mod	High	High			
The Sandon	-	NPWS, Crown land	-	Mod	Possible	Low	Low	High	High	Coastal hazards have not been assessed in detail.	Unknown	YNP1
Sandon River campground	EPS (GHD, 2011), CZMP (2012)	NPWS	-	Mod	Likely	Mod	Mod	High	High		High	S1
Sandon village		Residents, CVC managed Crown land	Ad hoc revetment	Mod	Likely	Mod	Mod	Mod	Mod			
Sandon Beach	-	NPWS	-	Minor	Possible	Minimal	Low	Low	Low		Mod	YNP1
Illaroo campground	-	NPWS	-	Mod	Possible	Mod	Mod	High	High			

Threats (use, activity or stressor) and location	Source	Management responsibility	Current management approach	Present day risk			Future Risk			Assessment of Knowledge Gaps		Recommendation for additional studies*
				Consequence	Likelihood	Current Risk	20-year	50-year	100-year	Knowledge/gap	Priority for Resolution	
T2 – Shoreline recession (continued)												
Minnie Water Beach	-	CVC managed Crown land	-	Mod	Possible	Low	Low	High	High	Coastal hazards have not been assessed in detail.	Mod	A1
Minnie Water Back Beach	-	NPWS	-	Minor	Possible	Minimal	Low	Low	Low		Mod	YNP1
Diggers Camp	-	CVC managed Crown land	-	Mod	Possible	Low	Low	Low	Low		Mod	A1
Wooli Beach (north) – Yuraygir National Park	WorleyParsons, (2010), Royal HaskoningDHV (2018a)	NPWS	Beach and dune rehabilitation, revegetation and weed control	Minor	Possible	Minimal	Mod	High	High	Coastal hazards have been assessed and current, 2050 and 2100 hazard lines were mapped in (WorleyParsons, 2010) but should be reassessed.	Unknown	YNP1
Wooli village (original)		Residents, CVC managed Crown land	Beach nourishment scheme, beach and dune rehabilitation, revegetation and weed control	Major	Likely	High	High	High	High		Mod	W1
Wooli Beach (south)		CVC managed Crown land	Beach and dune rehabilitation, revegetation and weed control	Mod	Almost Certain	Mod	High	High	High		Mod	W1
Jones Beach		NPWS, Crown land	-	Mod	Almost Certain	Mod	Mod	Mod	Mod		Mod	YNP1
T3 – Coastal Inundation												
Ten Mile Beach	-	NPWS	-	Insignificant	Unlikely	Minimal	Minimal	Low	Low	Coastal inundation has not been assessed.	Unknown	BNP1
Shark Bay	-	NPWS	-	Mod	Likely	Mod	Mod	Mod	Mod		High	WH1
Woody Bay		NPWS	Rock protection/ seawall and artificial dune	Major	Possible	Mod	Mod	High	High			
Iluka area (Bluff Beach, Back Beach)	-	NPWS	-	Insignificant	Unlikely	Minimal	Minimal	Low	Low		Mod	BNP1
Iluka Beach	-	CVC managed Crown land, Crown land	-	Insignificant	Unlikely	Minimal	Minimal	Low	Low			IL1
Andersons Beach	-	Crown land	Sea wall	Mod	Unlikely	Minimal	Minimal	Low	Low			

Threats (use, activity or stressor) and location	Source	Management responsibility	Current management approach	Present day risk			Future Risk			Assessment of Knowledge Gaps		Recommendation for additional studies*
				Consequence	Likelihood	Current Risk	20-year	50-year	100-year	Knowledge/gap	Priority for Resolution	
T3 – Coastal Inundation (continued)												
Whiting Beach	Royal HaskoningDHV (2015)	CVC managed Crown land	Beach nourishment (initial campaign)	Mod	Likely	Mod	Mod	High	High	Coastal inundation was assessed in Royal HaskoningDHV (2015)	-	-
Turners Beach	MHL (2003)	CVC managed Crown land, Crown land	Breakwall	Minor	Rare	Minimal	Low	Low	Low	Coastal hazards were documented in MHL (2003) but should be reassessed.	High	Y1
Yamba Main Beach		CVC managed Crown land, Yamba SLSC	Seawall in front of surf club, planned relocation of SLSC	Mod	Almost certain	Mod	High	High	High			
Convent Beach		Residents, CVC managed Crown land	-	Minor	Possible	Minimal	Low	Low	Low			
Pippi Beach	Royal HaskoningDHV (2016)	CVC managed Crown land, Crown land	-	Insignificant	Likely	Minimal	Minimal	Minimal	Minimal	Coastal hazards have been assessed. Current, 2050 and 2100 hazard lines have been mapped (Royal HaskoningDHV, 2016).	-	-
Barri Beach	-	Crown land	-	Insignificant	Unlikely	Minimal	Minimal	Low	Low	Coastal hazards have not been assessed in detail.	Unknown	A1
Spooky Beach	-	CVC managed Crown land, Crown land	-	Insignificant	Unlikely	Minimal	Minimal	Low	Low			
Angourie area (Angourie Back Beach, Little Shelley Beach, Shelley Beach, Plumbago Beach)	-	NPWS	-	Insignificant	Unlikely	Minimal	Minimal	Low	Low	Coastal hazards have not been assessed in detail.	Unknown	YNP1
Brooms Head (Main Beach)	SMEC (2013)	NPWS, Crown land	-	Insignificant	Unlikely	Minimal	Minimal	Minimal	Minimal	Coastal inundation hazard has been assessed. Design still water level (present and 2100) has been mapped (SMEC, 2013) but should be reassessed.	High	B3 – Assessment of coastal inundation risk (CMP Stage 2).
Lake Cakora (Ocean Road properties)		Residents	-	Major	Likely	High	High	High	High			
Brooms Head (foreshore reserve)		CVC managed Crown land, Crown land	Seawall	Minor	Almost certain	Low	Mod	Mod	High			

Threats (use, activity or stressor) and location	Source	Management responsibility	Current management approach	Present day risk			Future Risk			Assessment of Knowledge Gaps		Recommendation for additional studies*
				Consequence	Likelihood	Current Risk	20-year	50-year	100-year	Knowledge/gap	Priority for Resolution	
T3 – Coastal Inundation (continued)												
The Sandon	-	NPWS, Crown land	-	Insignificant	Unlikely	Minimal	Minimal	Low	Low	Coastal inundation has not been assessed.	Unknown	YNP1
Sandon River campground	-	NPWS	-	Major	Possible	Mod	Mod	High	High		High	S1
Sandon village		Residents, CVC managed Crown land	-	Major	Possible	Mod	Mod	High	High			
Sandon Beach		NPWS	-	Insignificant	Unlikely	Minimal	Minimal	Low	Low		Mod	YNP1
Illaroo campground	-	NPWS	-	Mod	Possible	Mod	Mod	Mod	Mod		Mod	A1
Minnie Water Beach	-	CVC managed Crown land	-	Mod	Possible	Low	Low	Low	Low		Mod	YNP1
Minnie Water Back Beach	-	NPWS	-	Mod	Possible	Low	Low	Low	Low		Mod	A1
Diggers Camp	-	CVC managed Crown land	-	Mod	Possible	Low	Low	Low	Low		Coastal inundation has not been assessed.	High
Wooli Beach (north) – Yuraygir National Park	-	NPWS	-	Insignificant	Possible	Minimal	Minimal	Low	Low			
Wooli village (original)		Residents, CVC managed Crown land	-	Major	Possible	Mod	Mod	High	High			
Wooli Beach (south)		CVC managed Crown land	-	Major	Possible	Mod	Mod	High	High			
Jones Beach		NPWS, Crown land	-	Insignificant	Possible	Minimal	Minimal	Low	Low			
T4 – Entrance instability												
Lake Cakora entrance	CZMP (SMEC, 2017) and Geotechnical Assessment (Royal HaskoningDHV, 2018b)	CVC managed Crown land, Crown land	-	Minor	Possible	Minimal	Low	Low	Low	Hazard has been assessed (Royal HaskoningDHV, 2018b). Effect of revetment on long-term sand supply and entrance stability has not been assessed.	Mod	B2.
Wooli Wooli River entrance	Royal HaskoningDHV (2018b)	CVC managed Crown land, Crown land	Training walls	Mod	Unlikely	Minimal	Minimal	Low	Low	-	-	-
Sandon River	CZMP (2012)	CVC managed Crown land, NPWS	-	Minor	Unlikely	Minimal	Minimal	Minimal	Minimal	-	-	-

Threats (use, activity or stressor) and location	Source	Management responsibility	Current management approach	Present day risk			Future Risk			Assessment of Knowledge Gaps		Recommendation for additional studies*
				Consequence	Likelihood	Current Risk	20-year	50-year	100-year	Knowledge/gap	Priority for Resolution	
T4 – Entrance instability (cont.)												
Lake Arragan	MEMS	NPWS	No artificial intervention	Insignificant	Rare	Minimal	Minimal	Minimal	Minimal	-	-	-
T5 - Slope instability/ landslide												
Headlands within Bundjalung National Park)	-	NPWS	-	Mod	Unlikely	Minimal	Minimal	Minimal	Minimal	-	-	-
Headlands within Yuraygir National Park)	-	NPWS	-	Mod	Unlikely	Minimal	Minimal	Minimal	Minimal	-	-	-
Pilot Hill	MHL (2003), JK Geotechnics (2017)	CVC managed Crown land	Monitoring program, stormwater improvements	Catastrophic	Possible	High	High	High	High	Landslide risk has been assessed (JK Geotechnics, 2017) and risk management measures recommended.	-	-
Yamba Point	Royal HaskoningDHV (2016)	CVC managed Crown land	-	Catastrophic	Likely	High	High	High	High	Hazard has been assessed (Royal HaskoningDHV, 2016) and risk management measures recommended.	-	-
Pippi Beach	Royal HaskoningDHV (2016)	CVC managed Crown land	-	Major	Possible	Mod	Mod	Mod	Mod			
Cakora Point	SMEC, 2012	CVC managed Crown land, Crown land	-	Catastrophic	Rare	Mod	Mod	High	High	Hazard has been assessed (SMEC, 2012) and risk management measures recommended.	-	-
T6 - Tidal inundation												
Wooloweyah Lagoon and channels	Woodhouse. (2001), CZMP, White, N. (2009a), Engeny (2019)	CVC managed Crown land, Crown land, NPWS, private landowners	-	Minor	Likely	Mod	High	High	High	-	-	To be addressed in Scoping Study for Clarence River Estuary
Whiting Beach	HaskoningDHV Australia (2015)	CVC managed Crown land	-	Minor	Likely	Low	Low	Mod	High	Coarse assessment available from Coastal Risk Australia and OEH (2018c). Inadequate understanding of tidal inundation extent and frequency and the associated impacts (e.g. to assets and infrastructure, ecological habitats access to built areas and to recreational opportunities and infrastructure).	Mod	WW1, SR1, A2 - Detailed tidal inundation assessment of the estuaries for a variety of future sea level rise scenarios, with a risk assessment relating to estuary assets (CVC/NPWS CMP Stage 5). CVC is currently undertaking a flood study for Wooli Wooli River which will include assessment of tidal (sunny day) inundation.
Lake Cakora	OEH (2018c)	CVC managed Crown land, NPWS	-	Minor	Possible	Minimal	Low	Mod	Mod			
Sandon River	EPS (GHD, 2011), OEH (2018c)	CVC managed Crown land, Crown land, NPWS, private landowners	-	Minor	Possible	Minimal	Low	Mod	Mod			

Threats (use, activity or stressor) and location	Source	Management responsibility	Current management approach	Present day risk			Future Risk			Assessment of Knowledge Gaps		Recommendation for additional studies*
				Consequence	Likelihood	Current Risk	20-year	50-year	100-year	Knowledge/gap	Priority for Resolution	
T6 - Tidal inundation (cont.)												
Wooli Village and Wooli Wooli River	Royal HaskoningDHV (2018a), OEH (2018c)	CVC managed Crown land, Crown land, NPWS, private landowners	-	Mod	Likely	Mod	Mod	High	High			
Other areas	Coastal risk mapping	CVC managed Crown land, Crown land, NPWS, private landowners	-	Mod	Likely	Mod	Mod	High	High			
T7 - Inadequate/ damaged coastal protection infrastructure												
Woody Bay	DECCW (2012)	NPWS	Progressive extension, repair.	Mod	Almost certain	Mod	High	High	High	-	-	-
Lake Cakora (Ocean Road)	Observation	Residents	-	Mod	Almost certain	Mod	High	High	High	-	-	-
Brooms Head foreshore reserve	Observation	CVC	-	Mod	Almost certain	Mod	High	High	High	-	-	-
Sandon Village	Observation	Residents	-	Mod	Almost certain	Mod	High	High	High	-	-	-
Bank erosion												
T8 - Estuarine bank erosion (MEMS TARA priority threat)												
Wooloweyah Lagoon and channels	Woodhouse. (2001), CZMP, White, N. (2009a)	CVC managed Crown land, Crown land, NPWS, private landowners	No wash zone in Palmers Channel.	Moderate	Almost certain	Mod	Mod	High	High	Erosion assessment included in Woodhouse. (2001). Causes are unclear. Requires updating.	High	To be addressed in Scoping Study for Clarence River Estuary
Lake Cakora	-	CVC managed Crown land, NPWS	-	Minor	Possible	Minimal	Low	Mod	Mod	Bank erosion assessment has not been undertaken.	High	B4, SR2, WW2 - Desktop assessment, field survey and mapping of bank condition (erosion and riparian vegetation) of navigable reaches. Develop Bank Management Strategy (BMS) in accordance with Initiative 2 of the MEMS and any tool/ guidance provided (CMP Stage 5).
Lake Cakora bridge footings	Observation	CVC	-	Moderate	Almost certain	Mod	Mod	High	High			
Sandon River	EPS (GHD, 2011), CZMP (2012)	CVC managed Crown land, Crown land, NPWS, private landowners	-	Minor	Possible	Minimal	Low	Mod	Mod	Erosion assessment included in GHD (2011). Current condition has not been assessed.	Mod	
Wooli Wooli River (e.g. boat ramp)	EMS (WBM, 2006)	CVC managed Crown land, Crown land, NPWS, private landowners	Ad hoc stabilisation in some locations	Mod	Almost certain	Mod	Mod	High	High	Erosion assessment included in WBM (2006) requires updating.	High	

Threats (use, activity or stressor) and location	Source	Management responsibility	Current management approach	Present day risk			Future Risk			Assessment of Knowledge Gaps		Recommendation for additional studies*
				Consequence	Likelihood	Current Risk	20-year	50-year	100-year	Knowledge/gap	Priority for Resolution	
Threats to Biodiversity												
T9 - Historic clearing of riparian vegetation and adjacent habitat (MEMS TARA priority threat)												
Wooli Wooli River	EMP (BMT WBM (2009), EPS (WBM, 2006)	CVC managed Crown land, Crown land, NPWS, private landowners	-	Mod	Likely	Mod	Mod	Mod	Mod	Bank condition assessment included in WBM (2006) requires updating.	Mod	WW2
Wooloweyah Lagoon and channels	Woodhouse. (2001), CZMP, White, N. (2009a)	CVC managed Crown land, Crown land, NPWS, private landowners		Major	Likely	High	High	High	High	Condition assessment included in Woodhouse. (2001) requires updating.	Mod	To be addressed in Scoping Study for Clarence River Estuary
Sandon River	EPS (GHD, 2011), CZMP (2012)	CVC managed Crown land, Crown land, NPWS, private landowners	-	Minor	Possible	Minimal	Low	Mod	Mod	Minimal clearing in mid-upper estuary (GHD, 2011). Current condition has not been assessed.	Mod	SR2
T10 - Foreshore development (MEMS TARA priority threat) and land clearing for agriculture or urban development												
Wooloweyah Lagoon catchment	Woodhouse. (2001), CZMP, White, N. (2009a)	CVC, private landowners	Vegetation management policies and legislation, development controls, land use planning	Mod	Almost certain	Mod	Mod	High	High	-	-	-
Yamba-Angourie coast	Community consultation	CVC		Mod	Likely	Mod	Mod	Mod	Mod	-	-	-
Sandon (campsite establishment)	SIMPA	CVC		Minor	Almost certain	Low	Low	Low	Low	Visual observation of issue at this location.	-	-
Smaller villages (Brooms Head, Sandon, Wooli)	Various	CVC		Minor	Likely	Low	Low	Low	Low	-	-	-
T11 – Bushfire												
Sandon River	CZMP, GHD (2012)	CVC, NPWS	NPWS fire management plans	Catastrophic	Possible	High	High	High	High	-	-	-
Wooli Beach	Royal HaskoningDHV (2018)	CVC	-	Catastrophic	Possible	High	High	High	High	-	-	-
Wooli Wooli River	EMP (BMT WBM (2009)	NPWS, Forestry Corporation	NPWS fire management plans	Catastrophic	Possible	High	High	High	High	-	-	-
All areas (not specified)	Community consultation	NPWS, CVC, RFS	-	Catastrophic	Possible	High	High	High	High	-	-	-

Threats (use, activity or stressor) and location	Source	Management responsibility	Current management approach	Present day risk			Future Risk			Assessment of Knowledge Gaps		Recommendation for additional studies*
				Consequence	Likelihood	Current Risk	20-year	50-year	100-year	Knowledge/gap	Priority for Resolution	
T12 - Invasive weeds (e.g. Bitou bush, Lantana)												
Coastline north of Clarence River estuary (Bundjalung National Park)	NPWS (1997), OEH (2012a, 2012b)	NPWS	National Park Plan of Management, NPWS Regional Pest Management Strategies	Mod	Almost certain	Mod	Mod	Mod	Mod	Documented occurrence of weeds.	-	-
Yamba-Angourie coast	Community consultation	CVC	-	Mod	Almost certain	Mod	Mod	Mod	Mod			
Wooloweyah Lagoon	Woodhouse. (2001), CZMP, White, N. (2009a)	CVC	-	Mod	Almost certain	Mod	Mod	Mod	Mod			
Brooms Head (Northern Beach)	CZMP (SMEC, 2017)	CVC	Brooms Head Reserve Vegetation Management Plan, dune revegetation and rehabilitation	Mod	Almost certain	Mod	Mod	Mod	Mod			
Yuraygir National Park	-	NPWS	National Park Plan of Management, NPWS Regional Pest Management Strategies	Mod	Almost certain	Mod	Mod	Mod	Mod			
Sandon River	EPS (GHD, 2011), CZMP (2012)	CVC, NPWS	National Park Plan of Management, NPWS Regional Pest Management Strategies	Minor	Possible	Minimal	Minimal	Minimal	Minimal	Assessment included in 2011 EPS, no recent assessment but considered adequate given protected land use.	-	-
Wooli Beach	Royal HaskoningDHV (2018)	CVC	Beach and dune rehabilitation, revegetation and weed control	Mod	Almost certain	Mod	Mod	Mod	Mod	Documented occurrence of weeds.	-	-
Wooli Wooli River	EPS (WBM, 2006)	CVC, NPWS		Mod	Almost certain	Mod	Mod	Mod	Mod			
T13 - Uncontrolled stock access to and grazing within the riparian zone												
Wooli Wooli River	EMP (BMT WBM (2009)	Private landowners	-	Mod	Almost certain	Mod	Mod	Mod	Mod	Bank condition assessment included in WBM (2006).	High	WW2
Wooloweyah Lagoon and channels	Woodhouse. (2001), CZMP, White, N. (2009a)	Private landowners	Rock fillets and revetment along north-western shore of lagoon and northern bank of Palmers Channel.	Mod	Almost certain	Mod	Mod	High	High	Erosion assessment included in Woodhouse (2001). Causes are unclear. Updated assessment required.	High	To be addressed in Scoping Study for Clarence River Estuary

Threats (use, activity or stressor) and location	Source	Management responsibility	Current management approach	Present day risk			Future Risk			Assessment of Knowledge Gaps		Recommendation for additional studies*
				Consequence	Likelihood	Current Risk	20-year	50-year	100-year	Knowledge/gap	Priority for Resolution	
T14 - Grazing of wetlands, saltmarsh and mangroves												
Wooloweyah Lagoon and channels	Woodhouse. (2001), CZMP, White, N. (2009a)	Private landowners	-	Mod	Almost certain	Mod	Mod	High	High	Documented in Woodhouse. (2001), CZMP, White, N. (2009a)	Mod	To be addressed in Scoping Study for Clarence River Estuary.
T15 – Seagrass decline												
Wooloweyah Lagoon	Woodhouse. (2001), CZMP, White, N. (2009a), community consultation	DPI-Fisheries	-	Mod	Almost certain	Mod	Mod	Mod	Mod	Anecdotal evidence of seagrass decline. Causes are unclear.	Mod	To be addressed in Scoping Study for Clarence River Estuary
Sandon River (particularly Tumbaal Creek)	CEMC	DPI-Fisheries	-	Mod	Almost certain	Mod	Mod	Mod	Mod	Anecdotal evidence of seagrass decline over last 10-15 years, no studies.	Mod	SR3, WW3 – Desktop review of historical aerial photographs and data. Seagrass extent and condition survey (CMP Stage 5, to be repeated annually).
Wooli Wooli River	DPI-Fisheries	DPI-Fisheries	-	Mod	Almost certain	Mod	Mod	Mod	Mod			
T16 - Mangrove damage												
Wooli Wooli River	SIMPA	DPI-Fisheries	-	Minor	Possible	Minimal	Minimal	Minimal	Minimal	-	-	-
T17 - Unauthorised clearing of reserves for views												
Wooli Beach	Royal HaskoningDHV (2018)	CVC	Council vegetation management policy	Minor	Possible	Minimal	Minimal	Minimal	Minimal	-	-	-
Yamba	Community consultation	CVC		Minor	Possible	Minimal	Minimal	Minimal	Minimal	-	-	-
T18 - Overfishing, non-compliance with fishery regulations												
Wooloweyah Lagoon	Woodhouse. (2001), CZMP, White, N. (2009a), community consultation	DPI-Fisheries	Fisheries regulations	Mod	Possible	Low	Low	Low	Low	Impacts of commercial and recreational fishing activity on Wooloweyah Lagoon have not been assessed. Historic and anecdotal evidence of impacts of trawlers on seagrass loss.	Mod	To be addressed in Scoping Study for Clarence River Estuary
Lake Cakora	CZMP (SMEC, 2017)	DPI-Fisheries		Minor	Likely	Low	Low	Low	Low	-	-	-
Sandon River	CZMP, GHD (2012)	DPI-Fisheries		Minor	Likely	Low	Low	Low	Low	-	-	-
All areas (not specified)	Community survey	DPI-Fisheries		Minor	Likely	Low	Low	Low	Low	-	-	-

Threats (use, activity or stressor) and location	Source	Management responsibility	Current management approach	Present day risk			Future Risk			Assessment of Knowledge Gaps		Recommendation for additional studies*	
				Consequence	Likelihood	Current Risk	20-year	50-year	100-year	Knowledge/gap	Priority for Resolution		
T19 - Anthropogenic barriers (i.e. physical barriers, land use and planning constraints) to migration of vegetation communities with sea level rise													
Wooloweyah Lagoon	Woodhouse. (2001), CZMP, White, N. (2009a)	DPI-Fisheries	-	Minor	Possible	Minimal	Low	Mod	Mod	No assessment undertaken	Mod	To be addressed in Scoping Study for Clarence River Estuary	
Lake Cakora	CZMP (SMEC, 2017)	DPI-Fisheries	-	Minor	Possible	Minimal	Low	Mod	Mod	No assessment undertaken	Mod	B5, SR4, WW4 - Assessment of potential for estuarine vegetation migration with sea level rise based on vegetation types, topography, land use and tidal inundation and including mapping of anthropogenic barriers and land use constraints to migration (e.g. training walls and rock revetments, footpaths, roads, land uses) and management priority classification indicating the level of intervention required to minimise the potential impact of sea level rise on migration (CMP Stage 5) with reference to MEMS Actions 2.3, 3.1 and 3.5.	
Sandon River	CZMP, GHD (2012)	DPI-Fisheries	-	Minor	Possible	Minimal	Low	Mod	Mod				
Wooli Wooli River	-	DPI-Fisheries	-	Minor	Possible	Minimal	Low	Mod	Mod				
T20 - Uncontrolled dog access													
All areas (particularly Brooms Head,	CEMC, community consultation	CVC, NPWS	Dogs banned in caravan park. Off-leash area north of the Lake Cakora 4WD access. Dogs prohibited south of 4WD track.	Mod	Likely	Mod	Mod	Mod	Mod	-	-		-
National Parks (e.g. Shark Bay)	NPWS	NPWS	Dogs banned in National Parks	Mod	Likely	Mod	Mod	Mod	Mod	-	-	-	
T21 - 4WD/motorbikes on beaches													
Brooms Head	CEMC, community consultation	CVC	2018 Beach Access Policy, 4WD access north of Lake Cakora	Mod	Likely	Mod	Mod	Mod	Mod	-	-	-	
Shark Bay (Bundjalung National Park)	NPWS	NPWS	PoM	Mod	Likely	Mod	Mod	Mod	Mod	-	-	-	

Threats (use, activity or stressor) and location	Source	Management responsibility	Current management approach	Present day risk			Future Risk			Assessment of Knowledge Gaps		Recommendation for additional studies*
				Consequence	Likelihood	Current Risk	20-year	50-year	100-year	Knowledge/gap	Priority for Resolution	
T22 - Predation and invasion by introduced animals (e.g. pigs, cane toads, foxes, rabbits)												
Bundjalung National Park	NPWS (1997), OEH (2012a,b)	NPWS	Bundjalung National Park Plan of Management, Regional Pest Management Strategies	Moderate	Almost certain	Mod	Mod	Mod	Mod	Documented occurrence of introduced species.	-	-
Yuraygir National Park	NPWS, (2003), OEH (2012a,b)	NPWS	Yuraygir National Park Plan of Management, Regional Pest Management Strategies	Moderate	Almost certain	Mod	Mod	Mod	Mod		-	-
Brooms Head	CZMP (SMEC, 2017)	CVC, NPWS		Minor	Likely	Mod	Mod	Mod	Mod		-	-
Sandon River	CZMP, GHD (2012)	CVC, NPWS		Minor	Likely	Mod	Mod	Mod	Mod		-	-
Wooli Wooli River	EPS (WBM, 2006)	CVC, NPWS		Minor	Likely	Mod	Mod	Mod	Mod		-	-
Wooloweyah Lagoon	Woodhouse. (2001), CZMP, White, N. (2009a), community consultation	CVC, NPWS	-	Minor	Likely	Mod	Mod	Mod	Mod		-	-
T23 - Insufficient protection for marine animals												
All areas	Community consultation	NPWS	Legislation	Minor	Possible	Minimal	Minimal	Minimal	Minimal	-	-	-
T24 - Illegal (freedom) camping												
All areas (particularly Spooky Beach, Angourie Back Beach car park, Green Point, Angourie Point, Iluka Beach, Shark Bay, Sandon)	Community consultation, SIMPA	CVC, NPWS	Policy, Council working party, no parking signs in high impact areas, ranger patrols, free camping excluded within 10km of coast.	Minor	Almost certain	Low	Low	Low	Low	-	-	-
T25 - Spear fishing												
All areas (not specified)	Community consultation	DPI-Fisheries	DPI-Fisheries policy and legislation	Minor	Possible	Minimal	Minimal	Minimal	Minimal	-	-	-

Threats (use, activity or stressor) and location	Source	Management responsibility	Current management approach	Present day risk			Future Risk			Assessment of Knowledge Gaps		Recommendation for additional studies*
				Consequence	Likelihood	Current Risk	20-year	50-year	100-year	Knowledge/gap	Priority for Resolution	
Water Quality												
T26 - Urban stormwater pollution (MEMS TARA priority threat)												
Wooloweyah Lagoon	Woodhouse (2001)	CVC	-	Mod	Almost certain	Mod	Mod	High	High	Ecohealth assessment (Ryder <i>et al.</i> , 2014) does not adequately analyse/assess sites within study area and requires review and update	Mod	To be addressed in Scoping Study for Clarence River Estuary
Lake Cakora	CZMP (SMEC, 2017),	CVC	-	Mod	Almost certain	Mod	Mod	High	High			A3 – Review and modify Ecohealth monitoring program to cover estuaries and potential issues (CMP Stage 4) with reference to outcomes of MEMS Action 1.5. A4 – Regular (5-yearly) monitoring (CMP Stage 5).
Sandon River	CZMP, GHD (2012)	CVC	-	Mod	Almost certain	Mod	Mod	High	High			
Wooli Wooli River	EMP (BMT WBM (2009)	CVC	-	Mod	Almost certain	Mod	Mod	High	High			
T27 - On-site wastewater management												
Wooloweyah Lagoon	White, N. (2009a)	CVC, residents	Ongoing inspection program	Mod	Almost certain	Mod	Mod	High	High	Ecohealth assessment (Ryder <i>et al.</i> , 2014) does not adequately analyse/assess sites within study area and requires review and update	Mod	A3, A4
Lake Cakora (caravan park)	CZMP (SMEC, 2017)	CVC	Planned upgrade of OSSMS	Mod	Almost certain	Mod	Mod	High	High			
Lake Cakora (residential properties)	CZMP (SMEC, 2017)	CVC, residents	Ongoing inspection program	Mod	Almost certain	Mod	Mod	High	High			
Wooli village	EMP (BMT WBM (2009)	CVC, residents		Mod	Almost certain	Mod	Mod	High	High			
Sandon village	CZMP, GHD (2012)	CVC, residents		Mod	Almost certain	Mod	Mod	High	High			
Sandon campground	CZMP, GHD (2012)	NPWS	-	Mod	Almost certain	Mod	Mod	High	High			
T28 - Poor flushing of ICOLLs												
Lake Cakora	CZMP (SMEC, 2017), Ryder <i>et al.</i> , (2014)	CVC, NPWS	No formal management	Mod	Almost certain	Mod	Mod	Mod	Mod	Ecohealth assessment (Ryder <i>et al.</i> , 2014) does not adequately analyse/assess sites within study area and requires review and update	Mod	A2, A3
Lake Arragan	Ryder <i>et al.</i> , (2014)	NPWS	No formal management	Mod	Almost certain	Mod	Mod	Mod	Mod			

Threats (use, activity or stressor) and location	Source	Management responsibility	Current management approach	Present day risk			Future Risk			Assessment of Knowledge Gaps		Recommendation for additional studies*
				Consequence	Likelihood	Current Risk	20-year	50-year	100-year	Knowledge/gap	Priority for Resolution	
T29 - Sea level rise increasing salinity within the estuary												
Wooloweyah Lagoon and channels	White, N. (2009a)	CVC, landowners	Floodgate management and upgrades	Minor	Possible	Minimal	Low	Mod	Mod	No assessment undertaken	Unknown	-
Lake Cakora	CZMP (SMEC, 2017)	CVC, NPWS	-	Minor	Possible	Minimal	Low	Mod	Mod			
Sandon River	CZMP, GHD (2012)	CVC, NPWS	-	Minor	Possible	Minimal	Low	Mod	Mod			
Wooli Wooli River	EMP (BMT WBM (2009)	CVC, NPWS	-	Minor	Possible	Minimal	Low	Mod	Mod			
T30 - Climate warming and extreme temperatures												
Study area	Various	CVC, NPWS	-	Minor	Possible	Minimal	Low	Mod	Mod			
T31 - Increased storminess and changed rainfall patterns												
Study area	Various	CVC, NPWS	-	Minor	Possible	Minimal	Low	Mod	Mod			
T32 - Land/waterway contamination												
Estuaries (e.g. chemical/fuel spills)	Various	CVC, NPWS	-	Minor	Possible	Minimal	Minimal	Minimal	Minimal	-	-	-
Sandon (tarring oyster sticks)	SIMPA	CVC, NPWS	-	Minor	Likely	Low	Low	Low	Low	Visual observation of issue at this location.	-	-
T33 - Modified environmental flows (floodplain drainage) and catchment runoff (MEMS TARA priority threat)												
Wooloweyah Lagoon and channels	White, N. (2009a)	CVC, private landowners	Floodgate management and upgrades	Major	Almost certain	High	High	High	High	-	-	To be addressed in Scoping Study for Clarence River Estuary with reference to MEMS Action 2.4.
Wooloweyah ring drain and radial outlets	Clarence Canegrowers Association	CVC, private landowners	Floodgate management and upgrades	Mod	Likely	Mod	Mod	High	High	-	-	
T34 - Agricultural diffuse source runoff (MEMS TARA priority threat)												
Wooloweyah Lagoon and channels	Woodhouse. (2001), CZMP, White, N. (2009a)	CVC, private landowners	-	Major	Almost certain	High	High	High	High	Ecohealth assessment (Ryder et al., 2014) does not adequately analyse/assess sites within study area and requires review and update	Mod	To be addressed in Scoping Study for Clarence River Estuary

Threats (use, activity or stressor) and location	Source	Management responsibility	Current management approach	Present day risk			Future Risk			Assessment of Knowledge Gaps		Recommendation for additional studies*
				Consequence	Likelihood	Current Risk	20-year	50-year	100-year	Knowledge/gap	Priority for Resolution	
T35 - Commercial trawling increasing turbidity												
Wooloweyah Lagoon	Woodhouse. (2001), CZMP, White, N. (2009a), community consultation	DPI-Fisheries	Licensing commercial fishers	Mod	Possible	Low	Low	Low	Low	Included in Woodhouse. (2001). Contribution of trawling to turbidity in lagoon is unclear.	Mod	To be addressed in Scoping Study for Clarence River Estuary
T36 - Future development, urban growth												
Wooloweyah Lagoon catchment	Woodhouse. (2001), CZMP, White, N. (2009a), community consultation	CVC	Land use planning and development controls	Mod	Almost certain	Mod	Mod	High	High	-	-	-
Yamba (planned port and industrial development)	Community consultation	Port Authority	-	Major	Possible	Mod	Mod	Mod	Mod	Impacts of proposed Port development are unknown.	Mod	Investigations to be undertaken by Port Authority.
T37 - Long fetch and strong winds increasing turbidity												
Wooloweyah Lagoon	Woodhouse. (2001), CZMP, White, N. (2009a)	Crown land	-	Mod	Almost certain	Mod	Mod	Mod	Mod	Included in Woodhouse. (2001).	-	-
T38 - Disturbance of acid sulfate soils												
Wooloweyah Lagoon	Woodhouse. (2001), CZMP, White, N. (2009a)	CVC managed Crown land, Crown land, NPWS, private landowners	Drainage management plans	Mod	Possible	Low	Low	Low	Low	-	-	-
T39 - Forestry activities												
Sandon River and Wooli Wooli River catchments	Mapping	Forestry Corporation	Harvest operations planning, monitoring, environmental management system	Moderate	Possible	Low	Low	Low	Low	Ecohealth assessment (Ryder et al., 2014)	-	-
Shoaling and Estuary Hydraulics												
T40 - Shoaling and sediment movement within estuaries												
Wooli Wooli River	EMP (BMT WBM (2009), community consultation	DPIE-Crown land	-	Mod	Almost certain	Mod	Mod	Mod	Mod	No assessment undertaken	Unknown	-
Sandon River	EPS (GHD, 2011), CZMP (2012)	DPIE-Crown land	-	Minor	Likely	Low	Low	Low	Low	No assessment undertaken	Unknown	-

Threats (use, activity or stressor) and location	Source	Management responsibility	Current management approach	Present day risk			Future Risk			Assessment of Knowledge Gaps		Recommendation for additional studies*
				Consequence	Likelihood	Current Risk	20-year	50-year	100-year	Knowledge/gap	Priority for Resolution	
T41 - Erosion and sedimentation affecting navigation												
Clarence River entrance	Port Authority	Port Authority	Periodic maintenance dredging	Moderate	Likely	Mod	Mod	Mod	Mod	Investigation into sedimentary process drivers in Clarence River estuary is required (action in 2003 Clarence River EMP)	High	Y1. (Estuary processes to be addressed in Scoping Study for Clarence River Estuary) with reference to MEMS Action 2.1.
T42 - Estuary entrance modifications (MEMS TARA priority threat)												
Clarence River entrance	MEMS	Port Authority	Breakwalls	Moderate	Likely	Mod	Mod	Mod	Mod	Investigation into sedimentary process drivers in Clarence River estuary is required (action in 2003 Clarence River EMP)	High	Y1. (Estuary processes to be addressed in Scoping Study for Clarence River Estuary) with reference to MEMS Action 2.1.
Lake Cakora	MEMS	CVC	Planned extension of seawall	Minor	Possible	Minimal	Mod	Mod	Mod	Changes to entrance management regime from planned sea wall extension has not been investigated.	Unknown	B2
Smaller ICOLLs (Mara Creek, Lake Arragan)	MEMS	NPWS	No artificial intervention	Insignificant	Rare	Minimal	Minimal	Minimal	Minimal	-	-	-
Use and Access - Pedestrian												
T43 - Limited pedestrian access												
Brooms Head (Northern Beach)	CZMP (SMEC, 2017)	CVC	-	Minor	Likely	Low	Low	Low	Low	-	-	-
Wooli Beach (Scope Street, Braithwaite Lane, Cenotaph)	Royal HaskoningDHV (2018)	CVC	Planned renewal of Cenotaph access steps	Mod	Likely	Mod	Mod	Mod	Mod	-	-	-
T44 - Informal pedestrian access												
Wooli Beach	Royal HaskoningDHV (2018)	CVC	Planned renewal of access steps	Mod	Likely	Mod	Mod	Mod	Mod	-	-	-
T45 - Population increase and visitor pressure increasing demand on services and environment and conflict between users												
Sandon River	EPS (GHD, 2011), CZMP (2012)	CVC, NPWS	Campground capacity limitations	Minor	Likely	Low	Low	Low	Low	-	-	-

Threats (use, activity or stressor) and location	Source	Management responsibility	Current management approach	Present day risk			Future Risk			Assessment of Knowledge Gaps		Recommendation for additional studies*
				Consequence	Likelihood	Current Risk	20-year	50-year	100-year	Knowledge/gap	Priority for Resolution	
T46 - Bushfire damage to access												
Yuraygir National Park	NPWS	NPWS	NPWS planning for replacement (access, isolation options)	Mod	Almost certain	Mod	Mod	Mod	Mod	-	-	-
Use and Access - Waterways												
T47 - Limited boating access (upper estuary)												
Wooli Wooli River	EMP (BMT WBM (2009)	CVC, NPWS	-	Mod	Likely	Mod	Mod	Mod	Mod	Potential access locations in upper estuary have not been investigated.	Mod	WW5 - Strategic review of boating facilities (CMP Stage 5).
T48 - Poor condition of public facilities (boat ramps etc.)												
Wooli Wooli River	EMP (BMT WBM (2009)	CVC	-	Minor	Likely	Low	Low	Low	Low	Condition and risks associated with existing infrastructure has not been assessed.	Mod	A8 - Develop asset register including location, use, construction date, condition, risk of erosion/recession, level of service etc. (CMP Stage 5)
T49 - Unauthorised access points												
Wooli Wooli River	EMP (BMT WBM, 2009)	Residents	-	Mod	Likely	Mod	Mod	Mod	Mod	Issues was noted in EMP (BMT WBM, 2009) but no recent assessment.	Mod	WW5 with reference to MEMS Action 2.3.
T50 - Competing uses of the estuary/ coastal zone												
Sandon River	EPS (GHD, 2011), CZMP (2012)	CVC, NPWS	Signage	Minor	Likely	Low	Low	Low	Low	-	-	-
T51 - Unstable/unsafe bar crossing												
Sandon River	EPS (GHD, 2011), CZMP (2012)	DPIE-Crown Lands	Signage	Minor	Likely	Low	Low	Low	Low	-	-	-
T52 - Sedimentation affecting safe navigation												
Wooloweyah Lagoon	Woodhouse. (2001), CZMP, White, N. (2009a)	DPIE-Crown Lands	1992 and 2011 dredging	Mod	Rare	Minimal	Mod	Mod	Mod	-	-	-
T53 – Algal blooms												
Blue Pools	-	CVC	Monitoring	Minor	Almost certain	Low	Low	Low	Low	-	-	-

Threats (use, activity or stressor) and location	Source	Management responsibility	Current management approach	Present day risk			Future Risk			Assessment of Knowledge Gaps		Recommendation for additional studies*
				Consequence	Likelihood	Current Risk	20-year	50-year	100-year	Knowledge/gap	Priority for Resolution	
T54 - Bushfire damage to National Park assets												
All National Park areas	-	NPWS	Planned repair, Fire management strategy. Current tender for design and construction of replacement bridge for Mara Creek. Planned completion February 2021.	Mod	Almost certain	Mod	Mod	Mod	Mod	-	-	-
T55 - Damage to beach access points from erosion and coastal storms												
Bundjalung National Park beach areas (e.g. Woody Bay)	CEMC, CVC, community consultation	NPWS	-	Mod	Almost certain	Mod	High	High	High	Observed erosion, causes and management options not yet assessed.	Mod	BNP2, YNP2 - Assessment of options to manage erosion and preserve beach access (NPWS).
Yuraygir National Park beach areas (e.g. Diggers Camp)		NPWS	-	Mod	Almost certain	Mod	High	High	High			
Other beach areas – e.g. Yamba, Minnie Water, Brooms Head, Angourie (Spooky Beach), Wooli, Iluka		CVC	-	Mod	Almost certain	Mod	High	High	High			
T56 – Stormwater erosion at beaches/estuaries												
Minnie Water	Community consultation	CVC	-	Minor	Almost certain	Low	Low	Low	Low	-	-	-
T57 - Insufficient access for commercial fishers												
Red Cliff/Lake Arragan	Community consultation	NPWS	-	Minor	Almost certain	Low	Low	Low	Low	-	-	-
T58 - Jet skis												
Yamba	Community consultation	RMS	Boating regulations	Minor	Likely	Low	Low	Low	Low	-	-	-
T59 - Inadequate boat launch facilities												
Brooms Head	Community consultation	CVC	Boat ramp (shallow)	Minor	Likely	Low	Low	Low	Low	-	-	-
T60 - Night net fishing												
Yamba	Community consultation	DPI-Fisheries	Estuary general fishing regulations	Minor	Likely	Low	Low	Low	Low	-	-	-

Threats (use, activity or stressor) and location	Source	Management responsibility	Current management approach	Present day risk			Future Risk			Assessment of Knowledge Gaps		Recommendation for additional studies*
				Consequence	Likelihood	Current Risk	20-year	50-year	100-year	Knowledge/gap	Priority for Resolution	
T61 - Reduced accessible beach at high tide due to rock wall												
Brooms Head	Observation	CVC	-	Mod	Almost certain	Mod	Mod	Mod	Mod	Potential loss of sandy beach due to planned sea wall extension has not been addressed.	Mod	B2
Woody Bay		NPWS	-	Mod	Almost certain	Mod	Mod	Mod	Mod	Not yet assessed.	High	WH1
Use and Access – Vehicles												
T62 - 4WD/motorbikes on beaches												
Shark Bay (Bundjalung National Park)	NPWS	NPWS	PoM	Mod	Likely	Mod	Mod	Mod	Mod	-	-	-
Barri Point	Community consultation	CVC	2018 Beach Access Policy	Mod	Likely	Mod	Mod	Mod	Mod	-	-	-
Brooms Head (Northern Beach)	CZMP (SMEC, 2017)	CVC	2018 Beach Access Policy	Mod	Likely	Mod	Mod	Mod	Mod	-	-	-
Brooms Head	CEMC, community consultation	CVC	2018 Beach Access Policy, 4WD access north of Lake Cakora	Mod	Likely	Mod	Mod	Mod	Mod	-	-	-
Brooms Head trail	Community consultation	CVC	2018 Beach Access Policy	Mod	Likely	Mod	Mod	Mod	Mod	-	-	-
Wooli Beach	Royal HaskoningDHV (2018)	CVC	2018 Beach Access Policy, gate at breakwall	Mod	Likely	Mod	Mod	Mod	Mod	-	-	-
T63 - Insufficient emergency services access												
All areas (not specified)	Community consultation	CVC, NPWS, SES	Emergency access roads and beach ramps in some areas	Major	Unlikely	Low	Low	Low	Low	-	-	-
T64 - Inadequate parking (boat trailers)												
Brooms Head	Community consultation	CVC	Car parking bay at boat ramp (too small for trailers).	Minor	Likely	Low	Low	Low	Low	-	-	-

Threats (use, activity or stressor) and location	Source	Management responsibility	Current management approach	Present day risk			Future Risk			Assessment of Knowledge Gaps		Recommendation for additional studies*
				Consequence	Likelihood	Current Risk	20-year	50-year	100-year	Knowledge/gap	Priority for Resolution	
Governance												
T65 - Multiple land managers												
Sandon River	CZMP, GHD (2012)	CVC, DPI – Crown Lands, NPWS, SIMPA, private landowners	Management Plans, collaboration during CMP development	Mod	Possible	Low	Low	Low	Low	-	Mod	Development and implementation of CMP and other planning documentation
T66 - Inadequate action on coastal protection (due to difficulties gaining community consensus, high cost of implementation and stringent approval requirements)												
All areas (not specified)	Community consultation	CVC, DPI – Crown Lands, NPWS, SIMPA, private landowners	CMP development, coastal protection works.	Major	Possible	Mod	Mod	Mod	Mod	-	Mod	Development and implementation of CMP and other planning documentation
Woody Bay	NPWS	NPWS	Seawall, asset relocation, PoM (out of date)	Major	Likely	Mod	Mod	Mod	Mod	Confirm appropriate mechanism for planning and delivery of NPWS coastal protection works	Mod	CMP Scoping Study
Yuraygir National Park	NPWS	NPWS	PoM (out of date)	Major	Likely	Mod	Mod	Mod	Mod			
T67 - Inability to source sand for beach nourishment												
Whiting Beach	Royal HaskoningDHV (2015)	CVC	Crown Lands navigation maintenance dredging	Mod	Possible	Low	Mod	High	High	Ongoing sand sources. Royal HaskoningDHV (2015) recommended dredging sand from between Hickey and Dart Islands, effectively back passing the sand to Whiting Beach.	High	Y2 - Ongoing liaison with TfNSW MIDO and review of sand sources (CMP Stage 5) with reference to MEMS Action 2.1.
Wooli	Royal HaskoningDHV (2018a), community consultation	CVC	Initial sand scraping (2019), planned for 2021.	Mod	Possible	Low	Mod	High	High	Ongoing sand sources	High	W5 - Success of second sand scrape to be assessed. Sand sourcing to be reviewed following second scrape (CMP Stage 5).
T68 - Inaccurate or incomplete mapping of coastal management areas												
CWLRA	CM SEPP mapping, CVC LEP	CVC, NPWS, DPIE- Crown Lands	CM SEPP mapping of CUA, CEA, CWLRA	Mod	Possible	Low	Low	Low	Low	Detailed vegetation mapping is not available for the study area. Accuracy of CWLRA in SEPP cannot be confirmed with available mapping.	Mod	A6 – Once DPIE vegetation mapping for North Coast is available, accuracy of CWLRA should be confirmed (CMP Stage 5).
CVA				Mod	Possible	Low	Low	Low	Low	Not mapped in SEPP	Mod	A7 – Updated mapping potentially to be included in SEPP (CMP Stage 5)
CUA and CEA				Minor	Possible	Minimal	Minimal	Minimal	Minimal	CMP SEPP mapping is considered suitable for future management.	-	-

Threats (use, activity or stressor) and location	Source	Management responsibility	Current management approach	Present day risk			Future Risk			Assessment of Knowledge Gaps		Recommendation for additional studies*
				Consequence	Likelihood	Current Risk	20-year	50-year	100-year	Knowledge/gap	Priority for Resolution	
T69 - Inadequate asset management planning												
All Council areas	-	CVC	AMPs	Minor	Possible	Minimal	Minimal	Minimal	Minimal	Registers of assets within the coastal zone have not been prepared.	Mod	A7 - Develop asset register including location, use, construction date, condition, risk of erosion/recession, level of service etc. (CMP Stage 5)
Bundjalung and Yuraygir National Parks	-	NPWS	-	Minor	Possible	Minimal	Minimal	Minimal	Minimal			BNP3, YNP3 - Develop asset register including location, use, construction date, condition, risk of erosion/recession, level of service etc. (NPWS)
T70 - Inadequate land use planning and development controls												
All areas	-	CVC	2011 LEP, DCPs	Major	Possible	Mod	Mod	Mod	Mod	Coastal design guidelines are being updated (MEMS Action 2.2)	-	-
T71 – Lack of funding for coastal management												
Council managed areas	-	CVC	IP&R, external grant funding	Major	Possible	Mod	Mod	Mod	Mod	-	-	-
National Parks and reserves		NPWS		Major	Possible	Mod	Mod	Mod	Mod	-	-	-
Heritage												
T72 - Lack of protection/ management of former oyster leases												
Sandon River (Toomba Creek)	CEMC	Heritage NSW	-	Minor	Likely	Low	Low	Low	Low	-	-	-
T73 - Inadequate consultation with Aboriginal land managers												
Study area	CEMC, CVC	CVC, Aboriginal representatives, NPWS	Cultural heritage mapping, development of Indigenous Land Use Agreement with Yaegl TOAC	Mod	Likely	Mod	Mod	Mod	Mod	-	-	-
T74 - Damage to cultural heritage items/ sites												
Woody Head/Iluka coast	Community consultation	NPWS	Plan of Management	Mod	Possible	Low	Low	Low	Low	-	-	-

Threats (use, activity or stressor) and location	Source	Management responsibility	Current management approach	Present day risk			Future Risk			Assessment of Knowledge Gaps		Recommendation for additional studies*
				Consequence	Likelihood	Current Risk	20-year	50-year	100-year	Knowledge/gap	Priority for Resolution	
T75 - Erosion of cultural heritage sites (e.g. middens)												
Angourie	NPWS	NPWS	Plan of Management	Mod	Likely	Mod	Mod	Mod	Mod	Registers of cultural heritage sites within the coastal zone are currently being prepared	Mod	A9 - Identify cultural heritage sites potentially affected by coastal hazards (through cultural heritage mapping where appropriate)
Sandon campground	NPWS	NPWS	Plan of Management	Mod	Likely	Mod	Mod	Mod	Mod			
Amenity												
T76 - Fish cleaning waste												
Minnie Water	CEMC, community consultation	CVC, DPI-Fisheries	-	Minor	Almost certain	Low	Low	Low	Low	-	-	-
T77 - Beached or deceased whales on/ near beaches												
Marine areas	NPWS, CEMC	NPWS	NPWS review into management of deceased whales in NSW (2019)	Minor	Almost certain	Low	Low	Low	Low	Review provides sufficient information and recommendations.	-	-
T78 - Vehicles on beaches												
Brooms Head	CEMC, community consultation	CVC	4WD access north of Lake Cakora	Mod	Likely	Mod	Mod	Mod	Mod	-	-	-
T79 - Increased shark activity												
All beaches	Community consultation	DPI-Fisheries	NSW Government shark mitigation strategy	Mod	Possible	Low	Low	Low	Low	-	-	-
T80 - Lack of or poor condition of public toilets												
All areas (not specified)	Community consultation	CVC, NPWS	Public toilets and maintenance/ cleaning program	Minor	Possible	Minimal	Minimal	Minimal	Minimal	-	-	-
T81 - Increasing traffic on roads during peak periods												
All areas (not specified)	Community consultation	RMS, CVC, NPWS	Pacific Highway upgrade, road maintenance programs	Minor	Likely	Low	Low	Low	Low	-	-	-
T82 - Insufficient camping access												
National Parks	Community consultation	NPWS	Designated camping areas and capacity limits	Minor	Possible	Minimal	Minimal	Minimal	Minimal	-	-	-

Threats (use, activity or stressor) and location	Source	Management responsibility	Current management approach	Present day risk			Future Risk			Assessment of Knowledge Gaps		Recommendation for additional studies*
				Consequence	Likelihood	Current Risk	20-year	50-year	100-year	Knowledge/gap	Priority for Resolution	
T83 - Fallen/ dangerous trees on eroded beaches												
Woody Bay	Observation	NPWS	Warning signs, tree/debris removal	Moderate	Almost certain	Mod	Mod	Mod	Mod	-	-	-
T84- Marine debris and kelp following storm event												
Brooms Head foreshore	CZMP (SMEC, 2017)	CVC	-	Minor	Likely	Low	Low	Low	Low	Documented occurrence of debris/kelp.	-	-
T485 - Litter												
All areas (terrestrial)	Community consultation	CVC, NPWS	Rubbish bins.	Mod	Likely	Mod	Mod	Mod	Mod	Documented occurrence of litter	-	-
All areas (marine e.g. Jones Beach)	SIMPA	NPWS, SIMPA	NPWS and community clean-up days	Mod	Likely	Mod	Mod	Mod	Mod	Documented occurrence of litter/debris	-	-

*Recommendation for additional studies:

BNP – Bundjalung National Park:

- BNP1 - Coastal hazard assessment and mapping – beach erosion, shoreline recession, coastal inundation (NPWS).
- BNP2 - Assessment of options to manage erosion and preserve beach access (NPWS Stage 3).
- BNP3 - Develop asset register including location, use, construction date, condition, risk of erosion/recession, level of service etc. (NPWS)

WH – Woody Head (Woody Bay and Shark Bay).

- WH1 - Coastal hazard assessment and mapping – beach erosion, shoreline recession, coastal inundation (NPWS)
- WH2 - Asset register and risk assessment (road and services) (NPWS)

IL – Iluka area

- IL1 - Coastal hazard assessment and mapping – beach erosion, shoreline recession, coastal inundation (CMP Stage 5)

Y – Yamba/Angourie area.

- Y1 - Coastal hazard assessment and mapping – beach erosion, shoreline recession, coastal inundation (CMP Stage 5)
- Y2 - Ongoing liaison with TfNSW MIDO and review of sand sources (CMP Stage 5) with reference to MEMS Action 2.1.

B – Brooms Head/Lake Cakora.

- B1 - review and update of EASP (CMP Stage 4).
- B2 - Cost-benefit analysis and distributional analysis for seawall extension (CMP Stage 3).
- B3 – Assessment of coastal inundation risk (CMP Stage 2).
- B4 - Desktop assessment, field survey and mapping of bank condition (erosion and riparian vegetation) of navigable reaches. Develop Bank Management Strategy (BMS) in accordance with Initiative 2 of the MEMS and any tool/ guidance provided (CMP Stage 5).
- B5 - Assessment of potential for estuarine vegetation migration with sea level rise based on vegetation types, topography, land use and tidal inundation and including mapping of anthropogenic barriers and land use constraints to migration (e.g. training walls and rock revetments, footpaths, roads, land uses) and management priority classification indicating the level of intervention required to minimise the potential impact of sea level rise on migration (CMP Stage 5) with reference to MEMS Actions 2.3, 3.1 and 3.5.

Yuraygir National Park:

- YNP1 - Coastal hazard assessment and mapping – beach erosion, shoreline recession, coastal inundation (NPWS).
- YNP2 - Assessment of options to manage erosion and preserve beach access (NPWS).
- YNP3 - Develop asset register including location, use, construction date, condition, risk of erosion/recession, level of service etc. (NPWS)

S – Sandon (Village and campground):

- S1 - Coastal hazard assessment and mapping – beach erosion, shoreline recession, coastal inundation (NPWS and CVC CMP Stage 2)

SR – Sandon River

- SR1 - Detailed tidal inundation assessment for a variety of future sea level rise scenarios, with a risk assessment relating to estuary assets (CVC/NPWS CMP Stage 5).
- SR2 - Desktop assessment, field survey and mapping of bank condition (erosion and riparian vegetation) of navigable reaches. Develop Bank Management Strategy (BMS) in accordance with Initiative 2 of the MEMS and any tool/ guidance provided (CVC/NPWS CMP Stage 5).
- SR3 – Desktop review of historical aerial photographs and data. Seagrass extent and condition survey (CVC/NPWS CMP Stage 5, to be repeated annually).
- SR4 - Assessment of potential for estuarine vegetation migration with sea level rise based on vegetation types, topography, land use and tidal inundation (SR1) and including mapping of anthropogenic barriers and land use constraints to migration (e.g. training walls and rock revetments, footpaths, roads, land uses) and management priority classification indicating the level of intervention required to minimise the potential impact of sea level rise on migration (CVC/NPWS CMP Stage 5) with reference to MEMS Actions 2.3, 3.1 and 3.5.

W – Woolli Village:

- W1 - Coastal hazard assessment and mapping – beach erosion, shoreline recession, coastal inundation (CMP Stage 2).
- W2 - Monitoring of beach profile, near shore wave and current monitoring, sand tracing, beach camera monitoring, offshore wave data collection (CMP Stage 2 and ongoing).
- W3 – review and update of EASP including response to storm damage (CMP Stage 4).
- W4 – Assessment of coastal inundation risk (CMP Stage 2).
- W5 - Success of second sand scrape to be assessed. Sand sourcing to be reviewed following second scrape (CMP Stage 5).

WW – Woolli Woolli River:

- WW1 - Detailed tidal inundation assessment for a variety of future sea level rise scenarios, with a risk assessment relating to estuary assets (CVC/NPWS CMP Stage 5).
- WW2 - Desktop assessment, field survey and mapping of bank condition (erosion and riparian vegetation) of navigable reaches. Develop Bank Management Strategy (BMS) in accordance with Initiative 2 of the MEMS and any tool/ guidance provided (CVC/NPWS CMP Stage 5).
- WW3 – Desktop review of historical aerial photographs and data. Seagrass extent and condition survey (CMP Stage 5, to be repeated annually).
- WW4 - Assessment of potential for estuarine vegetation migration with sea level rise based on vegetation types, topography, land use and tidal inundation (WW1) and including mapping of anthropogenic barriers and land use constraints to migration (e.g. training walls and rock revetments, footpaths, roads, land uses) and management priority classification indicating the level of intervention required to minimise the potential impact of sea level rise on migration (CMP Stage 5) with reference to MEMS Actions 2.3, 3.1 and 3.5.
- WW5 - Strategic review of boating facilities (CVC/NPWS CMP Stage 5).

A – all areas

- A1 - Coastal hazard assessment and mapping (CMP Stage 5)
- A2 - Detailed tidal inundation assessment for a variety of future sea level rise scenarios, with a risk assessment relating to estuary assets (CVC/NPWS CMP Stage 5).
- A3 – Review and modify Ecohealth monitoring program to cover estuaries and potential issues (CMP Stage 4) with reference to outcomes of MEMS Action 1.5.
- A4 – Regular (5-yearly) Ecohealth monitoring (CMP Stage 5).
- A5 - Assessment of options to manage erosion and preserve beach access (CMP Stage 3)
- A6 – Once DPIE vegetation mapping for North Coast is available, accuracy of CWLRA should be confirmed (CMP Stage 5).
- A7 – Updated mapping potentially to be included in SEPP (CMP Stage 5)
- A8 - Develop asset register including location, use, construction date, condition, risk of erosion/recession, level of service etc. (CMP Stage 5).
- A9 - Identify cultural heritage sites potentially affected by coastal hazards (through cultural heritage mapping where appropriate).