



# Coastal Zone Management Plan: Evans Head Coastline and Evans River Estuary





# Coastal Zone Management Plan for the Evans Head Coastline and Evans River Estuary

FINAL CZMP ADOPTED BY COUNCIL 25<sup>th</sup> JUNE 2013

## Acknowledgement

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*Cover Photo: Evans Head Aerial Photo (Photo courtesy of Department of Environment and Climate Change, NSW Coastal and Floodplain Programs 29-May-1999)*

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<b>PROJECT 12-015 – COASTAL ZONE MANAGEMENT PLAN EVANS HEAD COASTLINE AND EVANS RIVER ESTUARY</b>						
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## **EXECUTIVE SUMMARY**

### **Introduction**

This Coastal Zone Management Plan (CZMP) for the Evans Head Coastline and Evans River Estuary provides a ten year strategic plan for the implementation of key actions that are recommended to achieve the objectives for management of the Evans Head coastline and Evans River estuary. The main aim of the CZMP is to protect and enhance the key values of this area by increasing resilience of the coastal zone and addressing key threats through efficient, effective and timely management. This will be achieved through the implementation of integrated, balanced, responsible strategies to address coastal risks and restore and maintain the ecological sustainability of the coastline and estuary as well as the recreational and commercial activities associated with it.

The CZMP is the culmination of the coastal zone management process for the Evans Head Coastline and Evans River Estuary. The Plan is supported by the scientific knowledge from the *Evans Head Coastline Hazard and Estuarine Water Level Definition Study* (WorleyParsons, 2012), the *Evans River Processes Study* (PBP, 1999), *Evans River Estuary Management Plan* (WBM 2002), and a range of other background information summarised in Part B: Literature and Information Review (Appendix 3).

### **Management Framework**

The CZMP supports the goals and objectives of the *NSW Coastal Policy 1997* and will assist in implementing integrated coastal zone management for the Evans Head coastline and Evans River estuary. The CZMP was prepared in accordance with Part 4A of the *Coastal Protection Act, 1979* and NSW Government's *Guidelines for Preparing Coastal Zone Management Plans* (DECCW, 2010a). The CZMP will be referred to the Minister for certification under section 55G of the *Coastal Protection Act, 1979* and will be formally adopted by Richmond Valley Council (RVC) and published in the Government Gazette in accordance with the *Coastal Protection Act, 1979* section 55H.

### **Strategy Development Process**

The development of management strategies followed a structured approach to assessing management options built on the current scientific understanding of the estuary and coastline, the identified issues, and the established values and objectives for management of the study area. The management options were evaluated using a quadruple bottom line assessment (i.e. considering environmental, social, economic and governance factors) to short-list management options. Short-listed options were then collated into management actions and strategies for implementation. The management strategies, which contain one or more actions for implementation, form the basis of this CZMP.

This CZMP is consistent with the *Coastal Zone Management Plan for the Richmond River Estuary* (Hydrosphere Consulting, 2011) which includes the Evans River catchment as a management zone within the plan area and was adopted by Council in early 2012. When developing management strategies for the Evans Head CZMP, the intention is not to duplicate any of the catchment-wide actions already contained in the Richmond River CZMP. The aim is to support the catchment-wide initiatives, ensuring the detailed issues identified by the Evans Head CZMP are considered appropriately within the context of the Richmond River.

## **Management Objectives**

To ensure a balance between long-term utilisation and conservation of the Evans Head coastline and Evans River estuary, specific objectives for the CZMP have been developed. The CZMP Objectives are consistent with the nine goals of the *NSW Coastal Policy 1997* but have been expanded and adapted to be relevant to the local area values to be protected. The CZMP objectives are:

- O1. To protect and enhance ecological values
- O2. To protect cultural heritage values
- O3. To protect the visual amenity and character of the local area
- O4. To maintain and improve public access and use
- O5. To minimise and manage risk to public health and safety
- O6. To minimise and manage risks to community assets
- O7. To promote sustainable development
- O8. To adequately plan for management of known future risks
- O9. To provide efficient and effective management
- O10. To maximise the likelihood of success of management strategies
- O11. To minimise overall cost while achieving the goals of the CZMP
- O12. To ensure consistency with other strategic planning instruments and programs

## **Summary of Management Issues, Strategies and Actions**

Management issues to be addressed by this CZMP were collated from the review of background information and stakeholder consultation activities undertaken for Part B: Literature and Information Review. Management issues have been grouped into three main categories:

- Coastal Risks (Section 3) – issues associated with beach erosion and coastline recession impacting public safety and property. This CZMP considers the projected 2050 and 2100 coastal hazard lines/areas defined as part of preceding study (WorleyParsons, 2012) as potential future impacts and issues. Note that while 2100 risks and potential issues are reported, this CZMP focuses on addressing risks to 2050 and does not include detailed scenario building to address 2100 impacts.
- Coastal Ecosystem Health (Section 4) – key factors affecting the ecological health of the Evans River estuary and Evans Head coastline; and
- Community Uses of the Coastal Zone (Section 5) – issues associated with the on-going use and enjoyment of the estuary and coastline areas including amenity, public access, recreation and cultural heritage.

A total of thirteen management strategies have been developed to address the identified issues. Table 1 lists the key issues and the management strategies and actions developed to address each issue and provides links to the description of tasks. A summary of the strategies and actions follows the table.

**Table 1: Management strategies and actions to address key issues**

	Issue	Strategy
<b>Coastal Risks</b>		
Beach erosion	1. Severe storms currently erode the dunes along the beach affecting beach access, public safety, visual amenity and dune flora and fauna.	Strategy 1: Management of Coastal Erosion and Recession Strategy 9: Coastal Dune Management Strategy 11: Public Access
	2. The Evans River estuary training walls are vital coastal infrastructure that are currently impacted during severe storms and this is predicted to be exacerbated into the future under sea level rise.	Strategy 11: Public Access
Shoreline recession	3. Evans Head - Casino Surf Life Saving Club is at risk from coastal recession by 2050	Strategy 1: Management of Coastal Erosion and Recession
	4. By 2100 the shoreline is projected to be landward of the eastern boundary of the Silver Sands Holiday Park.	Strategy 1: Management of Coastal Erosion and Recession Strategy 2: Management of Estuarine Inundation
	5. Camp Koinonia and areas landward of Terrace Street and Beech Street may also be at threat from erosion/recession coastline hazards by 2100	Strategy 1: Management of Coastal Erosion and Recession
Coastal inundation	6. There is a risk of oceanic inundation if the current dune heights along the coast are not maintained. Areas seaward of Beech Street are of particular importance and if the dune was breached in this area, oceanic inundation could extend southwards into the low-lying Silver Sands Holiday Park.	Strategy 1: Management of Coastal Erosion and Recession Strategy 9: Coastal Dune Management
Tidal inundation (including estuaries)	7. The north bank of Evans River including Silver Sands Holiday Park and southwards (east of Park Street) to McDonalds Place is currently at risk from estuarine inundation during severe storms including catchment flooding effects and this is predicted to be exacerbated into the future under sea level rise.	Strategy 2: Management of Estuarine Inundation
	8. The south bank of Evans River including the Boat Harbour and several lots on the southern side of Ocean Drive to the north-east and the south west of the boat harbour are currently at risk from estuarine inundation during severe storms including catchment flooding effects and this is predicted to be exacerbated into the future under sea level rise.	Strategy 2: Management of Estuarine Inundation
	9. By 2100, an additional 8 lots to the north-east of the Boat Harbour are also predicted to be inundated in a severe storm.	Strategy 2: Management of Estuarine Inundation

**COASTAL ZONE MANAGEMENT PLAN: EVANS HEAD COASTLINE AND EVANS RIVER ESTUARY**

	<b>Issue</b>	<b>Strategy</b>
Erosion within estuaries caused by tidal waters, including the interaction of with catchment floodwaters	10. Bank erosion along the estuary places built and natural assets at risk in some locations. Increased estuary levels in future are predicted to increase the erosion.	Strategy 3: Management of Bank Erosion Strategy 5: Agricultural Land Management Strategy 7: Vegetation Management
<b>Coastal Ecosystem Health</b>		
Estuary health status	11. The NSW Monitoring Evaluation and Reporting (MER) program assessed the overall estuary health condition as "Moderate". The Evans River is subject to poor water quality episodes including elevated levels of chlorophyll a and turbidity.	Strategy 4: Monitoring, Evaluation and Review Strategy 5: Agricultural Land Management Strategy 6: Urban Water Cycle Management Strategy 7: Vegetation Management
Estuary health pressures	12. The MER program found that tidal flows (low flushing capacity) is a "Very High" pressure on the Evans River. This characteristic exacerbates poor water quality in the upper estuary.	Strategy 4: Monitoring, Evaluation and Review
	13. The MER program found that sediment input is a "High" pressure on the Evans River. Elevated sediment levels are caused by highly turbid flood waters and bank erosion and are a key driver of water quality decline.	Strategy 3: Management of Bank Erosion Strategy 4: Monitoring, Evaluation and Review Strategy 5: Agricultural Land Management
	14. The MER program found that nutrient input (TN) is a "High" pressure on the Evans River. Nutrient rich flood waters flowing from agricultural areas upstream of Tuckombil Weir and overflowing to the Evans River during flood are the major cause of elevated nutrients in the Evans River.	Strategy 4: Monitoring, Evaluation and Review Strategy 5: Agricultural Land Management Strategy 6: Urban Water Cycle Management
	15. The Woodburn Town Drain and drained upper agricultural areas of Brandy Arm Creek have been identified as sources of Acid Sulfate Soil runoff and deoxygenated water to the mid and upper estuary which contributes to poor water quality (low pH and low dissolved oxygen).	Strategy 4: Monitoring, Evaluation and Review Strategy 5: Agricultural Land Management
	16. Urban stormwater inputs can contribute pollutants to the estuary including gross pollutants, nutrients and sediments with impacts on ecosystem health, visual amenity and recreation.	Strategy 6: Urban Water Cycle Management

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	<b>Issue</b>	<b>Strategy</b>
	17. The Evans Head Boat Harbour has been identified as a potential source of water quality pollution due to the risk of spillage of petrochemicals, discharge from bilge tanks and antifouling of hulls.	Strategy 4: Monitoring, Evaluation and Review
	18. The current concept design for the Pacific Highway upgrade includes a road bridge crossing the Evans River along the Tuckombil Canal. Environmental impacts on the estuary are not currently known.	Strategy 4: Monitoring, Evaluation and Review
	19. On-site Sewage Management Systems (OSSMs) in the catchment have the potential to contribute pollutants to the estuary.	Strategy 6: Urban Water Cycle Management
	20. There is a high risk of declared aquatic weeds (Alligator weed and Water lettuce) spreading from Rocky Mouth Creek to the Evans River, impacting on water quality.	Strategy 7: Vegetation Management Strategy 4: Monitoring, Evaluation and Review
	21. Riparian vegetation of the Evans River has pockets of degraded vegetation due to clearing, weed infestation and stock access to creek banks.	Strategy 7: Vegetation Management Strategy 4: Monitoring, Evaluation and Review
	41. There is concern that motorised water craft contributes to estuary health pressures including bank erosion caused by boat wash and damage sensitive habitats (e.g. propeller or anchor damage to seagrass beds).	Strategy 12: Recreation Strategy 3: Management of Bank Erosion
	42. There is concern about observed decreases in recreational fish and crab catches in the Evans River.	Strategy 12: Recreation
	43. There is concern about decrease in number of pipis on the beach and impacts of commercial harvesting	Strategy 12: Recreation Strategy 8: Shorebird Management
Climate change impacts on estuary health	22. There is a risk that natural upslope migration of estuarine wetlands (mangroves and saltmarsh) due to sea level rise will be curtailed by anthropogenic constraints (roads, agriculture, urban development etc.)	Strategy 10: Climate Change Adaptation
	23. Increased estuary water levels due to sea level rise will affect riparian and other low-lying vegetation in the freshwater reaches of the estuary.	Strategy 10: Climate Change Adaptation
	24. The habitat of the endangered Oxleyan Pygmy Perch (OPP) may be impacted by sea level rise.	Strategy 10: Climate Change Adaptation
Coastal ecosystems	25. Coastal weeds (e.g. Bitou Bush) are encroaching on the Crown Reserve east of Beech Street and west of Broadwater Evans Head Road.	Strategy 9: Coastal Dune Management



**COASTAL ZONE MANAGEMENT PLAN: EVANS HEAD COASTLINE AND EVANS RIVER ESTUARY**

	<b>Issue</b>	<b>Strategy</b>
	26. Pest fauna species have been identified in coastal areas and along the riparian zone of the estuary (cane toad, foxes and cats) and have potential to impact ecosystem health through predation and out-competing native species for food and habitat resources.	Strategy 9: Coastal Dune Management Strategy 8: Shorebird Management
	27. There is the potential for disturbance of shorebirds and/or shorebird habitat from boats, vehicles, pedestrians and dogs accessing the beach and estuary in the vicinity of nesting areas.	Strategy 8: Shorebird Management
	28. Severe storms currently erode the dunes along the beach affecting dune vegetation	Strategy 1: Management of Coastal Erosion and Recession Strategy 9: Coastal Dune Management Strategy 11: Public Access
	29. By 2050 the shoreline is predicted to be landward of existing foredune vegetation and encroaching on areas mapped as Littoral Rainforest, Paperbark Swamp forest and Shrubland. These areas have also been identified as habitat areas for threatened fauna species.	Strategy 1: Management of Coastal Erosion and Recession Strategy 9: Coastal Dune Management Strategy 11: Public Access
	30. By 2100 the shoreline is predicted to be landward of the existing Salty Lagoon catchment boundary. Salty Lagoon is a freshwater wetland and seawater intrusion would significantly impact this coastal ecosystem.	Strategy 9: Coastal Dune Management
<b>Community Uses of the Coastal Zone</b>		
Public access	31. Existing boating and pedestrian access to the lower estuary is currently at risk from estuarine inundation including catchment flooding effects and this is predicted to be exacerbated into the future.	Strategy 4: Monitoring, Evaluation and Review Strategy 2: Management of Estuarine Inundation
	32. The existing jetty on the northern foreshore of the river, on the downstream side of Elm Street Bridge, is in poor condition. Its current state of disrepair represents a significant risk to safety.	Strategy 11: Public Access
	33. A number of informal access tracks to the beach are causing disturbance to dune ecosystems (adding to destabilisation of dunes, disturbance of vegetation etc.)	Strategy 11: Public Access
	34. Severe storms currently erode the dunes along the beach affecting beach access points.	Strategy 1: Management of Coastal Erosion and Recession Strategy 9: Coastal Dune Management Strategy 11: Public Access

**COASTAL ZONE MANAGEMENT PLAN: EVANS HEAD COASTLINE AND EVANS RIVER ESTUARY**

	<b>Issue</b>	<b>Strategy</b>
	35. By 2050 the shoreline is predicted to be landward of existing beach access points	Strategy 1: Management of Coastal Erosion and Recession Strategy 9: Coastal Dune Management Strategy 11: Public Access
Amenity	36. The stormwater drain and runoff discharging into the lower estuary reduce the amenity value of the area.	Strategy 4: Monitoring, Evaluation and Review Strategy 6: Urban Water Cycle Management
	37. Severe storms currently erode the dunes along the beach reducing beach amenity	Strategy 1: Management of Coastal Erosion and Recession Strategy 9: Coastal Dune Management Strategy 11: Public Access
Recreational use	38. The lower Evans River has significant shoaling and sand build-up and this is an ongoing issue for navigation through the bar.	Strategy 11: Public Access
	39. The upper Evans River has significant shoaling and sand build-up is an ongoing issue for navigation through the upper reaches.	Strategy 11: Public Access
	40. Community concern about potential conflicts between different estuary uses such as swimming and motorised watercraft.	Strategy 12: Recreation
	41. There is concern that motorised water craft contributes to estuary health pressures including bank erosion caused by boat wash and damage sensitive habitats (e.g. propeller or anchor damage to seagrass beds).	Strategy 12: Recreation Strategy 3: Management of Bank Erosion
	42. There is concern about observed decreases in recreational fish and crab catches in the Evans River.	Strategy 12: Recreation
	43. There is concern about decrease in number of pipis on the beach and impacts of commercial harvesting	Strategy 12: Recreation Strategy 8: Shorebird Management
	44. While recreational water quality is generally of a very high standard at monitored swimming locations (ocean beaches and river); poor results are occasionally measured in response to rainfall, particularly in the Evans River (near revetment wall).	Strategy 4: Monitoring, Evaluation and Review Strategy 6: Urban Water Cycle Management Strategy 12: Recreation

**COASTAL ZONE MANAGEMENT PLAN: EVANS HEAD COASTLINE AND EVANS RIVER ESTUARY**

	<b>Issue</b>	<b>Strategy</b>
Cultural heritage	45. There are a number of significant Aboriginal cultural sites in the study area that are not currently identified and recorded/mapped by AHIMS (OEH's Aboriginal Heritage Information Management System).	Strategy 13: Cultural Heritage Management
	46. Beach erosion, coastal recession and bank erosion processes could potentially impact on cultural sites of significance. There is concern that there are sites that have not yet been identified and mapped and impacts are not fully known.	Strategy 13: Cultural Heritage Management
	47. Bank erosion has impacted Gumma Garra, an Aboriginal site in the lower estuary. This is likely to be exacerbated by future increases in tidal inundation due to sea level rise.	Strategy 13: Cultural Heritage Management

**Strategy 1: Management of Coastal Erosion and Recession (Priority: High)**

- **Action 1a: Coastline recession monitoring** - To support future planning and development of a coastal risk management policy, accurate monitoring of the erosion scarp position in relation to the WorleyParsons (2012) hazard lines is required. This action aims to develop a detailed knowledge of the current status and trends in coastal recession in relation to threatened assets and hazard predictions.
- **Action 1b: Preliminary feasibility assessment of coastal recession management scenarios** - To enable informed Council and community involvement in the planning and assessment of management scenarios, the range of considerations for each scenario need to be determined to a level that informs future planning and decision-making. The aim of this action is to determine preliminary feasibility of coastal recession scenarios to enable development of feasible options and facilitate community involvement.
- **Action 1c: Determine community and stakeholder preferences** - Based on the outcomes of (Action 1b: Preliminary feasibility assessment of coastal recession management scenarios) a consultation program to inform and obtain feedback from the community, affected property owners and public land managers will be developed and implemented. The aim is to evaluate stakeholder preferences for coastline recession management in terms of values, management outcomes, willingness-to-pay and trade-offs.
- **Action 1d: Implement the Emergency Action Subplan (EASP)** –The EASP describes the emergency response actions that Richmond Valley Council (RVC) will take when coastal erosion is imminent, occurring or has occurred. It sets out a plan to ensure Council responds to coastal erosion emergencies effectively and efficiently to minimise risk to public safety and property.

**Strategy 2: Management of Estuarine Inundation (Priority: Medium)**

- **Action 2a: Inundation studies for Silver Sands Holiday Park-** Further development of the findings of WorleyParsons (2012) is required to address current limitations in inundation modelling for the Silver Sands Holiday Park. The desired outcome of this action is improved understanding of likely inundation frequency, duration and depth of inundation for Silver Sands Holiday Park and adjoining low-lying areas.
- **Action 2b: Works planning for Silver Sands Holiday Park** - Concept to be developed for works and/or actions required to address the current inundation risk in the immediate and long-term.
- **Action 2c: Address inundation risks for low-lying properties in the vicinity of Ocean Drive-** This action seeks to inform current and future landholders of potential inundation risks at this location. This action will ensure landholder knowledge of estuarine inundation risks and establish requirements for redevelopment of flood prone land.

**Strategy 3: Management of Bank Erosion (Priority: Medium)**

- **Action 3a: Kalimna Park to Shark Bay erosion works** - RVC has assessed the erosion risk at this site and has plans in place to address the issues affecting public assets. This action supports Council's current activities and future funding requirements.
- **Action 3b: Foreshore Park bank erosion monitoring** - It is recommended that this site is monitored to confirm risk of bank erosion to natural and built assets prior to any expenditure by Council.
- **Action 3c: Liaison with landholders regarding Doonbah bank erosion** - Council will consult with landholders to inform them of results of the 2012 Bank Erosion Survey.

**Strategy 4: Monitoring, Evaluation and Review (Priority: Fundamental)**

- **Action 4a: EcoHealth monitoring program** - The Richmond River EcoHealth monitoring program (which includes the Evans River estuary) is recommended as an appropriate long-term program, providing that key issues and sites for the Evans River are considered in the design and implementation of the program.
- **Action 4b: Contribute to planning for proposed Pacific Highway upgrade** – Council to review the environmental assessment and detailed design when available, to ensure any impacts on the Evans River system have been adequately assessed and appropriate mitigation or compensatory measures have been proposed in keeping with the objectives of this CZMP.
- **Action 4c: Risk assessment of Boat Harbour operations** - The level of risk of Boat Harbour operations to the health of the Evans River will be assessed and appropriate management actions will be developed.
- **Action 4d: Review of CZMP progress and monitoring of KPIs** – The success of the CZMP will be indicated by the implementation of substantial measures to address the issues facing the coastal zone. Conclusive documentation of the effectiveness of these measures will be reported. KPIs have been identified where appropriate for each management action to provide a target for achievement of the major steps in each action. This task requires review and reporting of progress towards the KPIs as part of the Council State of the Environment (SoE) Reports.
- **Action 4e: 10 year review of CZMP** - The CZMP and the specified management actions to be reviewed to ensure they are being achieved and are resulting in the desired outcomes. A ten year review (or earlier if warranted by legislative or management changes or improved scientific understanding) of the CZMP is required.

**Strategy 5: Agricultural Land Management (Priority: High)**

- **Action 5a: Maintenance of 2010 stock fencing work** – Council will assess and maintain works carried out in 2010 to ensure ongoing protection.
- **Action 5b: Acid Sulfate Soil management** – Council will support implementation of the Richmond River CZMP actions to address acid sulfate soil issues with particular focus on Woodburn Town Drain and Brandy Arm Creek.

**Strategy 6: Urban Water Cycle Management (Priority: High)**

- **Action 6a: Stormwater management** - On-going improvements in urban design resulting in reduction of contaminants transported to the estuary will be achieved through existing Council programs as well as shire-wide community education programs.
- **Action 6b: Feasibility study of stormwater drainage improvements at Evans Head Reserve Drain** – Council will conduct a feasibility study into options to improve the appearance and treatment performance of the Evans Head Reserve Drain and the quality of stormwater discharging to the estuary.
- **Action 6c: On-going on-site sewerage system inspections and improvements** - Council undertakes on-site sewage and wastewater management programs including specification of design requirements and audit and inspection of on-site systems. Adequate funding for continuation of these actions to be allocated to these programs as part of the Council environmental health service budgets.

**Strategy 7: Vegetation Management (Priority: High)**

- **Action 7a: Maintenance of 2010 riparian restoration sites** - Maintenance activities will depend on site specific factors but are likely to include weed management, repair of tree

guards and fencing, supplementary planting and collecting and broadcasting seed. This will improve the condition of riparian vegetation and maximise the success of previous effort.

- **Action 7b: Promotion and support of further riparian restoration works** – Council will request expressions of interest from landholders with river frontage to promote the benefits of restoration and identify potential new sites.
- **Action 7c: Aquatic weed management** – This action will provide for a holistic approach to aquatic weed management through improvements in catchment management and also control aquatic weed outbreaks as they occur.

**Strategy 8: Shorebird Management (Priority: Medium)**

- **Action 8a: Shorebird management** - This action will consider recommendations of the *Threatened Species (Pied Oyster Catcher) Management Strategy* (DOL, 2007) as relevant to Evans Head coastline and Evans River estuary. The aim is to minimise the negative impacts on threatened shorebirds inhabiting the estuary and coastal beaches and ensure their continued survival.

**Strategy 9: Coastal Dune Management (Priority: High)**

- **Action 9a: Dune management** - The current activities managed and regulated by existing Crown Lands and Council services are encouraged to continue outside but complementary to the CZMP process, while ensuring consistency with the CZMP. The desired outcome is to enhance the environmental, cultural and social values of coastal ecosystems and improve resilience of coastal dunes to provide coastal erosion protection. This action (and possible variations) is highly dependent on the coastal management scenario selected as part of Strategy 1.

**Strategy 10: Climate Change Adaptation (Priority: Fundamental)**

- **Action 10a: Climate change adaptation** – Catchment and estuary specific information regarding climate change will be used to facilitate adaptation to climate change.
- **Action 10b: Oxleyan Pygmy Perch habitat risk mapping** - RVC's OPP habitat mapping and habitat restoration works will be examined in relation to predicted tidal inundation extents with sea level rise to determine the risk to habitats. Depending on the results of this assessment it may be necessary to conduct management to ensure protection of the species.

**Strategy 11: Public Access (Priority: Medium)**

- **Action 11a: Rationalisation of beach access tracks** – The aim is to minimise the disturbance to coastal dune ecosystems caused by a number of informal access tracks to the beach while creating better quality accesses for those that remain.
- **Action 11b: Repair or remove the jetty behind the Evans Head RSL** – The aim is to remove the risk to public safety currently posed by the dilapidated structure
- **Action 11c: Boating navigation in the lower estuary** – This action aims to maintain a safe navigable entrance through dredging programs wherever possible, and in times when this is not viable, provide adequate warnings about bar conditions to minimise risks to public safety.

**Strategy 12: Recreation (Priority: High)**

- **Action 12a: Recreational use** – The aim is for continued recreational use of Evans River and coastline while minimising any adverse impacts on the environment, cultural values or public health and safety. Tasks include continued implementation of existing actions such as Beachwatch Monitoring, DPI-Fisheries coordination with Evans Head Fishing Classic, and implementation of the Department of Lands *Pied Oystercatcher Management Strategy*. The development of a strategic plan for estuary usage as part of the Richmond River CZMP is also

supported, and ensuring the key issues for the Evans River are identified and considered in management.

### **Strategy 13: Cultural Heritage Management (Priority: High)**

- **Action 13a: Identification and recording of Aboriginal cultural heritage sites** – This action will identify and register sites that are currently known to community members but not recorded on planning registers to ensure the appropriate level of protection. This is an action from the Richmond River CZMP directly applicable to the Evans Head area.
- **Action 13b: Cultural site management plans** - Cultural Site Management Plans may be required for certain sites. The aim of the plan(s) would be dependent on a range of site specific factors including the type, location and cultural sensitivities. This is also an action from the Richmond River CZMP which is directly applicable to the Evans Head area.

### **Monitoring, Evaluation and Review of the CZMP**

The ability to achieve the management objectives will be determined through the success of the management strategies and actions. Evaluation will require coordinated monitoring across the estuary coastal zone as well as on-going review of performance against defined targets.

The success of the defined management actions will be measured through achievement of the key performance indicators (KPIs) so that any required amendments can be identified. An adaptive management approach will be implemented through:

- Review and reporting of KPIs for each action as part of the council State of the Environment (SoE) Reporting (Action 4d: Review of CZMP progress and monitoring of KPIs);
- A ten year review of the CZMP considering results of the SoE reviews, any barriers identified to the effective implementation of actions or overall success of actions, data provided by the estuary monitoring program, any new or updated scientific knowledge, prevailing community attitudes, estuary management issues, objectives and government policy (Action 4e: 10 year review of CZMP); and
- Adoption and gazettal of the amended CZMP as required.

### **Implementation of the CZMP**

Table 21, in Section 13 provides an overview of the recommended strategies, listing the key actions, responsibilities and indicative costs estimated over the ten year implementation period. The total cost of the CZMP implementation is estimated to be approximately \$4.1 million over ten years. This includes an estimated \$2 million in current funding commitments and programs already adopted for the local area and \$2.1 million in additional funding.

The CZMP strategies are expected to be funded through Council and State Government contributions, grants and in-kind contributions. Identification of grants and successful application is an important component of this CZMP.

On-going community involvement and liaison with industry bodies, private landholders and community groups will be required to ensure successful implementation of the CZMP.

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## **1. INTRODUCTION**

### **1.1 Purpose of this Coastal Zone Management Plan**

This Coastal Zone Management Plan (CZMP) consists of a scheduled sequence of actions that are recommended to achieve the objectives for management of the Evans Head Coastline and Evans River Estuary.

The main aim of the CZMP is to protect and enhance the key values of this area by increase resilience of the coastal zone and addressing key threats through efficient, effective and timely management. This will be achieved through the implementation of integrated, balanced, responsible strategies to restore and maintain the ecological sustainability and local character of the coastline and estuary as well as the recreational and commercial activities associated with it. The CZMP provides links to other related management strategies which will assist in achieving the objectives of the CZMP.

### **1.2 The Study Area**

Evans Head is located at the mouth of the Evans River on the NSW north coast. The closest regional centre is Ballina approximately 30km to the north. The management area covered by this CZMP was defined during the initial Scoping Study phase of project in consultation with the CZMP Committee (refer Appendix 1 – Part A: Scoping Study).

The study area lies wholly within the Richmond Valley Council (RVC) local government area (LGA). The coastline area considered by the plan stretches from Shark Bay at Evans Head to Salty Creek on Airforce Beach, but does not include Salty Creek or the Salty Lagoon catchment. The coastline landward extent is from low water mark (defined as the LGA boundary) to the landward limit of the 2100 erosion hazard zone (see WorleyParsons 2012). Further discussion of the erosion hazard zone is provided in Section 3. Any land parcels (lots) intersected by the 2100 hazard line are also included in the study area (except National Parks Estate). While the projected 2100 hazard lines/areas are acknowledged and discussed as potential future impacts, this CZMP does not include detailed scenario building to address 2100 impacts.

The estuarine reaches under consideration start at the mouth of the Evans River and extend to the upstream extent of Tuckombil Canal at Tuckombil Weir, near Woodburn, including the surrounding Evans River catchment. Figure 1 provides an overview of the study area showing the coastline, estuary and catchment topography.

This management plan focusses on issues with direct impact on the coastline and estuary. Areas of the broader catchment as indicated in Figure 1 are only considered where activities or processes occurring in the catchment have been shown to affect the health and/or function of the Evans River estuary or coastline. The Tuckombil Canal has been the subject of comprehensive investigations in recent years and the current weir has been determined to be the most appropriate management option (GeoLINK, 2008). This CZMP does not include further investigation of options for the Tuckombil Canal.

Figure 2 provides an overview of the Evans Head coastline including the township, lower estuary and beaches and Figure 3 provides an overview of the Evans River Estuary stretching from the ocean mouth of the Evans River to the Tuckombil Weir. The key features and values of the study area are described in Section 2. Further details of key features are included in Appendix 1 – Part A: Scoping Study and Appendix 3: Part B: Literature and Information Review.



Figure 1: The Evans Head coastline and Evans River estuary study area



Figure 2: The Evans Head coastline (aerial photography supplied by RVC, 2009)

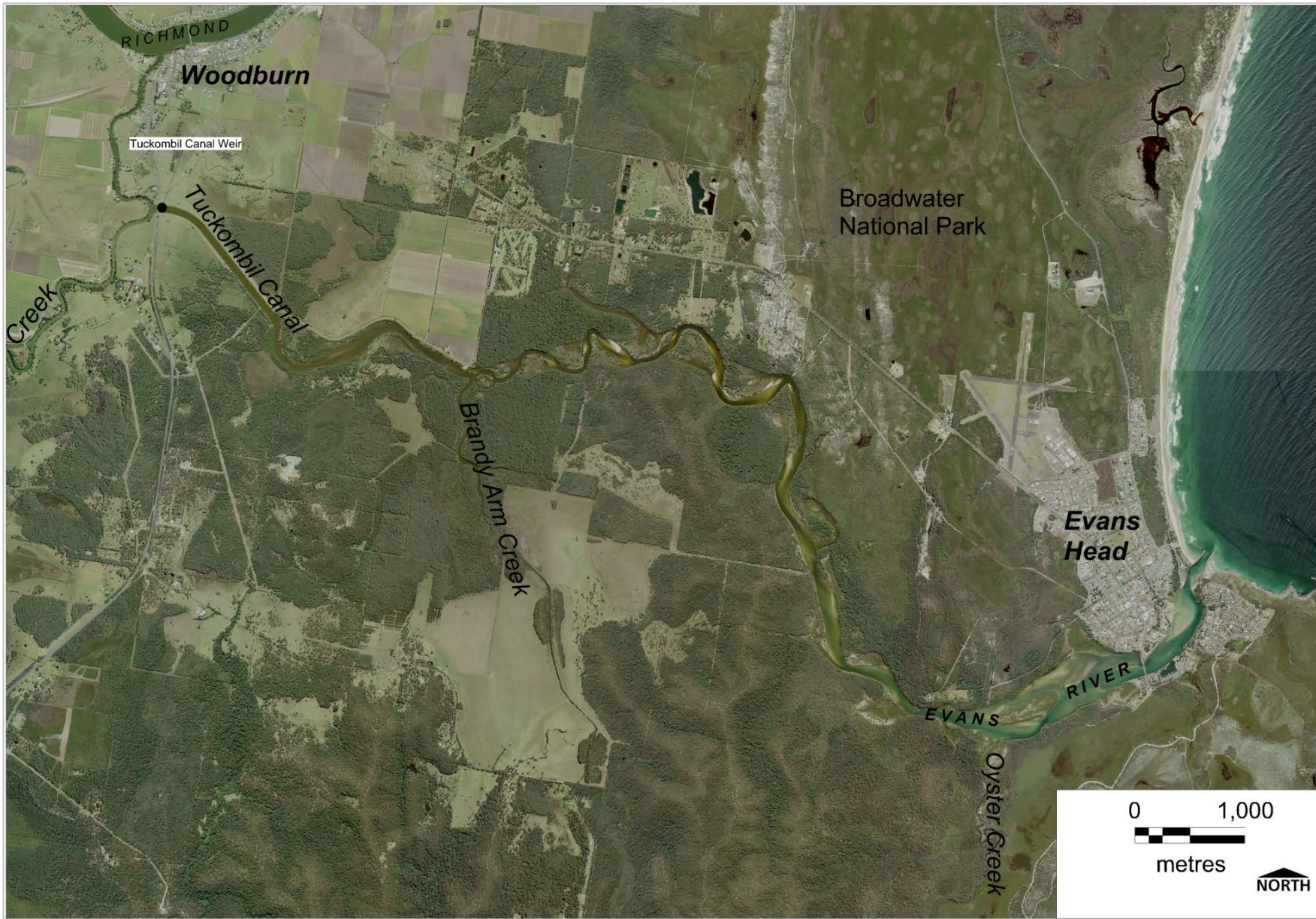


Figure 3: The Evans River estuary (aerial photography supplied by RVC, 2009)



### 1.3 Management Framework

Coastal councils are required to prepare a coastal zone management plan (CZMP) in accordance with the Minister's guidelines adopted in 2010 under section 55D of the *Coastal Protection Act, 1979*. This CZMP was prepared in accordance with Part 4A of the *Coastal Protection Act, 1979* and CZMP guidelines (DECCW, 2010a).

This CZMP supports the goals and objectives of the *NSW Coastal Policy 1997* and assists in implementing integrated coastal zone management for the Evans Head Coastline and Evans River Estuary.

In terms of Coastal Hazards and Risk, this CZMP considers the projected 2050 and 2100 coastal hazard lines/areas defined as part of preceding study (WorleyParsons, 2012) as potential future impacts and issues. Note that while 2100 risks and potential issues are reported, this CZMP focuses on addressing risks to 2050 and does not include detailed scenario building to address 2100 impacts.

The aims for the CZMP for the Evans Head estuary and coastline are to:

- Link Council's coastal zone management planning with other planning processes in the coastal zone to facilitate integrated coastal zone management;
- Involve the community in the preparation of the CZMP including making information relating to the plan publicly available;
- Recognise and accommodate natural coastal processes and hazards. The CZMP will include strategies to deal with threats to existing development and to ensure that new development is not exposed to such threats;
- Maintain the condition of high value coastal ecosystems and rehabilitate priority degraded coastal ecosystems;
- Address the current and potential risks to coastline and estuary health;
- Protect amenity, maintain and improve public access arrangements to foreshores, support recreational uses and protect the cultural and heritage environment; and
- Base decisions for managing risks to public safety and built assets and pressures on coastal ecosystems and community uses of the Evans Head estuary and coastline on the best available information and reasonable practice, including adopting an adaptive management approach.

The effects of climate change, including sea level rise, on coastal hazards, ecosystem health and community uses of the estuary are an integral component of the management actions.

The CZMP has adopted a risk management approach to managing risks to public safety and assets and pressures on coastal ecosystems, including avoiding risks where feasible and mitigation where risks cannot be reasonably avoided. Interim actions are adopted to manage high risks while long-term options are implemented. Management actions in the CZMP have been prioritised based on public benefit including cost-effectively achieving the best practical long-term outcomes.

The CZMP guidelines specify the minimum requirements that are to be met when preparing a CZMP, in addition to the requirements in the Act. The minimum requirements in the guidelines relate to:

- Preparation of the CZMP;
- Coastal risk management;
- Coastal ecosystem health; and
- Community uses of the coastal zone.

Appendix 2 summarises the minimum requirements and how they have been met by this CZMP.

To achieve the aims outlined above, the CZMP was prepared through a series of project phases. Each phase was an essential step in the development of the CZMP. The preparation process is illustrated in Figure 4. The key phases were as follows:

- Collection and consolidation of background information from a range of sources including existing documentation, Council staff, external stakeholders and the community;
- Part A: Scoping Exercise – to define the study area, issues and potential management options;
- Part B: Literature and Information Review – analysis of the information from existing studies on coastal hazards (Part C), estuary health (Part E) and community uses (Part F);
- Development of an Emergency Action Sub Plan (Part D) for beachfront margins where erosion is likely to threaten public and private safety, infrastructure or assets;
- Development and prioritisation of potential options to address the management issues (Part G);
- Development of an Implementation Schedule with prioritised actions, costs, funding, timing and monitoring requirements (Part H);
- Development of a strategic plan to address the priority management issues including an implementation framework with clearly defined and prioritised outcomes, actions, timeframes, funding, responsibilities and monitoring requirements; and
- Consultation with stakeholders to obtain feedback on the proposed strategy.

Once Council has revised the Plan considering submissions received as part of the Public Exhibition Phase, the plan will be referred to the Minister for certification under section 55g of the *Coastal Protection Act, 1979*. Once certified, the Plan will be formally adopted by Council. Council then finalises the CZMP by publishing it in the Government Gazette. The management strategies contained in this CZMP will direct Council's future strategic planning, as well as other government agencies with responsibility for management of the Evans Head Coastline and Evans River Estuary. The CZMP certification process as mapped by DECCW (2010a) is provided as Figure 5.

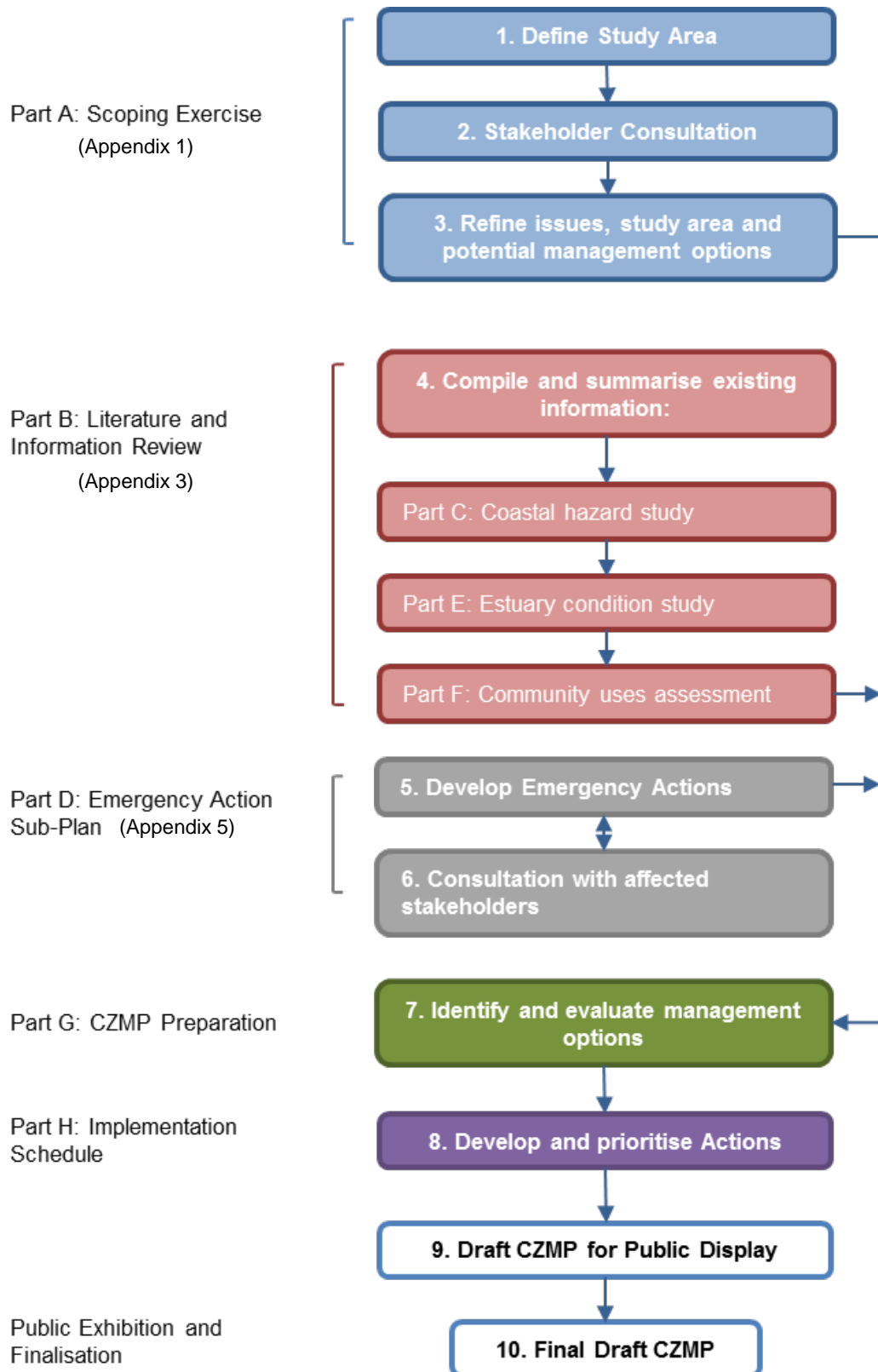
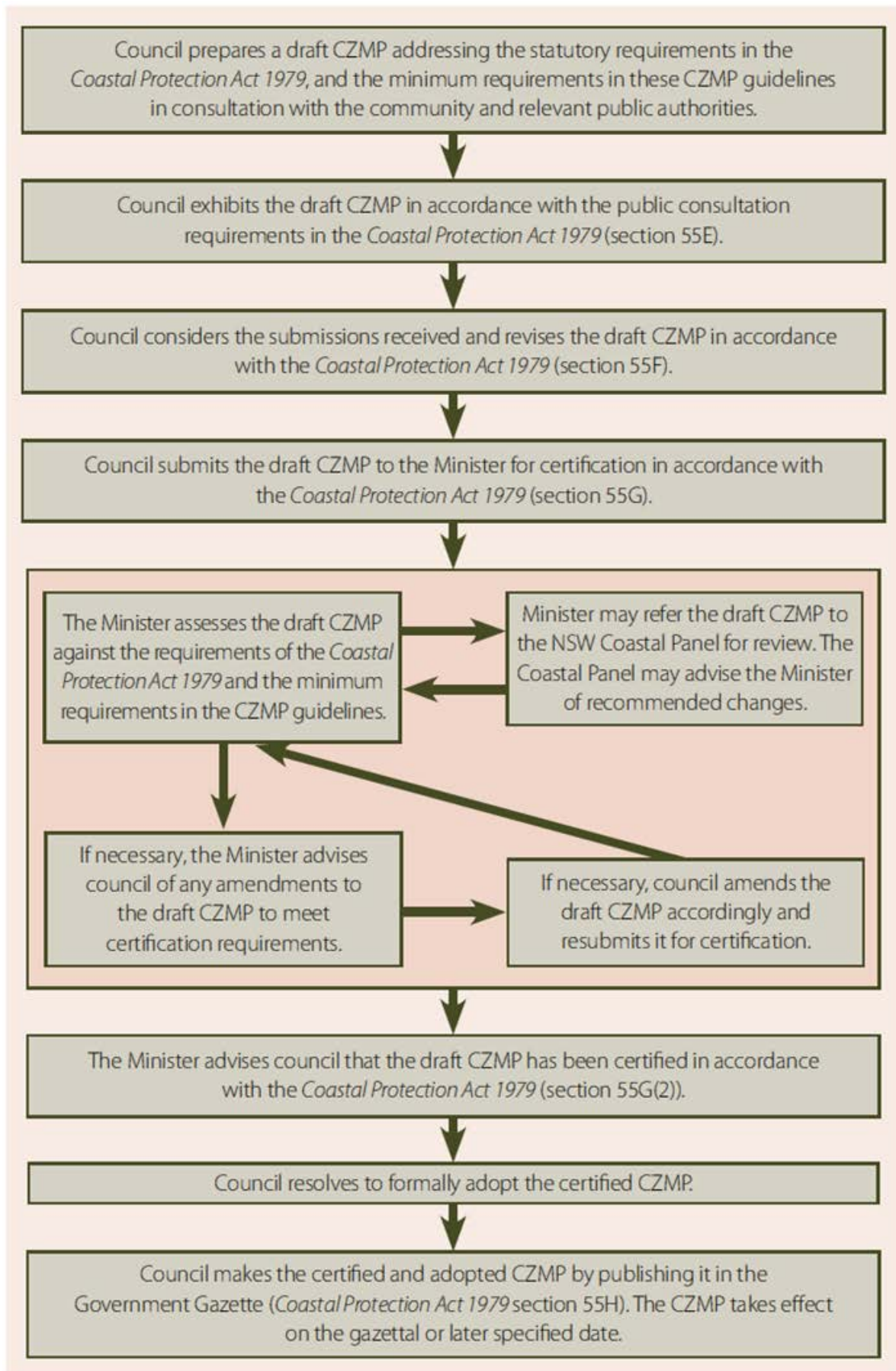


Figure 4: CZMP preparation process for the Evans Head estuary and coastline



**Figure 5: CZMP certification process for the Evans Head estuary and coastline**

Source: DECCW, 2010a

## 1.4 Coastal Management Reforms in NSW

At the time of completion of this CZMP, the NSW Government was reforming its approach to coastal management in NSW. It is uncertain what implications these reforms may have on the coastal zone planning and management in NSW at this stage, however, OEH have indicated that probable changes will include amendments to the *Coastal Protection Act, 1979* and accompanying guidelines and supporting documents.

The first stage of coastal management reforms has recently been made public with the announcement that the *2009 NSW Sea Level Rise Policy Statement* (DECCW, 2009) is no longer NSW Government policy and that state-wide sea level rise projections for use by councils would not be prescribed (OEH, 2012). The guideline documents published by OEH on incorporating sea level rise into flood risk (*Flood Risk Management Guide: Incorporating sea level rise benchmarks in flood risk assessments 2010*) and coastal hazard assessment (*Coastal Risk Management Guide: Incorporating sea level rise benchmarks in coastal risk assessments 2010*) will also be reviewed as part of the reform process. These reforms mean that local councils are now responsible for determining their own sea level rise projections to suit their local conditions.

A recent survey of NSW Local Councils found that 16 out of 17 Councils surveyed continue to consider the DECCW (2009) sea level rise benchmarks of 40cm by 2050 and 90cm by 2100 (Shoalhaven City Council, 2012). The benchmarks are considered to be based on the best information available at this time and will be updated as necessary as new information becomes available. Some Councils have formally adopted the benchmarks and others use the benchmarks for planning without formal adoption.

In April 2012, the NSW Chief Scientist and Engineer provided a report to the Coastal Ministerial Taskforce giving an assessment of the sea level rise benchmarks derived for the *2009 NSW Sea Level Rise Policy Statement*. The report concluded that the approach used by the OEH was considered to be adequate, given the data available at the time. The complexity of climate change modelling was acknowledged and the need for frequent ongoing review of sea level rise projections for the NSW coast was highlighted considering the rapid pace of advancement in scientific understanding and modelling capacity. Based on the NSW Government's expert opinion, the *2009 NSW Sea Level Rise Policy Statement* benchmarks are considered to be appropriate for use in coastal hazard assessments at the present time, but may be updated in the future as further information becomes available.

Richmond Valley Council adopted a Climate Change Scenario for the *Casino Floodplain Risk Management Plan* (2002) and the *Mid Richmond Floodplain Risk Management Plan* (2004) as follows:

- +900mm sea level rise +10% increase in rainfall intensity by 2100.

The scenario was determined by consideration of local conditions and in consultation with DECCW (now OEH) and allows for long term development to be undertaken with due consideration of the future impacts of climate change (RVC, 2010b). The scenario is consistent with the sea level rise projection of 90cm by 2100 recommended in the *2009 NSW Sea Level Rise Policy Statement*.

WorleyParsons (2012) completed an independent review of sea level rise estimates as part of the *Evans Head Coastline Hazard and Estuarine Water Level Definition Study*. This study notes that there is considerable uncertainty regarding sea level rise projections. For the purposes of defining coastline hazard lines, the following sea level rise benchmarks were used:

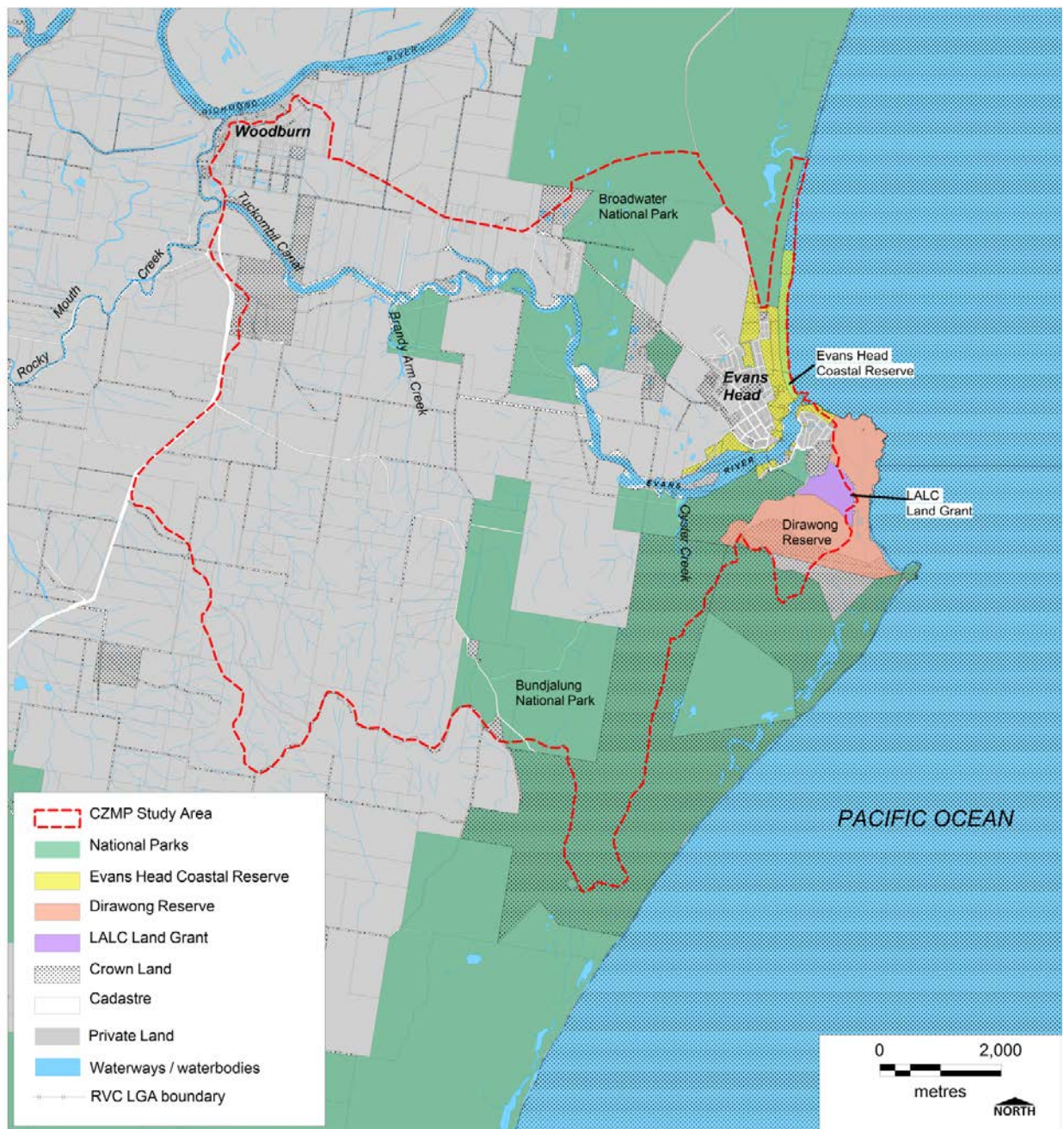
- 0.4m at 2050 and 0.9m at 2100 (relative to 1990) as per DECCW (2009); and
- 1.1m at 2100 (relative to 1990) as per Department of Climate Change (2009).

In summary, even though the NSW Government no longer prescribes the sea level rise benchmarks set out in the *2009 NSW Sea Level Rise Policy*, the benchmarks are still widely used and are

generally considered to be appropriate as ratified by the NSW Government Chief Scientist and Engineer based on available information. RVC's adopted Climate Change Scenario is consistent with the long-term (2100) benchmark. The sea level rise benchmarks used for the Evans Head coastal hazard assessment carried out by WorleyParsons (2012) is also consistent with the accepted approach and includes an additional conservative estimate to account for some of the known variability. Continued monitoring, adaptive management and ongoing evaluation of new research is required to most appropriately plan for sea level rise impacts. As part of the on-going review process of this CZMP, future sea level rise benchmarks and advances in scientific understanding and modelling capacity will be considered and amendments made if and when required.

### 1.5 Concurrent/Parallel Programs

The study area includes large areas of National Park, Crown Reserves (managed by Council), Crown Reserves well as private land within the Evans Head township (Figure 6).



**Figure 6: Land management within the study area**

The Evans Head Coastline and Evans River Estuary Coastal Zone Management Plan has links to many other Natural Resource Management Plans and Strategies. This Plan has been prepared with regard for the NSW State Targets for Natural Resource Management, and the targets of the Northern Rivers Catchment Action Plan. Local Council, government agencies and statutory bodies are implementing management programs in parallel with the preparation of this CZMP. Many of these initiatives are related to the management of the Evans River estuary, foreshore areas and coastline. This CZMP will complement existing plans of management. The roles and responsibilities of the various land managers are summarised in Appendix 8.

Council programs include:

- *Evans Head Crown Reserve Plan of Management* (GHD, 2010) – see Section 1.5.1;
- *Coastal Zone Management Plan (CZMP) for the Richmond River Estuary* (Hydrosphere Consulting, 2010) – see Section 1.5.2;
- *RVC Stormwater Quality Management Plan* (RVC, 2007);
- *Mid-Richmond Floodplain Risk Management Study and Plan* (WBM, 2002);
- *RVC On-Site Sewage and Wastewater Management Strategy* (RVC, 2001); and
- *Richmond Valley DISPLAN* (RVC, 2010a).

Agency programs in the study area include:

- *Broadwater National Park, Bundjalung National Park and Iluka Nature Reserve Plan of Management* (NPWS, 1997);
- *Dirawong Reserve Evans Head Plan of Management* (Tein McDonald & Associates for Dirawong Reserve Trust, 2007); and
- NSW Government's Minor Ports and River Entrance Programs.

Agency programs in the broader, Northern Rivers area include:

- *Northern Rivers CMA Catchment Action Plan* (NRCMA, 2006);
- Northern Rivers CMA programs including community capacity building;
- DPI - Fisheries assessment of waterfront structures;
- DPI – Agriculture landholder education programs;
- *Northern Rivers Regional Biodiversity Management Plan* (DECCW, 2010b);
- *Fox Threat Abatement Plan* (DECC, 2010)
- *Shorebirds of Northern NSW* (DECCW, 2010c);
- *Threatened Species (Pied Oystercatcher) Management Strategy* (Department of Lands, 2007);
- *SES NSW State Storm Sub Plan* (SES, 2007); and
- *Far North Coast Regional Strategy 2006-2013* (NSW Department of Planning, 2006).

### 1.5.1 Evans Head Crown Reserve Plan of Management

The *Evans Head Crown Reserve Plan of Management* (PoM; GHD, 2010) aims to rationalise the strategies set out in previous management plans for the coastal reserves and implement additional approaches to ensure the future management of the Evans Head Coastal Reserve is coordinated and achievable, in both the long and short term. The PoM contains a range of practical and attainable

strategies and actions to enable Richmond Valley Council, DPI-Crown Lands and the community to manage this valuable resource in an integrated and ecologically sustainable manner.

### **1.5.2 Coastal Zone Management Plan for the Richmond River Estuary**

The *Coastal Zone Management Plan for the Richmond River Estuary* (Hydrosphere Consulting, 2011) contains a suite of broad catchment actions aimed at improving estuarine ecosystem health. The Plan includes the Evans River Catchment as a management zone within the plan area and therefore many of the management strategies are directly applicable to the Evans River. The Richmond River CZMP is much broader in its approach to management across a large catchment encompassing several local government areas. The Richmond River CZMP includes actions to assess and prioritise key areas to direct management effort such as riparian restoration at key sites to provide maximum overall benefit. It also promotes catchment wide initiatives, such as farm management planning, assessment of alternative land uses for backswamp farms, education programs, and EcoHealth monitoring. The Richmond River CZMP was adopted by Council in 2011 and gazetted by the Minister in February 2012.

When developing management strategies for the Evans Head CZMP, the intention is not to duplicate any of the catchment-wide actions already contained in the Richmond River CZMP. The aim is to support the catchment-wide initiatives contained in the Richmond River CZMP, ensuring the detailed issues identified by the Evans Head CZMP are considered appropriately. Costs for the Evans Head CZMP have been estimated for actions to specifically address issues in this study area, however, in many cases, funding has already been identified as part of the Richmond River CZMP for management action. The Richmond River CZMP will be referred to where appropriate, ensuring consistency between planning documents and avoiding duplication of costs. Where issues identified by this Plan are not addressed by the Richmond CZMP, local management strategies have been developed and costs estimated accordingly.



## 2. VALUES AND SIGNIFICANCE OF THE STUDY AREA

The Evans Head estuary and coastline are highly valued for their cultural and natural attributes which support a wide range of recreational and commercial activities. The estuary with its associated wetlands and waterways support a rich biodiversity and a range of important environmental functions. The coastline and lower estuary provide recreational opportunities, high amenity value and coastal lifestyle highly valued by residents and visitors (Plate 1). Tourism is a key economic driver for Evans Head particularly in the peak holiday seasons when the population of the town increases significantly with the population estimated to double during the Christmas holiday period.

The following discussion of the significance and value of the Evans Head estuary and coastline have been derived from the scientific understanding documented in background material (see Part B) and outcomes of stakeholder consultation conducted as part of previous studies and also as part of this CZMP. The key background materials used to identify values were:

- Evans River Processes Study (PBP, 1999);
- Evans River Estuary Management Plan (WBM, 2002); and
- The Evans Head Coastal Reserve Plan of Management (GHD, 2010).



**Plate 1: The picturesque Evans Head coastline and mouth of the Evans River estuary**

### 2.1.1 Coastline and Estuary Significance

Features of national and state significance within the Evans Head estuary and coastline include high biodiversity areas, National Parks, Nature Reserves, wetlands of conservation significance including habitat for migratory waders and federally listed threatened species, fisheries and rare and threatened communities as defined under the *Threatened Species Conservation Act, 1995*. Tourism, commercial and recreational fishing, and agriculture are economic drivers for the region.

### **National Significance**

Evans Head occurs in the McPherson-Macleay Overlap Zone, defined as that area of eastern Australia where the Tropical and Temperate Zones overlap (Burbridge 1960). It is an area of extremely high biodiversity, resulting from the wide range of soil types, climate and topography across the region. This overlap area has the third highest level of biodiversity in Australia (Richmond Regional Vegetation Committee, 2002).

Within Evans River estuary and along the coastline, the Bundjalung and Broadwater National Park wetlands are listed in the Directory of Important Wetlands in Australia (Environment Australia, 2001). The estuarine wetlands of the Evans River catchment provide habitat for a large number of migratory waders including federally listed threatened species (see Section 2.1.2 below).

The estuary is a contributor to the Australian east coast fishery through a range of mechanisms including direct contribution to catches, provision of nursery habitats, spawning stock and nutrients for offshore fisheries.

### **State Significance**

The Evans River catchment includes large areas of National Park (Broadwater and Bundjalung National Parks) and Reserves (Evans Head Coastal Reserve and Dirawong Reserve).

The wetlands of the Evans River catchment provide habitat for one of the widest range of wetland dependant threatened species in NSW (see Section 2.1.2 below). The high-energy nature of the NSW north coast means there are no intertidal wetlands between estuaries, so there is a natural fragmentation of these habitats on a regional scale, giving weight to the conservation significance of habitats in each estuary (ABER, 2007).

### **Regional Significance**

Tourism and recreation are major economic drivers for the Evans Head community, as they are for the whole North Coast Region. The Evans River and the beaches of Evans Head are major factors in enticing tourists and visitors to the area. Outdoor recreation and sports (e.g. swimming, fishing, boating and surfing) are popular activities, particularly in the lower estuary and beaches at Evans Head. The Silver Sands Holiday Park is one of the largest tourist parks on the North Coast and generates significant income for the community. Tourism has been identified as a priority industry for the North Coast Region (Department of Planning, 2006).

## 2.1.2 Ecological Values

The Evans Head coastline, estuary and wetlands provide a diversity of habitats for a range of terrestrial and aquatic species.

- This includes those protected under state and Commonwealth legislation, species of fisheries value and migratory birds protected under international agreements.
- Important protected species known to occur within the study area include: threatened (in NSW) Oxleyan Pygmy Perch, critically endangered (in NSW) Beach Stone-curlew (Plate 2) and endangered (in NSW) Pied Oystercatcher.



**Plate 2: Beach Stone Curlew on Airforce Beach – Threatened Shorebird Nesting Area**

The study area supports a number of rare and threatened communities.

- Examples are SEPP 14 wetlands, Endangered Ecological Communities (EECs) including Coastal Saltmarsh, Swamp Oak Floodplain and Littoral Rainforest.

Estuarine wetlands including mangroves, saltmarsh and seagrass areas provide an important role in healthy ecosystem function.

- The role of wetlands includes bed/bank stabilisation, cycling of nutrients and habitat for fisheries nursery and breeding grounds.
- Airforce Beach and the Evans River estuary are recognised as an important location for shorebird habitat in Northern NSW (DECCW, 2010c).

The riparian zone provides a number of important ecological functions.

- It provides wildlife corridors that create connectivity in a largely cleared and fragmented landscape.
- It also provides a buffer for waterways to reduce and filter overland runoff of nutrients and contaminants.

- Riparian vegetation cover provides shade which reduces water temperature, increases dissolved oxygen levels and aquatic habitat and reduces aquatic weed.

Good water quality is highly valued and considered a general indicator of estuary health by the community.

- The general perception within the community is that if water quality is good, then ecological, economic and social values will be preserved or enhanced.

### **2.1.3 Social and Cultural Values**

The Evans Head estuary and coastline has high cultural and spiritual significance to local Aboriginal communities.

- There are many sites of Aboriginal heritage significance in the study area and their recognition and protection is of high importance to the community (Plate 3).
- Fishing along the estuary and beaches is an important part of Aboriginal culture.



**Plate 3: The Wedding Tree, a significant Aboriginal cultural heritage site within Bundjalung National Park on the banks of the Evans River**

A number of European cultural heritage sites and items exist in the study area and their acknowledgement and protection is important to the community.

- European heritage items are related to key industries such as fishing, sand mining, agriculture, defence (Airforce) and associated transportation networks and include the boat harbour, aerodrome and associated heritage items.

The beaches, estuary and foreshore areas are highly valued by the community and visitors for recreational activities.

- Activities include fishing, boating, swimming, surfing, walking and bird watching in the estuary and adjacent foreshore areas. It is important to the local community to have permanent public access to the ocean and foreshore areas.
- Silver Sands Holiday Park is a key contributor to the local economy and environmental, social and cultural values of the area.
- The natural appeal of the estuary should be preserved.

Scenic amenity is valued highly by the local community and visitors.

- Specific characteristics identified by the community include clean beaches (Plate 4) and foreshore areas, presence of native flora and fauna (including threatened species), good water quality and appreciation of landscape, geomorphic and estuarine features.



**Plate 4: Shark Bay, a popular recreational location at Evans Head**

The estuary provides opportunities for both formal and informal education.

- The ecological and cultural characteristics, economic aspects and management issues of the estuary offer a diverse range of educational opportunities for students and the general public.

#### **2.1.4 Economic Values**

The Evans Head coastline and estuary, particularly the lower estuary is considered to be a key attraction for tourists and recreational users to the area, with associated economic benefits.

- Tourism activities include recreational fishing, boating, swimming, holidaying, day trips, ecotourism, bird watching and nature appreciation. Tourism has been identified as a priority industry for the North Coast Region and was estimated to have a value of \$646 million for the region (ABER, 2007).
- Silver Sands Holiday Park is a key contributor to the local economy and environmental, social and cultural values of the area.

Fishing contributes to the local and regional economy.

- Recreational fishing is a popular lifestyle choice for residents and visitors to the estuary with flow-on economic implications for local commerce including boat supplies, bait/tackle shops and tourism.
- A small oceanic commercial fishing fleet (Plate 5), is housed at the Evans Boat Harbour which is an economic driver in the community and also forms a key part of the character of the town. The Evans River estuary itself is closed to commercial fishing.



**Plate 5: Commercial fishing trawler going out to sea via the Evans River bar**

The study area supports a wide range of land uses which are important contributors to the local and regional economy.

- Real-estate values and the associated rate base are recognised as a major driver of the local economy and are related to river and coastline health, coastal lifestyle, the recreational opportunities and scenic amenity.
- Agricultural practices occupy approximately 16% of the study area. Sugar cane and cattle grazing are the predominant agricultural activities.

### **3. COASTAL RISKS**

This section provides an understanding of the coastal processes, hazards and associated risks relevant to the Evans Head estuary and coastline to provide a basis for development of appropriate responses to manage identified risks.

A detailed review of the background material relevant to coastal risks in the Evans Head study area is provided as Appendix 3 (Part B: Literature and Information Review). The following section summarises the current status of identified issues and discusses options that have been employed at other locations to address similar issues. A series of examples have been presented in Section 3.5.1: Planned Retreat and Section 3.5.2: Coastal Protection Options, to provide initial information to the community about the type of solutions that could be employed at Evans Head to manage coastal erosion and long term coastline recession. The examples are hypothetical in nature and have not been technically assessed for their feasibility and effectiveness at this stage.

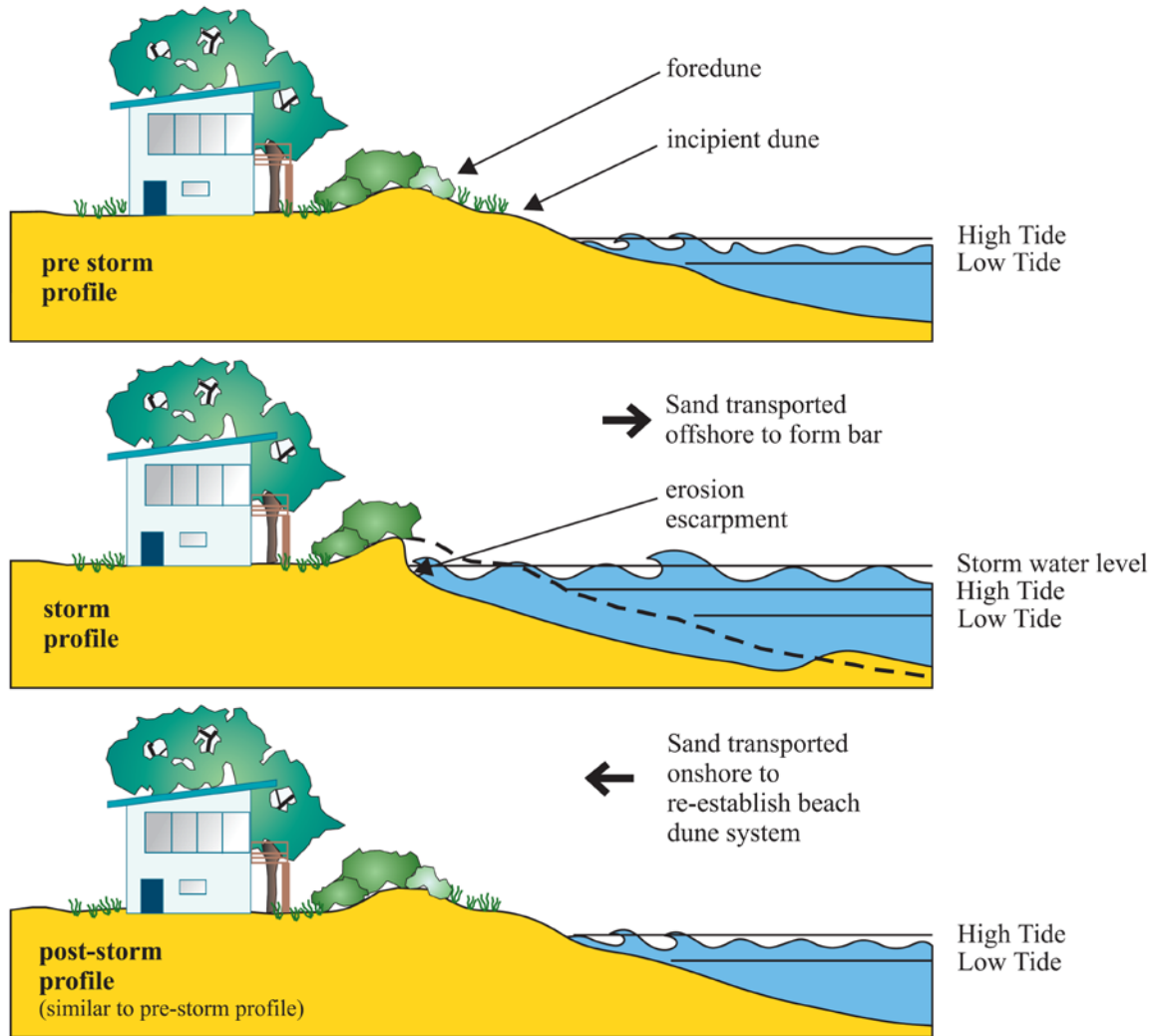
#### **3.1 Coastal Processes**

The coastal zone is exposed to many hazards of differing severity that may threaten coastal ecosystems, built assets, human activities and coastal amenity. In principle, coastal hazards are part of natural coastal processes and only become a problem when they threaten development, public safety and human uses of the coastal zone. It can be considered that coastal processes are not the problem, but rather that development has occurred within the naturally variable coastal zone. Nevertheless, if coastal hazards affect the human uses of the coastal zone, in particular public safety or built assets, responses need to be planned and managed.

An understanding of coastline hazards and their potential effects on development, safety and amenity is essential if the coastal zone is to be effectively managed. The following sections provide a brief summary description for each coastal hazard identified in the Evans Head study area. Please refer to Appendix 3 for further details.

##### **3.1.1 Beach Erosion**

The term 'beach erosion' is used to describe the short term exchange of sand between the sub-aerial (above water) and sub-aqueous (underwater) portions of the beach, with no net loss from the active beach system. The beach erosion/accretion cycle is illustrated in Figure 7 below. Sand is eroded from the beach and dunes and deposited offshore during storm events, but returns to the beach during calmer conditions when average swell waves deliver sediment back to the shoreline. Beach erosion is strongly linked to the occurrence of storms inducing high wave conditions, elevated ocean water levels and strong winds. Erosion is more likely to be significant when the large waves coincide with a high tide. The relative prominence (offshore extent) of the rocky coastline south of Evans Head provides some sheltering to the southern end of Airforce Beach from storm waves from the dominant directions from the S to SE. Despite this natural protection, major storm events currently erode Main Beach and Airforce Beach, affecting beach access, public safety, visual amenity and dune flora and fauna. It is important to note that while the dominant direction of storms is from the S to SE, storms from the E or ENE can also have a significant erosion impact on Airforce Beach. The hazard lines defined by WorleyParsons (2012) include an immediate hazard line which depicts the potential position of the top of the erosion scarp following a severe storm or a series of closely spaced storms (Section 3.2, Figure 9).



**Figure 7: Beach erosion/accretion cycle – no permanent sand loss or shoreline recession (Source: NSW DLWC, 2001)**

Plate 6 illustrates the recent beach erosion in front of the Evans Head Surf Life Saving Club (SLSC) affecting beach access and amenity.



**Plate 6: Recent beach erosion in front of the Evans Head SLSC (Photo by G. Owers, August 2012)**



### 3.1.2 Shoreline Recession

The hazard of shoreline recession is the progressive landward shift in the average long term position of the coastline (NSW Government, 1990). This is illustrated in Figure 8 below. Two potential causes of shoreline recession are net sediment loss and an increase in sea level. Shoreline recession due to net sediment loss should not be confused with temporary beach erosion where sand periodically cycles between the beach and offshore bars with no net loss. Based on a review of photogrammetric data collected from 1953 to 2010, WorleyParsons (2012) adopted a historical long term recession rate of 0.05m/year. Under the future predicted conditions of accelerated sea level rise, it is expected that the rate of shoreline recession will increase. The predicted long term recession due to sea level rise at Airforce Beach at 2050 and 2100 was estimated by WorleyParsons (2012) to be about 30m and 76m respectively relative to the 2010 coastline position (see Section 3.2, Figure 9).

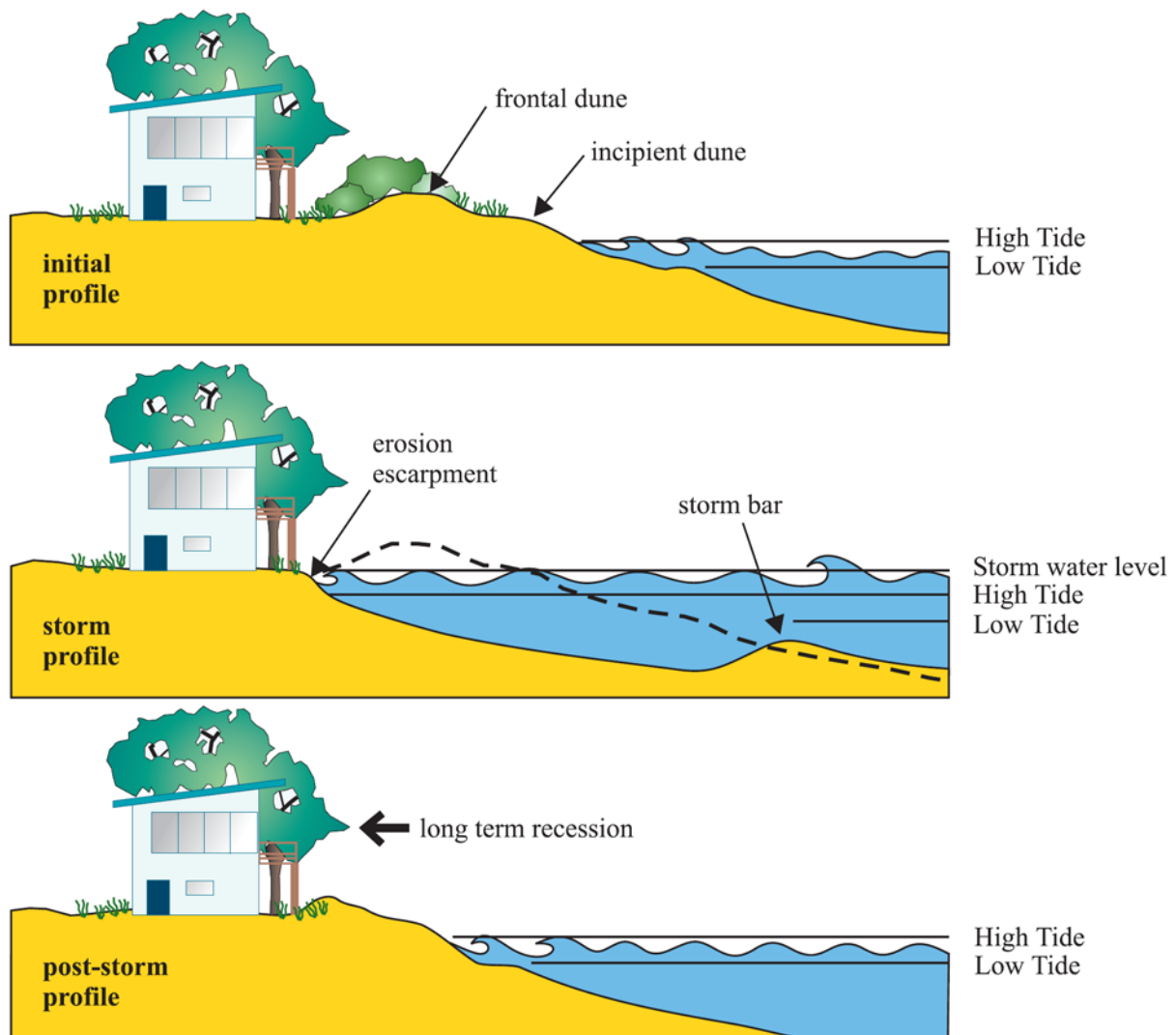


Figure 8: Long term shoreline recession – beach profile displaced landward due to permanent sand loss (Source: NSW DLWC, 2001).

### **3.1.3 Watercourse Entrance Instability**

Prior to the training wall construction, the Evans River entrance was characterised by a variable shallow bar across its mouth and shallow areas upstream. After the training wall construction in 1963, the entrance location has been stabilised, however variability in the depth of the entrance bar and position and depth of shoals within the estuary remains. It is assumed that the position of the Evans River estuary entrance will be maintained into the foreseeable future via retention of the training walls. Entrance instability is not therefore considered a current management issue boating navigation through the entrance bar is an on-going issue and is discussed in Section 5.1.1.

### **3.1.4 Slope Instability**

Slope and cliff instability hazards relate to the possible structural incompetence of coastal features and associated potential problems with the foundations of buildings, seawalls and other coastal works (NSW Government, 1990). Dune scarp slope instability can be a threat to any buildings and works constructed on coastal sand dunes, particularly in areas with higher dunes subject to erosion. The coastal hazard lines generated for the Evans Head study area included assessment of slope instability along Main Beach and Airforce Beach (see Section 3.2, Figure 9).

### **3.1.5 Coastal Inundation**

Coastal inundation is the flooding of coastal lands by ocean waters which is generally caused by large waves and elevated water levels associated with severe storms. Severe inundation is an infrequent event and is normally of short duration, but it can result in significant damage to both public and private property (NSW Government, 1990). The impact of coastal storms on Evans Head has been a concern since the 1970's when a severe storm in 1974 prompted the first investigations into the impact of coastal processes on coastal assets, particularly the Evans Head SLSC (PBP, 1999).

WorleyParsons (2012) found that dunal elevations in the Evans Head area are generally sufficiently high to prevent wave overtopping at present. Maintenance of the height of this dunal barrier (to 5.8m AHD) into the future is required to prevent inundation of the low lying areas landward of the dune, particularly seaward of Beech Street. If the dune was breached in this area, oceanic inundation could extend southwards into the low-lying Silver Sands Holiday Park.

### **3.1.6 Tidal Inundation**

Flooding in the lower reaches of coastal waterways may occur due to a combination of ocean and catchment flooding driven by the same storm cell. WorleyParsons (2012) estimated estuarine inundation due to tidal inundation under various sea level rise scenarios including Evans River catchment flooding. Projected inundation extents for current, 2050 and 2100 sea level rise scenarios combined with catchment flooding were mapped in WorleyParsons (2012) as discussed further in Section 3.2.

### **3.1.7 Bank Erosion Within Estuaries**

Bank erosion can lead to a range of environmental, social and economic problems such as the loss of riverfront property and infrastructure, damage to or loss of cultural heritage sites, water quality degradation, destruction of natural and artificial levees, loss or destabilisation of native trees and the destruction of habitat and aquatic plants and animals. Water quality issues associated with erosion include high turbidity and the mobilisation of nutrients and contaminants associated with sediment from land to waterways.

Bank erosion along the Evans River was assessed in 1999, 2007 and most recently as part of this CZMP (July 2012). The *Evans River Bank Erosion Assessment* (attached as Appendix 5) conducted in

2012, identified four sections of high risk bank erosion where significant assets were under threat. These sites were prioritised for management action (refer Section 3.8).

### **3.2 Risks to Public Safety and Built Assets from Coastal Hazards**

The *Evans Head Coastline Hazard and Estuarine Water Level Definition Study* (WorleyParsons, 2012) defined the immediate hazard areas and the predicted hazard areas in 2050 and 2100 according to current sea level rise scenarios specified in DECCW (2010a). While the projected 2100 hazard lines/areas are acknowledged and discussed as potential future impacts, this CZMP focuses on addressing risks to 2050 and does not include detailed scenario building to address 2100 impacts. Figure 9 provides an overview of the coastal hazard areas as predicted by WorleyParsons (2012) and further details are provided in Table 2. Larger scale maps are provided in Appendix 3. It should be noted that the coastal hazard lines identified by WorleyParsons (2012) also include an allowance for the Zone of Reduced Foundation Capacity and are therefore landward of predicted beach scarp location.

With respect to estuarine inundation, it is important to note that the identified inundation hazard area is the area affected as a consequence of the combination of a coastal storm, high tides and significant catchment flooding equal to a 1 in 100 year ARI flood. Therefore, unlike the coastal recession hazard areas which give an indication of the of the new (long-term) coastline location, the predicted estuarine inundation hazard area will only be affected temporarily and is projected to occur for a short period of time during flooding and will subside as flood waters and tides recede. The extent of more frequent events than a 1 in 100 year ARI is currently unknown.

### **3.3 Summary of Coastal Hazard Issues**

Table 2 provides a summary of coastal hazard for consideration in this CZMP.

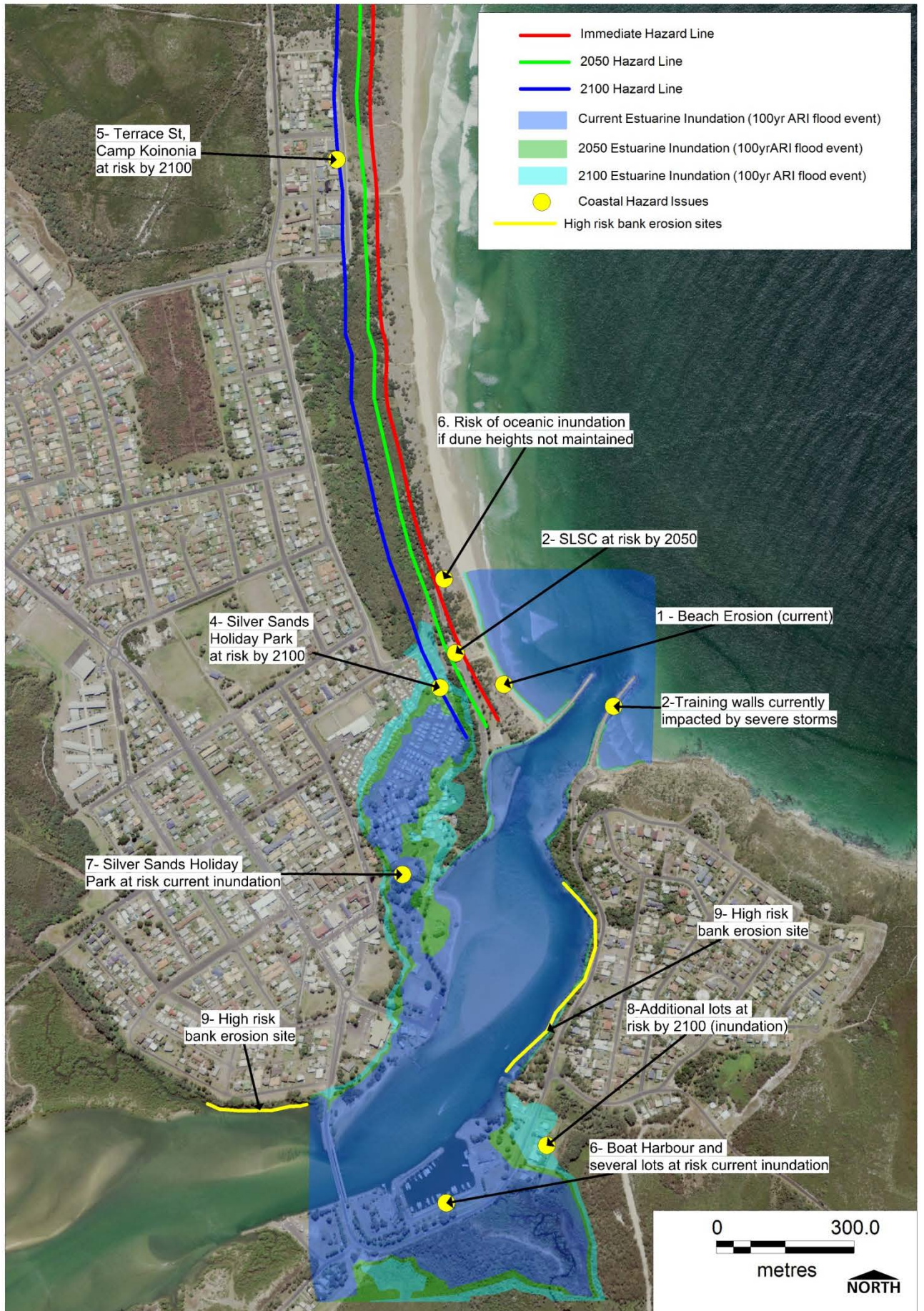


Figure 9: Coastal hazard issues identified in the Evans Head study area

**Table 2: Summary of coastal hazard issues for consideration by the CZMP**

Issue category	Issue Description	Location
Beach erosion	1. Severe storms currently erode the dunes along the beach affecting beach access, public safety, visual amenity and dune flora and fauna.	Main Beach and Airforce Beach
	2. The Evans River estuary training walls are vital coastal infrastructure that are currently impacted during severe storms and this is predicted to be exacerbated into the future under sea level rise.	Estuary entrance
Shoreline recession	3. Evans Head - Casino Surf Life Saving Club is at risk from coastal recession by 2050	Coastline beaches – Main Beach in vicinity of the SLSC
	4. By 2100 the shoreline is projected to be landward of the eastern boundary of the Silver Sands Holiday Park.	Lower Estuary - Silver Sands Holiday Park
	5. Camp Koinonia and areas landward of Terrace Street and Beech Street may also be at threat from erosion/recession coastline hazards by 2100	North Evans Head Township - Camp Koinonia and landward of Terrace Street
Coastal inundation	6. There is a risk of oceanic inundation if the current dune heights along the coast are not maintained. Areas seaward of Beech Street are of particular importance and if the dune was breached in this area, oceanic inundation could extend southwards into the low-lying Silver Sands Holiday Park.	Coastal dunes particularly seaward of Beech Street
Tidal inundation (including estuaries)	7. The north bank of Evans River including Silver Sands Holiday Park and southwards (east of Park Street) to McDonalds Place is currently at risk from estuarine inundation during severe storms including catchment flooding effects and this is predicted to be exacerbated into the future under sea level rise.	North and south side of river downstream of Elm St Bridge - Silver Sands Holiday Park and southwards (east of Park Street) to McDonalds Place
	8. The south bank of Evans River including the Boat Harbour and several lots on the southern side of Ocean Drive to the north-east and the south west of the boat harbour are currently at risk from estuarine inundation during severe storms including catchment flooding effects and this is predicted to be exacerbated into the future under sea level rise.	Boat harbour and adjacent lots.
	9. By 2100, an additional 8 lots to the north-east of the Boat Harbour are also predicted to be inundated in a severe storm.	Boat harbour and adjacent lots.
Erosion within estuaries caused by tidal waters, including the interaction of with catchment floodwaters	10. Bank erosion along the estuary places built and natural assets at risk in some locations. Increased estuary levels in future are predicted to increase the erosion.	Whole estuary

### 3.4 Property Risk Categories

The number and type of buildings (e.g. residential, commercial, community) and significant infrastructure within each coastal hazard area is provided in Table 3. Coastal hazard areas include those at risk from erosion and recession as well estuarine inundation (as mapped in Figure 9 above). The risk category assigned to each area follows DECCW’s vulnerability categories (DECCW, 2010a) which are based on the timeframes of expected impacts as follows:

- Risk category 1: Current Hazard Area (i.e. likely to be affected by erosion, recession or inundation during severe weather events occurring at present);
- Risk category 2: 2050 Hazard Area (i.e. likely to be affected by erosion, recession or inundation in the next 40 years); and
- Risk category 3: 2100 Hazard Area (i.e. likely to be affected by erosion, recession or inundation in the next 40-90 years).

The preliminary public authority response to manage risks to the property is also provided in Table 3 and Table 4 provides response category descriptions. The intended public response will be confirmed through further investigation of coastal management scenarios, recommended as actions by this CZMP (Refer Strategy 1: Management of Coastal Erosion and Recession).

**Table 3: Property risk and preliminary hazard response categories for Evans Head**

Risk category	Hazard Area for property	Hazard type	Specific Location	Type of building or infrastructure	No. of buildings/ infrastructure	Intended public authority response <sup>#</sup>
1	Current hazard area	Coastal Hazards	Evans River training walls	Community	2	A
			Tidal Inundation	Silver Sands Holiday Park	Administration	1
		Amenities			5	
		Residential sites (relocatable homes)			~26	
		Tourist sites (relocatable homes)			~136	
		Tennis Club		Community	1	A
		Community Hall		Community	1	A
		Boat Harbour		Moorings	~42	A
				Jetty	1	A
			Toilet Block	1	A	
			Boat ramp (east of bridge)	1	A	
		Coast Guard Shed (community)	1	A		

Risk category	Hazard Area for property	Hazard type	Specific Location	Type of building or infrastructure	No. of buildings/ infrastructure	Intended public authority response <sup>#</sup>
				Fisherman's co-op (commercial)	1	B
			RSL (ancillary building)	Commercial	1	B
			North side of river (McDonalds Place)	Residential	3	B
			South side river (Bundjalung Road and Ocean Drive)	Residential	8	B
2	2050 hazard area Note: these areas are additional to those areas described in risk category 1.	Coastal Hazard (shoreline recession)	Evans Head SLSC	Community	1	A
		Tidal Inundation	Silver Sands Holiday Park	Kiosk	1	A
				Residential sites (relocatable homes)	~12	
				Tourist sites (relocatable homes)	~63	
			South side river (Ocean Dr)	Residential	1	B

Table 4: Coastal hazard response<sup>#</sup> category (DECCW, 2010a)

Response category	Intended public authority response
A	Coastal protection works are considered technically feasible and cost-effective – funding is being sought for implementation
B	Coastal protection works are considered technically feasible but not cost-effective for public funding – unlikely to be implemented by a public authority
C	Coastal protection works are not considered technically feasible – no intended public authority works

<sup>#</sup> Please note that a full assessment of the feasibility of coastal protection works in managing projected coastal hazards over the 2050 planning horizon has not been undertaken in development of this CZMP. Ranking 'A' has been given to Hazard Response Categories for which coastal protection works are considered feasible and possibly cost effective subject to a more rigorous assessment as required through implementation of CZMP management Action 1b: Preliminary feasibility assessment of coastal recession management scenarios. Funding is recommended for implementation of this action

### 3.5 Potential Management Options for Coastal Risks

There are a range of potential management options to be considered in addressing coastal hazard issues within the Evans Head study area. Options can be divided into two main categories:

1. Planned retreat options which allow natural processes to occur and require buildings and infrastructure to move with the retreating coastline; and
2. Coastal protection works aimed at combating coastal erosion to protect existing assets.

Planning and development controls are an integral part of any coastal management strategy and aim to avoid or minimise risk through planning, land zoning, design and building criteria and public notifications.

An overview of the potential management options is provided in the following sections. To illustrate the range of potential coastal management scenarios to the community, planned retreat and coastal protection examples for Evans Head have been provided in this section. The examples are provided for illustrative purposes only and are to be developed further following community consultation and technical investigation. The examples have been based on the best information currently available and no additional technical investigations have been undertaken as part of this CZMP. Each example presents:

- Objectives and anticipated outcomes;
- General description of the key components;
- Broad advantages and disadvantages; and
- Indicative costs of implementation divided into costs incurred during the ten year life of the CZMP and long-term costs incurred beyond the ten year timeframe.

Broad costs have been estimated for the purpose of providing an indication to the community of the relative costs between examples. The costs relate to the planning and construction for physical works and don't include socio-economic considerations. In most cases the estimated monetary values are based on similar examples of works undertaken in other areas and therefore represent generic costs without consideration of site specific factors. Further development of potential scenarios with community consultation, detailed planning and technical investigation is required to assess the overall costs and benefits of each option and to refine costs for the Evans Head local area.

Note that while the projected 2100 hazard lines/areas are acknowledged and discussed as potential future impacts, this CZMP focuses on projected 2050 hazard areas and does not include specific options to address projected 2100 impacts.

#### 3.5.1 Planned Retreat

Planned retreat is a term used to describe the timely and organised removal of infrastructure from areas threatened by coastal erosion in the foreseeable future. This approach effectively returns the immediate coastline back to nature and allows the natural processes of erosion and recession to occur unimpeded. As the erosion escarpment moves landward, existing development and infrastructure will be required to retreat along with it. Planned retreat strategies generally seek to ensure that any infrastructure that is threatened by coastal erosion is removed prior to the issue occurring and aims to maintain an adequate buffer between the coastline and developed areas such that natural processes of dune formation and building, erosion and accretion can continue unabated. Planned retreat can be sequential – removing or relocating infrastructure in steps as successive erosion thresholds are reached, or implemented for an entire area within a chosen planning horizon. Sequential planned retreat would be informed by monitoring of coastal recession rates over time.

Planned retreat has been adopted by many NSW local councils for areas where coastal protection works are not technically feasible or where the financial and environmental costs of major engineering works are



prohibitive. Planned retreat may be the most appropriate or cost-effective policy response in some locations, yet can still come at significant cost. For existing coastal communities, planned retreat strategies may involve removal of important public or private infrastructure hence affecting the social and economic values of an area. In areas where planned retreat is the preferred strategy, relocatable buildings and structures may be appropriate in areas of increased risk.

Planned retreat is consistent with goals of the NSW Coastal Policy to protect, rehabilitate and enhance the natural environment and aesthetic qualities of the coastal zone. The beach and dunes will continue to exist in a similar state to the present, but will move landward as coastal recession continues unimpeded. In most cases the natural character, aesthetics, public access and amenity of the beach will be maintained.

An example of a possible planned retreat option for Evans Head has been developed to provide initial information to the community and allow for preliminary comparison with other coastal protection examples:

1. Planned retreat example: planned retreat from all areas within the 2050 hazard line except for Silver Sands Holiday Park, including landward retreat of Evans Head SLSC.

Variations of the planned retreat approach to address the identified coastal hazards to 2050 are possible but are likely to exhibit similar considerations to those discussed in the example. Beyond 2050, and depending on the actual coastal recession and sea level rise experienced, consideration of planned retreat from further areas may be warranted in the future.

### **Planned retreat example: retreat from all areas within the 2050 hazard area**

#### **Objective and anticipated outcomes:**

This example provides an overview of a potential planned retreat scenario for all areas within the projected 2050 hazard area including landward retreat of the Evans Head SLSC. Silver Sands Holiday Park and the Evans Head SLSC will be protected from coastal inundation by creation of a barrier dune.

#### **Description:**

The coastline will be allowed to recede naturally and the occupation and current use of land behind Main Beach will be maintained until coastal recession threatens public safety and/or property. On-going monitoring of coastal recession will inform management and trigger planned retreat actions well before any damage or public safety risk is realised. When a certain 'trigger' is reached, structures and infrastructure (roads, access tracks, amenities etc.) will be removed from the immediate risk areas.

This example includes the following:

- Raising of the low-lying area landward of the current Evans Head SLSC and the 2050 hazard line in order to establish a barrier dune of at least 5.8m AHD elevation (to account for the 2050 wave run up prediction in WorleyParsons, 2012); and
- Evans Head SLSC and associated infrastructure will be relocated as the erosion escarpment moves landward to the area behind the barrier dune. As the Evans Head SLSC building is not designed to be relocatable, it will need to be demolished and a new building constructed at the new location. It is assumed that the replacement SLSC building will be required to provide suitable facilities to allow for continuation of current activities and uses. Please refer to Coastal Protection Example 2 (Section 3.5.2) for alternative sites for relocation for the SLSC building. If a planned retreat strategy is adopted, the use of relocatable structures for any new works in the Silver Sands Holiday Park may be suitable at locations of increased risk.

Figure 10 provides an overview of a potential planned retreat scenario, retaining the Silver Sands Holiday Park and options for potential new locations of the Evans Head SLSC. Filling of the low-lying area to create the barrier dune indicated (Figure 10) is in response to the coastal inundation threat to the Silver Sands Holiday Park and also provides additional sand volume to satisfy storm demand and reduce recession rates. The areas of retreat would be raised through fill and/or dune management to provide increased resilience of this

area to future erosion. The location, size and configuration of the barrier dune and Evans Head SLSC relocation as shown in Figure 10 is provided for illustrative purposes only, and will need to be confirmed through further investigations and strategy development.

**Advantages:**

- Allows natural coastal processes to occur which are required to retain the natural dune and beach system. Coastal vegetation communities will respond naturally to changes in the position of the coastline;
- Beach and dunes will continue to exist in a similar state to current, but will move landward as coastal recession continues;
- The natural character, aesthetics and recreational amenity of the beach will be maintained.
- Public access to the beach will be retained, but will need to be modified as recession proceeds;
- The Silver Sands Holiday Park will be maintained at its current location and will continue to contribute to the local economy and character of Evans Head;
- Evans Head SLSC and facilities will be retained in close proximity to the beach;
- No need for building engineering structures to attempt to counteract natural coastal processes; and
- Consistent with goals of the NSW Coastal Policy to protect, rehabilitate and enhance the natural environment and aesthetic qualities of the coastal zone.

**Disadvantages:**

- Moving and/or removing and rebuilding existing facilities and structures at the SLSC can be high cost.
- A large amount of sand is likely to be required to raise the indicated dune area and finding a sufficient source of fill may be difficult;
- Facilities at the Silver Sands Holiday Park will be disrupted by filling works, although this can be timed for outside peak holiday periods and staged so only certain parcels of the park are raised at any one time.
- Need to relocate or modify infrastructure including roads, water and sewer, electricity etc.
- While coastal vegetation communities will respond naturally to changes, there is likely to be a significant shift in vegetation as the coastline recedes into the hind dune areas. The Littoral Rainforest and freshwater wetland communities east of Beech Street are likely to incur major changes as the coastline recedes into these areas.

**Indicative short-term costs (within 10 years):**

Component	Description/Assumptions	Quantity	Unit Cost	Total Cost
Develop monitoring triggers and Council policy	<ul style="list-style-type: none"> <li>• Establishment of appropriate monitoring of coastal recession and triggers for planned retreat actions; and</li> <li>• Develop a Planned Retreat Policy for Evans Head to be adopted by Council</li> </ul>	1	\$30,000	\$30,000
Monitoring of erosion escarpment	<ul style="list-style-type: none"> <li>• Accurate monitoring of the erosion scarp position in relation to the triggers for planned retreat actions.</li> </ul> <p>*Note on-going monitoring will be required beyond 10 yrs.</p>	2 pea	\$2,500	\$5,000p.a
Options assessment for relocation of Evans Head SLSC	<p>Investigation of options to remove and rebuild or modify structures including:</p> <ul style="list-style-type: none"> <li>• Identification of a preferred site for relocation;</li> <li>• Determine the type of structure and facilities to be provided (e.g. SLSC amenities and storage, kiosk, café, function rooms etc.);</li> <li>• Community and stakeholder consultation.</li> </ul>	1	\$50,000	\$50,000
Barrier dune works planning	<p>Determine optimal design and methodology for establishment of barrier dune including:</p> <ul style="list-style-type: none"> <li>• Design of barrier dune, calculate fill volumes required, identify potential sources of fill, determine staging;</li> <li>• Rehabilitation planning (revegetation, dune management, beach access tracks etc.); and</li> </ul>	1	\$50,000	\$50,000

**COASTAL ZONE MANAGEMENT PLAN: EVANS HEAD COASTLINE AND EVANS RIVER ESTUARY**

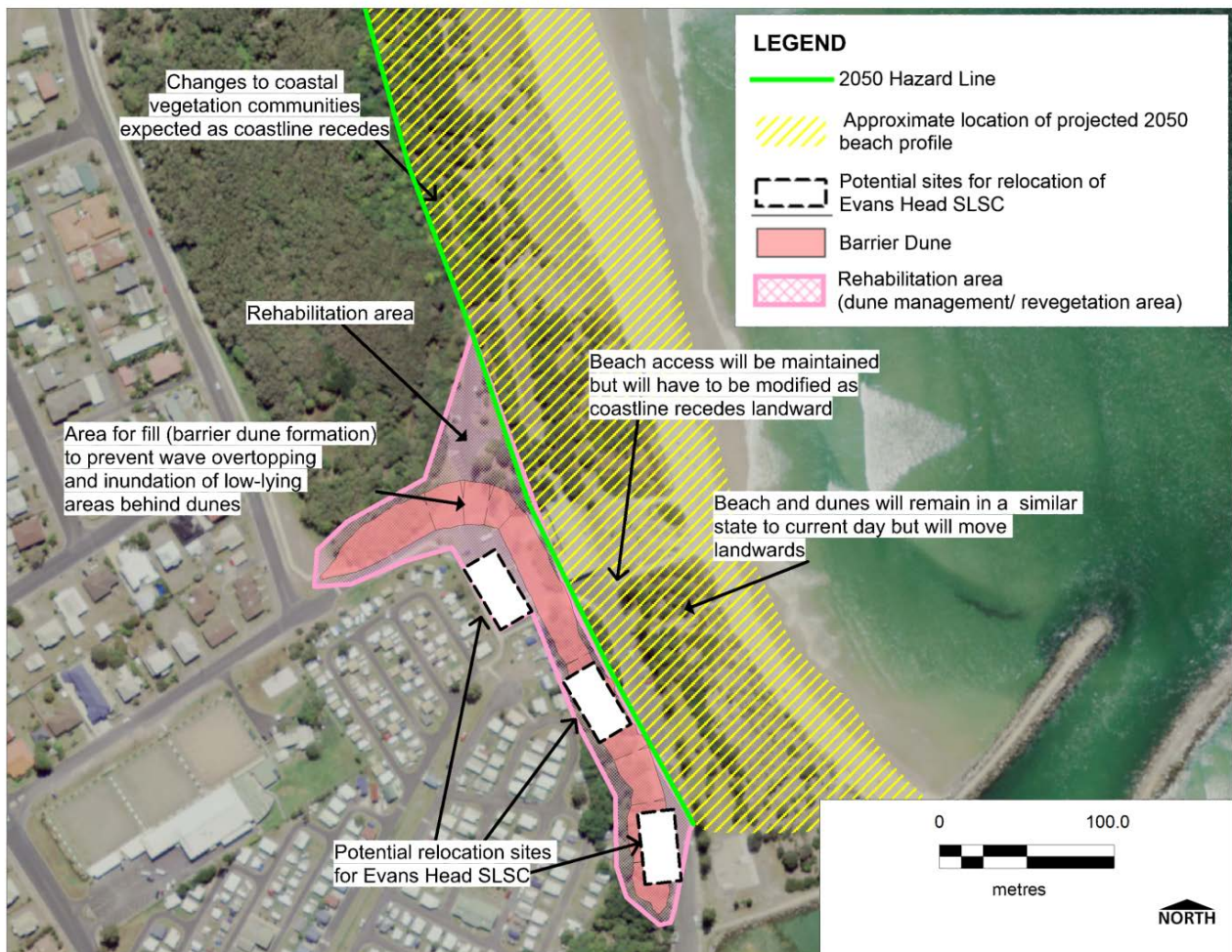
Component	Description/Assumptions	Quantity	Unit Cost	Total Cost
	<ul style="list-style-type: none"> <li>Cost estimation.</li> </ul>			
Barrier dune establishment	Fill and raise to provide dune crest height of 5.8m AHD	<sup>a</sup> 10,000m <sup>3</sup>	\$12/m <sup>3</sup>	\$120,000
	Earthworks/contouring	1	\$100,000	\$100,000
Rehabilitation	\$50,000 + 3 years @\$10,000	1	\$80,000	\$80,000
Evans Head SLSC retreat (demolish and rebuild at new site)	<ul style="list-style-type: none"> <li>Design and approvals;</li> <li>Complete removal of structures and associated assets and infrastructure (roads, and service connections);</li> <li>Restoration of dune vegetation and reinstate beach access; and</li> <li>Rebuild Surf Club at new site and associated assets and infrastructure (roads, and service connections).</li> </ul>	1	\$3,000,000 <sup>b</sup>	\$3,000,000
<b>TOTAL (10 year)</b>				<b>\$3,790,000</b>

<sup>a</sup> Fill volumes and costs highly dependent on final concept to be confirmed by the barrier dune works planning.

<sup>b</sup> Indicative cost based on redevelopment including demolition, and rebuild of buildings and infrastructure (roads, car park, assets etc.) to provide suitable facilities for continuation of current uses. Costs to be confirmed by options assessment.

**Indicative long-term costs:**

Component	Description/Assumptions	Quantity	Unit Cost	Total Cost
Maintain/repair beach access	Repairs to access tracks will need to be undertaken the as coastline retreats landward. Costs will depend on frequency of storms and nature of damage. \$10,000 has been allowed per yr	1 p.a.	\$10,000	\$10,000 p.a.



**Figure 10: Potential planned retreat example: retreat from all areas within the 2050 hazard area.**

### **3.5.2 Coastal Protection Options**

Coastal protection works aim to fortify coastal areas and increase their resilience to coastal processes. There are a range of generic management options available for consideration. Protection can comprise relatively minor works such as dune management and revegetation works, to major works including beach nourishment or hard structural options such as seawalls and groynes. Structural options aim to provide protection of property against ongoing erosion either directly through the construction of a hard barrier (e.g. seawall) or controlling the alignment of the beach and trapping sand (e.g. groynes) or by altering wave energy or currents (e.g. offshore reefs). Of the structural options available, only groynes and seawalls are commonly used on the NSW coast and are considered to have potential for Evans Head.

Regardless of the type of structure utilised, there are always some adverse impacts of engineering options, particularly where no additional sand is provided to mitigate exacerbated erosion in adjoining areas that aren't protected by the structure. Appendix 4 provides generic information on a range of available coastal protection options and discusses the associated issues.

Four coastal protection examples have been developed to provide initial information to the community on the type and range of potential options available for Evans Head. The examples are:

1. Coastal protection example 1a: seawall with beach nourishment;
2. Coastal protection example 1b: groyne(s);
3. Coastal protection example 1c: groynes, with terminal seawall and beach nourishment; and
4. Coastal protection example 2: relocate and protect Evans Head SLSC.

#### **Coastal protection example 1a: seawall with beach nourishment**

##### **Objective and anticipated outcomes:**

This example provides an overview of a potential coastal protection scenario with the aim of protecting Main Beach against future shoreline recession. In this example the aim is to maintain the Evans Head SLSC and Silver Sands Holiday Park at their current location and protect these assets from long-term recession and potential coastal inundation by a terminal seawall and beach nourishment.

##### **Description:**

There are two components to this option:

1. A terminal seawall would be established approximately as shown in Figure 11. This seawall would remain buried for the majority of the time and would only come into effect after large storms have depleted the beach. A seawall in this configuration acts as an insurance policy and provides the ultimate defence against shoreline recession once other protection/management measures have been defeated; and
2. Beach nourishment would be used with the aim of ensuring there is adequate beach volume to account for short-term storm demand and provide a soft buffer against the natural erosion and accretion of sand on the shoreline. Beach nourishment would seek to maintain a beach in front of the seawall, in a similar state to current. Without beach nourishment, the beach in front of the seawall would eventually be lost due to on-going erosion.

##### **Advantages:**

- The current location of the Silver Sands Holiday Park and the Evans Head SLSC, car-parks and access tracks can be maintained without needing to consider alternative sites or configurations;
- The use of a terminal seawall aims to provide a defined location from which further shoreline retreat will not occur. This seeks to provide a high degree of certainty regarding land use and development on the Evans Head shoreline within the protected area;

- Whilst the seawall may periodically be exposed during successive periods of erosion, natural post-storm accretion in association with a properly managed beach renourishment campaign would seek to replenish the beach sand;
- Providing that beach nourishment is able to be carried out at rates sufficient to maintain an adequate supply of sand, the current style of community use of Main Beach would continue and the aesthetic appeal of Main Beach (e.g. sweeping coastline and sandy beach) would remain in a similar condition to what is present today. However, it should be noted that in reality, there is likely to be periods of time when this cannot be practically achieved and there is a risk that amenity and community uses will be reduced when this occurs (see disadvantages listed below);
- Management of the coastline behind the seawall could be optimised to mitigate against other threats. For instance, maintenance of dune heights can be achieved with more certainty to prevent coastal inundation;
- There is anecdotal evidence that a buried seawall (built c.1936) already exists between the SLSC at the northern training wall of the Evans River. Significant cost savings may be realised if this seawall can be utilised or upgraded to provide the desired level of protection; and
- Sand dredged from the Evans River for other purposes (e.g. navigability) may be utilised for beach nourishment and therefore offset nourishment costs. However, it should be noted that taking sediment from this source alone will not be sufficient to supply the required on-going demand for Main Beach and a source outside the active longshore transport system will be needed (e.g. offshore sand sources).

### **Disadvantages:**

- The cost of this option and particularly ongoing beach nourishment will be high. Beach nourishment will be required on an on-going basis and the frequency of nourishment (e.g. in this example we have assumed 5-yearly nourishment) would need to be optimised according to prevailing conditions. The coordination of such a campaign (in order to share the very high mobilisation costs for an international dredge) in conjunction with other nourishment projects in NSW would be significant;
- Sand for beach nourishment should generally be drawn from outside the active longshore transport system (approximately 20m depth) to avoid depleting localised sand resources. The environmental effects of sand dredging as well as placement/management need to be considered;
- Sand placement on the beach, particularly if combined with other strategies such as beach scraping (to increase the volume of sand in the upper margins of the beach profile) will lead to some disruption of community use of the beach;
- Following periods of increased beach erosion, the terminal seawall may remain exposed for significant periods of time before renourishment (natural or artificial) of the beach can be achieved. This will apply particularly once the Airforce Beach shoreline to the north has receded westwards of the seawall alignment. Wave energy reflected by the seawall will tend to exacerbate removal of the beach front, leaving little or no beach for community use during these periods;
- During periods of seawall exposure, there is likely to be exacerbated erosion at the northern end of the seawall due to 'edge effects'. Increased erosion to the north may influence issues such as the maintenance of the 4WD access track, dune management, sensitive vegetation communities such as Coastal Wetlands and Littoral Rainforest north of the SLSC and the status of the Salty Lagoon entrance, etc.;
- Maintenance of the seawall during exposure will probably be required in order to ensure adequate on-going protection and to ensure that public safety hazards (e.g. loose rocks, voids) are adequately mitigated;

**Indicative short-term costs (within 10 years):**

Component	Description/Assumptions	Quantity	Unit Cost	Total Cost
Investigation of current seawall extent, specification and condition	Consult long-time residents, ground penetrating radar survey combined with test pits, level survey and inspection.	1	\$38,000	\$38,000
Seawall design/assessment study	Seawall design, environmental assessment, evaluation of northward erosion effects.	1	\$150,000	\$150,000
Seawall construction	Assumes construction of terminal seawall from north of the SLSC extending to the northern training wall of the Evans River.	385m	\$5,000/m	\$1,925,000
Beach nourishment feasibility study	Includes: investigation of potential sand source(s), EIS, placement and material management strategy.	1	\$250,000	\$250,000
<b>TOTAL (10 year)</b>				<b>\$2,363,000</b>

**Indicative long-term costs:**

Component	Description/Assumptions	Quantity	Unit Cost	Total Cost
Beach condition/sand volumes monitoring	Undertake beach profiles annually and after major beach depletion events to determine long-term nourishment requirements.  *Note: this is in addition to CZMP Action 1a	2 p.a.	\$5,000	\$10,000 p.a.
Seawall maintenance (during exposure)	Assumes maintenance cost will be 1% of construction cost (per annum).	385m	\$50/m/year	\$19,250 p.a.
Beach nourishment operations	Establishment and demobilisation cost of international dredge (without cost sharing).	1	\$5,000,000	\$5,000,000
	Sand dredging and placement (5 yearly) assumed <sup>a</sup> recession + storm demand = 11,550 + 77,000 = 88,550m <sup>3</sup> per 5 years.	88,550m <sup>3</sup>	\$7-10/m <sup>3</sup>	\$885,500 <sup>b</sup> per 5 years

<sup>a</sup> Annual recession between 2010 and 2050 predicted by WorleyParsons (2012) is ~0.75m/year which equates to 6m<sup>3</sup>/m/year using the relationship quoted therein. Storm demand of 200m<sup>3</sup>/m (1 in 100yr ARI) has been assumed as the 5 year combined storm demand.

<sup>b</sup> This estimate does not take into account the significant northward loss of sand due to littoral drift (note: 500,000m<sup>3</sup> p.a. drift rate occurs at Tweed Heads).



Figure 11: Potential configuration of coastal protection example 1a: seawall and beach nourishment

## Coastal protection example 1b: groyne(s)

### Objective and anticipated outcomes:

This example provides an overview of a potential coastal protection scenario with the aim of protecting Main Beach against future shoreline recession. This option involves the use one or more groynes to trap sand on Main Beach and thereby provide a buffer against beach erosion events. It is anticipated that an appropriately configured groyne field would maintain a sandy beach between the Evans River mouth and the Evans Head SLSC for some time until this strategy becomes less effective due to sea level rise induced recession. In this example the Evans Head SLSC and Silver Sands Holiday Park are maintained at their present location.

### Description:

Although there are a variety of options in groyne field configuration that may provide some protection for Main Beach, this example assumes the use of two shore-normal groynes. The larger groyne would be located to the north of the existing Evans Head SLSC and would trap the sand between this location and the northern training wall of the Evans River (Figure 12). This groyne would alter the curvature of the beach at this location, with accretion of sand on the southern side of the groyne and depletion of sand on the down-drift, northern side. To partially mitigate the potential erosion on the northern side of this groyne and protect the car park at this location, a second, smaller groyne would be installed further to the north. This groyne could also be utilised to provide a stable location for 4WD access to Airforce Beach. It is assumed that the groynes would be constructed of quarried rock. Although the groynes would provide a buffer against erosion events, there is no guarantee that the groynes alone will be able to protect against the threat of long-term coastal recession and monitoring and adaptive management would be required to mitigate this risk.

Both groynes would extend into the active surf zone, but would also be at an elevation that allowed sand bypass on the landward side during periods of high sand availability. The optimal groyne system to protect Main Beach would need to be determined through modelling of wave climate and sand availability in relation to groyne field configuration.

### Advantages:

- Apart from infrequent maintenance of the groynes (e.g. after major storm damage, or long-term settlement), there would be limited on-going works or interruption of public access to the beach;
- The additional complexity of the shoreline in this location as well as the groyne structures themselves may provide additional opportunities for beach use such as a variety of surfing conditions, vantage points, shelter from wind, etc.; and
- Stabilisation/formalisation of the 4WD access track in association with the northern groyne is likely to reduce track maintenance requirements and interruption to vehicle access to Airforce Beach. This however would reduce the length of vehicle-free beach and would need to be considered in light of public opinion on this issue.

### Disadvantages:

- Although the groynes would provide a buffer against erosion events, there is no guarantee that the groynes alone will be able to protect against the threat of long-term coastal recession.
- As no new sand is being added to the littoral drift system, the accretion of sand on the southern side of the groynes means that depletion of Airforce Beach and acceleration of coastal recession rates for an unknown distance down drift is likely. The extent of this is currently unknown and would need to be assessed;
- The natural sweeping line of the beach would be interrupted by the groynes, this may be regarded as a loss of visual amenity and a reduction in the recreational value of the beach (long stretches of sand are interrupted by groynes); and
- Following periods of increased beach erosion groynes may be further exposed or voids may appear due to settlement of the groynes elements. These could pose a public safety risk that would require rectification.



**Indicative short-term costs (within 10 years):**

Component	Description/Assumptions	Quantity	Unit Cost	Total Cost
Groyne design/assessment study	Groyne field modelling and design, environmental assessment, evaluation of northward erosion effects.	1	\$150,000	\$150,000
Groyne construction	Assumes construction of two shore-normal groynes at Main Beach.	2	\$2,000,000	4,000,000
<b>TOTAL (10 year)</b>				<b>\$4,150,000</b>

**Indicative long-term costs:**

Component	Description/Assumptions	Quantity	Unit Cost	Total Cost
Groyne condition/safety monitoring	Inspections of structure stability and public safety risks (e.g. loose rocks/voids) in response to major beach depletion events and public concerns.	1	\$5,000 p.a.	\$5,000 p.a.
Groyne maintenance	Assumes maintenance cost will be 1% of construction cost (per annum).	2	\$20,000 p.a.	\$40,000 p.a.



**Figure 12: Potential configuration of coastal protection example 1b: groyne(s)**

## Coastal protection example 1c: groynes, with terminal seawall and beach nourishment

### Objective and anticipated outcomes:

This example provides an overview of a potential coastal protection scenario to protect Main Beach against future shoreline recession. It is anticipated that the utilisation of groynes, terminal seawall and beach nourishment would provide the greatest level of protection for Main Beach. This example is a combination of examples 1a and 1b and whilst significantly more expensive in terms of structural works, also addresses the majority of the short-comings of these previous examples.

### Description:

This example includes three key elements:

1. A terminal seawall as described in Example 1a, whereby a buried seawall would provide ultimate protection against erosion events and provide certainty regarding the extreme landward position of the coastline;
2. Beach nourishment would be used to ensure there is adequate beach volume to account for short-term storm demand and provide a soft buffer against the natural erosion and accretion of sand on the shoreline. Beach nourishment will seek to maintain a beach in front of the seawall, in a similar state to current; and
3. Groynes would be used to trap sand at Main Beach and reduce the loss of nourishment sand to the north. The installation of groynes would therefore reduce the long-term volume of sand that would need to be placed by beach nourishment and would increase the resilience of Main Beach to short-term erosion events.

### Advantages:

The advantages of this example are in addition to the advantages identified for Examples 1a and 1b as discussed previously. The additional key advantages of this approach are:

- The highest degree of protection and certainty regarding shoreline management for Main Beach;
- The potentially very large volumes of sand that may be lost due to littoral drift from Main Beach after nourishment can be reduced by groyne entrapment. This would reduce the volume of sand that needs to be placed as part of a beach nourishment campaign and therefore reducing the variability in beach width from year to year; and
- Conversely, beach nourishment would help to overcome the disadvantages of groynes and a seawall as additional sand is being added to the littoral drift system and the depletion of sand north of such structures would be mitigated.

### Disadvantages:

- The key disadvantage of this option is total cost. Both groyne construction and seawall refurbishment/ augmentation/ construction would also need to be undertaken in addition to the combined feasibility and impact studies as well as on-going beach nourishment campaign expenses and maintenance and repair expenses;
- The intrusion of groynes into the view field and potential exposure of the terminal sea-wall could impact on visual amenity, public access to and use of the beach for extended periods of time until natural accretion re-established or artificial beach nourishment is implemented; and
- Periodic beach nourishment and maintenance of the groyne and seawall structures will temporarily affect public use and amenity, after large erosion/storm events.

**Indicative short-term costs (within 10 years):**

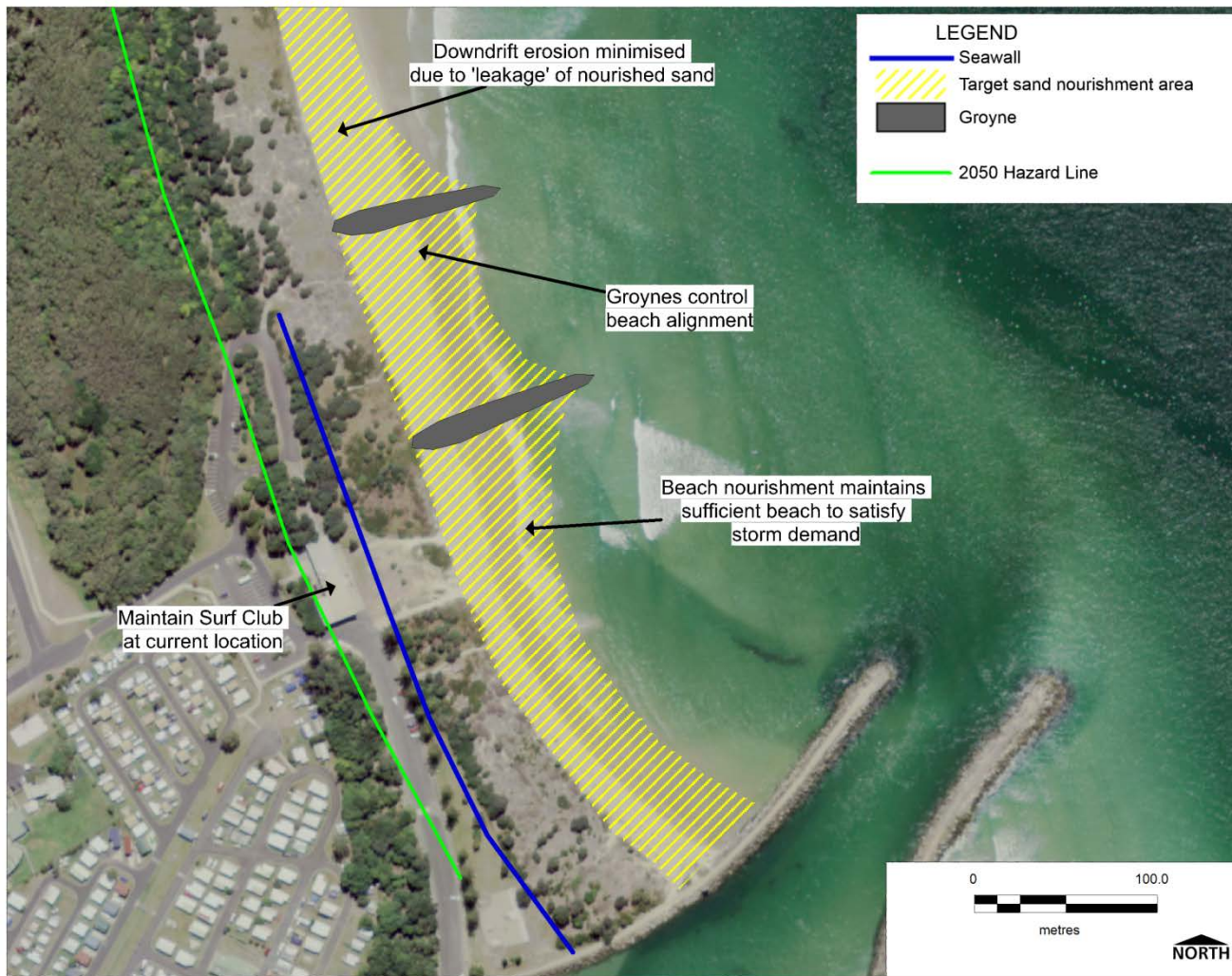
Component	Description/Assumptions	Quantity	Unit Cost	Total Cost
Investigation of current seawall extent, specification and condition	Consult long-time residents, ground penetrating radar survey combined with test pits, level survey and inspection.	1	\$38,000	\$38,000
Seawall design/assessment study	Seawall design, environmental assessment, evaluation of northward erosion effects.	1	\$150,000	\$150,000
Seawall construction	Assumes construction of terminal seawall from north of the SLSC extending to the northern training wall of the Evans River.	385m	\$5,000/m	\$1,925,000
Beach nourishment feasibility study	Includes: investigation of potential sand source(s), EIS, placement and material management strategy.	1	\$250,000	\$250,000
Groyne design/assessment study	Groyne field modelling and design, environmental assessment, evaluation of northward erosion effects.	1	\$150,000	\$150,000
Groyne construction	Assumes construction of terminal seawall from north of the SLSC extending to the northern training wall of the Evans River.	2	\$2,000,000	\$4,000,000
<b>TOTAL (10 year)</b>				<b>\$6,513,000</b>

**Indicative long-term costs:**

Component	Description/Assumptions	Quantity	Unit Cost	Total Cost
Beach condition/sand volumes monitoring	Undertake beach profiles annually and after major beach depletion events to determine long-term nourishment requirements. *Note: this is in addition to CZMP Action 1a	2 p.a.	\$5,000	\$10,000 p.a.
Seawall maintenance (during exposure)	Assumes maintenance cost will be 1% of construction cost (per annum).	385m	\$50/m/year	\$19,250 p.a.
Groyne and seawall condition/safety monitoring	Inspections of structure stability and public safety risks (e.g. loose rocks/voids) in response to major beach depletion events and public concerns.	1	\$5,000 p.a.	\$5000 p.a.
Groyne maintenance	Assumes maintenance cost will be 1% of construction cost (per annum).	2	\$20,000 p.a.	\$40,000 pa.
Beach nourishment operations	Establishment and demobilisation cost of international dredge (without cost sharing).	1	\$5,000,000	\$5,000,000
	Sand dredging and placement (5 yearly) assumed <sup>a</sup> recession + storm demand = 11,550 + 77,000 = 88,550m <sup>3</sup> per 5 years.	88,550m <sup>3</sup>	\$7-10/m <sup>3</sup>	\$885,500 <sup>b</sup> per 5 years

<sup>a</sup> Annual recession between 2010 and 2050 predicted by WorleyParsons (2012) is ~0.75m/year which equates to 6m<sup>3</sup>/m/year using the relationship quoted therein. Storm demand of 200m<sup>3</sup>/m (1 in 100yr ARI) has been assumed as the 5 year combined storm demand.

<sup>b</sup> Although groyne installation should significantly reduce losses, this estimate does not take into account northward loss of sand due to littoral drift (note: 500,000m<sup>3</sup> p.a. drift rate occurs at Tweed Heads).



**Figure 13: Potential configuration of coastal protection 1c: groynes, with terminal seawall and beach nourishment**

### Coastal protection example 2: relocate and protect Evans Head SLSC

**Objective and anticipated outcomes:**

This option seeks to protect a lesser length of coastline than presented in the previous examples by moving the Evans Head SLSC to a location that is more defensible against coastal erosion in the long-term and still provides protection to the Silver Sands Holiday Park by ensuring adequate dune heights to guard against coastal inundation.

**Description:**

This example encompasses the following:

- Relocation of the Evans Head SLSC from the current position to the vicinity of the skate-park near the northern training wall of the Evans River;
- Establishment of a seawall to protect the area around the new Evans Head SLSC location;
- Raising of the low-lying area landward of the current Evans Head SLSC and 2050 recession line in order to establish a coastal dune of at least 5.8m AHD elevation (2050 wave run up prediction in WorleyParsons, 2012); and
- Re-alignment of the Evans Head SLSC access road to behind the 2100 coastal recession line.

This location for the Evans Head SLSC was selected as it is considered the most defensible location on Main Beach and provides consistent access to the beach front under a range of coastal recession scenarios. This

location also provides potential for integrated restaurant/café development with excellent views of the beach and Evans River. Filling of the low-lying area indicated is in response to the coastal inundation threat to the Silver Sands Holiday Park and provides for long-term security of the Evans Head SLSC access road which would need to be realigned to avoid predicted coastal recession. This re-alignment would logically allow for all foreseeable threats (i.e. landward of the 2100 hazard line). The areas of retreat would be raised through fill and/or dune management to provide increased resilience of this area to future erosion.

**Advantages:**

- This option allows for natural coastal processes of erosion and accretion to operate over the majority of Main Beach, whilst protecting a limited area for the purposes of community infrastructure;
- The new Evans Head SLSC club location offers similar beach access to present, but may also offer other opportunities for community facilities/tourism development taking advantage of the views at this location; and
- The remaining section of the Silver Sands Holiday Park will be protected from long-term coastal recession as well as coastal inundation and is therefore compatible related options to protect the park from estuarine inundation.

**Disadvantages:**

- The eastern portion of the Silver Sands Holiday Park would likely need to be resumed for the realignment of the Evans Head SLSC access road;
- There are significant costs associated with removal of the existing Evans Head SLSC, car parks and roadways in addition to the cost of coastal protection works;
- The current amenity of the skate-park and surrounding area may be affected by co-location of the Evans Head SLSC. Car parking at this location may also be reduced from current;
- Following periods of increased beach erosion, the seawall in front of the new Evans Head SLSC location may remain exposed for significant periods of time thereby reducing the amenity of the beach at this location, including Evans Head SLSC activities;
- The establishment of the seawall may exacerbate erosion immediately to the north, thereby requiring additional measures (e.g. seawall extension, beach nourishment, etc.) to achieve the community's expectations; and
- While coastal vegetation communities will respond naturally to changes, there is likely to be a significant shift in vegetation as the coastline recedes into the hind dune areas. The Littoral Rainforest and freshwater wetland communities east of Beech Street are likely to incur major changes as the coastline recedes into these areas.

**Indicative short-term costs (within 10 years):**

Component	Description/Assumptions	Quantity	Unit Cost	Total Cost
Seawall design/assessment study	Seawall design, environmental assessment, evaluation of northward erosion effects.	1	\$150,000	\$150,000
Construction of new seawall	Flexible rockwork	150m	\$5,000/m	\$750,000

**COASTAL ZONE MANAGEMENT PLAN: EVANS HEAD COASTLINE AND EVANS RIVER ESTUARY**

Component	Description/Assumptions	Quantity	Unit Cost	Total Cost
Options assessment for relocation of Evans Head SLSC	Investigation of options to remove and rebuild or modify structures including: <ul style="list-style-type: none"> <li>• Identification of a preferred site for relocation;</li> <li>• Determine the type of structure and facilities to be provided (e.g. standard SLSC amenities and storage, kiosk, café, function rooms etc.);</li> <li>• Community and stakeholder consultation.</li> </ul>	1	\$50,000	\$50,000
Evans Head SLSC redevelopment (demolish and rebuild at new development area)	<ul style="list-style-type: none"> <li>• Design and approvals;</li> <li>• Complete removal of structures and associated assets and infrastructure (roads, and service connections);</li> <li>• Restoration of dune vegetation and reinstate beach access; and</li> <li>• Rebuild Surf Club at new site and associated assets and infrastructure (roads, and service connections).</li> </ul>	1	\$3,000,000 <sup>a</sup>	\$3,000,000
Barrier dune works planning	Determine optimal design and methodology for establishment of barrier dune including: <ul style="list-style-type: none"> <li>• Design of barrier dune;</li> <li>• Calculate fill volumes required;</li> <li>• Identify potential sources of fill;</li> <li>• Determine staging considering interruption of existing uses;</li> <li>• Rehabilitation planning (revegetation, dune management, beach access tracks etc.); and</li> <li>• Cost estimation.</li> </ul>	1	\$50,000	\$50,000
Barrier dune establishment	Fill and raise to provide barrier dune crest height of 5.8m AHD	<sup>b</sup> 18,000m <sup>3</sup>	\$12/m <sup>3</sup>	\$96,000
	Earthworks/contouring	1	\$100,000	\$100,000
Site Rehabilitation	\$50,000 + 3 years @\$10,000	1	\$80,000	\$80,000
<b>TOTAL (10 year)</b>				<b>\$4,276,000</b>

<sup>a</sup> Indicative cost based on redevelopment including demolition, and redevelopment of buildings and infrastructure (roads, car park, assets etc.) to provide suitable facilities for continuation of current uses. Costs to be confirmed by options assessment

<sup>b</sup> Fill volumes and costs highly dependent on final concept to be confirmed by barrier dune works planning.

**Indicative long-term costs:**

Component	Description/Assumptions	Quantity	Unit Cost	Total Cost
Seawall maintenance (during exposure)	Assumes maintenance cost will be 1% of construction cost (per annum).	150m	\$50/m/year	\$7,500 p.a.
Dune management	\$5,000 p.a.	1	\$5,000	5,000 p.a.

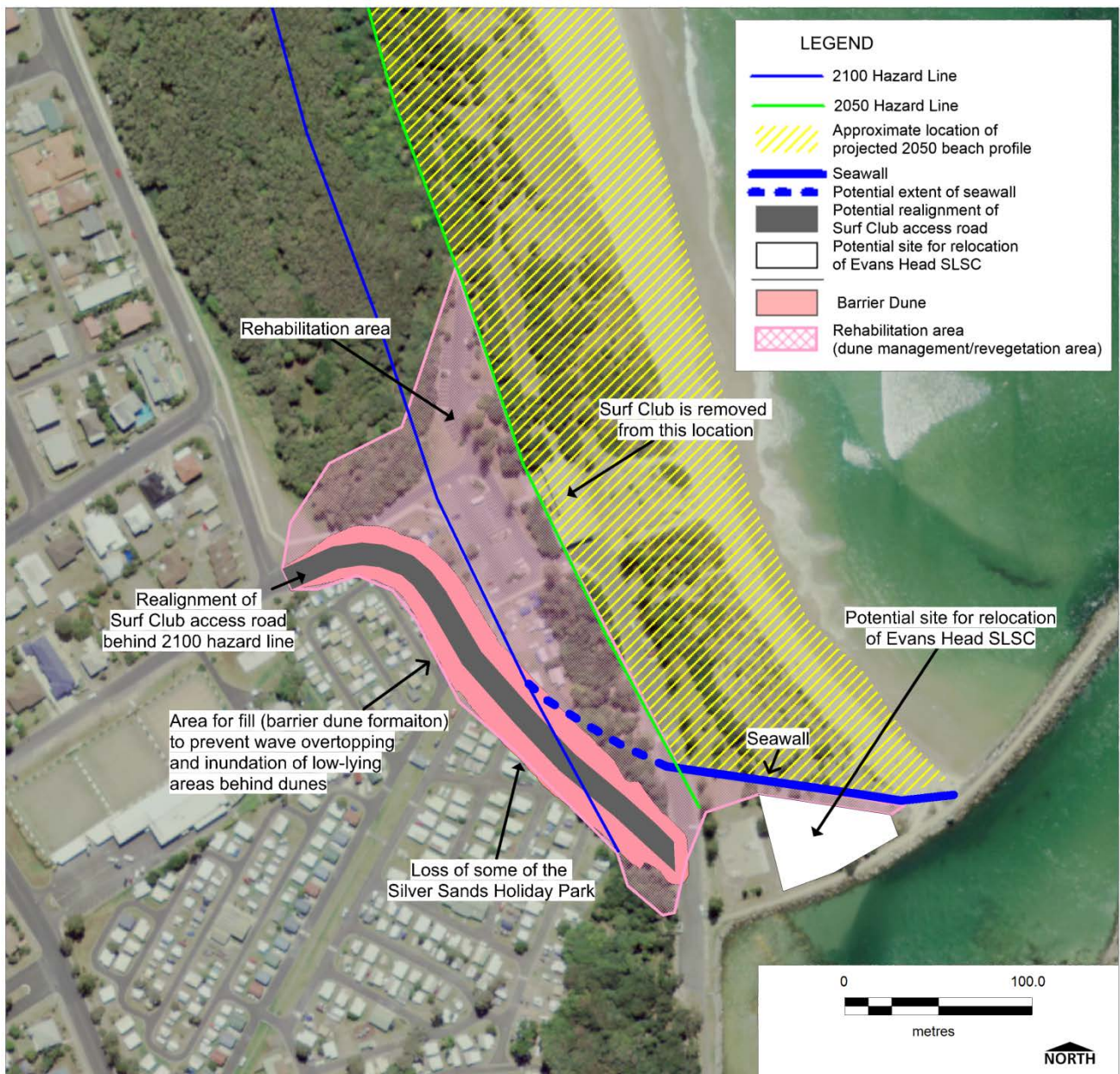
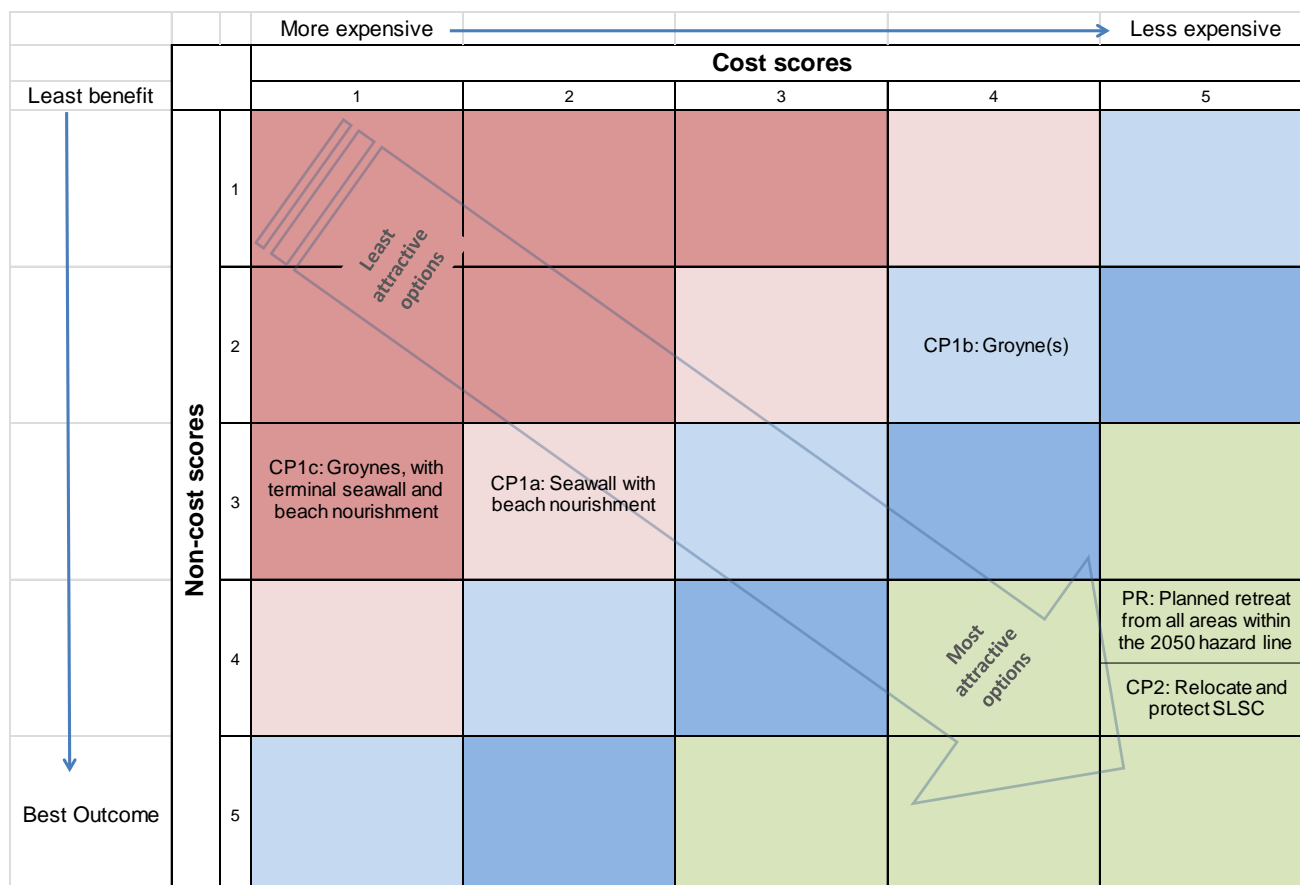


Figure 14: Potential configuration of coastal protection example 2: relocate Evans Head SLSC

### 3.5.3 Comparison of coastal risk management examples

In order to provide an initial comparison between the range planned retreat and coastal protection examples presented, an assessment of overall attractiveness was undertaken. The assessment is for discussion purposes only, and as discussed above, uses the best information currently available without site specific investigations into the feasibility of options at Evans Head.

The assessment follows a quadruple bottom line approach of evaluating environmental, social, economic and governance factors. Each example was evaluated in terms of the perceived effectiveness in achieving the CZMP management objectives categorised into environmental, social, economic and governance elements. Economic (cost) scores have been separated from non-cost scores and have been plotted against each other to create the overall “attractiveness” matrix. This allows for separate visualisation of the cost and non-cost factors and reflects the significant influence of cost on the decision to implement management. Details of the evaluation process are provided in Appendix 7, Matrix 7. The resultant overall attractiveness matrix is provided as Figure 15 below. The most attractive examples are located towards the bottom right corner of the matrix, being the least expensive and anticipated to provide the most benefit. The least attractive options are located towards the top left corner, being the most expensive examples to implement with the least amount of benefit.



**Figure 15: Overall “attractiveness” matrix for the hypothetical planned retreat and coastal protection examples.**

Figure 15 shows that the most attractive examples are:

- Coastal protection scenario 2: relocate and protect the Evans Head SLSC; and
- Planned retreat scenario: planned retreat from all areas within the 2050 hazard line.

Both scenarios had an average non-cost score of 4 and a cost score of 5. These were expected to derive more overall benefits than the other examples and were also expected to be less expensive. However, there are disadvantages including the need to relocate or modify infrastructure, finding sources of fill and disruption of public access, that need to be further investigated and considered carefully as part of the next stage of feasibility assessment (refer Strategy 1b). Examples using a high degree of engineering work (e.g. CP1a and CP1c, involving groynes and seawalls) were assessed as having less overall benefit, due to more dramatic changes to the existing beach environment with subsequent effects on visual amenity, public access and the local character of the area. These were also much higher cost options with on-going maintenance requirements. The example using groynes in isolation of other works (example CP1b), has similar costs to the most attractive examples, but uncertainties regarding their on-going effectiveness, the impact on visual amenity and concerns about public safety meant that this scored less on non-cost elements.

As discussed previously, this indicative assessment has been undertaken for a preliminary indication of overall attractiveness and further work is required to refine the costs and benefits of any coastal management option for Evans Head.



### Status of Existing Management

The hazard areas defined by WorleyParsons (2012) according to predicted sea level rise scenarios present significant challenges to management of the coastal zone and planning for long-term coastal recession and tidal inundation. The hazard lines and this CZMP mark the start of Council's process of investigating and evaluating a suitable response strategy to issues identified by the long-term recession projections.

The historical and existing management strategies employed to address coastal hazards have focused on maintaining and enhancing beach amenity and access and responding to coastal erosion events as they occur including:

- There is anecdotal evidence that a buried concrete seawall (built c.1936) already exists between the Evans Head SLSC at the northern training wall of the Evans River. A tea tree fence was also installed about 10m in front of the Evans Head SLSC in 1970 to provide localised protection. The exact locations and condition of the buried concrete seawall or tea tree fence is not currently known;
- Sand dumping has occurred on Main Beach in the past, following dredging of the navigation channel in the Evans River. More recently dredged sand was dumped inside the estuary to nourish a popular swimming area near the revetment wall on the north side of the river. Dredging of navigation channels and subsequent placement of sand is carried out infrequently and is not a suitable source of sand (being within the same system) to achieve adequate long-term beach nourishment for coastal protection;
- Training walls at the mouth of the Evans River were installed to stabilise the entrance and allow for safer navigation. The training walls were not designed for coastal protection but they have a significant influence on the movement of sand in the vicinity. Repairs to training walls following damage from severe storms are conducted as part of NSW Government's Minor Ports and River Entrance Programs;
- Dune Management activities include formalising access tracks and the viewing platform, weed management, dune fencing and revegetation programs. Works have been carried by RVC and local Landcare Groups. While it will be important to continue dune management activities, in isolation of other strategies (such as Planned Retreat, beach nourishment or hard structures) they will not be sufficient to address the long-term coastal recession trend; and
- OEH currently conducts monitoring of coastline recession at Evans Head including aerial photography and photogrammetric analysis every three years. This information is provided to Council.

### Recommendations for Management:

The following actions are recommended:

- Adoption of hazard lines by RVC. It is recommended that formal adoption of hazard lines is accompanied by notifications to landholders and consideration in RVC's planning and development processes (i.e. inclusion in section 149 certificates);
- Continue to monitor on-going coastal erosion and recession to provide detailed information on current status and trends in coastal recession in relation to threatened assets and hazard predictions;
- Based on the outcomes of this CZMP, it is recommended that Council adopt a preferred coastal hazard management scenario. Due to the controversial nature of the issues and risks to both public and private property, community consultation will be critical in informing the community of risks and involving the public in decision making; and
- Development of a suitable planning document, either as an amendment of the exiting DCP or a stand-alone document to set out the approach, principles and implementation requirements of the adopted coastal management scenario.

## 3.6 Potential Management Options for Estuarine Inundation

### 3.6.1 Silver Sands Holiday Park

The Silver Sands Holiday Park is situated on low-lying land adjoining the Evans River and is threatened by extreme water level conditions within the estuary as well as coastal recession risks as discussed in the previous sections. The WorleyParsons (2012) *Hazard Definition Study* determined that there is a current risk of inundation for a 1 in 100 year ARI (probability) event for the central portion of the park, with the majority of the park at risk of inundation with a 1 in 100 year ARI event with predicted 2100 sea levels.

The WorleyParsons assessment is not definitive as there are a number of limitations in the methodology used, however it does indicate that there is a clear risk of estuarine inundation of this land and that future sea-level rise will continue to exacerbate this risk. Further work is required to fully understand the inundation risk for this area and there is a need to determine factors such as the frequency, duration and depth of flooding. The current estimates also include catchment flooding in unison with oceanic influences. Increased understanding of the risk could be gained from understanding the relative contribution of these two sources in relation to the above factors and to determine the extent of flooding that could be expected at higher frequencies (i.e. more frequent but less extensive than a 1 in 100 year event).

There are two broad strategies to address this inundation risk:

- Separate the low lying area from the estuary such that estuarine inundation does not propagate into the park; and/or
- Raise the land to be protected above the projected inundation levels (or to minimise the depth of inundation).

To limit propagation of high water levels into the park it would be necessary to create a raised levee such that overland flow was contained within the estuary basin. WorleyParsons (2012) identified a narrow area at the southern end of the park which connects the low-lying area of the park to the estuary at high water levels. The inundation mapping for the current risk suggests that establishment of a low levee at this location (approximately 30m long) would prevent overland flow into of the majority of the park. However, the inundation maps appear to ignore the large stormwater channel located north of this point which would provide an alternative pathway for water to flood into the park and it would therefore be necessary to address this issue in order to prevent inundation. A levee north of this point may still be sufficient but would require more detailed assessment. A key component to consider with this strategy is the influence of high estuary water levels on groundwater under the park. Any extended periods of high water are likely to still permeate through the sandy soils and result in inundation of the park.

In the longer-term (2100), sea level rise will exacerbate the extent of estuarine inundation with a 1 in 100 year ARI inundation event as well as the frequency of more minor events. To prevent inundation of the park in the longer-term, a broader level of protection is likely to be required. Within this timeframe, it is projected that the eastern portion of the Silver Sands Holiday Park will be threatened by coastal recession and the potential for wave run up into the park area. Raising of the low-lying land through filling of the site is likely to be the most viable strategy to address inundation risk and could be implemented progressively over a number of decades to achieve the target land levels. Any dredging of the Evans River for navigability could potentially gain fill material for this use, thereby achieving multiple community benefits.

The adopted approach in terms of management of Main Beach recession in the long-term will affect the overall strategy for the Silver Sands Holiday Park and therefore the combined issues of coastal recession and estuarine inundation need to be considered in unison for long-term planning.

### 3.6.2 Evans Head Boat Harbor and low-lying residential areas in vicinity of the boat harbor

Property managers and land holders need to be made aware of the estuarine inundation risks identified in the WorleyParsons (2012) *Hazard Definition Study* and landholders meet the requirements for development on flood prone land within the affected area. Alternative options to protect this land such as with the provision of levees have not been assessed, however, land raising is consistent with Council's policy treatment of other flood-prone private land and is the preferred option.

#### Status of Existing Management

The historical and existing management strategies employed to address estuarine inundation are:

- Hydrological modifications to the Silver Sands Holiday Park. There is anecdotal evidence that the Silver Sands Holiday Park was once much lower than its current elevation and a natural creek ran from Airforce beach to the south, behind the surf club and connected with a natural creek that ran through the Silver Sands Holiday Park. In times of large floods combined with large tides, water would run North to South and drain out through the Silver Sands Holiday Park. The Silver Sands Holiday Park has been filled with dredged material from the Evans River and a large stormwater drain (present today) was installed where the natural drainage line once was;
- Today the park is subjected to periodic minor flooding during extreme rainfall events; and
- Private property which is located on flood-prone land is subject to the requirements for development on flood prone land. This includes minimum floor levels and design criteria for development or re-development.

#### Recommendations for Management:

The following management actions are recommended:

- Further work to improve the current understanding of inundation occurring or likely to occur in the future at the Silver Sands Holiday Park and adjoining low-lying areas;
- Works planning for Silver Sands Holiday Park. This involves the development of feasible concepts for managing inundation to minimise risk to property and public safety;
- Formal notification of landholders and related planning and development controls for areas at risk of inundation identified by WorleyParsons (2012).

### 3.7 Potential Emergency Management Options

The sandy beaches of Evans Head are highly dynamic, undergoing continual cycles of erosion and accretion in response to the variation of tides, wind and waves. Beach erosion occurs during severe storms and erodes the dunes along Main Beach and Airforce Beach at Evans Head, affecting beach access, public safety, visual amenity and dune flora and fauna. There is no major infrastructure currently at risk from beach erosion at Evans Head and management options therefore will be aimed at maintaining access, minimising risks to public health and safety and beach amenity. An Emergency Action Subplan has been developed as part of this CZMP to guide emergency response to beach erosion events (Appendix 6).

Hanslow and Howard (2005) suggest a series of principles to be used to guide planning and response decisions relating to coastal erosion emergencies including:

- The first priority of any emergency response should be to protect any lives which may be threatened;

- The second priority should be to minimise damage to property through the removal of household contents or commercial stock and equipment from buildings;
- Emergency response works should be planned for in advance and based on assessment of all available options;
- Emergency engineering responses to protect development from coastal erosion should favour options that do not compromise the natural and cultural values of the area;
- Impacts generated by emergency engineering works on beach environments, beach amenity or beach access must be mitigated following the emergency; and
- Emergency engineering works should be consistent with long-term coastal management strategies.

Emergency management requires planned and timely response to events. Responses include warnings and public education to advise of risks to safety and appropriate actions including:

- Warnings - will be necessary where beach erosion poses a threat to public safety or disrupts public access to the beach. Warnings may take the form of newspaper notices and notices on Council's webpage and signage at the beach warning of any hazards; and
- Public Education – this involves both information about the known risks and the planned responses by public authorities to prepare communities about the potential consequences and hazards and how they will be managed.

Physical works may be required where damage to access or beach erosion poses a risk to public health and safety. Brief descriptions of coastal protection works that may be used in emergency management situations are provided by the NSW State Emergency Management Committee (cited in Howard and Hanslow, 2005) as follows:

- Do nothing - this option may be appropriate where long-term coastal erosion strategies involve retreat or voluntary purchase, or where the costs of protective works and their likely effects on the environment exceed that of the development at risk;
- Building or structure relocation - this is the preferred option for all relocatable structures, and may also be possible for timber structures with raised footings such as access tracks and viewing platforms;
- Sand dumping - this option involves the addition of beach or dune sand to eroding areas. During an emergency, sand nourishment could be achieved through the dumping or placement of trucked material. This option is likely to be viable only if erosion problems are localised, nearby sand sources can be obtained and the problem areas accessed;
- Beach scraping - this option involves shifting sand from the lower to the upper part of the beach face or dune to provide a storm erosion buffer. This would usually be undertaken with a bulldozer at low tide, but may be difficult to undertake during the height of an erosion event. Its benefits may be limited since it does not generally involve the addition of sand from outside of the beach system. However, it may provide minor benefits that are sufficient to avoid property damage. If only part of a beach is treated, the benefit may be at the expense of untreated areas. Where sediment transport processes are dominated by longshore drift, scraping may effectively 'borrow' sand from the littoral system, thereby increasing local dune storage levels and lowering the risk to property. However, this is likely to increase down drift recession rates;
- Geotextile or sand bag structures - this option involves protection structures constructed from large, sand-filled geotextile containers. These are generally constructed parallel to the shore as seawalls, and can be built from layers of sand-filled geotextile bags or from longer 'geotubes'. Coastal engineering advice should be sought regarding their design and construction, as well as their potential impacts on beaches and adjacent areas. Construction of these structures is very problematic during

the height of a storm event. Impacts of these structures on beach amenity should be mitigated following the event through removal or other action; and

- Rock structures - seawalls, revetments and other structures can be constructed to limit erosion during storms. Varying rock sizes can be used, although larger material is likely to be more stable and less likely to be transported elsewhere on the beach assisting subsequent removal. Coastal engineering advice should be sought about the design and construction of seawalls as well as their potential impacts on beaches and adjacent areas. Rock structures should only be considered as a last resort and preferably only when incorporated as a future element of a long-term management strategy. Impacts of these structures on beach amenity should be mitigated following the event through removal or other action.

#### **Status of Existing Management**

- RVC currently responds to coastal erosion events where it results in damage to beach access points with an ad hoc approach. The response is generally activated by resident or staff notification through observations at access points. Warnings signs and fencing is erected where needed and repairs are undertaken to beach accesses which have included beach scraping, rock structures to formalise and strengthen the 4WD access or realignment of tracks.

#### **Recommendations for Management:**

- It is recommended that the Emergency Action Subplan (Appendix 6) is adopted and implemented.

### **3.8 Potential Management Options for Bank Erosion**

The selection of management options to address bank erosion is highly dependent on the nature of erosion, the location of the site and the values to be protected. Where erosion presents a significant risk to built assets that cannot be easily relocated, structural engineering options for erosion control such as rock revetment works and groynes may be considered. Where possible, the relocation of assets such as stairs and structures that are deemed at immediate risk may be the most practical alternative. Where significant cultural sites or natural assets are threatened, consideration of remediation works will need to consider the impact of intervention works on natural site values against the threat of allowing natural processes to proceed. Restoration of vegetation and providing formalised access points to the estuary are management options to increase the resilience and strength of banks to prevent or minimise erosion. In some cases monitoring of sites to better assess the rate of recession and level of risk may be the most appropriate action prior to any major commitment to capital expenditure by Council or other land managers.

#### **Status of Existing Management**

- RVC is planning erosion control works on the southern side of the river between Kalimna Park and Shark Bay to protect the existing footpath and road. RVC have been monitoring the situation for 2 years, have scoped the required works and have applied for funding. Some funding has already been secured for damage at stormwater outlets and vegetation rehabilitation. Council have recently applied for further funding to complete planned works (RVC, 2012a).
- The fixed weir in place at the Tuckombil Canal since 2001 was adopted by Council as the preferred management option in 2008 (GeoLINK, 2008). It is likely that the weir assists to reduce the erosive potential for flood waters impacting the Evans River.
- An 8 knot speed limit and no wash zone were implemented for the Evans River Estuary to limit bank erosion caused by boat wash. The rules are promoted through signage in the estuary and recorded on NSW Maritime boating maps. NSW Maritime enforces regulations through periodic boating patrols.

- Riparian mapping and restoration actions are detailed in Section 4.6.2. Stock fencing work is detailed in Section 4.6.2.
- The bank erosion survey completed as part of this CZMP in 2012 (refer Appendix 5) concluded that current stock access to the estuary was limited and is a minor contributor to bank erosion. This study also conducted a risk assessment that identified four high risk sites where significant values or assets were under threat. Management actions were assigned for high risk sites.

**Recommendations for Management:**

It is recommended that the high risk bank erosion sites identified by the *Evans River Bank Erosion Assessment (2012)* be prioritised for management action including:

- Monitor erosion rates to confirm level of risk prior to any major commitment to capital expenditure by Council (valid at certain sites);
- Structural engineering options such as rock revetment works and groynes may be necessary to protect significant assets at risk from bank erosion. In most areas backfilling, revegetation/landscaping and providing formalised pedestrian access points will also be required following installation of hard engineering options; and
- In the case of private land and assets, consultation with landholders is required to inform them of results of the survey and determine the appropriate course of action.

## 4. COASTAL ECOSYSTEM HEALTH

This section provides an assessment of ecosystem health of the Evans Head coastline and estuary including:

- A description of the status of ecosystem health of the Evans River estuary;
- A description of the pressures affecting ecosystem health of the Evans River estuary;
- A description of Evans Head coastal ecosystems and issues affecting their health; and
- A description of the projected climate change impacts on ecosystem health;

Ecosystem health status will act as a benchmark against which changes in condition can be assessed through an ongoing ecosystem health monitoring program (refer Section 4.6.1).

The key issues identified for coastal ecosystem health are summarised for each topic. Potential management options to respond to these coastal ecosystem health pressures are also discussed. Refer to Section 8 for the evaluation of management options and Section 9 for a description of management strategies.

### 4.1 Estuary Health Status

The Evans River Catchment is one of the least disturbed on the North Coast of NSW. Less than 7.5% of the catchment has been cleared (Roper *et al.*, 2011) and urban development has only occurred at the ocean entrance to the estuary. Large tracts of the Broadwater and Bundjalung National Parks comprise approximately 30% of the study area and extend to the banks of the Evans River in some sections (refer to Figure 1: Study Area map). There are also large tracts of natural scrub and wetland areas outside these conservation areas making up over 40% of the study area. Agricultural use comprises the next highest percentage of land area in the catchment, and is divided into grazing land (~13%) and sugar cane (~2.5%). Urban land accounts for approximately 7.3% of the study area.

Unlike other rivers on the North Coast, no sewage or industrial waste is discharged into the Evans River, and no commercial fishing is permitted within the estuary. However, both past and present human activities have affected the health of the Evans River. The Evans River carries the legacy of former flood mitigation works for the Richmond River and Rocky Mouth Creek areas, including the construction and subsequent enlargement of Tuckombil Canal (in the early 1900s and 1965), removal of vegetation along the Evans River floodplain corridor (1962 and 1963) and the widening and deepening of Iron Gates (around 1914; PBP, 1999). Poor water quality entering the Evans River from Rocky Mouth Creek and the Richmond River was identified by WBM (2002) as the key negative impact affecting the health of the estuary. The Estuary Management Plan recommended that this issue be addressed as a priority for management.

Responding to this key recommendation in the Estuary Management Plan, recent management actions involving the construction of Tuckombil Weir were undertaken to address this issue. The permanent weir in place in Tuckombil Canal separates the Evans River from major sources of poor water quality (Rocky Mouth Creek and the Richmond River) during most flow conditions. The weir overtops during major flood events and allows flood relief for the mid-Richmond floodplain. A comprehensive assessment of potential management options undertaken by local and state government authorities in consultation with local stakeholders concluded that the weir was the most appropriate management option to achieve the best balance of costs and benefits in minimising the environmental impacts of Tuckombil Canal, while maintaining flood relief functions (GeoLINK, 2008). Given that this work has been concluded, this CZMP will not include further investigation of options for the weir. However, ongoing monitoring of estuary health is recommended as part of this CZMP.

#### 4.1.1 Monitoring, Evaluation and Reporting (MER) Strategy

The Natural Resource Commission's Monitoring Evaluation and Reporting (MER) strategy provides information on natural resource condition and trends within catchments. The results of the latest condition assessment for the Evans River were based on data collected in 2007 and 2008. The overall condition rating

was assessed as “Moderate”. This was essentially an average of all scores which ranged from Very Poor and Poor water quality results to Good and Very Good results for seagrass and saltmarsh increases in extent. Macro-algae, mangrove and fish data were not assessed for this period. Condition ratings for the Evans River estuary are provided in Table 5.

The Evans River rated poorly against other estuaries in the Northern Rivers Region included in the MER program. It is noted that these results are based on sampling between August 2007 and April 2008 which was a particularly wet period and included the January 2008 flood. The results are therefore considered to be heavily influenced by flood flows and probably poorer than average conditions for the Evans River. Further MER assessments through time will provide greater assessment of water quality under a variety of climatic conditions.

**Table 5: Condition rating of Evans River estuary (adapted from Roper *et al.*, 2011)**

Indicator	Evans River Condition Score	Condition Rating	Index	Condition indicator notes
Chlorophyll a	1	Very Poor		>= 90% exceedance of water quality guideline trigger levels
Macro-algae	-	No data		
Turbidity	2	Poor		75 - < 90% exceedance of water quality guideline trigger levels
Seagrass	5	Very Good		>10% gain in extent since last survey
Mangrove	-	Baseline only		
Saltmarsh	4	Good		<=10% gain to -10% loss in extent
Fish	-	No data		The Richmond River scored “Good”
Confidence	M	Medium		
<b>Overall Condition Index</b>	<b>3.0</b>	<b>Moderate</b>		Average Score

#### 4.1.2 Water Quality

During average conditions (i.e. not during or immediately following rainfall events), water quality in the Evans River estuary generally exhibits a trend from good or excellent water quality in the lower estuary and becomes progressively poorer with distance upstream. The lower estuary is well flushed by tides and exhibits near oceanic water quality conditions. The upper reaches are not well flushed, and there is a well-documented history of poor water quality in this upper section (PBP, 1999; WBM, 2002; WBM, 2010). During periods of high rainfall and catchment runoff, water quality conditions can be poor throughout the estuary, as floodwaters are flushed to the ocean mouth.

Poor water quality in the Evans River has been linked to:

- The historical connection with Rocky Mouth Creek and inputs of poor quality water (low oxygen and acidic). The Tuckombil Weir effectively cuts off this connection with Rocky Mouth Creek during normal flows;
- The connection to the Richmond River system and the significant impacts of poor quality flood waters from this source. While the Tuckombil Weir disconnects the Evans from the Richmond during normal flows, major floods still overtop the weir;
- Bank erosion contributing to sediment loads and increased turbidity;



- Naturally poor tidal flushing of the upper reaches; and
- Local acid sulfate soil runoff from Woodburn Town Drain and Brandy Arm Creek.

A discussion of recreational water quality is provided in Section 5.3.

#### **4.1.3 Riparian Vegetation**

Riparian zone functions include fisheries habitat, terrestrial habitat, bank stability and maintenance of soil structural integrity, land use buffering, water quality filtering, lowering water temperature and reducing aquatic weeds as well as providing scenic amenity. In general, the majority of the riparian vegetation along the Evans River appears in a good condition with 'pockets' of degraded vegetation as a result of being cleared and/or weed infested. Nine different vegetation communities have been identified and mapped by GHD (2007) as follows:

- Wet Sclerophyll Forest;
- Dry Sclerophyll Forest;
- Swamp Sclerophyll Forest;
- Heathland/Forest Regenerating;
- Mangroves;
- Saltmarsh Complex;
- Agricultural/Pasture;
- Littoral Rainforest; and
- Subtropical Rainforest.

Refer to Appendix 3 for vegetation maps.

Important koala habitat has also been identified along the Evans River estuary in recent work by RVC. The *Richmond Valley Koala Habitat Atlas* (Mitchell, 2008) provides Koala habitat mapping for the Richmond Valley Shire and is available from RVC.

#### **4.1.4 Wetland Vegetation**

The Evans River and Brandy Arm Creek catchments contain large areas of highly significant wetland vegetation including estuarine and alluvial plain vegetation types. Endangered Ecological Communities (EECs) known to occur here include: Saltmarsh, Swamp Oak Floodplain Forest, Subtropical Coastal Floodplain Forest and Swamp Sclerophyll Forest on Floodplains (DECC, 2008a).

Saltmarsh, mangrove and seagrass habitats of the Evans River estuary were monitored over a number of decades from around 1940 to 2000. The estuary underwent significant changes in macrophyte area between the 1940s and 2000. Compared to other small north coast estuaries the Evans River estuary has not suffered much decline in total macrophyte area. Overall approximately 28.4% or almost 22 hectares of all remaining estuarine macrophyte habitats in the Evans River have been stable as some form of macrophyte since 1953 (Russell, 2005).

Saltmarsh was once the dominant habitat type in the Evans River up until the 1990s, particularly upstream between the meanders of the river. However a sharp decline in saltmarsh area occurred between 1993 and 2000, particularly near the eastern end of Tuckombil Canal possibly due to changes to the management of flows in the Canal. Most of the remaining saltmarsh is now protected by planning controls but may still be under threat from the effects of increased flooding from the Richmond River through Tuckombil Canal (Russell, 2005). Mangroves are now the dominant macrophyte in the estuary with some stable areas present just west of Evans Head township and mixed with saltmarsh on Mangrove Island and in Oyster Creek.

Seagrass declined from 1953 (1.9ha) to 1993 (0.5ha) in the Evans River. More recently, small areas of seagrass have become established against the southern bank of the river downstream of Mangrove Island.

#### 4.1.5 Estuarine Fauna

There is little specific information on aquatic fauna in the Evans River. Fish species caught by recreational anglers include bream, whiting, trevally, mangrove jack, flathead, garfish, mullet, estuary cod, bass and estuary perch. Mud crabs are also taken in traps (PBP, 1999).

One fish species of conservation significance recorded in the Evans River region is the Oxleyan Pygmy Perch (OPP). The OPP is a small freshwater fish that has been listed as ‘endangered’ under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* and the *NSW Fisheries Management Act 1994*. They are endemic to the coastal region of eastern Australia, from northern NSW to south-eastern Queensland. They occur mostly in freshwater swamps, creeks and lakes of coastal ‘wallum’ (Banksia-dominated coastal heath) (DPI, 2005). The species has been identified in several drains in and around Evans Head and RVC have completed several restoration and habitat creation works to improve habitat for this species. One of the key future threats to OPP is sea-level rise affecting freshwater wallum habitats through tidal intrusion (refer Section 4.4).

Fish kills have been recorded periodically in the Evans River. Previous fish kills occurred in 1993, 1996, 1998 and Jan/Feb 1999, and have mostly been associated with poor water quality resulting from drainage of the Rocky Mouth Creek catchment (PBP, 1999). Significant fish kills were also recorded during a blackwater event in 2001 and in March 1999, where thousands died throughout the length of the waterway due to low oxygen levels and possibly acid runoff. The 2001 fish kill occurred as a result of a deoxygenation event following the 2001 flood, when anoxic blackwater entered the Evans River via Tuckombil Canal from Rocky Mouth Creek catchment and the Mid Richmond (GeoLINK, 2008). A lesser magnitude fish kill occurred in 2008 and it is believed that the majority of poor quality water was held upstream of the Tuckombil Canal by the weir (GeoLINK, 2008). The present fixed weir management regime at Tuckombil Canal appears to limit the impact of fish kills in the Evans to small scale local fish kills at locations such as Brandy Arm Creek and in the vicinity of Woodburn Town Drain.

#### 4.1.6 Shorebirds

Airforce Beach is important habitat for beach-nesting shorebirds and the Evans River estuary was also reported to be a priority location for threatened resident and migratory shorebirds (DECCW, 2010e). The Evans River estuary provides important nesting, feeding and roosting habitat for the critically endangered (in NSW) Beach Stone-Curlew and endangered (in NSW) Pied Oystercatcher. There are nesting sites on islands in the river, in the area between Iron Gates and Bundjalung National Park on the other side of the river. Threatened migratory shorebirds use the estuary between July and March each year (pers. comm. NPWS).

### 4.2 Estuary Health Pressures

The 2010 MER assessment rated the overall pressure score for the Evans River Estuary as “Moderate”. Some pressure categories were assessed as being Very Low or Low, such as low catchment clearing and low fishing pressure, freshwater flow and disturbed habitat. Other pressures were assessed as Very High or High such as Tidal Flow (low flushing capacity) and high sediment and nutrient inputs. Table 6 provides the MER pressure rating results for the Evans River in 2010.

**Table 6: Pressure rating of Evans River estuary (adapted from Roper *et al.*, 2011)**

Indicator	Evans River Pressure Score	Pressure Rating	Index	Pressure indicator notes
Cleared Land	5	Very low		<7.5% catchment cleared
Population	3	Moderate		9-<41 people / km <sup>2</sup>

Indicator	Evans River Pressure Score	Pressure Rating	Index	Pressure indicator notes
Sediment input	2	High		80-<600 % increase from natural
Nutrient input (TN)	2	High		150-<400 % increase from natural
Freshwater flow	4	Low		Water extraction: 6.3-<12.7 % annual flow; Catchment runoff: 11.9-<21.9 % increase
Disturbed Habitat	4	Low		Structures: 4.1 - <8.2% of perimeter Aquaculture: 4.9-<9.9 % of area
Tidal Flow	1	Very High		Entrance: level <1.4mAHD Training Walls: 2- both sides
Fishing	5	Very low		<2.0 annual t/km <sup>2</sup>
<b>Overall Pressure Index</b>	<b>3.1</b>	<b>Moderate</b>		Average Score

Other pressures identified through the review of background information are provided in the following sections. Refer to Appendix 3 for further detailed information.

#### 4.2.1 Agricultural Runoff

Sediment, nutrient and chemical runoff from agricultural land can be significant with negative impacts on water quality and ecosystem function. While there are some areas of agriculture within the upper reaches of the Evans River catchment, the majority of land is forested. The significant agricultural run-off impacts occur during flood flows, when flows from the Richmond River and Rocky Mouth Creek are impacting the Evans River (flowing over the weir). WBM (2010) estimated that Tuckombil Weir overflows can be significant and can exceed the total runoff generated from the Evans River catchment in certain years. Water quality data show that sites within the Evans River study area experience periodic eutrophication and this is caused primarily by excess nutrient concentrations in the water column which can be resuspended from flood-deposited sediments. Localised effects of grazing and particularly stock access to creek banks have been raised as issues for estuary health in the Evans River (DECC, 2008a).

#### 4.2.2 Acid Sulfate Soils

Acid Sulfate Soils (ASS) runoff impacts on the estuarine environment include low pH, high concentrations of dissolved iron, aluminium and other metals (ABER, 2008). Exposure to ASS runoff can impair gill function and increase susceptibility to disease in fish, particularly Epizootic Ulcerative Syndrome (EUS), otherwise known as Red Spot Disease. Incidences of low pH in the lower estuary are generally rare because of the enhanced tidal flushing in these locations which act to neutralise, dilute and remove much of the acidic runoff from the estuary (WBM, 2002).

ASS have been classified and mapped as part of the RVC LEP (2012). Hotspot areas within the Evans River catchment include:

- Woodburn Town Drain catchment; and
- Brandy Arm Creek catchment.

Rocky Mouth Creek is also a high priority area but with the construction of the weir at Tuckombil Canal, most of the acid runoff generated within Rocky Mouth Creek is excluded from the Evans River (GeoLINK, 2008).

### 4.2.3 Urban Stormwater

Urbanisation can affect estuarine processes through:

- Changes to the hydrologic characteristics (catchment hardening) of lands making them drain more quickly, partly due to the increased imperviousness i.e. road, roofs, etc.;
- The use of hydraulically efficient stormwater pipe systems which remove stormwater to the waterways more quickly; and
- Changing the quality of stormwater runoff due to the influence of fertilisers, cars, lawnmowers, domestic animals, etc.

In the Evans River estuary, stormwater discharges are limited to the lower estuary and the relatively small area of urban development (relative to the catchment). There are stormwater drains with outlets to the lower estuary and the stormwater drain traversing the Silver Sand Holiday Park has been identified as a particular area of concern due to its high visibility and proximity to a popular swimming beach along the river (refer to Section 5.2 for amenity issues).

### 4.2.4 On-site Sewage Management Systems

Most urban areas within the Evans River catchment are served by a reticulated sewerage system. Rural and rural residential areas without reticulated sewerage have on-site systems including septic systems, aerated wastewater systems, pump-out systems and grey water treatment systems. The design, installation and operation of domestic on-site sewage management systems are regulated under the *Local Government Act 1993*.

When designed, installed and maintained adequately, on-site sewage management (OSSM) systems do not pose a risk to downstream water quality. When systems fail, there is a risk of contamination of ground and surface water which can impact ecosystem and human health.

Concerns have been raised by stakeholders about the impact of OSSM systems on water quality in the estuary. Water quality monitoring as part of previous studies is not conclusive on this issue. It is noted that the Riverside Retirement Village in Evans Head currently operates an OSSM system and any expansion of the current village will require connection to Council's reticulated sewerage system. Potential Impacts Associated with the Evans Head Boat Harbour

WBM (2002) noted the potential for water quality pollution from activities at the boat harbour as an issue for estuary health. The boat harbour houses a variety of commercial boats (fish and prawn trawlers, coast guard) and recreational vessels (yachts, cruisers). Potential impacts reported in WBM (2002) include spillage of petrochemicals, discharge from bilge tanks, antifouling of hulls and the introduction of exotic organisms from visiting vessels. The community consultation carried out by WBM (2002) revealed that a minor diesel spill was reported in early 2000 at the boat harbour and containment and clean up equipment was housed at the boat harbour in case of spills. The EMP contained an action to develop an operation management plan for the boat harbour, however this has not yet been undertaken.

### 4.2.5 Aquatic Weeds

Outbreaks of aquatic weeds can reduce the ecosystem values of open water for birds and fish. Aquatic weeds can cause diurnal fluctuations of dissolved oxygen and provide a source of organic matter for the production of mono-sulfidic black ooze (MBO) which when mobilised by flood flows can completely deoxygenate the water column (ABER, 2008).

There is a high risk of Alligator weed (*Alternanthera philoxeroides*) and Water lettuce (*Pistia stratiotes*) spreading from Rocky Mouth Creek to the Evans River. The spread of these declared weeds under the

*Noxious Weeds Act 1993* will produce major negative impacts on water quality. Far North Coast Weeds is the local council appointed entity responsible for the management of noxious weeds.

#### **4.2.6 Pacific Highway Upgrade**

The planned Pacific Highway upgrade includes a bridge crossing the Evans River in the vicinity of the Tuckombil Canal, immediately east of the existing road bridge. The nature and severity of impacts of the upgrade construction are not currently known, however potential impacts could include:

- Changes to catchment hydrology and runoff characteristics as a result of filling and road building activities;
- Removal of catchment and riparian vegetation;
- Sediment runoff from the construction site during rainfall events; and
- Risk of contamination through fuel or chemical spills associated with machinery or plant used for construction.

The project is currently in the planning stages with the Environmental Impact Statement (EIS) currently being developed.

### **4.3 Coastal Dune Environments**

#### **4.3.1 Coastal Dune Flora**

Vegetation along Airforce Beach and coastal vegetation immediately landward of dunes in the north eastern portion of the Evans Head Crown Lands Coastal Reserve includes nine vegetation associations in six communities. The area was assessed as having high conservation value. Regionally significant stands of Littoral Rainforest (an Endangered Ecological Community protected under the *Threatened Species Conservation Act 1995*) were identified as of particular value (Parker, 2001).

The key management issue identified for coastal flora during the Part B: Information Review was:

- Coastal weeds (e.g. Bitou bush) are encroaching on the Crown Reserve east of Beech Street and west of Broadwater Evans Head Road.

Historical sand mining at Evans Head is the main cause of coastal dune management problems. Sand mining activities stripped all native vegetation from dunes and the exotic species Bitou bush was used to stabilise dune systems. Bitou bush quickly established a mono-culture, out-competing native species recovery. The battle against Bitou bush and other exotic species is still being fought today.

#### **4.3.2 Coastal Dune Fauna**

Coastal land between Airforce Beach and the village of Evans Head provides habitat for a range of coastal animals. Vulnerable fauna species previously recorded within the Airforce Beach area include:

- Four vulnerable birds – the Glossy black cockatoo and Osprey (Parker, 2001) and the Barred cuckoo-shrike and Pied oyster catcher (now endangered) (Clancy, 1991 cited in Parker, 2001); and
- Five vulnerable bats – the Little bent-wing bat, the Large bent-wing bat, the Large-footed myotis, the Common blossom bat and the Grey-headed flying fox.

Parker (2001) also stated that the number of threatened species seasonally or opportunistically using habitats at the site may be considerably higher.

The presence of pest species including cane toad, foxes and cats in coastal areas has been identified by stakeholders as an issue to be addressed. Introduced species have potential to impact ecosystem health through predation and out-competing native species for food and habitat resources. NPWS undertakes a pest

management program in National Parks and there is concern that adjacent parcels of land may provide a 'pest seed bank' if unmanaged.

#### **4.4 Climate Change Impacts**

Sea level rise is expected to increase the average depth in the estuary and extend tidal propagation up the estuary with potential changes in salinity regime. It is anticipated that sea level rise will naturally result in the landward recession of fringing estuarine wetland systems. The location of estuarine habitats such as mangrove forests and salt marsh are controlled principally by tidal range and salinity influence and will gradually respond to changes in increases in average water levels and salinity. There is a risk that natural upslope migration of these wetlands will be curtailed by anthropogenic constraints such as roads, levees, agriculture and urban development on the landward side (Department of Climate Change (2009). Increased estuary water levels due to sea level rise will also affect riparian and other low-lying vegetation in the freshwater reaches of the estuary. While the location of estuarine vegetation communities in the Evans River has been mapped by DPI-Fisheries, it is not currently known to what extent barriers to upslope migration will affect the wetlands and vegetation communities. Due the existing high level of riparian vegetation cover along the Evans River and the planning protection afforded by environmental zoning along most of the river, it is likely that upslope migration of estuarine communities will proceed naturally for most of the estuarine extent. Exceptions may exist in the lower estuary where urban development could curtail migration of communities such as mangroves and small pockets of communities may be lost.

The endangered Oxleyan Pygmy Perch (OPP) is found in the vicinity of Evans Head in low-lying freshwater habitats in wallum heathland. Significant efforts to identify and map habitat, restore and enhance habitats of the species have been undertaken in recent times. Due to the low-lying nature of OPP habitat, it is likely that at some point in the future, this habitat may be impacted by sea level rise.

#### **4.5 Summary of Coastal Ecosystem health issues**

Table 7 provides a summary of the coastal ecosystem health issues.

**Table 7: Summary of coast and estuary ecosystem health issues for consideration in development of the CZMP**

Issue category	Issue Description	Location
Estuary health status	11. The NSW Monitoring Evaluation and Reporting (MER) program assessed the overall estuary health condition as “Moderate”. The Evans River is subject to poor water quality episodes including elevated levels of chlorophyll a and turbidity.	Whole estuary
Estuary health pressures	12. The MER program found that tidal flows (low flushing capacity) is a “Very High” pressure on the Evans River. This characteristic exacerbates poor water quality in the upper estuary.	Upper estuary
	13. The MER program found that sediment input is a “High” pressure on the Evans River. Elevated sediment levels are caused by highly turbid flood waters and bank erosion and are a key driver of water quality decline.	Estuarine reaches to ocean mouth
	14. The MER program found that nutrient input (TN) is a “High” pressure on the Evans River. Nutrient rich flood waters flowing from agricultural areas upstream of Tuckombil Weir and overflowing to the Evans River during flood are the major cause of elevated nutrients in the Evans River.	Estuarine reaches to ocean mouth
	15. The Woodburn Town Drain and drained upper agricultural areas of Brandy Arm Creek have been identified as sources of Acid Sulfate Soil runoff and deoxygenated water to the mid and upper estuary which contributes to poor water quality (low pH and low dissolved oxygen).	Mid-upper estuary
	16. Urban stormwater inputs can contribute pollutants to the estuary including gross pollutants, nutrients and sediments with impacts on ecosystem health, visual amenity and recreation.	Evans Head
	17. The Evans Head Boat Harbour has been identified as a potential source of water quality pollution due to the risk of spillage of petrochemicals, discharge from bilge tanks and antifouling of hulls.	Evans Head Boat Harbour
	18. The current concept design for the Pacific Highway upgrade includes a road bridge crossing the Evans River along the Tuckombil Canal. Environmental impacts on the estuary are not currently known.	Tuckombil Canal
	19. On-site Sewage Management Systems (OSSMs) in the catchment have the potential to contribute pollutants to the estuary.	Riverside Retirement Village and rural areas upstream of Evans Head
	20. There is a high risk of declared aquatic weeds (Alligator weed and Water lettuce) spreading from Rocky Mouth Creek to the Evans River, impacting on water quality.	Upper freshwater reaches
	21. Riparian vegetation of the Evans River has pockets of degraded vegetation due to clearing, weed infestation and stock access to creek banks.	Scattered pockets along estuary riparian zone

**COASTAL ZONE MANAGEMENT PLAN: EVANS HEAD COASTLINE AND EVANS RIVER ESTUARY**

Issue category	Issue Description	Location
Climate change impacts on estuary health	22. There is a risk that natural upslope migration of estuarine wetlands (mangroves and saltmarsh) due to sea level rise will be curtailed by anthropogenic constraints (roads, agriculture, urban development etc.)	Estuarine habitats
	23. Increased estuary water levels due to sea level rise will affect riparian and other low-lying vegetation in the freshwater reaches of the estuary.	Freshwater reaches of estuary,
	24. The habitat of the endangered Oxleyan Pygmy Perch (OPP) may be impacted by sea level rise.	"Wallum" heathland habitats of OPP
Coastal dune environments	25. Coastal weeds (e.g. Bitou Bush) are encroaching on the Crown Reserve east of Beech Street and west of Broadwater Evans Head Road.	Crown Reserves
	26. Pest fauna species have been identified in coastal areas and along the riparian zone of the estuary (cane toad, foxes and cats) and have potential to impact ecosystem health through predation and out-competing native species for food and habitat resources.	Estuary riparian areas
	27. There is the potential for disturbance of shorebirds and/or shorebird habitat from boats, vehicles, pedestrians and dogs accessing the beach and estuary in the vicinity of nesting areas.	Main Beach and Airforce Beach
	28. Severe storms currently erode the dunes along the beach affecting dune vegetation	Main Beach and Airforce Beach
	29. By 2050 the shoreline is predicted to be landward of existing foredune vegetation and encroaching on areas mapped as Littoral Rainforest, Paperbark Swamp forest and Shrubland. These areas have also been identified as habitat areas for threatened fauna species.	Main Beach and Airforce Beach
	30. By 2100 the shoreline is predicted to be landward of the existing Salty Lagoon catchment boundary. Salty Lagoon is a freshwater wetland and seawater intrusion would significantly impact this coastal ecosystem.	Salty Lagoon, Broadwater National Park (outside study area)



## 4.6 Potential Management Options for Coastal Ecosystem Health

A description of management options which could be applied to address specific coastal ecosystem health management is provided in the following sections. Each of these options and the combination of options aim to improve the overall estuary health condition of the study area. Further discussion of management options and options assessment is provided in Section 8.

### 4.6.1 Estuarine Monitoring and Evaluation

This section focuses on monitoring of ecosystem health including geomorphic condition, vegetation status, weed growth, water quality, fish, macrophytes and visual indicators.

An effective ecosystem health monitoring program is regarded as a key component of an ecosystem management program in order to measure the relative success of management efforts on the overall health of the system. Specific investigations may also be required in targeted areas to fill gaps in the current understanding of issues in order to direct appropriate management actions as required.

#### Status of Existing Management

- The Office of Environment and Heritage (OEH) conducts monitoring of water quality in Evans River as part of the state-wide MER program. Each sampling event is conducted over a few weeks with a frequency of approximately every 2 years and therefore is useful as a 'snapshot' of conditions at the time of sampling but cannot be used to investigate trends occurring within timeframes less than 2 years and has limited ability to be able to investigate potential sources and mechanisms of water quality decline. With a recurrence interval of 2 years, there is also the risk that sampling will be undertaken during atypical periods, such as coinciding with flood events, where water quality is particularly poor (as occurred during the last round of MER sampling in the Evans in 2007-2008). The condition assessment is therefore potentially skewed to those conditions within the window of sampling and may not be indicative of overall conditions during that 2 years. The MER program may be appropriate for assessing relative waterway health on a state-wide scale, but it is not intended to provide enough local data for effective evaluation of river health, identification of problem areas and tracking of health trends in response to management.
- Richmond River County Council (RRCC) conducted monitoring in Evans River at the outlet of the Woodburn Town Drain between 2000 and 2011 to track water quality in response to drain management actions. Monitoring has not resumed after the data logger was stolen in late 2011.
- There have been limited Council resources for ongoing monitoring of water quality in the Evans River and monitoring has been typically undertaken from time to time on a project basis. Beachwatch water quality monitoring has been undertaken by Council since 2006. Four swimming locations (three ocean beaches and one estuary site) are monitored for *Enterococci* on a weekly basis throughout the year
- Current monitoring does not provide a consistent approach over the catchment and therefore does not address the identification and separation of specific issues and sources of water quality problems over time. Additionally, there is no integrated environmental monitoring and reporting system in place at a scale that is meaningful to determine the effectiveness of management and investment in programs and projects that affect the estuary.

**Recommendations for Management:**

To address the need for a more coordinated approach to water quality monitoring, the Northern Rivers Catchment Management Authority (NRCMA) in partnership with Local Councils have commenced planning for a Northern Rivers Ecosystem Health Monitoring Program (EcoHealth) which is a comprehensive marine, estuarine and freshwater monitoring program that reports on the health of the waterways. The program is modelled on the South East Queensland Healthy Waterways Partnership and the NSW State Monitoring, Evaluation and Reporting program. The program provides an assessment of key indicators of aquatic ecosystem health, including water quality, riparian (river bank) vegetation condition, fish assemblage, and macro-invertebrate (water-bugs) distribution. The results are interpreted to provide an overall picture of the ecological condition of the waterways (NRCMA, 2012). The program aims to bring together the aquatic sampling programs of government and other natural resource management agencies and partners into a standardised, region-wide system. Data should be provided to a range of natural resource managers for use in planning, implementing and evaluating environmental projects and activities and assists these organisations to identify with confidence where current stresses lie in individual catchments and where management actions and investment are most needed.

A pilot project commenced in the Bellingen catchment in 2009. In 2011/12, the Northern Rivers Catchment Management Authority (CMA) is contributing funds toward projects in Port Macquarie, Coffs Harbour and the Clarence Valley along with advice and support as part of its overall coordination role for the Northern Rivers EcoHealth Program. It is envisaged that the Northern Rivers EcoHealth program is eventually implemented across all catchments in the region, including the Richmond and Evans Rivers. It is expected that this program would provide the monitoring data required to effectively implement estuary management priorities. Consideration of the CZMP in the design stages of the Richmond River EcoHealth program will offer the opportunity to measure the success of management actions implemented through this plan on a catchment-wide basis. Integration with the Richmond River catchment monitoring will also assist in answering questions about the on-going impacts from this source during flood (when floodwater flows into the Evans River over the Tuckombil Weir).

Based on the review of background information and considering the identified issues, the following key sites for monitoring in the Evans River are recommended:

- Tuckombil Canal downstream of the weir (particularly during flood events to provide data on the load of nutrients, sediment and other pollutants delivered to the Evans River estuary from the Richmond River). While the current weir arrangement is considered to be the most appropriate management option to achieve the best balance of costs and benefits in minimising the impacts of the structure while maintaining flood relief functions, monitoring is required to confirm this;
- Woodburn Town drain to monitor acid input from this known ASS hotspot area;
- Brandy Arm Creek to monitor acid input from this known hotspot area;
- Stormwater drain outlet to the lower estuary near Silver Sands Holiday Park to monitor sediment, nutrients and visual indicators including colour, gross pollutants. It is recommended that human health recreational indicators also be assessed regularly at this site as part of the current Beachwatch monitoring program; and
- Evans Head Boat Harbour with a focus on detecting potential contamination from spills, pump out and monitoring for invasive species etc.

Monitoring of estuary status and obtaining feedback on the success of management initiatives is a critical aspect of effective management of the Evans River estuary. Performance indicators need to incorporate evaluation of the status of key values in the estuary, as well as documenting trends in

underlying ecological processes. Monitoring of environmental condition and processes, estuary stressors and community opinions will provide a solid information base for future decision making.

All monitoring should seek to capitalise as much as possible on existing information to provide a baseline from which the success of management actions can be measured and effort can be targeted to appropriate actions. However, as full characterisation of estuarine dynamics and the factors controlling them cannot be achieved, monitoring should be prioritised to address high risk/high priority outcomes. The monitoring program is to provide robust scientific data while considering the limited human and financial resources available. It is recommended that Council and agency staff be involved in the development of the program.

It is recommended that existing Council monitoring programs (e.g. Beachwatch monitoring) continue, however the estuary monitoring program should capitalise on all available information and consider these information sources in the overall monitoring program design.

The ability to achieve the management objectives will be determined through the success of the management actions. This will require coordinated monitoring across the estuary as well as on-going review of performance against defined targets. Ongoing reporting of progress of the CZMP will be undertaken as part of the Council State of the Environment (SoE) Reporting. A major 10 year review of the CZMP is also required.

#### **4.6.2 Restoration of Estuarine Riparian Vegetation**

Compared to other estuaries in the Northern Rivers, the Evans River has a relatively intact and functioning riparian zone. Management focus should be on continued protection of high value riparian areas and further enhancing the riparian zone by restoring the identified 'pockets' of degraded vegetation. Bank erosion presents the greatest risk to riparian vegetation in the Evans River (refer to Section 3.8).

Education of landowners and the community is required to demonstrate the value of riparian zones. It is recommended that the provision of funding incentives and labour assistance through existing funding avenues continue to be offered to land owners to facilitate these actions.

#### **Status of Existing Management**

Many stretches of riparian vegetation are already protected within Bundjalung and Broadwater National Parks. The Richmond Valley LEP E1, E2 and E3 zoning covers the majority of riparian areas except for urban areas in the lower estuary and land zoned for Primary Production (RU1) adjacent to the Tuckombil Canal. The Environmental Conservation and Management zonings offer planning protection to riparian vegetation through the objectives of the zone:

- To protect, manage and restore areas of high ecological, scientific, cultural or aesthetic values; and
- To prevent development that could destroy, damage or otherwise have an adverse effect on those values.

Riparian zone management projects are undertaken in the Richmond River Catchment by a number of different stakeholders including Landcare groups and private landholders in association with government agencies. Richmond Landcare Inc. oversees many of the funded projects. The Evans River and Coastal Landcare Inc. have been working within the coastal dunes and parts of the lower Evans River riparian areas. Supporting local Landcare groups to continue work in coastal and river areas (i.e. provide funding, equipment etc.) is often a highly beneficial way to improve vegetation management.

RVC has completed a suite of works including:

- Riparian vegetation assessment and mapping including identification of problem weed infestations was completed in 2006/2007 (GHD, 2007);
- In 2010, a request for Expressions of Interest was sent to all private landholders with riparian lands along the Evans River, for parties willing to have restoration works on their land;
- Riparian restoration work including weed removal and revegetation was completed in 2010 within riparian zones along the river. Most work areas were within Crown Reserves and some areas of private land where private land holders were supportive;
- Observations during the bank erosion survey completed as part of this CZMP in 2012 noted that revegetation areas were in need of follow up maintenance;
- Riparian lands have been comprehensively mapped in the RVC LEP and are afforded consideration when assessing impacts of developments; and
- The Evans Head Coastal Reserves Plan of Management (GHD, 2010) includes actions directly supporting replanting crown reserves.

The Richmond River CZMP includes a number of riparian zone management options including:

- Riparian buffer zone establishment (Option 22);
- Identify priority riparian areas and rehabilitate (Options 23); and
- Assessment and mapping of tidal inundation extent including potential sea level rise.
- 

#### **Recommendations for Management:**

Recent restoration work along the Evans River provides a good basis for further improvement of the natural riparian values. However, if sites are not adequately maintained until they are at a point of establishing a reasonable cover of native vegetation then the previous expenditure and benefit gained from initial work will be lost as weeds encroach on the site and animals graze planted seedlings. The following actions are recommended to maintain existing work and promote further improvements into the future:

- Maintenance of riparian restoration sites initiated in 2010. Activities will depend on site specific factors and an initial site assessment will be required to scope the works and confirm costs. GHD (2007) recommended a two year maintenance program with three general maintenance visits conducted in the first year and two in the second year. It is recommended that follow up inspections on a yearly basis after the two year maintenance period be conducted to assess the need for on-going maintenance. Maintenance activities are likely to include weed management, repair of tree guards and fencing, supplementary planting to replace plants that did not survive, and collecting and broadcasting seed. Initial inspection of sites will allow maintenance work to be scoped and costed;
- Repeating the request for expressions of interest from landholders with river frontage could be a worthwhile exercise to promote the benefits of restoration and identify potential new sites. A cycle of every 5 years may be appropriate to gauge interest;
- Support local Landcare groups to continue work in coastal and river areas (i.e. provide funding, equipment etc.);
- Promote riparian restoration project sites through Council's website and local media to raise community awareness about the value of riparian zones and the work underway;

- Coordinate and support current investigations recommended as part of the Richmond River CZMP to prioritise riparian rehabilitation areas; and
- Keep track of developments associated with the planned Pacific Highway upgrade as the currently proposed route traverses the Tuckombil Canal which is one area noticeably devoid of riparian vegetation at present. There may be opportunities for riparian restoration in coordination with site remediation work post-construction. This will be a highly visible stretch of the river and could present a high profile demonstration site for riparian restoration work.

### **4.6.3 Shorebirds**

For Evans Head beaches, a *Threatened Species (Pied Oystercatcher) Management Strategy* already exists (Department of Lands, 2007) and addresses issues pertaining to shorebird habitat and sources of disturbance. The Strategy includes several management actions that could be implemented to protect nesting birds including:

- Continuation of controls for introduced animals and specifically fox control methods;
- Community education and awareness;
- Improved management of 4WD vehicles. This could include investigating the introduction of a 'restricted' permit system;
- Improved management of horse riding on beaches;
- Limits on-leash dog exercising areas and implementation of exclusion zones;
- On-going rationalisation of beach access tracks;
- Management of commercial and recreational pipi gathering;
- Weed management; and
- Monitoring and evaluation.

Improved protection for shorebirds could be achieved by ensuring that management actions proposed in the approved strategy are applied. In general, the strategies for protecting Pied Oyster Catchers also benefit other species of shorebirds.

#### **Status of Existing Management**

Management controls in place on Airforce Beach with relevance to the protection of shorebirds include:

- 4WD vehicles are permitted north of the Airforce beach 4wd access;
- 30km/hr speed limit for vehicles on Airforce beach;
- Vehicles are prohibited from on parking or intruding on nesting sites for the Pied Oyster Catcher during breeding season (i.e. Salty Lagoon). Signage is erected to mark nesting sites during breeding season;
- Vehicles are prohibited from travelling above the high tide mark;
- Dogs are permitted off-leash from the 4WD beach access north to a maximum distance of 1.3km and prohibited south of the 4WD access. Therefore they are excluded from Main Beach and key nesting sites at Salty Lagoon entrance. A \$330 fine exists for dogs found in prohibited places;

- Signage at the 4WD access on Airforce beach informs public about the above beach rules; and
- NPWS conducts fox baiting programs on National Parks Estate.

**Recommendations for Management:**

It is recommended that the management actions outlined in the *Threatened Species (Pied Oystercatcher) Management Strategy* (Department of Lands, 2007) as relevant to Evans Head coastline and Evans River estuary are implemented including:

- Fox baiting programs on both public and private lands;
- Raising community awareness and involvement in the protection of the Pied Oyster Catcher,
- Improved management of 4WD vehicles and horse riding on beaches (this could involve permit system similar to that in place at Seven Mile Beach in Lennox Head);
- Rationalisation of beach access tracks (refer Strategy 11: Public Access); and
- Scientific research is encouraged into sustainable visitor use and the ecology of pipis as a food source for Pied Oyster Catchers.

**4.6.4 Agricultural Land Management Practices**

Issues associated with agricultural land management are some of the most widespread and culturally challenging aspects of catchment management. Past studies have identified the major factors impacting on water quality in the Evans River including nutrient and sediment-rich flood waters flowing from agricultural areas upstream of Tuckombil Weir and overflowing to the Evans River during floods. The management of farms in the Richmond River catchment upstream of the weir will continue to have an impact on water quality in the Evans River when the weir is overtopped by floodwaters. There are also likely to be longer-term effects due to the residual load of sediment, nutrients and other pollutants imported to the system.

The CZMP Richmond River Estuary includes a Farm Management Strategy with catchment wide initiatives, such as farm management planning, assessment of alternative land uses for backswamp farms, provision of extension officers and education programs. Changes to agricultural land use and practices that will reduce impacts on the Richmond River will also have positive flow on effects for the Evans River. As the Richmond River CZMP also includes the Evans River catchment as part of its study area, catchment-wide initiatives are also applicable to the Evans River area. A key action of this Plan therefore is to support and encourage the implementation of the Richmond River Estuary CZMP.

There have been specific management issues identified by this plan for the immediate Evans River catchment, and it will be necessary to consider additional actions at a local scale to address these. Agricultural land occupies a relatively small proportion of the total land area of the Evans River catchment and previous studies suggest that impacts from agricultural land within the immediate catchment are not a major factor compared to inputs from the Richmond River (PBP, 1999; WBM, 2010). However issues including stock access to river banks, degraded riparian zones and issues associated with the disturbance of ASS were raised in the 2002 Estuary Management Plan (WBM (2002)). Actions relating to ASS management on agricultural lands are discussed in Section 4.6.5 below. Actions related to riparian restoration are discussed in Section 4.6.2.

**Status of Existing Management**

RVC has completed a suite of works including:

- Assessment and mapping of priority areas for control of stock access was carried out in 2006/2007 (GHD, 2007);
- Some stock fencing and off-stream watering facilities were installed in 2010 in collaboration with land holders; and

The bank erosion survey completed as part of this CZMP in 2012 concluded that current stock access to the estuary was limited and is a minor contributor to bank erosion (refer Appendix 5).

The Richmond River CZMP includes a number of farm management options including:

- Farm management planning for priority properties;
- Liaise with agriculture industry bodies to improve education and ensure estuary friendly practices are incorporated into industry guidelines;
- Identify high impact farming activities and investigate alternatives;
- Cost benefit analysis of backswamp farming activities;
- Scientific trials to investigate strategies for retention of water on backswamp areas;
- Changes in pasture management including changes to inundation tolerant pasture species;
- Retirement/buy back backswamp areas and return to wetlands; and
- Work with backswamp property owners to identify alternative management strategies.

**Recommendations for Management:**

Considering the work already proposed to address the agricultural land management issues, the current focus of management options for agricultural land in the Evans River catchment is:

- To support implementation of the Richmond River CZMP Strategy 4: Floodplain Infrastructure Management and Strategy 5: Farm Management;
- Periodic checking of stock fencing carried out in 2010. Periodic maintenance may be required to ensure protection; and
- Maintenance of riparian restoration sites initiated in 2010 (discussed in Section 4.6.2).

**4.6.5 Acid Sulfate Soil Management**

There are a range of ASS management options that have been developed through technical research and scientific trials both within the Richmond River catchment and at other locations. The effective application of various management options is dependent on a number of site specific factors and a case by case assessment of specific sites is required to recommend appropriate actions.

Management actions include floodgate management and infilling and/or reshaping of drains for groundwater control. These methods seek to manage ASS by reducing the exposure of the soil profile to air. By submerging the ASS, the risk of oxidising the pyrite within the ASS and subsequent acid leachate being released into the drains and downstream watercourses is reduced. These activities also reduce the interception of iron and aluminium rich groundwater and reduce the extent of accumulation of mono-sulfidic black ooze (MBO) behind the floodgates.

Managing floodgates for tidal flushing has allowed for buffering of acid build-up (Moore, 2006). RRCC actively manages most of the major flood gated systems in the Richmond River catchment to allow

tidal flushing where practical. Floodgate management trials were conducted by RRCC on the Tuckean Barrage in 2002. Water quality monitoring showed that tidal flushing during dry times can decrease the build-up of acid waters upstream of the barrage and improve aquatic habitat. Even though water quality can quickly decline following rainfall, due to ASS runoff, the tidal flushing offers at least periodic improvements in water quality.

Groundwater management, drain remodelling and drain infilling have also been conducted at various sites within the floodplain. In-filling and shallowing can also be used to partially restore former wetland floodplain hydrology with subsequent water quality improvements. These management actions have had major effects on reducing ASS exposure, oxidation and acid export.

The Floodgate Drain Management Guidelines (RRCC, 2006) provides guidance for RRCC staff, private contractors and landholders to undertake 'best practice' in flood mitigation drain and floodgate management. A review of the guidelines was recommended in the Richmond River CZMP in association with review of floodgate management protocols to ensure the guidelines are updated with the latest information (scientific innovations, legislation, planning changes, best practice, etc.) particularly with regard to sea level rise implications and the effects of blackwater releases via drains and floodgates to the Richmond River post-flood.

### **Status of Existing Management**

A number of management actions have been undertaken to address ASS issues including:

- Priority ASS areas have been mapped in Council's LEP 2012. Any works likely to disturb or impact on ASS must develop and work within a Council approved ASS management plan as part of development consent conditions;
- A memorandum of understanding between NSW Sugar Milling Co-op/Cane Farmers/RVC aims to ensure compliance with Council planning requirements for ASS management;
- Council has the authority to issue Orders or Directions (and impose fines) for breaches to the LEP (DCP) provisions in accordance with the *Environmental Planning and Assessment Act 1979*. Council has investigated limited incidences of non-compliance since 2002;
- The Woodburn Town Drain Floodgate Trial Management Plan was developed by RRCC and private landholders in 2006. The aim of the trial was to reduce the impacts of poor drainage water quality on Tuckombil Canal and the Evans River through controlled tidal flushing;
- In 2009, a 700 m canal through ASS on private property was filled in within the Woodburn Town Drain catchment;
- Between 2000 and 2011, RRCC conducted monitoring at the outlet of Woodburn Town Drain. Monitoring consistently indicated low pH water discharging from the drain during an outgoing tide. Monitoring has not resumed since the data logger was stolen; and
- DPI-Fisheries manages the Floodplain Network which shares information about the best techniques for floodgate management.
- The present fixed weir management regime at Tuckombil Canal appears to limit the impact of fish kills in the Evans to small scale local fish kills at locations such as Brandy Arm Creek and the vicinity of Woodburn Town Drain which have been observed by landholders and government agency staff periodically since the weir was installed. Monitoring is required to confirm perceived improvements (refer Section 4.6.1).

The Richmond River CZMP includes a number of farm management actions related to the management of acid sulfate soils including:

- Identify high impact farming activities and investigate alternatives;



- Identify and prioritise drainage for infilling of redundant drains and reshaping of other drainage;
- Identify and prioritise levees for redesign and/or remodelling; and
- Review floodgate management protocols.

**Recommendations for Management:**

The planning controls now incorporated into RVC's LEP and enforcement by Council are the appropriate framework with which to manage any new development or works likely to affect ASS. Woodburn Town Drain and Brandy Arm Creek are areas of existing and on-going ASS issues in the Evans River catchment that require further investigation and management to address issues. Further management options include:

- Support implementation of the Richmond River CZMP and specifically
  - Strategy 4: Floodplain Infrastructure Management
    - 4a) 'Identify, prioritise and optimise drains and levees' – Ensure agricultural drains discharging to Woodburn Town Drain and Brandy Arm Creek are included as priority sites in the Richmond River CZMP actions. On-ground options need to be investigated in consultation with landholders to determine their feasibility taking into account the costs and benefits across social, environmental and economic factors. Examples include drain reshaping/shallowing, filling-in drains completely or tidal flushing through management of floodgates. Drain modification will naturally change the hydrology of the floodplain and the existing and planned future uses of the land will need to be considered.
    - 4b) 'Review Floodgate management protocols' - Review of the Woodburn Town Drain Floodgate Trial Management Plan including the current implementation actions. It is clear that there are on-going water quality issues from this source impacting the Evans River and consideration of further management actions is recommended to address the issues.
  - Strategy 5: Farm Management- to investigate alternative land uses to high impact farming activities. There may be opportunities for alternative land use with lower environmental impact that are also attractive to landholders in the Evans River catchment.
- Monitor the progress of the planned Pacific Highway upgrade as the currently proposed route traverses the Woodburn Town Drain catchment and there may be opportunities for complementary actions associated with the upgrade or the potential to direct compensatory measures into addressing ASS issues at this site.

**4.6.6 Urban Stormwater Management**

Options to improve urban stormwater quality, hydrological function and amenity can be divided into three main categories:

- Retrofit stormwater assets in existing urban areas;
- A holistic and integrated management approach to stormwater assets and protection of water quality for new developments in line with the principles of Water Sensitive Urban Design (WSUD); and

- Stormwater education aimed at enhancing public understanding of the connections between stormwater runoff on water quality in the estuary and the role individuals play in day to day reduction of pollution.

Evans Head has reached a point where almost all areas zoned for urban development have been developed. Iron Gates is the only land parcel zoned for urban development that has not yet been developed. For existing urban areas, there may be opportunities to retrofit and improve stormwater assets either as a part of Council's routine maintenance and renewals processes or in response to a particular need identified.

For both retrofit of existing systems and installation of new urban developments a holistic approach to stormwater design and construction should aim for:

- Management of stormwater to ensure no significant risk to public health, property and the environment;
- Reduction in stormwater volume and improved quality of stormwater entering the estuary; and
- Sustainable and affordable reuse of stormwater.

WSUD differs from conventional conveyance based management methods as it takes an integrated approach to the management of stormwater quality and quantity. It seeks to incorporate sound stormwater management principles into the design of the development during the planning stages to minimise the need for "end of pipe solutions". Ideally, it also examines the total water cycle for the development and includes provision for water harvesting and water reuse.

The linkages between day-to-day activities and the health of the estuary, such as the impact of stormwater runoff on water quality in the estuary are not well understood. A key component of any stormwater management program is education on the impacts of urban runoff and potential improvements.

The *Local Government Act* provides councils with the ability to raise additional funds for stormwater management services outside traditional funding sources. These additional funds (the stormwater charge) can be spent on urgent works to improve stormwater treatment and infrastructure to improve the quality of stormwater that is returned to the waterways. The stormwater charge only relates to urban developed land within a town or village to which Council provides stormwater services.

#### **Status of Existing Management**

Council is actively involved in the management of urban stormwater through a variety of projects, programs and policies including RVC's Stormwater Management Plan (SWMP) (2007) and Development Control Plan (2012).

The RVC DCP includes sections for Water Sensitive Urban Design (WSUD) and requirements to assess potential impacts of stormwater upon receiving environments.

In response to concerns raised in both the Stormwater Management Plan and the Estuary Management Plan (WBM, 2002) regarding the lack of stormwater treatment for urban areas in Evans Head, RVC has undertaken the following work:

- The Oak Street Stormwater Trust Grant Project (2002) included installation of a GPT at Oak Street and stormwater education programs for local schools. The GPT was situated to intercept stormwater flowing from Oak Street stormwater catchment which includes the Evans Head village centre (CBD), prior to discharge to the Evans Head Reserve Stormwater Drain (an open, concrete-lined channel) and the Evans River. The GPT is maintained (cleaned out) regularly by Council;
- Education programs were conducted as part of the Oak Street project and other projects with

the aim of increasing public awareness about stormwater issues and controlling pollution at the source (i.e. reduce littering);

- Stormwater Quality Improvement Devices (SQIDs) were installed at stormwater outlets discharging to wetlands along Beech Street and behind the Evans Head SLSC;
- A number of GPTs and trash racks have been installed within urban areas;
- Signage has been installed around the estuary to educate the public about the connection of stormwater to the river and
- Beachwatch monitoring is conducted at a site adjacent to the outlet of the drain, which is a popular swimming beach.

The SWMP (2006) included an action to investigate the best stormwater treatment system for the Evans Head Reserve Stormwater Drain, however this has not been undertaken to date. The Estuary Management Plan (WBM 2002) suggested that the drain could be reinstated to a more natural state, consisting of vegetated banks and small pools and riffles.

### **Recommendations for Management:**

The reduction of urban pollution such as gross pollutants, sediment, nutrients and faecal coliforms is consistent with the aims of the Coastal Zone Management Program. As stormwater management activities are managed and regulated by existing Council services, it is proposed that the majority of these activities continue outside but complimentary to the CZMP process, while ensuring consistency with the CZMP.

One area that has been highlighted as in need of further management consideration is the Evans Head Reserve Stormwater Drain. In particular the discharge point in close proximity to recreational areas in the lower estuary has been raised as an issue affecting visual amenity in the location due to the appearance of the structure itself and the discharge of discoloured water to the river. Occasional exceedances of recreational water quality guidelines have also been noted at this site through the Beachwatch monitoring program. The SWMP (2007) recommended an investigation into treatment options for the drain, although this has not been undertaken to date. This issue continues to be raised by the community and through water quality monitoring results. It is apparent that an assessment of feasible modification and/or retrofit of treatment options is needed for this site. It is recommended that the feasibility assessment considers:

- Source controls including education of residents and particularly visitors using the Silver Sands Holiday Park to minimise sources of pollution. Provision of pet dropping bags and bins to encourage collection and disposal could also be considered;
- End of pipe treatments within the drainage line itself. Works to retrofit or modify the open, concrete-lined channel to improve the look of the structure and to further remove sediment and pollutants. Options should include the principles of WSUD and installation of SQIDs;
- Redirection of stormwater to discharge to a less visible location (i.e. ocean discharge). While the feasibility assessment should include an assessment of all options it is acknowledged that this option is likely to have high costs, potential environmental impacts and high level of technical difficulty. This option would also affect visual amenity at the new discharge site and may therefore only transfer the problem;
- Complimentary options including education about discolouration of water due to natural tannin-staining from Melaleuca swamp areas could assist in improving public perception of this issue; and
- The potential impact of any proposed solutions on environmental, social and economic factors

existing at the location. The impact on flooding due to proposed changes and consideration of climate change scenarios are also of high importance when assessing options.

Refer to Section 5.2 for a discussion of the stormwater drain discharging to the lower estuary and the associated amenity problems.

#### **4.6.7 Manage/Improve Onsite Sewage Management Systems**

Council has implemented on-site sewage and wastewater management strategies in accordance with the *Local Government (Approvals) Regulation 1999* including audit and inspection of on-site systems. However, it is the responsibility of the owner or occupier of the premises that has an on-site wastewater system to ensure that on-site systems are designed, installed and managed so that pollution of groundwater or surface waters does not occur and there is no risk to public health, safety and the environment from the operation of an OSSM system.

##### **Status of Existing Management**

- Council has implemented an OSMS Strategy and DCP to guide landowner in suitable design, installation and operation of OSSM systems. OSSM systems are assessed and have to be approved by Council to be registered on the Sewage Management System Approval Register. Site inspections are carried out by Council staff at installation stage and from time to time to verify performance. Existing systems are also inspected and approved by Council. Any improvements required are discussed with landholders and added to operating conditions.
- Council backlog sewer programs have identified areas to be connected to the Council sewerage system based on the risks to public health, aquatic ecosystems, groundwater supplies and contamination of shellfish areas and inappropriate soils, lot size and topographic conditions. Council is in the process of providing reticulated sewerage system to Broadwater with connection to the Evans Head/Woodburn sewerage system. Construction should be complete by 2013. North Woodburn Lismore City Council residents are also being connected to the Evans Head/Woodburn sewerage system.

##### **Recommendations for Management:**

It is recommended that Council continue implementation of the OSMS strategy including inspection of systems. As these activities are managed and regulated by existing Council services, it is proposed that the majority of these activities continue outside but complimentary to the CZMP process, while ensuring consistency with the CZMP.

#### **4.6.8 Boat Harbour Management Options**

The Evans Head Boat Harbour has been identified as a potential source of water quality pollution due to the risk of spillage of petrochemicals, discharge from bilge tanks and antifouling of hulls. Management options are aimed at improving management practices at the boat harbour to reduce risks to water quality.

##### **Status of Existing Management**

The 2002 EMP recommended the development and implementation of an Operational and Environmental Management Plan for Evans Head boat harbour. This has not yet been undertaken.

**Recommendations for Management:**

A review of the current management procedures in place at Boat Harbour is recommended including assessment of the risk to the health of the Evans River. The review would incorporate assessment of current bilge water management, emergency spill response and chemical storage. Based on results of the review, if risk to the estuary is assessed as unacceptable, it is recommended that an environmental management plan for Boat Harbour operations be developed including:

- Water quality management – discharge / bilge water controls, etc.;
- Emergency response (spill clean-up, contamination events, etc.); and

Monitoring water quality and sediment contamination to confirm level of risk and help refine the management plan.

**4.6.9 Aquatic Weed Management**

**Status of Existing Management**

Management of aquatic weeds is currently carried out by Far North Coast Weeds and RRCC in the study area by mechanical harvesting and chemical controls. Much of this work is carried out as part of asset maintenance works, however environmental benefits, such as improved water quality and habitat values are also acknowledged.

**Recommendations for Management:**

- Rocky Mouth Creek is a high priority site for routine management of aquatic weeds. While Rocky Mouth Creek is outside the study area for this CZMP, monitoring should aim to detect weed outbreaks in Rocky Creek and particularly any presence in the Evans River. Observations could be recorded as part of the EcoHealth monitoring. Post-flood times will be particularly important for monitoring.
- In addition to routine aquatic weed management, a more holistic approach to management is recommended. This involves addressing ecological issues that contribute to aquatic weeds such as improving tidal flushing, restoring a more natural hydrology and increasing riparian planting for shade (which will limit weed growth) and as a nutrient buffer.

**4.6.10 Coastal Dune Environments**

Weed and pest management in coastal environments is an issue requiring on-going management. Coastal dunes are particularly susceptible to weed encroachment due to their historical disturbance through sand mining, the dynamic nature of the coastal environment and high recreational use creating ongoing disturbance.

Restoration of sand dune ecosystems and securing their biodiversity involves protecting the relatively undisturbed vegetation that remains as well as trying to restore what has been lost, ideally to a condition that prevailed before disturbance. Coastal dunes also play a vital role in mitigating coastal erosion.

**Status of Existing Management**

- DPI-Fisheries has mapped estuarine vegetation communities (mangrove, saltmarsh and seagrass) throughout the Evans River.
- Evans Head Landcare Group carry out monthly dune management work including weed removal and revegetation. Council provides resources to assist with this work which includes

funding of \$5,000 per year for project work and trailer maintenance (RVC, 2012b);

- Crown Lands have made arrangements with the NSW DPI and the Noxious Weeds Advisory Committee (NWAC) to provide limited funds for integrated weed control programs on Crown land and other land under the control of the department. This can include Crown land which is vacant, under short term tenure or the control of community or corporate trusts; and
- Crown Lands is also responsible for eradication of pest animals on land under its control. DPI is the lead agency and Livestock Health and Pest Authorities (LHPAs) are responsible for the planning and coordination of on-ground actions. The division's pest animal control programs include support for the Fox Threat Abatement Plan prepared by the DECC and Outfox the Fox, an initiative of DPI and the LHPAs. The division also supports Regional Wild Dog Management Plans, Recovery Plans for threatened native species and a research project into the effect of aerial baiting of dogs and foxes on native quoll populations.

**Recommendations for Management:**

- The current activities outlined above are managed and regulated by existing Crown Lands and Council services. It is proposed that the majority of these activities continue outside but complimentary to the CZMP process, while ensuring consistency with the CZMP.
- The continued support of local Land care Groups is recommended including the provision of equipment and funding.
- NPWS has indicated that they wish to coordinate pest species management with adjacent Crown Land Reserves. It is recommended that Crown Land Managers consult with NPWS to determine appropriate strategies.
- The number of beach access tracks can affect the resilience and health of coastal dune systems. The rationalisation of beach access tracks in Evans Head is discussed in Section 5.1.
- Dune management works are recommended as part of Coastal Risk Strategies (Section 10).
- While Salty Lagoon is outside of the study area for this CZMP, it is recommended that NPWS be notified that the Coastal Hazard assessment has indicated that the shoreline may be landward of the existing Salty Lagoon catchment boundary by 2100. Salty Lagoon is a freshwater wetland and seawater intrusion would significantly impact this coastal ecosystem. No further management actions are recommended as part of this CZMP.

**4.6.11 Climate Change Adaptation**

Climate change is an important consideration for strategic planning, particularly in coastal areas where the combined effects of sea level rise and potentially increased storminess are considered key threats. Sea level rise may result in impacts associated with tidal inundation, bank erosion, shoreline recession, implications for draining and flooding, damage to infrastructure, inundation of low lying ecosystems and landward migration of ecological communities. The increase in frequency and intensity of storm events and altered flooding patterns will also potentially exacerbate erosion, bank stability and water quality issues. An overall goal for the management of the coastline is to ensure that the coastline and estuary are as healthy and resilient as possible, so that it can respond naturally to the impacts of climate change.

### **Status of Existing Management**

The Evans Head Coastline Hazard and Estuarine Water Level Definition Study (WorleyParsons, 2012) assessed and mapped the tidal inundation extent for the lower estuary downstream of Elm Street Bridge incorporating the 1 in 50 and 1 in 100 year ARI events for the present day, 2050 and 2100 planning periods (NSW sea level rise benchmarks).

The Richmond River CZMP documents several tasks in Action 2b: Planning for sea level rise and climate change impacts which are supported by this CZMP. Tasks include:

- Ensure that the management of the floodplain drainage network, including the operation of flood gates, modification of levees and drains as well as planning for future floodplain management considers climate change effects;
- Map predicted future estuarine wetland habitat distribution in response to changes in sea level, tide propagation and salinity regime within the estuary, building on existing research/models where appropriate. This mapping should identify barriers to upslope transgression (e.g. current development, road embankments, etc.) and highlight key areas of importance for maintaining the balance of future habitats within the estuary. This information should be compiled as a set of GIS layers which are available for land use planning and development controls;
- A strategic plan for long-term estuarine habitat management should be prepared to ensure that upslope migration of key habitats can be accommodated within the long-term land use adjoining the estuary. This should include provision for buffer zones and offsets as appropriate to achieve no net loss of mangrove, saltmarsh habitats and priority riparian habitats within the study area; and
- All catchment/estuary specific information regarding climate change and potential risks for the estuary should be made available to decision makers in the catchment. This should include provision of a resource base (e.g. sea level rise maps, habitat management strategies, etc.) to be utilised in LEP reviews, development assessment, education campaigns and strategic planning.

### **Recommendations for Management:**

- It will be necessary to consider the impacts of climate change as part of each management option and strategy. This is consistent with the recommendations of the Richmond River CZMP and guidance provided by the NSW government. The current investigations recommended as part of the Richmond River CZMP are supported by this plan.
- There is a need to examine Council's OPP habitat mapping and habitat restoration works in relation to predicted tidal inundation extents with sea level rise to determine the risk to habitats. Depending on the results of this assessment it may be appropriate to undertake management measures to ensure protection of the species.

## 5. COMMUNITY USES OF THE COASTAL ZONE

Richmond Valley Council recognises the importance of community uses of the coastal zone. Evans Head beaches, coastline, estuary and foreshores provide recreational opportunities, high amenity value and a coastal lifestyle highly valued by residents and visitors. Activities include fishing, boating, swimming, surfing, walking and nature appreciation in the estuary and adjacent foreshore areas. The study area has high cultural and spiritual significance to local Aboriginal communities and there are many important cultural sites to be protected and conserved. Tourism is a key economic driver for Evans Head and the natural beauty of the coastal zone and the recreational opportunities are major factors in the appeal of Evans Head as a holiday destination. It is important to the local community and visitors to have permanent public access to the beaches, the river and foreshore areas.

This section provides an understanding of:

- The current access arrangements to beaches, waterways and foreshores in the study area;
- Any potential impacts (e.g. erosion, accretion or inundation) on these access arrangements; and
- The cultural and heritage significance of the plan area.

A review of the background material relevant to community uses of the coastal zone in the Evans Head study area is provided as Appendix 3 (Part B: Literature and Information Review). The following section outlines the current status of identified issues.

The potential management options raised in Section 5.6 are carried through to the options assessment process detailed in Section 8.

### 5.1 Access

In the preparation of this CZMP, public access refers to the ability of the general public to gain appropriate access to public lands in the coast and estuary including access to coastal environments such as beaches and estuarine waterways. Whilst providing and maintaining access to public lands in coastal environments is important, access and use must be balanced with the need to protect the environment and maintain public safety. RVC recognises that:

- Access to and sympathetic use of publicly owned coastal lands is desirable where it does not conflict with environmental management objectives;
- Uncontrolled public access has the potential to irreparably damage fragile coastal environments; and
- Human safety is a prime consideration when planning access.

#### 5.1.1 Current Access Arrangements

Public access can be categorised as:

- Pedestrian access for swimming, fishing, walking and recreation;
- 4WD vehicle access on Airforce Beach; and
- Access for boating.

#### Beach Access

Current beach access points and predicted coastal hazard lines are mapped in Figure 16. Some beach access points have been formalised by Council such as the 4WD access (no. 10 on Figure 16),



the Evans Head SLSC access (no. 4) and Shark Bay access (no.1). A number of other pedestrian access points appear to be informal access points created through the dunes over many years.



**Figure 16: Current beach access points**

### **Estuary Foreshore Access**

Pedestrian access to foreshores is generally through Crown Reserve land in the lower estuary. The Reserve has extensive frontage to the estuary with pathways, roads and parking areas providing links and access from the town to the river, the estuary and the beach (GHD, 2010). The foreshore and riverside recreation areas of the Reserve are used by the public as open space for general year round use. Figure 17 shows the foreshore footpaths and access points to the lower estuary and overlays the predicted present and future estuarine inundation areas from WorleyParsons (2012).

### **Boating and Navigation**

Safe navigation of the entrance bar at Evans Head is an on-going issue. There is ongoing community pressure for dredging to maintain a safe, navigable entrance. At present, navigation is difficult and sometimes hazardous, particularly to those who are unfamiliar with the estuary. The upper estuary also has significant shoaling and sand build up is an ongoing issue for navigation, although the demand for boating in the upper reaches is much less than in the lower estuary.

#### **5.1.2 Potential impacts on access arrangements**

Beach accesses along Main Beach and Airforce Beach can be heavily eroded during severe storms. Both pedestrian and 4WD access tracks, causing closure and repair work by Council. The access is under threat from coastal hazards both at present and in the future (Figure 16).

Potential present and future estuarine inundation threatens the viability of some of the foreshore access points in the lower estuary, particularly in the vicinity of the Silver Sands Holiday Park and the Boat Harbour (Figure 17).

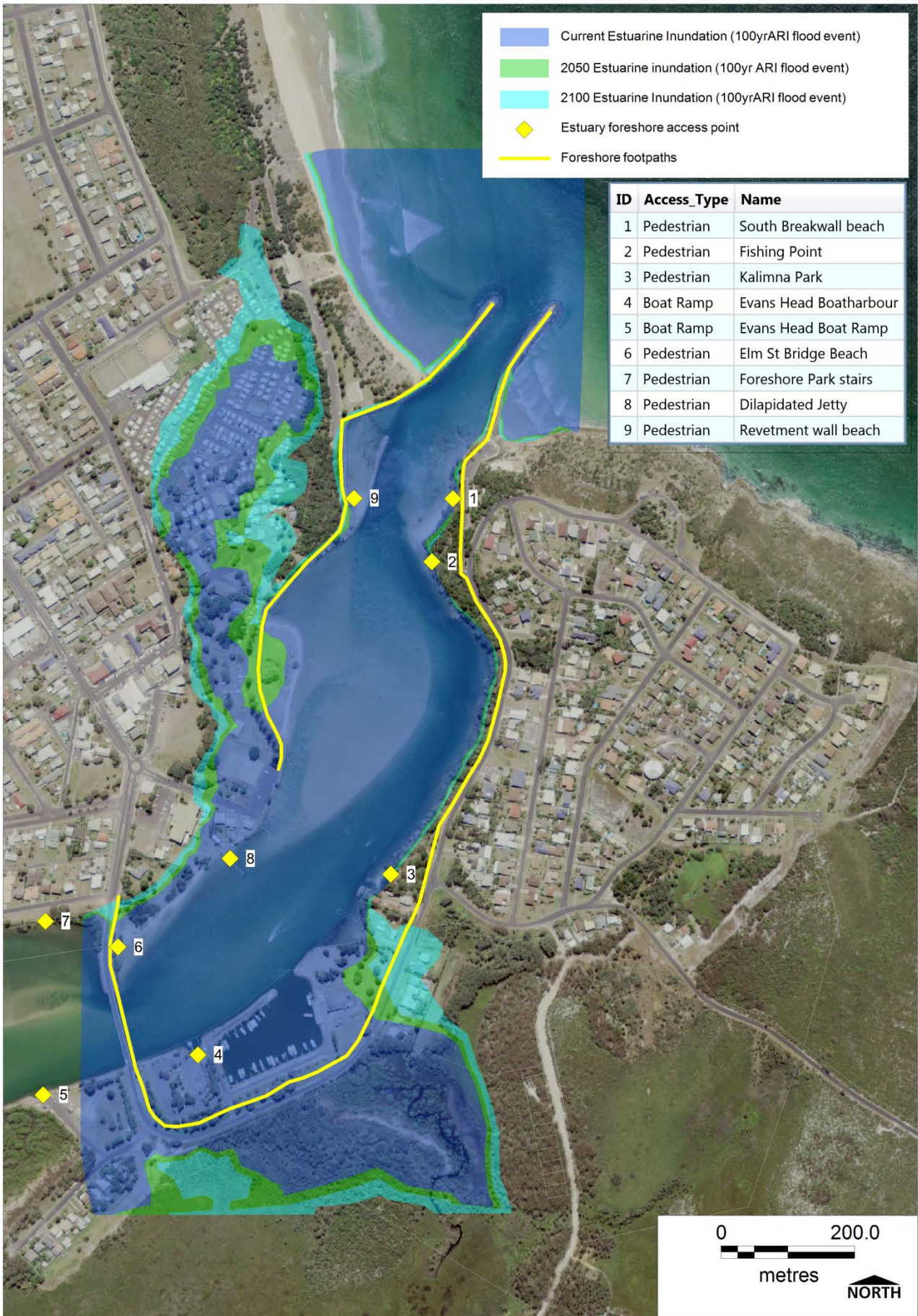


Figure 17: Estuary foreshore access and present and future estuarine inundation areas

## **5.2 Amenity**

Scenic amenity is valued highly by the local community and visitors. Evans Head is a naturally beautiful place and is enjoyed by locals and tourists alike. Specific characteristics identified at Evans Head include the Silver Sands Holiday Park, clean beaches and foreshore areas, presence of native flora and fauna (including threatened species), good water quality and appreciation of landscape, geomorphic and estuarine features. The maintenance and enhancement of amenity at Evans Head is important to maintain community enjoyment and tourism in the town.

## **5.3 Recreational Use**

The waterways and foreshores of the Evans Head estuary and coastline are of great importance for both passive and active uses. 'Active uses' are those with the greatest potential for impacts on the environment and on other pursuits. They include recreational activities such as water skiing, boating, swimming or surfing and economic activities such as aquaculture and commercial fishing. In contrast 'passive uses' have less potential for impacts. Examples of passive uses include nature conservation, habitat protection, walking tracks and nature appreciation.

The nature of activities that should be permitted within a given area varies according to natural constraints, community objectives, accessibility issues, legislation, land tenure, government policies and seasonal variations.

Concerns have been raised in the past regarding user conflicts (e.g. between motorised watercraft and other activities) (WBM, 2002). From a navigation perspective, the lower reaches receive the highest concentration of boat traffic due to the proximity of the boat harbour and the two public boat ramps. However, a small percentage of vessels remain within the estuary, and mostly stay within the lower reaches (due to inadequate navigation depths upstream of Iron Gates) (WBM, 2002). Even within the lower reaches, safe navigation requires care and experience due to the presence of shallow shoals and bars. Boating on the northern side of Mangrove Island is significantly restricted due to the very shallow depths, whilst access is restricted to only a narrow gutter in the rock shelf at Iron Gates during the lower stages of the tide. The actual number of vessels navigating the lower reaches of the Evans River is not known, however WBM (2002) estimated it is likely to be less than about 20 per day, with higher numbers on weekends and during holiday periods and events such as the Evans Head Fishing Classic. Navigation issues associated with sediment accumulation in the lower estuary and entrance is discussed in Section 5.1.1.

Recreational fishing is a popular activity in Evans Head and has been identified as a major factor enticing residents and tourists to the area and is a key economic driver in the community. Stakeholders have raised concerns about observed decreases in recreational fish and crab catches in the Evans River. Overfishing has been raised as the potential cause of the perceived decline in fish stocks in past consultation as part of the 2002 EMP. The Evans Head Fishing Classic has been highlighted by some stakeholder as of particular concern, with a perceived decrease in fish stocks following the event. There is also concern about the observed decrease in number of pipis on the beach and community members have expressed particular concern about the impacts of commercial harvesting on pipi numbers.

RVC conducts Beachwatch monitoring at ocean and river swimming beaches around Evans Head. While recreational water quality is generally of a very high standard at monitored swimming locations poor results are occasionally measured in response to rainfall, particularly in the Evans River (near the revetment wall). Results from this site indicated that the microbial water quality is suitable for swimming most of the time but the water may be susceptible to pollution after heavy rain due to river discharges and urban stormwater. Elevated *Enterococci* results have been recorded in the last two years in conjunction with flooding of the Evans River.

## **5.4 Cultural Heritage**

The Evans Head region is recognised as being an area of significant cultural and historical heritage for Aboriginal people (RVC, 2000). The entire region surrounding Evans Head was an important gathering place for the people of the Bundjalung (nation). The Bundjalung (nation) comprised numerous tribal groups who were part of a larger linguistic group and shared a common culture, and occupied an area stretching from Nerang Valley in Queensland, south to the Clarence River and west to the Great Dividing Range (DLWC, 2003).

The Evans Head region contains sites and places of significance to the local Aboriginal community, some of which are also of high archaeological significance. Sites associated with Goanna Headland, the Olive Gap and Razor Back Lookout (south of the Evans River) and Gumma Garra (on the southern side of the river) comprise ceremonial sites, middens, carved trees, campsites and stone tool workshops and quarries (NPWS, 1997). Dirawong Reserve, immediately south of Evans Head is managed by a trust for the conservation of Aboriginal cultural heritage (RVC, 2000).

A search of the NPWS Aboriginal Heritage Information Management System (AHIMS) was conducted for the CZMP study area and is included in Appendix 3. The AHIMS search returned a total of thirty-seven aboriginal sites within the search area (details of the sites are included in Appendix 3). Aboriginal sites and relics are protected under the National Parks and Wildlife Act 1974, and statutory responsibility for the sites and relics around the Evans River lies with OEH. A licence must be obtained from OEH prior to carrying out any proposed works in relation to known Aboriginal sites. An archaeological assessment should also be undertaken and a notification will need to be made to the native Title claimants under the *Native Title Act, 1993*.

Both past and present consultation with local Aboriginal groups has revealed that not all sites have been recorded in the area and this is seen as a gap in current understanding and ongoing protection of cultural heritage values. It has been identified that coastal recession, beach erosion and bank erosion could potentially impact on Aboriginal sites. There is concern that there are sites that have not yet been identified and mapped and impacts are not fully known.

Gumma Garra has been identified as a significant Aboriginal cultural site that is currently under threat from bank erosion. Management of this site has been discussed in Section 10.3.

RVC recognises that cultural heritage is an important coastal zone management issue due to the long association of Aboriginal communities with the coastal zone over many tens of thousands of years. More recently, European settlement has also made extensive use of the coastline, resulting in a multi-layered pattern of cultural usage of coastal sites and resources.

There were no specific non-Aboriginal cultural heritage issues raised during the development of this CZMP. However, it is noted that all of the issues related to ecosystem health, public use and recreation in and around the estuary and Evans Head beaches are intrinsically linked to cultural values enjoyed by the community and visitors.

## **5.5 Summary of Community Uses issues in the coastal zone**

Table 8 provides a summary of the community uses issues identified for the Evans Head coastline and estuary.

**Table 8: Summary of community uses issues in the coastal zone for consideration in development of the CZMP**

Issue category	Issue Description	Location
Public access	31. Existing boating and pedestrian access to the lower estuary is currently at risk from estuarine inundation including catchment flooding effects and this is predicted to be exacerbated into the future.	Lower estuary
	32. The existing jetty on the northern foreshore of the river, on the downstream side of Elm Street Bridge, is in poor condition. Its current state of disrepair represents a significant risk to safety.	Jetty, northern foreshore of river
	33. A number of informal access tracks to the beach are causing disturbance to dune ecosystems (adding to destabilisation of dunes, disturbance of vegetation etc.)	Main Beach and Airforce Beach
	34. Severe storms currently erode the dunes along the beach affecting beach access points.	Main Beach in vicinity of SLSC
	35. By 2050 the shoreline is predicted to be landward of existing beach access points	Beach access points
Amenity	36. The stormwater drain and runoff discharging into the lower estuary reduce the amenity value of the area.	Beaches, foreshores
	37. Severe storms currently erode the dunes along the beach reducing beach amenity	Main Beach and Airforce Beach
Recreational use	38. The lower Evans River has significant shoaling and sand build-up and this is an ongoing issue for navigation through the bar.	Lower Estuary/Entrance
	39. The upper Evans River has significant shoaling and sand build-up is an ongoing issue for navigation through the upper reaches.	Upper Estuary
	40. Community concern about potential conflicts between different estuary uses such as swimming and motorised watercraft.	Estuary-wide
	41. There is concern that motorised water craft contributes to estuary health pressures including bank erosion caused by boat wash and damage sensitive habitats (e.g. propeller or anchor damage to seagrass beds).	Estuary-wide
	42. There is concern about observed decreases in recreational fish and crab catches in the Evans River.	Estuary-wide
	43. There is concern about decrease in number of pipis on the beach and impacts of commercial harvesting	Airforce Beach
	44. While recreational water quality is generally of a very high standard at monitored swimming locations (ocean beaches and river); poor results are occasionally measured in response to rainfall, particularly in the Evans River (near revetment wall).	Swimming beaches- lower estuary and ocean beaches

**COASTAL ZONE MANAGEMENT PLAN: EVANS HEAD COASTLINE AND EVANS RIVER ESTUARY**

<b>Issue category</b>	<b>Issue Description</b>	<b>Location</b>
Cultural heritage	45. There are a number of significant Aboriginal cultural sites in the study area that are not currently identified and recorded/mapped by AHIMS (OEH's Aboriginal Heritage Information Management System).	Various throughout study area
	46. Beach erosion, coastal recession and bank erosion processes could potentially impact on cultural sites of significance. There is concern that there are sites that have not yet been identified and mapped and impacts are not fully known.	Coastline and estuary banks- significant sites
	47. Bank erosion has impacted Gumma Garra, an Aboriginal site in the lower estuary. This is likely to be exacerbated by future increases in tidal inundation due to sea level rise.	Gumma Garra – lower estuary

## 5.6 Potential Management Options

### 5.6.1 Access

One of the goals of the NSW Coastal Policy is “providing for appropriate public access and use”. Providing and maintaining appropriate public access to Evans Head beaches and estuary foreshores now and into the future is vital in retaining the local character and continued enjoyment of the area.

#### Beach Access

Beach access tracks are used to encourage pedestrian and authorised vehicle access across dunes to the beach. It is important that the number of access tracks is minimised and those that are retained are located, designed and maintained to provide effective public access while providing maximum protection to dunes. Formalised tracks are usually fenced to direct and confine the movement of pedestrian and vehicular traffic. The track surface is usually protected to prevent erosion and to provide traction for traffic. It is important to note that there is no single method that can be applied universally due to beach variability. Provision of access must be very carefully matched to the prevailing environmental character and usage patterns, so as to minimise adverse impacts.

Available publications for guidance on the design and construction for tracks include:

- *Coastal Dune Management Manual* (DLWC, 2001);
- *NSW National Parks and Wildlife Service’s Walking Track Construction Guidelines* (Gorrell undated); and
- Australian standards for walking tracks (*AS 2156.1*).

#### Estuary Foreshore Access

Public access to the Evans River estuary and foreshores is currently at risk from estuarine inundation including catchment flooding effects. At present, the effect of estuarine inundation during severe storm events is expected to be experienced for a short time only. Water levels will recede as the storms abate and public access will be restored. Because it is unlikely the community would want to access the estuary or foreshores during severe storms and floods, this is considered to be an issue of minor consequence at present. However, if estuarine flooding worsens as is predicted with sea level rise, there may be a point in the future where public access points are affected more severely and management action will be required to modify current access arrangements or provide alternatives.

The jetty located behind the Evans Head RSL Club poses a significant risk to public safety and requires attention. A ‘do nothing’ option is not considered to be appropriate when risks to public safety remain.

#### Boating and Navigation

The lower Evans River has significant shoaling and sand build-up and this is an ongoing issue for navigation through the bar. Dredging is a management option available to remove sediment build up and provide for safer navigation. Depending on the coastal recession management option(s) selected, there may be opportunities to combine dredging operations with beach nourishment which make dredging more attractive. However, it has been previously identified that sand supply from the Evans River dredging would not be sufficient to supply the required sand for beach nourishment. An appropriate sand supply outside of the active beach sediment budget is required to overcome the processes leading to shoreline recession.

Monitoring of bar conditions and issuing appropriate warnings to boaters is important in minimising safety risks particularly in times when the bar is not considered safe for crossing.

Navigation is also an issue in the upper reaches, however due to much greater demand for boating in the lower estuary, dredging the bar would take priority over any works in the upper estuary.



### Status of Existing Management

The following actions have been undertaken in relation to public access to the coastal zone:

- RVC has formalised a number of beach access tracks including the 4WD access off Terrace Street, the SLSC and Shark Bay access tracks and the viewing platform access between the SLSC and the training wall. A number of informal tracks still remain in the area and are a likely source of disturbance;
- Both the Estuary Management Plan (WBM, 2002), and the Evans Head Coastal Reserves PoM (GHD, 2010) contain strategies to close the jetty to the public, and either repair or replace the structure. This has not been undertaken to date;
- The 2002 Estuary Management Plan documented an action to create and maintain a more permanent navigable entrance. Since that time the bar has been dredged on a number of occasions, but sand builds up over time causing the problem to re-occur;
- The *Lower Evans River Dredge Feasibility Assessment* was completed in 2001 (WBM, 2001). The report assessed the proposal to dredge between Iron Gates and Elm Street Bridge and concluded that dredging was technically feasible but likely to incur high costs;
- A Review of Environmental Factors was completed for the dredging of the Evans River approach channel to the boat harbour prior to dredging in late 2011. Environmental impacts of the proposed dredging were not considered to be significant and activity was recommended to proceed;
- Dredging of boat harbour and lower estuary navigation channel was conducted most recently in 1994, 2004 and 2011. Due to coastal processes and sand supply from ocean, dredging is usually only a short-term solution with sand building up again in just a few months; and
- DPI-Crown Lands is responsible, under the NSW Government's Minor Ports and River Entrance Programs, for the management and maintenance of important coastal infrastructure (i.e. breakwaters, training walls and minor ports) located on Crown Land. Crown Lands have adopted a management approach which prioritises the 39 trained river entrances in NSW for dredging based on identified environmental, social and economic benefits. The Authority seeks applications from local government under its Waterways Program which involves direct management of the dredging project by the relevant local council and contributions of up to 50% of the total estimated cost being made from the Waterways Program. The program has a limited budget and projects are therefore approved according to merit on a state-wide basis.

### Recommendations for Management:

To complement the existing management actions, the following further work is recommended:

- Rationalisation of beach access tracks to decrease the number of informal tracks and focus effort on providing and maintaining high quality public access at key locations with minimal impact on coastal dunes;
- Review the risk of estuarine inundation on public access to the estuary and foreshores as part of the CZMP 10-year review;
- Repair or remove the jetty behind the Evans Head RSL Club;
- To maintain a permanent deep navigation channel at the mouth of the Evans River, it would be necessary to conduct dredging on a frequent basis. The high cost of dredging operations at the level of frequency required to maintain a deep channel is the main barrier to its on-going implementation. It is recommended that Council continue to apply for dredging funding under the Waterways Program, however it is unlikely that dredging operations will be approved for implementation at the

frequency required to maintain a safe, navigable entrance at all times. The focus for management is therefore the continuation of monitoring of bar conditions and the issuing of warnings and public notifications.

### 5.6.2 Amenity

Many of the issues discussed in other sections relate to amenity and actions to facilitate improved management of water quality, dune ecosystem health and public access will also improve amenity values. Management options for the Evans Head Reserve Stormwater Drain are discussed in Section 4.6.6.

### 5.6.3 Recreational Use

#### Status of Existing Management

The following actions have been undertaken in relation to recreational use of the coastal zone:

- An 8 knot speed limit and no wash zone were implemented for the Evans River estuary to limit bank erosion caused by boat wash. The speed limit also has positive impacts for the safety of recreational users and decreases the likelihood of conflicts between motorised craft and 'passive' users of the estuary. The rules are promoted through signage in the estuary and recorded on NSW Maritime boating maps. NSW Maritime enforces regulations through periodic boating patrols;
- A recreational fishing licence is required for the Evans River estuary. Size limit and maximum bag limits are set for different fish species. DPI-Fisheries officers' conduct patrols to enforce fishing rules;
- DPI Fisheries have been working closely with organisers of the Evans Head Fishing Classic for a number of years to promote responsible fishing practices to benefit the environment. The Classic has developed into one of the leading fishing competitions in Australia and provides significant social and economic benefits to the local community at Evans Head. A new working group has been set up in 2012 consisting of local commercial and recreational fishers and other relevant stakeholders was set up to discuss ongoing issues and provide a communication path between stakeholder groups. Management outcomes for the Classic include:
  - A catch and release requirement for all estuary based categories;
  - Half bag limits for all retained species;
  - A new 'snapper photo validation' section where anglers can be judged on a photo of their catch, allowing immediate release of fish;
  - *Responsible Fishing Guidelines for Classic Competitors* have been developed and issued to all participants;
  - DPI Fisheries provided a demonstration for participants on recommended fish handling techniques at the Classic's initial briefing;
  - DPI Fisheries will also be collecting recreational fishing catch information at the boat ramps during the 2012 Classic to monitor and improve management;
- A recreational fishing licence is required for persons wishing to collect pipis. A total bag limit of 50 pipis exists for recreational pipi gathering. Pipis are not to be taken from beyond 50m of the high tide mark;
- In June 2012, the Primary Industries minister announced the resumption of pipi harvesting throughout NSW. Harvesting is subject to a new minimum size limit of 45mm and a maximum daily limit of 40kgs;

- RVC joined the Beachwatch Partnership Program in 2006. Four swimming locations (three ocean beaches and one estuary site) are monitored for *Enterococci* on a weekly basis throughout the year; and
- The Richmond River CZMP contains an action to develop a strategic plan for estuary usage that covers the entire estuary (including the Evans River). The plan will assess many issues relevant to the Evans River including potential usage conflicts, public access to foreshores now and into the future, erosion, protection of estuarine habitats (e.g. seagrass) and the effect of sea level rise on estuary use.

### Recommendations for Management:

- DPI-Fisheries recommend that management of fish stocks for recreational and commercial fisheries is undertaken at a geographic scale beyond the scope of this CZMP. Reference is made to the Status of Fisheries Resources in NSW, which documents the exploitation status of each species.
- It is recommended that DPI continue to work with the Evans Head Fishing Classic organisers to ensure ongoing implementation of management measures and development of further measures to mitigate any adverse impacts on fish stocks.
- The Pied Oystercatcher Management Strategy (Department of Lands, 2007) contains a suite of actions to address issues related to declines in pipi numbers. This CZMP should support and promote the implementation of these actions.
- It is recommended that Beachwatch monitoring be continued at swimming sites.
- The Richmond River CZMP action to develop a strategic plan for estuary usage (including the Evans River) is supported by this CZMP.

### 5.6.4 Cultural Heritage

#### Status of Existing Management

The following actions have been undertaken in relation to cultural heritage:

- NPWS Aboriginal Heritage Information Management System (AHIMS) lists a total of thirty-seven aboriginal sites within the search area. However, consultation with Aboriginal stakeholders indicates that there is concern that there are additional sites in the area that have not been identified and mapped are therefore not afforded an adequate level of protection;
- Aboriginal sites and relics are protected under the *National Parks and Wildlife Act 1974*, and statutory responsibility for the sites and relics around the Evans River lies with OEH;
- A licence must be obtained from OEH prior to carrying out any proposed works in relation to known Aboriginal sites. An archaeological assessment should also be undertaken and a notification will need to be made to the native Title claimants under the *Native Title Act, 1993*;
- A number of known sites in and around the estuary including Gumma Garra, Goanna Headland, the Olive Gap and Razor Back Lookout are acknowledged as significant sites and management includes tracks and fencing to protect areas from damage and signage has been installed to provide information about the significance of sites;
- Dirawong Reserve is managed by a trust for the conservation of Aboriginal cultural heritage;
- Council is currently engaged in discussions with representatives of the Aboriginal community (RVC committee, LALCs) to prepare a memorandum of understanding required for a comprehensive Aboriginal Study and mapping of significant sites and items; and

- The Richmond River CZMP contains a Cultural Heritage Strategy for the Richmond River catchment including the Evans River. The strategy involves two main actions:
  - Identification and recording of cultural sites; and
- Development of Cultural Site Management Plans.

**Recommendations for Management:**

While the protection of Aboriginal cultural heritage sites is provided for under several pieces of State Government legislation, there is recognition that further work is required to identify, assess and register remaining sites within the Evans River catchment and along the Evans Head Coastline. The two key management actions identified in the Richmond River CZMP are considered appropriate to address the issues for the Evans River and Coastline.

It is recommended that the existing management options listed above continue with an emphasis on:

- OEH to continue to administer processes under the *National Parks and Wildlife Act 1974* for the protection of Aboriginal sites and relics. This includes the maintenance and updating of the AHIMs database as new sites or items are identified; archaeological assessments; and notifications required under the *Native Title Act, 1993*;
- Maintain existing sites, tracks, signage and fencing as appropriate at known sites and reserve areas; and
- Implement actions contained in the Richmond River CZMP to identify and register sites and develop Cultural Site Management Plans where considered necessary.

## 6. COMMUNITY AND STAKEHOLDER CONSULTATION

Community and stakeholder consultation has been undertaken throughout previous work relevant to this CZMP and during the development of this CZMP including:

- The 2002 Estuary Management Study and Plan (EMP) obtained information on community values, issues and concerns with regard to the Evans River;
- Consultation undertaken for the 2010 Coastal Reserves PoM included a committee meeting, media release, community newsletter, community survey and public display of the PoM;
- Consultation undertaken for the present study included:
  - Project webpage with background information, updates on project status, document downloads and contact information to provide input and feedback throughout the project;
  - Targeted stakeholder consultation with key stakeholder groups including an introductory letter/email notifying stakeholders of project commencement and requesting information and feedback on key issues affecting the study area;
  - Workshops with the CZMP Committee at key stages in the development of the CZMP;
  - Meetings with Aboriginal Stakeholder Groups (RVC Aboriginal Advisory Committee, Local Aboriginal Land Councils – Bogal, Ngulingah and Jali, and Native Title Claimants - Bandjalang People); and
  - Eight week public exhibition of the CZMP (Dec 2012- Feb 2013) including community 'drop-in' sessions held at Evans Head during public exhibition stage. The information sessions were an opportunity for the community to discuss the CZMP with the project team prior to making submissions.
  - Submissions received as part of the public exhibition were assessed by RVC and considered in producing the Final CZMP.

Consultation activities have been documented in Appendix 3.

## 7. MANAGEMENT OBJECTIVES

To ensure a balance between long-term utilisation and conservation of the Evans Head Coastline and Evans River Estuary, management objectives for the Coastal Zone Management Plan have been developed. The CZMP Objectives are consistent with the nine goals of the *NSW Coastal Policy 1997* but have been expanded and adapted to be relevant to the local area values to be protected. The management objectives for the CZMP for the Evans Head Coastline and Evans River Estuary are:

- O1. To protect and enhance ecological values;
- O2. To protect cultural heritage values;
- O3. To protect the visual amenity and character of the local area;
- O4. To maintain and improve public access and use;
- O5. To minimise and manage risk to public health and safety;
- O6. To minimise and manage risks to community assets;
- O7. To promote sustainable development;
- O8. To adequately plan for management of known future risks;
- O9. To provide efficient and effective management;
- O10. To maximise the likelihood of success of management strategies;
- O11. To minimise overall cost while achieving the goals of the CZMP; and
- O12. To ensure consistency with other strategic planning instruments and programs.

Table 9 shows the relationship of management objectives to the coastal policy goals and objectives set out in existing management plans.

Table 9: CZMP management objectives and relationship to goals of the *NSW Coastal Policy 1997*

Objective	Detailed description of objective	Goals of the <i>NSW Coastal Policy 1997</i>
O1 - To protect and enhance ecological values	<ul style="list-style-type: none"> <li>• Reduce pollution impacting the estuary and coastline</li> <li>• Maintain, rehabilitate and/or improve the riparian zone</li> <li>• Maintain, rehabilitate and/or improve the beach and dune system</li> <li>• Minimise adverse impacts on the natural beach and dune system</li> <li>• Enhance habitat values of the estuary and coast</li> </ul>	<p>1.To protect, rehabilitate and improve the natural environment;</p> <p>2.To recognise and accommodate natural processes and climate change;</p>
O2 - To protect cultural heritage values	<ul style="list-style-type: none"> <li>• To identify significant cultural heritage sites</li> <li>• To assess impacts on sites</li> <li>• To minimise impacts on sites</li> </ul>	<p>4.To protect and conserve cultural heritage;</p>
O3 - To protect the visual amenity and character of the local area	<ul style="list-style-type: none"> <li>• Preserve the natural beauty and unique character of Evans Head</li> <li>• Preserve iconic elements such as the Silver Sands Holiday Park, Evans Head SLSC, Commercial Fishing Fleet and Boat Harbour</li> <li>• Protect and improve water quality in the Evans River and ocean beaches</li> <li>• Protect flora and fauna species and habitat values to enhance nature watching activities around the estuary and coastline.</li> </ul>	<p>3. To protect and enhance the aesthetic qualities of the coastal zone;</p>
O4 - To maintain and improve public access and use	<ul style="list-style-type: none"> <li>• Ensure suitable access to foreshore and beaches is retained</li> <li>• Maintain/repair or relocate access that is impacted by coastal hazards</li> </ul>	<p>7. To provide for appropriate public access and use;</p>

**COASTAL ZONE MANAGEMENT PLAN: EVANS HEAD COASTLINE AND EVANS RIVER ESTUARY**

Objective	Detailed description of objective	Goals of the <i>NSW Coastal Policy 1997</i>
O5 - To minimise and manage risk to public health and safety	<ul style="list-style-type: none"> <li>• Set appropriate setbacks for infrastructure, access points and buildings from river bank and beach escarpments</li> <li>• Remove people from hazard areas (e.g. fence off hazardous erosion escarpment etc.)</li> <li>• Remove hazardous infrastructure</li> <li>• Support practical evacuation procedures</li> <li>• Provide information to community about safety risks</li> </ul>	<p>7. To provide for appropriate public access and use;</p> <p>3.To protect and enhance the aesthetic qualities of the coastal zone;</p>
O6 - To minimise and manage risks to community assets	<ul style="list-style-type: none"> <li>• Implement management strategies to avoid or address risks to community assets</li> <li>• Allow for ongoing use of community assets</li> </ul>	<p>7. To provide for appropriate public access and use;</p> <p>5.To promote ecologically sustainable development and use of resources;</p> <p>3.To protect and enhance the aesthetic qualities of the coastal zone;</p>
O7 - To promote sustainable development	<ul style="list-style-type: none"> <li>• Enhance recreational amenity</li> <li>• Preserve community uses (fishing, swimming, surfing, beach, estuary and foreshore use etc.)</li> <li>• Enhance social benefits (employment, sense of place, community)</li> <li>• Promote economic benefits for the community (tourism dollars, land value etc.)</li> </ul>	<p>5.To promote ecologically sustainable development and use of resources;</p> <p>6.To provide for ecologically sustainable human settlement;</p>
O8 - To adequately plan for management of known future risks	<ul style="list-style-type: none"> <li>• Have a long-term view when assessing the true costs and benefits of management responses (i.e. don't necessarily choose cheap options for quick fixes, if the cost is likely to be greater in the future.</li> </ul>	<p>2.To recognise and accommodate natural processes and climate change;</p>



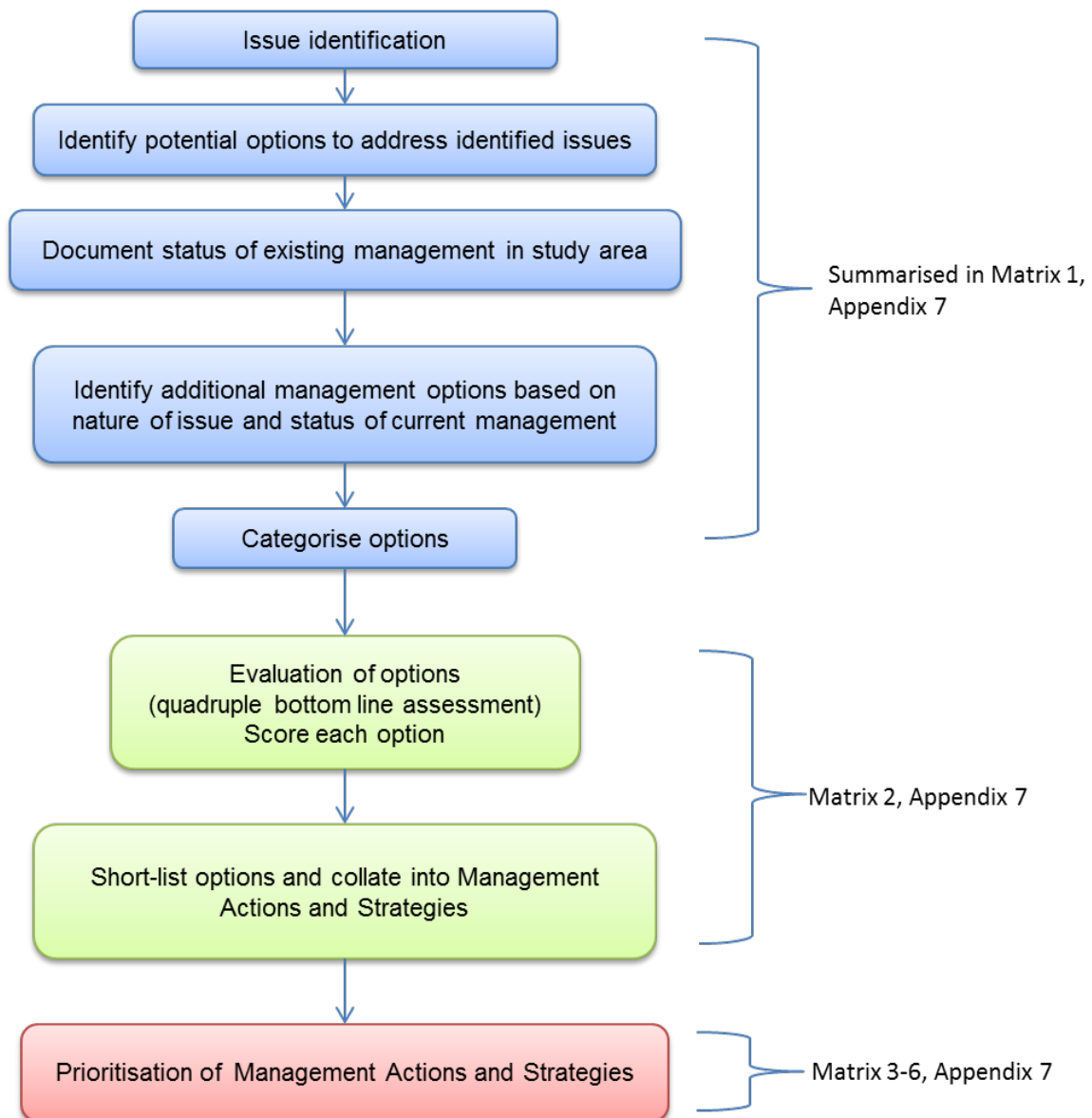
**COASTAL ZONE MANAGEMENT PLAN: EVANS HEAD COASTLINE AND EVANS RIVER ESTUARY**

Objective	Detailed description of objective	Goals of the <i>NSW Coastal Policy 1997</i>
O9 - To provide efficient and effective management	<ul style="list-style-type: none"> <li>• Timely management and governance</li> <li>• Conduct monitoring of management strategies to measure success and improve practice</li> <li>• Identify equitable funding sources for implementation of management</li> </ul>	<p>8.To provide information to enable effective management;</p> <p>9.To provide for integrated planning and management;</p>
O10 - To maximise the likelihood of success of management strategies	<ul style="list-style-type: none"> <li>• Undertake community education about issues, the need for management and the options assessment process</li> <li>• Enhance public awareness and support of adopted management strategies</li> <li>• Include community in decision making</li> </ul>	<p>8.To provide information to enable effective management;</p> <p>9.To provide for integrated planning and management;</p>
O11 - To minimise overall cost of management and ensure value for money	<ul style="list-style-type: none"> <li>• Minimise costs where possible while achieving aims of management (get the best 'bang for buck')</li> <li>• Ensure true costs are reflected in assessment of options (quick fix may be cheap but costs may be more in the long run)</li> </ul>	<p>none</p>
O12 - To ensure consistency with other strategic planning instruments and programs	<ul style="list-style-type: none"> <li>• To provide a consistent management framework that logically facilitates efficient and effective management</li> <li>• To ensure management is not duplicated from other planning instruments or programs, but supports and refers to other programs where appropriate</li> </ul>	<p>9.To provide for integrated planning and management;</p>

## 8. ASSESSMENT OF MANAGEMENT OPTIONS, ACTIONS AND STRATEGIES

### 8.1 Management Option Development and Evaluation

A range of management options are available to address the coastal and estuary issues identified by this CZMP. Potential management options have been discussed within Sections 3, 4 and 5 as they relate to the major issues for coastal risks, ecosystem health and community uses of the coastal zone. Certain actions were recommended based on the nature of the problem, its location and consideration of what work has already been undertaken. The range of management options were then categorised and evaluated using a quadruple bottom line assessment (i.e. considering environmental, social, economic and governance factors) to short-list management options. Short-listed options were then collated into management actions and strategies for implementation. Details of the options assessment process is provided in Appendix 7. Figure 18 provides an overview of the process to develop management options, actions and strategies.



**Figure 18: Overview of the development of management options, actions and strategies**

## 8.2 Prioritisation of Management Actions and Strategies

The list of management actions were evaluated and prioritised by considering a number of factors including:

- Cost of implementation;
- Effectiveness of each action in addressing the management objectives;
- Expected level of community support and acceptance of the action; and
- Environmental impacts (both positive and negative).

The total scores for each of these factors created a comparative score for each action. Management strategies were created by combining management actions into practical units for implementation. Priorities for the strategies were then assigned based on the average scores of actions making up that strategy.

Details of the assessment process are presented in Appendix 7. The outcome of the assessment is a priority ranking for each management action and strategy. Two strategies were considered to be essential to the implementation of the CZMP because of their over-arching influence on estuary values and the fact that most of the other strategies rely on their implementation. These were categorised as “Fundamental” strategies and were not assessed in the same way as the other actions and strategies. These were:

- Strategy 4: Monitoring, Evaluation and Review; and
- Strategy 10: Climate Change Adaptation.

Table 10 presents the Management Strategies ranked in order of comparative scores. The higher comparative scores the greater the benefit anticipated to the Evans Head Coastline and estuary. See Appendix 7 for a breakdown of all management action scores.

**Table 10: Combined strategy scores and priorities ranked by score**

Strategy	Score	Priority
Strategy 4: Monitoring, Evaluation and Review	n/a	Fundamental
Strategy 10: Climate Change	n/a	Fundamental
Strategy 1: Management of Coastal Erosion and Recession	16	High
Strategy 5: Agricultural Land Management	16	High
Strategy 9: Coastal Dune Management	16	High
Strategy 12: Recreation	16	High
Strategy 6: Urban Water Cycle Management	16	High
Strategy 7: Vegetation Management	15	High
Strategy 13: Cultural Heritage	15	High
Strategy 2: Management of Estuarine Inundation	15	High
Strategy 8: Shorebird Management	14	Medium
Strategy 11: Public Access	13	Medium
Strategy 3: Management of Bank Erosion	13	Medium

Priority rank	lower limit	higher limit
High	15	20
Medium	10	14
Low	0	9
Fundamental	Required for effective management	

## 9. MANAGEMENT STRATEGIES

The following tables summarise the components of the recommended management strategies. Each strategy contains:

- A brief introduction which provides an overview of the strategy development process;
- A table for each action making up the strategy. Where there is more than one action, a summary table is provided of the key details after the strategy introduction. Each action table includes:
  - Priority of management strategy;
  - Desired Outcome - the specific goal to be achieved by implementation of each action;
  - Lead Organisation – the body or bodies responsible for implementation of the action;
  - Support Organisation – provide assistance in the implementation and contribution of staff, resources and/or funding;
  - Cost Estimate – broad estimate of costs for implementation over the 10 year life of the plan. In some cases actions are implemented only in the first few years, and others are on-going actions, to be implemented continuously over the 10 years. Refer to Section 13 – Implementation Program for a breakdown of action costs.
  - Potential Funding – identified possible sources of funding from currently available grants and contributions although it is acknowledged that resources will change over the course of the plan and new sources of funding will need to be sought on a regular basis;
  - Timing – indicative timeframe for implementation;
  - Location – location of actions either estuary-wide or within specific areas;
  - Objectives – list of objectives developed in the CZMP relevant to the action;
  - Description of Tasks – an outline of the scope of works required; and
  - KPIs (Key Performance Indicators) – target(s) for each action which can be used to measure the level of success.

### 9.1 Management Actions

The Implementation Schedules (Section 9) include a list of actions or steps which have been developed to provide the desired outcomes for each of the management strategies.

Actions consist of a combination of studies, investigations and on-ground works. Generally, all strategies require some research or assessment prior to implementation of on-ground works. This is to ensure the appropriate effort, funding and geographical focus of on-ground works is undertaken.

Management strategies and actions have been developed for a ten year period. The CZMP and the progress of the management actions should be reviewed to ensure the actions remain relevant and the implementation of the plan is being achieved.

### 9.2 Responsibilities

Responsibilities for implementation of the management strategies have been assigned to Council or the relevant agency. In addition, support from various other local government and non-government organisations and groups, including industry bodies, private landholders and community groups, will be essential in the implementation of the plan.

The actions identify the Lead Organisation as well as Support Organisations which may be required and/or requested to assist in implementation of the action, either through their regulatory role or land management function or as a potential funding or information source.

### **9.3 Timeframe**

Based on the priorities developed in this CZMP, timeframes for management actions have been developed. The assumed start date for CZMP implementation is July 2013, following Council adoption of the Plan. The CZMP has a planning timeframe of 10 years, therefore the duration of the Plan implementation period is from July 2013 to June 2023. Strategies or actions that require additional funding as part of this CZMP are scheduled to commence on or after the 2015 financial year to allow for inclusion in Councils' budget. Actions with no additional budget requirements such as those that are part of existing activities can commence in the first year of implementation (2014 financial year). Management strategies in Sections 10, 11 and 12 have been scheduled according to the following timeframes:

- Immediate (Year 1);
- On-going: starting year 1 and implemented over the 10 year life of the CZMP with possible extension beyond that period;
- Short Term: year 1 – 3;
- Medium term: year 4 – 6; and
- Long term: year 7 – 10.

### **9.4 Funding**

The CZMP strategies are expected to be funded through Council and State Government contributions, grants and in-kind contributions. Identification of grants and successful application is an important component of this CZMP. Collaboration with universities may also provide opportunities for research projects. The responsible agency/ies have been identified for each strategy, together with potential funding sources. It is important to note that many grants and funding sources are only available up to a limited budget and as such, the available grants are changing from year to year. It will be necessary to keep abreast of current funding availability throughout the implementation of the CZMP.

Where actions are implemented through a concurrent program, additional expenditure and funding have not been included. This is the case for many relevant strategies referred for implementation to the Richmond River CZMP. Similarly, where a study/review is required to determine the appropriate level of expenditure, the cost of the review have been estimated in the action planning. Implementation costs should be confirmed by the results of the review. Cost estimates provided in the action descriptions are preliminary only and based on the best available information.

A summary of potentially relevant and available grant schemes is given in Appendix 9. In most cases it is expected that in-kind contributions will be provided from responsible Councils or agencies and this has been identified for each action.

### **9.5 Community Involvement**

On-going community involvement will be required to ensure successful implementation of the CZMP. This will include:

- Ongoing consultation with interested and committed community groups;
- A high degree of engagement and collaboration with landholders;
- On-ground participation in management actions, particularly local community groups such as Landcare and fishing groups;

- Consultation and collaboration with local Aboriginal representatives and groups; and
- Education programs.

Achievement of the management plan objectives is reliant on community understanding and effective involvement in the management process.

## **9.6 Measures of success of the CZMP**

Most of the management objectives defined in the CZMP are aspirational in that they are high level goals that may not be achievable within the life of this plan. However they remain as long-term desires held by the Evans Head estuary and coastline stakeholders. Continuous improvement towards these objectives across the full range of issues should be seen as the first measure of success.

Success of the CZMP will be indicated by the implementation of substantial measures to address the root cause of issues facing the estuary, as well as conclusive documentation of the effectiveness of such measures. Success of the CZMP will be gauged by:

- Stakeholder acceptance;
- Certification by the Minister for Environment;
- Adoption and gazettal of the plan by the Councils;
- Incorporation of the plan recommendations into business planning for the responsible agencies;
- Securing sufficient funds to implement these actions;
- Implementation of actions in an efficient and timely manner;
- Uptake of actions by stakeholders and others;
- Positive stakeholder feedback on improvements; and
- Measured improvements in estuary health such as improved water quality and reduction of frequency and severity of adverse environmental events such as fish kills.

Key Performance Indicators (KPIs) have been identified where appropriate for each management action to provide a target for achievement of the major steps in each action.

## 10. COASTAL RISK STRATEGIES

### 10.1 Strategy 1: Management of Coastal Erosion and Recession

Priority: High

**Table 11: Summary of coastal recession management actions**

<p><b>Objectives:</b></p> <p>O1 - To protect and enhance ecological values</p> <p>O2 - To protect cultural heritage values</p> <p>O3 - To protect the visual amenity and character of the local area</p> <p>O4 - To maintain and improve public access and use</p> <p>O5 - To minimise and manage risk to public health and safety</p> <p>O6 - To minimise and manage risks to community assets</p> <p>O7 - To promote sustainable development</p> <p>O8 - To adequately plan for management of known future risks</p> <p>O9 - To provide efficient and effective management</p> <p>O10 - To maximise the likelihood of success of management strategies</p> <p>O11 - To minimise overall cost of management and ensure value for money</p> <p>O12 - To ensure consistency with other strategic planning instruments and programs</p>				
<p><b>Issues addressed:</b></p> <ol style="list-style-type: none"> <li>1. Severe storms currently erode the dunes along the beach affecting beach access, public safety, visual amenity and dune flora and fauna.</li> <li>2. The Evans River estuary training walls are vital coastal infrastructure that are currently impacted during severe storms and this is predicted to be exacerbated into the future under sea level rise.</li> <li>3. Evans Head - Casino Surf Life Saving Club is at risk from coastal recession by 2050</li> <li>4. By 2100 the shoreline is projected to be landward of the eastern boundary of the Silver Sands Holiday Park.</li> <li>6. There is a risk of oceanic inundation if the current dune heights along the coast are not maintained. Areas seaward of Beech Street are of particular importance and if the dune was breached in this area, oceanic inundation could extend southwards into the low-lying Silver Sands Holiday Park.</li> </ol>				
Action (short name)	Total Cost Estimate (10 year)	Timing	Location	Lead Responsibility
Coastline recession monitoring	\$26,000	On-going	Main Beach and Airforce Beach	RVC
Preliminary feasibility assessment	\$150,000	Short-term (year 2)	Main Beach and Airforce Beach	RVC
Stakeholder preferences	\$50,000	Medium term (Year 3)	Community Wide	RVC
Implement the Emergency Action Subplan (EASP)	\$88,000	On-going	Main Beach and Airforce Beach	RVC

**Action 1a: Coastline recession monitoring**

<b>Desired Outcome</b>	Detailed knowledge of current status and trends in coastal recession in relation to threatened assets and hazard predictions
<b>Lead Organisation</b>	RVC
<b>Support Organisation</b>	OEH, DPI-Crown Lands
<b>Total Cost Estimate (10 year)</b>	\$32,000
<b>Additional Funding Required (10 year)</b>	\$2,000 RVC staff time (\$30,000 OEH existing commitment)
<b>Potential Funding</b>	OEH Coastal Management Program, RVC
<b>Timing</b>	On-going (every five years)
<b>Location</b>	Main Beach and Airforce Beach
<b>DESCRIPTION OF TASKS:</b>	
<p>To support future planning and development of a coastal risk management policy, accurate monitoring of the erosion scarp position in relation to the WorleyParsons (2012) hazard lines and infrastructure is required. OEH currently undertake aerial photography and photogrammetry analysis of the Evans Head Coastline every five years. It is recommended that this work continues ensuring the following considerations are included:</p> <ul style="list-style-type: none"> <li>• Accurate geo referencing of current and future aerial imagery for area of interest. This should include utilisation of standard reference points to ensure comparability between images;</li> <li>• Ground-truthing of current erosion scarp position relative to infrastructure and assets;</li> <li>• Further consideration of the risk of coastal inundation threat particularly in the vicinity of the Evans Head SLSC, the Silver Sands Holiday Park and seaward of Beech Street;</li> <li>• Depending on the selection of coastal recession management scenarios (as an outcome of Action 1b), modifications to coastal recession monitoring may be required;</li> <li>• Notification of the outcomes of the WorleyParsons (2012) hazard definition study to the community and ongoing monitoring actions;</li> <li>• Inclusion of statement of hazard in land title and rate notices; and</li> <li>• Reporting of coastline recession changes following monitoring activities (every five years).</li> </ul> <p>Costs of this action have been based on estimated costs of the current OEH monitoring (approx. \$15k every 5 years) and allowing RVC staff time to carry out public notifications in the first year of the CZMP.</p>	
<b>KPIs</b>	<ul style="list-style-type: none"> <li>• Erosion scarp monitoring program implemented by June 2015</li> <li>• Property owner notification by June 2014</li> </ul>



**Action 1b: Preliminary feasibility assessment of coastal recession management scenarios**

<b>Desired Outcome</b>	Determine preliminary feasibility of coastal recession scenarios to enable development of feasible options and facilitate community involvement
<b>Lead Organisation</b>	RVC
<b>Support Organisation</b>	OEH, DPI-Crown Lands
<b>Total Cost Estimate (10 year)</b>	\$150,000
<b>Additional Funding Required (10 year)</b>	\$150,000
<b>Potential Funding</b>	RVC
<b>Timing</b>	Short-term (year 2)
<b>Location</b>	Main Beach and Airforce Beach
<b>DESCRIPTION OF TASKS:</b>	
<p>To enable informed Council and community involvement in the planning and assessment of management scenarios, the range of considerations for each scenario need to be determined to a level that informs future planning and decision-making. This will include:</p> <ul style="list-style-type: none"> <li>• Development and preliminary evaluation of design options for planned retreat and coastal protection scenarios. The scenarios may be based on the preliminary examples provided in Sections 3.5.1 and 3.5.2, but expanded and modified according to feedback gained through public exhibition of this CZMP, and further site specific investigations;</li> <li>• Determine the environmental and social implications of each scenario as well as socio-economic factors;</li> <li>• Determine initial and on-going costs; and</li> <li>• Develop recommendations for future development of feasible/attractive scenarios.</li> </ul>	
<b>KPIs</b>	<ul style="list-style-type: none"> <li>• Concept development and technical assessment undertaken by June 2016</li> </ul>

**Action 1c: Determine community and stakeholder preferences**

<b>Desired Outcome</b>	Stakeholder awareness of coastal recession hazards and community feedback on most appropriate coastline management scenario
<b>Lead Organisation</b>	RVC
<b>Support Organisation</b>	OEH, DPI-Crown Lands
<b>Total Cost Estimate (10 year)</b>	\$50,000
<b>Additional Funding Required (10 year)</b>	\$50,000
<b>Potential Funding</b>	RVC
<b>Timing</b>	Medium-term (year 3)
<b>Location</b>	Main Beach and Airforce Beach
<b>DESCRIPTION OF TASKS:</b>	
Based on the outcomes of (Action 1b: Preliminary feasibility assessment of coastal recession management scenarios), develop and implement a consultation program to inform and obtain feedback from the community, affected property owners and public land managers. The aim is to evaluate stakeholder preferences for coastline recession management in terms of values, management outcomes, willingness-to-pay and trade-offs.	
<b>KPIs</b>	<ul style="list-style-type: none"> <li>Community preferences determined by December 2016</li> </ul>

**Action 1d: Implement the Emergency Action Subplan (EASP)**

<b>Desired Outcome</b>	Council responds to coastal erosion emergencies effectively and efficiently to minimise risk to public safety and property.
<b>Lead Organisation</b>	RVC
<b>Support Organisation</b>	SES, NSW Police, OEH
<b>Total Cost Estimate (10 year)</b>	\$88,000 (allowing for actions required prior to an emergency only)
<b>Additional Funding Required (10 year)</b>	\$88,000
<b>Potential Funding</b>	RVC, OEH
<b>Timing</b>	On-going (years 1-10)
<b>Location</b>	Main Beach and Airforce Beach
<b>DESCRIPTION OF TASKS:</b>	
<p>The EASP (Appendix 6 of this CZMP) describes the emergency response actions that Richmond Valley Council (RVC) will take when coastal erosion is imminent, occurring or has occurred. The key tasks include:</p> <p>Actions prior to an emergency:</p> <ul style="list-style-type: none"> <li>Appoint Coastal Emergency Response Team (CERT) including RVC Local Emergency Management Officer (LEMO), Manager Civil Operations, Manager Strategic Planning and other staff considered necessary to develop and implement effective responses;</li> <li>Develop risk assessment and reporting methodology and contact list;</li> </ul>	

<b>DESCRIPTION OF TASKS cont.:</b>	
<ul style="list-style-type: none"> <li>• On-going monitoring of coastal weather conditions, beach conditions and access points described in EASP;</li> <li>• Implement preparedness component of communication strategy;</li> <li>• Organise and maintain supplies of equipment (signage, barricades, fencing etc.) and plant necessary to implement closures;</li> <li>• Ensure planning approvals in place to allow for repair of access points;</li> <li>• Identify coastal/geotechnical engineer to provide advice in coastal erosion emergency;</li> <li>• Update RVC DISPLAN to ensure consistency with this EASP.</li> </ul> <p>Actions during an emergency:</p> <ul style="list-style-type: none"> <li>• Undertake field inspections and collect data on the extent of beach erosion. Complete risk assessment;</li> <li>• Liaise with Evans Head SLSC to monitor extent of erosion</li> <li>• CERT determines response strategy based on extent of erosion and access affected (closures, barricades, signage, repair access etc.)</li> <li>• Implement response component of communication strategy</li> <li>• Implement response strategy once erosion threat has abated and it is safe to conduct post-erosion activities.</li> <li>• Monitor progress of response strategy and report to CERT</li> </ul> <p>Actions after an emergency:</p> <ul style="list-style-type: none"> <li>• Monitor success of response strategy and report to CERT</li> <li>• Liaise with Evans Head SLSC to monitor extent of erosion and success of response strategy</li> <li>• Inspect condition of tracks, re-open tracks, remove barriers and signage and implement recovery component of communication strategy</li> <li>• Reporting of erosion event to CERT</li> <li>• Review and update EASP as required</li> </ul> <p>Costs allowed for this action only cover those actions required prior to an emergency (e.g. staff time to appoint responsibilities, develop risk assessments, update DISPLAN, and on-going monitoring, review and reporting). Costs associated with on-ground emergency works will be assessed on a case by case basis.</p>	<ul style="list-style-type: none"> <li>• EASP finalised and adopted by December 2013</li> <li>• Annual review and update of EASP</li> </ul>
<b>KPIs</b>	<ul style="list-style-type: none"> <li>• EASP finalised and adopted by December 2013</li> <li>• Annual review and update of EASP</li> </ul>

## 10.2 Strategy 2: Management of Estuarine Inundation

Priority: High

**Table 12: Summary of estuarine inundation management actions**

<p><b>Objectives:</b></p> <p>O1 - To protect and enhance ecological values</p> <p>O2 - To protect cultural heritage values</p> <p>O3 - To protect the visual amenity and character of the local area</p> <p>O4 - To maintain and improve public access and use</p> <p>O5 - To minimise and manage risk to public health and safety</p> <p>O6 - To minimise and manage risks to community assets</p> <p>O7 - To promote sustainable development</p> <p>O8 - To adequately plan for management of known future risks</p> <p>O9 - To provide efficient and effective management</p> <p>O10 - To maximise the likelihood of success of management strategies</p> <p>O11 - To minimise overall cost of management and ensure value for money</p> <p>O12 - To ensure consistency with other strategic planning instruments and programs</p>				
<p><b>Issues addressed:</b></p> <p>7. The north bank of Evans River including Silver Sands Holiday Park and southwards (east of Park Street) to McDonalds Place is currently at risk from estuarine inundation during severe storms including catchment flooding effects and this is predicted to be exacerbated into the future under sea level rise.</p> <p>8. The south bank of Evans River including the Boat Harbour and several lots on the southern side of Ocean Drive to the north-east and the south west of the boat harbour are currently at risk from estuarine inundation during severe storms including catchment flooding effects and this is predicted to be exacerbated into the future under sea level rise.</p> <p>9. By 2100, an additional 8 lots to the north-east of the Boat Harbour are also predicted to be inundated in a severe storm.</p>				
Action (short name)	Total Cost Estimate (10 year)	Timing	Location	Lead Responsibility
Inundation studies for Silver Sands Holiday Park	\$75,000	Short term (Year 2)	Lower estuary	RVC
Works planning for Silver Sands Holiday Park	\$100,000	Short term (Year 3)	Lower estuary	RVC
Address Ocean Drive inundation risks	\$4,800	On-going	Lower estuary	RVC

**Action 2a: Inundation studies for Silver Sands Holiday Park**

<b>Desired Outcome</b>	Improved understanding of likely inundation frequency, duration and depth of inundation for Silver Sands Holiday Park and adjoining low-lying areas.
<b>Lead Organisation</b>	DPI-Crown Lands
<b>Support Organisation</b>	RVC , OEH
<b>Total Cost Estimate (10 year)</b>	\$75,000
<b>Additional Funding Required (10 year)</b>	\$75,000
<b>Potential Funding</b>	OEH Estuary and Coastal Management Program, RVC, State Floodplain Management Program
<b>Timing</b>	Short-term (year 2)
<b>Location</b>	Lower estuary
<b>DESCRIPTION OF TASKS:</b>	
<p>Further develop the findings of WorleyParsons (2012) to refine inundation modelling for the Silver Sands Holiday Park:</p> <ul style="list-style-type: none"> <li>• Verify land elevation at critical points - utilise GPS ground survey to verify critical elevations (e.g. overflow points) derived from previous LiDAR surveys.</li> <li>• Refinement of inundation scenarios to separately identify the effects of oceanic influences from catchment flooding;</li> <li>• Detailed hydraulic modelling to more accurately determine water levels under key risk scenarios;</li> <li>• Inclusion of the effect of stormwater infrastructure; and</li> <li>• Reporting on the magnitude versus frequency (i.e. various ARIs) of the range of anticipated inundation events.</li> </ul> <p>This work could be investigated as part of the future Evans Head Flood Risk Management Study.</p> <p>Council in conjunction with Richmond River County Council have recently had grant funding approved to undertake flood modelling of the Evans River. The modelling builds upon the Richmond River modelling as the Evans River is a major flood bypass of the Richmond. This will provide baseline information for the inundation studies at Silver Sands Holiday Park.</p>	
<b>KPIs</b>	<ul style="list-style-type: none"> <li>• Study completed by June 2015</li> </ul>

**Action 2b: Works planning for Silver Sands Holiday Park**

<b>Desired Outcome</b>	Development of feasible concepts for achieving managing inundation within Silver Sands Holiday Park
<b>Lead Organisation</b>	DPI-Crown Lands
<b>Support Organisation</b>	RVC, OEH
<b>Total Cost Estimate (10 year)</b>	\$100,000
<b>Additional Funding Required (10 year)</b>	\$100,000
<b>Potential Funding</b>	DPI-Crown Lands
<b>Timing</b>	Short-term (year 3)
<b>Location</b>	Silver Sands Holiday Park
<b>DESCRIPTION OF TASKS:</b>	
<p>Concept design to be undertaken for works and/or actions required to address the current inundation risk in the immediate and long-term. This design work will be informed by the outcomes of Action 2a and will include:</p> <ul style="list-style-type: none"> <li>• An assessment of the feasibility of a levee and tide gates to prevent estuarine inundation in the short-medium term (0-20 years);</li> <li>• Consideration of stormwater drainage systems and potential inundation due to surcharge of the stormwater system during peak events;</li> <li>• Determination of volumes and works feasibility to raise affected land above 1 in 100 year ARI inundation levels in the short and long-term; and</li> <li>• Consideration of the long-term strategy in relation to coastline recession and implications for the north-eastern margin of the park.</li> </ul>	
<b>KPIs</b>	<ul style="list-style-type: none"> <li>• Inundation management concepts completed by June 2016</li> </ul>

**Action 2c: Address inundation risks for low-lying properties in the vicinity of Ocean Drive**

<b>Desired Outcome</b>	Ensure landholder knowledge of estuarine inundation risks and establish requirements for redevelopment of flood prone land.
<b>Lead Organisation</b>	RVC
<b>Support Organisation</b>	OEH, DPI-Crown Lands
<b>Total Cost Estimate (10 year)</b>	\$4,800 (Allowance for RVC staff time)
<b>Additional Funding Required (10 year)</b>	\$4,800
<b>Potential Funding</b>	N/A
<b>Timing</b>	On-going
<b>Location</b>	Ocean Drive properties in the vicinity of the Boat Harbour
<b>DESCRIPTION OF TASKS:</b>	
<p>Inform current and future landholders of potential inundation risks:</p> <ul style="list-style-type: none"> <li>• Formal notification of existing property holders and facility managers of the outcomes of the WorleyParsons (2012) Hazard Definition Study;</li> <li>• Inclusion of statement of flood risk on land title and rate notices;</li> <li>• Development controls to reflect flood liability and requirement for land raising for any re-development.</li> </ul>	
<b>KPIs</b>	<ul style="list-style-type: none"> <li>• Completed by June 2015</li> </ul>

### 10.3 Strategy 3: Management of Bank Erosion

Priority: Medium

Table 13: Summary of bank erosion management actions

<p><b>Objectives:</b></p> <p>O1 - To protect and enhance ecological values</p> <p>O2 - To protect cultural heritage values</p> <p>O3 - To protect the visual amenity and character of the local area</p> <p>O4 - To maintain and improve public access and use</p> <p>O5 - To minimise and manage risk to public health and safety</p> <p>O6 - To minimise and manage risks to community assets</p> <p>O7 - To promote sustainable development</p> <p>O8 - To adequately plan for management of known future risks</p> <p>O12 - To ensure consistency with other strategic planning instruments and programs</p>				
<p><b>Issues addressed:</b></p> <p>10. Bank erosion along the estuary places built and natural assets at risk in some locations. Increased estuary levels in future are predicted to increase the erosion.</p> <p>46. Beach erosion, coastal recession and bank erosion processes could potentially impact on cultural sites of significance. There is concern that there are sites that have not yet been identified and mapped and impacts are not fully known.</p>				
Action (short name)	Total Cost Estimate (10 year)	Timing	Location	Lead Responsibility
Kalimna Park to Shark Bay erosion works	\$1,500,000	Medium term (Year 2-5)	Lower Estuary	RVC
Foreshore Park bank erosion monitoring	\$7,300	Short term (Year 1-3)	Lower Estuary	RVC
Liaison with landholders regarding Doonbah bank erosion	\$1,400	Immediate	Mid-estuary	RVC



**Action 3a: Kalimna Park to Shark Bay erosion works**

<b>Desired Outcome</b>	Protect existing assets (footpath and road) from bank erosion
<b>Lead Organisation</b>	RVC
<b>Support Organisation</b>	OEH, DPI-Crown Lands, NRCMA
<b>Total Cost Estimate (10 year)</b>	\$1,500,000
<b>Additional Funding Required (10 year)</b>	\$1,328,000 (\$172,000 already funded from Dep't of Commerce)
<b>Potential Funding</b>	OEH Estuary Management Program, RVC, Department of Commerce
<b>Timing</b>	Medium term (years 2-5)
<b>Location</b>	From Kalimna Park, along Ocean Drive to just short of the Shark Bay car park entrance (approx. 450m)
<b>DESCRIPTION OF TASKS:</b>	
<p>RVC has assessed the erosion at this site and has plans in place to address the issues affecting public assets (refer RVC, 2012a for details):</p> <ul style="list-style-type: none"> <li>• Protect toe of embankment with Gabion wall up to 2.5m high as required;</li> <li>• Flatten slope by stripping, filling &amp; compacting;</li> <li>• Limit surface erosion with geofabric matting;</li> <li>• Enhance bank stability &amp; beautify with selected endemic native plantings;</li> <li>• Repair existing scours at uncontrolled stormwater discharge points;</li> <li>• Amalgamate six existing stormwater discharge points to two or three;</li> <li>• Install gabion basket energy dissipating drop structures at proposed discharge points;</li> </ul> <p>The total cost of planned works has been estimated by RVC to be \$1.5M. To date \$172k has been sourced from the Department of Commerce, leaving \$1.328M currently unfunded.</p> <p>Council's current plan of works is considered appropriate to address erosion issues. No additional works are recommended as part of this CZMP.</p>	
<b>KPIs</b>	<ul style="list-style-type: none"> <li>• RVC obtains funding and completes project by December 2018</li> </ul>

**Action 3b: Foreshore Park bank erosion monitoring**

<b>Desired Outcome</b>	Monitor bank erosion to confirm risk to natural and built assets
<b>Lead Organisation</b>	RVC
<b>Support Organisation</b>	OEH, DPI-Crown Lands, NRCMA
<b>Total Cost Estimate (10 year)</b>	\$7,300 (allowance for RVC staff time)
<b>Additional Funding Required (10 year)</b>	\$7,300
<b>Potential Funding</b>	RVC's current activities
<b>Timing</b>	Short term (year 1-3)
<b>Location</b>	Foreshore Park, Mangrove Road, Evans Head
<b>DESCRIPTION OF TASKS:</b>	
<p>It is recommended that this site is monitored for further erosion and risk to road (approx. 20m from erosion at present) and mature trees (several are currently undermined by erosion). Installation of a permanent benchmark will allow for accurate monitoring of the rate of erosion.</p> <p>If monitoring indicates continued erosion and risk to assets, major protection measures may be required including continuation of the rock revetment from adjacent sections.</p> <p>In the interim, controls for maintaining mature trees on the bank are to be investigated. Additional plantings may be required further upslope as a backup measure and to help stabilise the bank.</p>	
<b>KPIs</b>	<ul style="list-style-type: none"> <li>Review and reporting undertaken as part of SoE reporting – 2016.</li> </ul>

**Action 3c: Liaison with landholders regarding Doonbah bank erosion**

<b>Desired Outcome</b>	Notify affected landholders of bank erosion risk
<b>Lead Organisation</b>	RVC
<b>Support Organisation</b>	DPI-Crown Lands, OEH, private landholders, NRCMA
<b>Total Cost Estimate (10 year)</b>	\$1,400 (allowance for RVC staff time)
<b>Additional Funding Required (10 year)</b>	\$1,400
<b>Potential Funding</b>	RVC's current activities
<b>Timing</b>	Immediate (Year 1)
<b>Location</b>	High risk bank erosion sites identified by Bank Erosion Survey 2012
<b>DESCRIPTION OF TASKS:</b>	
<p>It is recommended that Council consult with landholders to inform them of results of the 2012 Bank Erosion Survey and assist with identification of management actions.</p>	
<b>KPIs</b>	<ul style="list-style-type: none"> <li>Contact landholders as soon as practical (by July 2013)</li> </ul>

## 11. COASTAL ECOSYSTEM HEALTH STRATEGIES

### 11.1 Strategy 4: Monitoring, Evaluation and Review

**Priority: Fundamental**

This strategy combines actions for ecosystem health monitoring, consultation regarding highway development, investigations to further develop the management strategies and ongoing review of the CZMP actions and the overall CZMP approach.

**Table 14: Summary of monitoring and evaluation actions**

<b>Monitoring and evaluation actions</b>
<p><b>Objectives:</b></p> <p>O1 - To protect and enhance the ecological values</p> <p>O3 - To protect the visual amenity and character of the local area</p> <p>O5 - To minimise and manage risk to public health and safety</p> <p>O7 - To promote sustainable development</p> <p>O8 - To adequately plan for management of known future risks</p> <p>O9 - To provide efficient and effective management</p> <p>O11 - To minimise overall cost of management and ensure value for money</p> <p>O12 - To ensure consistency with other strategic planning instruments and programs</p>
<p><b>Issues addressed:</b></p> <p>11. The NSW Monitoring Evaluation and Reporting (MER) program assessed the overall estuary health condition as “Moderate”. The Evans River is subject to poor water quality episodes including elevated levels of chlorophyll a and turbidity.</p> <p>12. The MER program found that tidal flows (low flushing capacity) is a “Very High” pressure on the Evans River. This characteristic exacerbates poor water quality in the upper estuary.</p> <p>13. The MER program found that sediment input is a “High” pressure on the Evans River. Elevated sediment levels are caused by highly turbid flood waters and bank erosion and are a key driver of water quality decline.</p> <p>14. The MER program found that nutrient input (TN) is a “High” pressure on the Evans River. Nutrient rich flood waters flowing from agricultural areas upstream of Tuckombil Weir and overflowing to the Evans River during flood are the major cause of elevated nutrients in the Evans River.</p> <p>15. The Woodburn Town Drain and drained upper agricultural areas of Brandy Arm Creek have been identified as sources of Acid Sulfate Soil runoff and deoxygenated water to the mid and upper estuary which contributes to poor water quality (low pH and low dissolved oxygen).</p> <p>16. Urban stormwater inputs can contribute pollutants to the estuary including gross pollutants, nutrients and sediments with impacts on ecosystem health, visual amenity and recreation.</p> <p>17. The Evans Head Boat Harbour has been identified as a potential source of water quality pollution due to the risk of spillage of petrochemicals, discharge from bilge tanks and antifouling of hulls.18. On-site Sewage Management Systems (OSSMs) at Riverside Retirement Village and rural areas have the potential to contribute pollutants to the estuary.</p> <p>20. There is a high risk of declared aquatic weeds (Alligator weed and Water lettuce) spreading from Rocky Mouth Creek to the Evans River, impacting on water quality.</p> <p>21. Riparian vegetation of the Evans River has pockets of degraded vegetation due to clearing, weed infestation and stock access to creek banks.</p>

**COASTAL ZONE MANAGEMENT PLAN: EVANS HEAD COASTLINE AND EVANS RIVER ESTUARY**

36. The stormwater drain and runoff discharging into the lower estuary reduce the amenity value of the area
44. While recreational water quality is generally of a very high standard at monitored swimming locations (ocean beaches and river); poor results are occasionally measured in response to rainfall, particularly in the Evans River (near revetment wall).

<b>Action (short name)</b>	<b>Total Cost Estimate (10 year)</b>	<b>Timing</b>	<b>Location</b>	<b>Lead Responsibility</b>
EcoHealth monitoring program	\$550,000	On-going (year 1-10)	Estuary-wide	Richmond River CZMP Implementation Committee
Contribute to planning for proposed Pacific Highway upgrade	\$2,400	Short-term (year 2-3)	Tuckombil Canal	RVC
Risk assessment of Boat Harbour operations	\$20,000	Short-term (year 2)	Boat Harbour	DPI-Crown Lands
Review of CZMP progress and monitoring of KPIs	\$2,800	Ongoing (every four years)	Estuary-wide	RVC
10 year review of CZMP	\$50,000	Long term (year 10)	Estuary-wide	RVC

**Action 4a: EcoHealth monitoring program**

<b>Desired Outcome</b>	Implementation of a coordinated catchment-wide monitoring program to monitor estuary health, measure the success of management actions and inform decision making in accordance with the NSW Natural Resources Monitoring, Evaluation and Reporting (MER) Strategy.
<b>Lead Organisation</b>	Richmond River CZMP Implementation Committee
<b>Support Organisation</b>	NRCMA, RVC, RRCC, OEH, DPI-Fisheries, DPI-Crown Lands
<b>Total Cost Estimate (10 year)</b>	\$550,000 (Evans Head proportion of Richmond River CZMP budget)
<b>Additional Funding Required (10 year)</b>	Nil (included in implementation schedule for the Richmond River CZMP)
<b>Potential Funding</b>	Richmond River CZMP current commitments
<b>Timing</b>	On-going (years 1-10)
<b>Location</b>	Estuary-wide
<b>DESCRIPTION OF TASKS:</b>	
<p>To meet the requirements of this CZMP, the Richmond River EcoHealth program (which includes the Evans River estuary) is recommended as appropriate providing the following items are considered:</p> <ul style="list-style-type: none"> <li>• Monitoring design (sites, indicators, and timing) should be specific to management issues identified in the CZMP (e.g. sources of acid runoff, stormwater input and effects of flood flows from the Richmond River), community concerns identified through consultation phases and actions implemented as part of the CZMP to address issues.</li> <li>• Measuring trends in water quality in areas affected by management efforts will be required to measure the success of actions and confirm issues or identify further management requirements. The catchment-wide approach of the EcoHealth program also offers a means to compare the effect of localised management on the health of the estuary as a whole and therefore assist in future management direction.</li> <li>• Establishment of the baseline ecosystem health status, considering all important health indicators and ongoing assessment of change against this baseline.</li> <li>• Assessment of known point sources such as the Woodburn Town Drain, Brandy Arm Creek and stormwater outlets will be important to track over time and in response to management effort to address issues.</li> <li>• The sampling regime should allow for assessment of average conditions and also capture high risk events for the estuary such as summer floods (particularly when Tuckombil Weir is overtopped by overflow from the Richmond River catchment).</li> <li>• Catchment-wide reporting will allow for an assessment of relative contributions of pollutants to the estuary and help to direct further management actions.</li> <li>• The program will need to be consistent with the NSW Natural Resources Monitoring, Evaluation and Reporting (MER) Strategy. However, it should be repeated more frequently than the current 2-year MER regime to capture the range of conditions.</li> <li>• Communication of the findings of the program to the wider community is a key requirement. It will be important to produce simple, easily understandable reports to inform the community about the health and specific needs of the estuary related to their local catchments and management efforts. Well-designed report cards offer a means to convey results in simple, visual terms and are easily distributed as single page leaflets or web downloads.</li> <li>• It is recommended that a review be undertaken annually to optimise and update the program.</li> </ul>	
<b>KPIs</b>	<ul style="list-style-type: none"> <li>○ Design of the Richmond River EcoHealth monitoring program (which includes Evans River study area) by March 2013.</li> <li>○ Program commenced by June 2013.</li> <li>○ Annual reports and community report cards prepared for each year of the program.</li> </ul>

**Action 4b: Contribute to planning for proposed Pacific Highway upgrade**

<b>Desired Outcome</b>	Ensure any impacts on the Evans River system have been adequately assessed and appropriate mitigation or compensatory measures have been proposed in keeping with the objectives of the CZMP
<b>Lead Organisation</b>	RVC
<b>Support Organisation</b>	RRCC, OEH, DPI-Fisheries, DPI-Crown Lands, NRCMA
<b>Total Cost Estimate (10 year)</b>	\$2,400 (allowance for RVC staff time)
<b>Additional Funding Required (10 year)</b>	\$2,400
<b>Potential Funding</b>	RVC's current activities
<b>Timing</b>	Short term (year 2-3) EIS is expected to be completed by 2014
<b>Location</b>	Tuckombil Canal
<b>DESCRIPTION OF TASKS:</b>	
<p>Review the EIS and the detailed design when it is available, to ensure any impacts on the Evans River system have been adequately assessed and appropriate mitigation or compensatory measures have been proposed in keeping with the objectives of the CZMP. There may be opportunities for complementary actions to be carried out with this CZMP including:</p> <ul style="list-style-type: none"> <li>• Modifications to drainage systems in the Woodburn Town Drain to minimise ASS impacts; and</li> <li>• Restoration of the riparian zone along Tuckombil Canal post-upgrade.</li> </ul>	
<b>KPIs</b>	<ul style="list-style-type: none"> <li>○ Review of EIS undertaken and submission from RVC submitted to RMS.</li> </ul>

**Action 4c: Risk assessment of Boat Harbour operations**

<b>Desired Outcome</b>	Assessment of the level of risk of Boat Harbour Operations to the health of the Evans River.
<b>Lead Organisation</b>	DPI-Crown Lands
<b>Support Organisation</b>	RVC, OEH, DPI-Fisheries, NSW Maritime
<b>Total Cost Estimate (10 year)</b>	\$20,000
<b>Additional Funding Required (10 year)</b>	\$20,000
<b>Potential Funding</b>	NSW Estuary Management Program, DPI-Crown Lands, RVC, NRCMA
<b>Timing</b>	Short term (year 2)
<b>Location</b>	Evans Head Boat Harbour
<b>Issues Addressed :</b>	16. The Evans Head Boat Harbour has been identified as a potential source of water quality pollution due to the risk of spillage of petrochemicals, discharge from bilge tanks and antifouling of hulls.
<b>DESCRIPTION OF TASKS:</b>	
<p>The Risk Assessment will involve the following tasks:</p> <ul style="list-style-type: none"> <li>• Conduct an audit of current management procedures in place at the Boat Harbour including: <ul style="list-style-type: none"> <li>○ Type of vessels and activities permitted;</li> <li>○ Refuelling facilities and procedures;</li> <li>○ Emergency spill response;</li> <li>○ Chemical storage;</li> <li>○ Bilge water management procedures; and</li> <li>○ Monitoring and reporting procedures.</li> </ul> </li> <li>• Based on results of the audit, determine an appropriate risk assessment methodology for current operations. Risks should tabulate relative likelihood of adverse impacts on the health of Evans River (based on review of practices) and the consequence of these impacts (based on the level of contamination due to potential incidents e.g. fuel spill and the sensitivity of the receiving environment).</li> <li>• Complete the risk assessment and document level of risk.</li> <li>• Where risks are regarded as significant, it will be necessary to develop management strategies to mitigate these risks. An environmental management plan for Boat Harbour operations may be developed to document management actions including: <ul style="list-style-type: none"> <li>○ Water quality management – discharge / bilge water controls, etc.;</li> <li>○ Emergency response plan (spill clean-up, contamination events etc.)</li> </ul> </li> </ul> <p>Complementary actions include:</p> <ul style="list-style-type: none"> <li>• Monitoring water quality and sediment contamination to confirm level of risk and help define management plan undertaken as part of boat harbour investigations or incorporated into the EcoHealth monitoring for the Evans Estuary.</li> </ul> <p>The budget cost estimate for this action is based on the completion of the site audit and risk assessment only. The need for an environmental management plan will be determined by the risk assessment and costs for this component and implementation of management actions will be determined at that stage. Based on similar projects in the local area, an estimate of \$20,000 has been allowed for the risk assessment.</p>	
<b>KPIs</b>	○ Risk Assessment completed by June 2015

**Action 4d: Review of CZMP progress and monitoring of KPIs**

<b>Desired Outcome</b>	Continuous improvement towards the CZMP objectives across the full range of issues
<b>Lead Organisation</b>	RVC
<b>Support Organisation</b>	RRCC, OEH, DPI-Fisheries, DPI-Crown Lands, NRCMA
<b>Total Cost Estimate (10 year)</b>	\$2,800 (allowance for RVC staff time)
<b>Additional Funding Required (10 year)</b>	Nil (included in Council State of Environment reporting)
<b>Potential Funding</b>	RVC's current activities
<b>Timing</b>	2016, 2020
<b>Location</b>	Estuary-wide
<b>DESCRIPTION OF TASKS:</b>	
<p>Success of the CZMP will be indicated by the implementation of substantial measures to address the issues facing the estuary and coastline. Conclusive documentation of the effectiveness of these measures is to be reported. KPIs have been identified where appropriate for each management action to provide a target for achievement of the major steps in each action. This task requires review and reporting of progress towards the KPIs as part of the Council State of the Environment (SoE) Reports (every 4 years).</p>	
<b>KPIs</b>	<ul style="list-style-type: none"> <li>○ Review and reporting undertaken as part of SoE reporting – 2016, 2020.</li> </ul>

**Action 4e: 10 year review of CZMP**

<b>Desired Outcome</b>	Management strategies remain appropriate for the long term
<b>Lead Organisation</b>	RVC
<b>Support Organisation</b>	RRCC, OEH, DPI-Fisheries, DPI-Crown Lands, NRCMA
<b>Total Cost Estimate (10 year)</b>	\$50,000
<b>Additional Funding Required (10 year)</b>	\$50,000
<b>Potential Funding</b>	NSW Estuary and Coastal Management Program, RVC
<b>Timing</b>	Long term (year 10)
<b>Location</b>	Estuary-wide
<b>DESCRIPTION OF TASKS:</b>	
<p>It is recommended that the CZMP and the specified management actions are reviewed to ensure they are being achieved and are resulting in the desired outcomes.</p> <p>A ten year review (or earlier if warranted by legislative or management changes or improved scientific understanding) of the CZMP is required to consider:</p> <ul style="list-style-type: none"> <li>• Results of the four-yearly KPI reviews;</li> <li>• Any barriers identified to the effective implementation of actions or overall success of actions;</li> <li>• Any new or updated scientific knowledge;</li> <li>• Data provided by the estuary monitoring program (Action 4a: EcoHealth monitoring program); and</li> <li>• Prevailing community attitudes, government policy, strategic planning and estuary management issues.</li> </ul>	
<b>KPIs</b>	<ul style="list-style-type: none"> <li>○ Review and reporting undertaken by year 10.</li> <li>○ Adoption and gazettal of the amended CZMP as required.</li> </ul>



## 11.2 Strategy 5: Agricultural Land Management

### Priority: High

This strategy combines management actions to address issues related to farm management and ASS Management.

**Table 15: Summary of agricultural land management actions**

<p><b>Objectives:</b></p> <p>O1 - To protect and enhance the ecological values</p> <p>O3 - To protect the visual amenity and character of the local area</p> <p>O5 - To minimise and manage risk to public health and safety</p> <p>O7 - To promote sustainable development</p> <p>O8 - To adequately plan for management of known future risks</p> <p>O9 - To provide efficient and effective management</p> <p>O10- To maximise the likelihood of success of management strategies</p> <p>O11 - To minimise overall cost of management and ensure value for money</p> <p>O12 - To ensure consistency with other strategic planning instruments and programs</p>				
<p><b>Issues addressed:</b></p> <p>10. Bank erosion along the estuary places built and natural assets at risk in some locations. Increased estuary levels in future are predicted to increase the erosion.</p> <p>11. The NSW Monitoring Evaluation and Reporting (MER) program assessed the overall estuary health condition as “Moderate”. The Evans River is subject to poor water quality episodes including elevated levels of chlorophyll a and turbidity.</p> <p>13. The MER program found that sediment input is a “High” pressure on the Evans River. Elevated sediment levels are caused by highly turbid flood waters and bank erosion and are a key driver of water quality decline.</p> <p>14. The MER program found that nutrient input (TN) is a “High” pressure on the Evans River. Nutrient rich flood waters flowing from agricultural areas upstream of Tuckombil Weir and overflowing to the Evans River during flood are the major cause of elevated nutrients in the Evans River.</p> <p>15. The Woodburn Town Drain and drained upper agricultural areas of Brandy Arm Creek have been identified as sources of Acid Sulfate Soil runoff and deoxygenated water to the mid and upper estuary which contributes to poor water quality (low pH and low dissolved oxygen).</p> <p>21. Riparian vegetation of the Evans River has pockets of degraded vegetation due to clearing, weed infestation and stock access to creek banks.</p>				
Action (short name)	Total Cost Estimate (10 year)	Timing	Location	Lead Responsibility
Maintenance of 2010 stock fencing work	\$25,000	On-going (every 2 years)	Estuary-wide	RVC
Acid Sulfate Soil management	\$271,700	On-going (years 1-10)	Estuary-wide	Richmond River CZMP Implementation Committee

**Action 5a: Maintenance of 2010 stock fencing work**

<b>Desired Outcome</b>	Maintain stock fencing work carried out in 2010
<b>Lead Organisation</b>	RVC
<b>Support Organisation</b>	OEH, Private landholders, NRCMA
<b>Total Cost Estimate (10 year)</b>	\$25,000
<b>Additional Funding Required (10 year)</b>	\$25,000
<b>Potential Funding</b>	NSW Estuary Management Program, RVC
<b>Timing</b>	On-going (Every 2 years) start 2015
<b>Location</b>	Estuary-wide
<b>DESCRIPTION OF TASKS:</b>	
<ul style="list-style-type: none"> <li>Assess condition of stock fencing and off-stream water supplies installed as part of Council and DECC Grants in 2010. This can either be achieved through self-assessment by landholders or Council staff conducting the site assessment with landholders.</li> <li>It will be necessary to document the location and nature of repairs required so that funding can be sourced. It is recommended that follow-up inspections are carried out as soon as practical after adoption of the CZMP and then at 2-year intervals.</li> <li>Undertake maintenance of fencing and off-stream water supplies as required following site assessments.</li> </ul> <p>For the purposes of this CZMP, maintenance costs (incurred every two years) were estimated as 10% of fencing installation costs (\$5,000 per maintenance visit).</p>	
<b>KPIs</b>	<ul style="list-style-type: none"> <li>Fencing site assessment completed by March 2016, March 2018, March 2020, and March 2022.</li> <li>Maintenance carried out as required by June 2016, June 2018, June 2020 and June 2022.</li> </ul>

**Action 5b: Acid Sulfate Soil management**

<b>Desired Outcome</b>	Reduce water quality impacts due to ASS issues in Woodburn Town Drain and Brandy Arm Creek
<b>Lead Organisation</b>	Richmond River CZMP Implementation Committee
<b>Support Organisation</b>	RVC, RRCC, OEH, DPI-Fisheries, DPI-Crown Lands, NRCMA
<b>Total Cost Estimate (10 year)</b>	\$271,700 (Evans Head proportion of Richmond River CZMP budget)
<b>Additional Funding Required (10 year)</b>	Nil (included in implementation schedule for the Richmond River CZMP)
<b>Potential Funding</b>	Richmond River CZMP current commitments
<b>Timing</b>	On-going (Year 1-10)
<b>Location</b>	Priority sites are Woodburn Town Drain and Brandy Arm Creek
<b>DESCRIPTION OF TASKS:</b>	
<p>Support implementation of the Richmond River CZMP specifically:</p> <ul style="list-style-type: none"> <li>• Floodplain Infrastructure Management strategy: <ul style="list-style-type: none"> <li>○ Identify, prioritise and optimise drains and levees.</li> <li>○ Review floodgate management protocols.</li> </ul> </li> <li>• Farm Management strategy; <ul style="list-style-type: none"> <li>○ Scientific investigations: strategies for retention of water on backswamp areas.</li> </ul> </li> </ul> <p>Keep track of developments associated with the planned Pacific Highway upgrade as the currently proposed route traverses the Woodburn Town Drain catchment and there may be opportunities for complementary actions associated with the upgrade, or potential to direct compensatory measures into addressing ASS issues at this site (refer Action 4b: Contribute to planning for proposed Pacific Highway upgrade).</p>	
<b>KPIs</b>	<ul style="list-style-type: none"> <li>○ Woodburn Town Drain and Brandy Arm Creek considered in Richmond River Drain and Levee Prioritisation Study to be completed by June 2013 (Richmond River CZMP timeframe).</li> <li>○ <i>Woodburn Town Drain Floodgate Trial Management Plan</i> reviewed and recommendations provided as part of Richmond River CZMP Actions by June 2013 (Richmond River CZMP timeframe).</li> <li>○ Richmond River Scientific Investigation report completed by December 2015 (Richmond River CZMP timeframe).</li> </ul>

### 11.3 Strategy 6: Urban Water Cycle Management

**Priority: High**

This strategy combines management actions to address issues related to stormwater and on-site sewage management systems.

**Table 16: Summary of urban water cycle management actions**

<p><b>Objectives:</b></p> <p>O1 - To protect and enhance the ecological values</p> <p>O3 - To protect the visual amenity and character of the local area</p> <p>O5 - To minimise and manage risk to public health and safety</p> <p>O7 - To promote sustainable development</p> <p>O8 - To adequately plan for management of known future risks</p> <p>O9 - To provide efficient and effective management</p> <p>O11 - To minimise overall cost of management and ensure value for money</p> <p>O12 - To ensure consistency with other strategic planning instruments and programs</p>				
<p><b>Issues addressed:</b></p> <p>10. The NSW Monitoring Evaluation and Reporting (MER) program assessed the overall estuary health condition as “Moderate”. The Evans River is subject to poor water quality episodes including elevated levels of chlorophyll a and turbidity.</p> <p>15. Urban stormwater inputs can contribute pollutants to the estuary including gross pollutants, nutrients and sediments with impacts on ecosystem health, visual amenity and recreation.</p> <p>18. On-site Sewage Management Systems (OSSMs) at Riverside Retirement Village and rural areas have the potential to contribute pollutants to the estuary.</p> <p>35. The stormwater drain and runoff discharging into the lower estuary reduce the amenity value of the area.</p>				
Action (short name)	Total Cost Estimate (10 year)	Timing	Location	Lead Responsibility
Stormwater management	\$707,100	Ongoing (year 1-10)	Estuary-wide	RVC
Feasibility study stormwater drain improvements	\$30,000	Short term (year 2)	Evans Head	RVC
OSSM on-going inspections and improvements	\$112,200	Ongoing (year 1-10)	Estuary-wide	RVC

**Action 6a: Stormwater management**

<b>Desired Outcome</b>	On-going improvements in urban design resulting in reduction of contaminants transported to the estuary
<b>Lead Organisation</b>	RVC
<b>Support Organisation</b>	NSW Planning
<b>Total Cost Estimate (10 year)</b>	\$707,100
<b>Additional Funding Required (10 year)</b>	Nil (included in RVC's current activities)
<b>Potential Funding</b>	Stormwater management levy, Council rebate programs, developer contributions, property owner contributions
<b>Timing</b>	Ongoing (Year 1-10)
<b>Location</b>	Estuary-wide
<b>DESCRIPTION OF TASKS:</b>	
<p>It is recommended that the management of urban runoff continue to occur outside the CZMP process as a core responsibility of Council. This includes:</p> <ul style="list-style-type: none"> <li>• On-going review and update of the stormwater management plan;</li> <li>• On-going review and update of Development Control Plans and development guidelines;</li> <li>• Community education</li> <li>• Incorporating water sensitive urban design in new developments;</li> <li>• Retrofitting stormwater/water quality controls to existing urban developments; and</li> <li>• The State Government BASIX program;</li> </ul> <p>A key component of any stormwater management program is education on the impacts of urban runoff and potential improvements. It is recommended that this be incorporated into existing Council programs as well as shire-wide community education programs.</p>	
<b>KPIs</b>	<ul style="list-style-type: none"> <li>○ Stormwater Management Plan is reviewed every 3 years.</li> </ul>

**Action 6b: Feasibility study of stormwater drainage improvements at Evans Head Reserve Drain**

<b>Desired Outcome</b>	Select best option to improve stormwater quality and amenity value
<b>Lead Organisation</b>	RVC, DPI-Crown Lands
<b>Support Organisation</b>	OEH
<b>Total Cost Estimate (10 year)</b>	\$30,000
<b>Additional Funding Required (10 year)</b>	\$30,000
<b>Potential Funding</b>	NSW Estuary Management Program, Urban Sustainability Program, RVC, State Floodplain Management Program
<b>Timing</b>	Short term (year 2)
<b>Location</b>	Lower Estuary
<b>DESCRIPTION OF TASKS:</b>	
<p>Conduct a feasibility study into options to improve the appearance and treatment performance of the Evans Head Reserve Drain and the quality of stormwater discharging to the estuary. The feasibility assessment should consider:</p> <ul style="list-style-type: none"> <li>• Do nothing option and associated costs and benefits.</li> <li>• Source controls including education of residents and particularly visitors using the Silver Sands Holiday Park to minimise sources of pollution. Provision of pet dropping bags and bins to encourage collection and disposal could also be considered.</li> <li>• End of pipe treatments within the drainage line itself. Works to retrofit or modify the open, concrete-lined channel to improve the look of the structure and to further remove sediment and pollutants. Options should include principles of WSUD and the range of current SQIDs available.</li> <li>• Redirection of stormwater to discharge to a less visible location (i.e. ocean discharge). While the feasibility assessment should include this alternative in assessment of all options it is acknowledged that this option is likely to have high costs, potential environmental impacts and high level of technical difficulty.</li> <li>• Complementary options including education about discolouration of water due to natural tannin-staining from Melaleuca swamp areas could assist in improving public perception of this issue.</li> <li>• The potential impact of any proposed solutions on environmental, social and economic factors existing at the location. The impact on flooding due to proposed changes, and consideration of climate change scenarios are also of high importance when assessing options.</li> <li>• Cost estimation including planning and approvals, construction and on-going maintenance costs.</li> <li>• Identification of a funding source for implementation; and</li> <li>• Ongoing consultation with Silver Sands Holiday Park Managers regarding proposed plans.</li> </ul> <p>The budget cost estimate for this action is based on the completion of the feasibility study only. The implementation budget required is to be estimated as part of the feasibility study. Based on similar projects in the local area, and the budget allowed in the 2007 SWMP, an estimate of \$30,000 has been allowed for the feasibility assessment.</p>	
<b>KPIs</b>	○ Feasibility assessment completed December 2015

**Action 6c: On-going on-site sewerage system inspections and improvements**

<b>Desired Outcome</b>	Improvements in the performance of on-site sewerage management systems resulting in reduction of contaminants transported to the estuary
<b>Lead Organisation</b>	RVC
<b>Support Organisation</b>	EPA
<b>Total Cost Estimate (10 year)</b>	\$112,200
<b>Additional Funding Required (10 year)</b>	Nil (included in RVC's current activities)
<b>Potential Funding</b>	Council environmental health services and sewerage service budgets
<b>Timing</b>	On-going
<b>Location</b>	Estuary-wide
<b>DESCRIPTION OF TASKS:</b>	
Council undertakes on-site sewage and wastewater management programs including specification of design requirements and audit and inspection of on-site systems. It is recommended that adequate funding be allocated to these programs as part of the Council environmental health service budgets.	
<b>KPIs</b>	<ul style="list-style-type: none"> <li>○ OSSM Strategy is fully implemented.</li> </ul>

## 11.4 Strategy 7: Vegetation Management

### Priority: High

This vegetation management strategy combines management actions to address issues related to riparian vegetation and aquatic weed management.

**Table 17: Summary of vegetation management actions**

<b>Objectives:</b>				
O1 - To protect and enhance the ecological values				
O3 - To protect the visual amenity and character of the local area				
O7 - To promote sustainable development				
O8 - To adequately plan for management of known future risks				
O9 - To provide efficient and effective management				
O10 - To maximise the likelihood of success of management strategies				
O11 - To minimise overall cost of management and ensure value for money				
O12 - To ensure consistency with other strategic planning instruments and programs				
<b>Issues addressed:</b>				
20. There is a high risk of declared aquatic weeds (Alligator weed and Water lettuce) spreading from Rocky Mouth Creek to the Evans River, impacting on water quality.				
21. Riparian vegetation of the Evans River has pockets of degraded vegetation due to clearing, weed infestation and stock access to creek banks.				
10. Bank erosion along the estuary places built and natural assets at risk in some locations. Increased estuary levels in future are predicted to increase the erosion.				
11. The NSW Monitoring Evaluation and Reporting (MER) program assessed the overall estuary health condition as "Moderate". The Evans River is subject to poor water quality episodes including elevated levels of chlorophyll a and turbidity.				
Action (short name)	Total Cost Estimate (10 year)	Timing	Location	Lead Responsibility
Maintenance of 2010 riparian restoration sites	\$130,000	Short to medium term(year 2-6)	Estuary-wide	RVC
Promotion and support of further riparian restoration works	\$2,800	On-going (year 1-10)	Estuary-wide	RVC
Aquatic weed management	\$83,300	On-going (year 1-10)	Estuary-wide	FNCW, RRCC



**Action 7a: Maintenance of 2010 riparian restoration sites**

<b>Desired Outcome</b>	Improved condition of riparian vegetation and maximised success of previous effort
<b>Lead Organisation</b>	RVC
<b>Support Organisation</b>	NRCMA, OEH, DPI-Crown Lands
<b>Total Cost Estimate (10 year)</b>	\$130,000
<b>Additional Funding Required (10 year)</b>	\$130,000
<b>Potential Funding</b>	NSW Estuary Management Program, RVC
<b>Timing</b>	Short to medium term (2-6)
<b>Location</b>	Estuary-wide (restoration sites initiated in 2010)
<b>DESCRIPTION OF TASKS:</b>	
<p>Maintenance of riparian restoration and weed management sites initiated in 2010 - activities will depend on site specific factors but are likely to include weed management, repair of tree guards and fencing, supplementary planting to replace plants that didn't survive, and collecting and broadcasting seed. Tasks include:</p> <ul style="list-style-type: none"> <li>• Initial inspection of sites to scope maintenance work and to confirm costs. This should be completed by an experienced bush regenerator.</li> <li>• Maintenance to be carried out as a series of visits over a number of years until vegetation is sufficiently established. Depending on the condition of sites assessed during the initial site inspection, a 2 year general maintenance program with 3 visits in the first year and 2 in the following year may be necessary.</li> <li>• After completion of the 2 year general maintenance period, follow up site inspections and subsequent maintenance should be conducted until vegetation communities are sufficiently established. The frequency of inspections and maintenance will depend on how well vegetation is established.</li> </ul> <p>The cost of maintenance works will be confirmed after the initial site visit, but assuming the condition of sites is poor, a similar expenditure will be required to the 2010 works which equates to approximately \$55k in 2014, to be incurred over 3 maintenance visits in the first year. In the second year, required maintenance should be reduced and \$28k has been allowed for the 2 visits in the second year. For years 3 to 5, an annual budget of \$14k has been estimated for follow up inspections, weed management and maintenance. \$5k has been allowed for the initial site inspection and report.</p>	
<b>KPIs</b>	<ul style="list-style-type: none"> <li>○ Initial site inspection by December 2014</li> <li>○ Three maintenance visits completed by December 2015</li> <li>○ Two maintenance visits completed between December 2015 and December 2016</li> <li>○ Annual maintenance visits completed by December 2017 and 2019</li> </ul>

**Action 7b: Promotion and support of further riparian restoration works**

<b>Desired Outcome</b>	Raise awareness about importance of riparian zones and engage landholders and broader community in riparian restoration projects.
<b>Lead Organisation</b>	RVC
<b>Support Organisation</b>	OEH, NRCMA, Richmond River CZMP Committee, DPI-Crown Lands, Landcare
<b>Total Cost Estimate (10 year)</b>	\$2,800 (allowance for RVC staff time)
<b>Additional Funding Required (10 year)</b>	\$2,800
<b>Potential Funding</b>	RVC's current activities
<b>Timing</b>	On-going (year 1-10)
<b>Location</b>	Estuary-wide (riparian zone)
<b>DESCRIPTION OF TASKS:</b>	
<ul style="list-style-type: none"> <li>• Coordinate and support current investigations recommended as part of the Richmond River CZMP to prioritise riparian rehabilitation areas.</li> <li>• Promote riparian restoration project sites through Council's website and local media to raise community awareness about the value of riparian zones and the work underway.</li> <li>• Support local Landcare groups to continue work in coastal and river areas (i.e. provide funding, equipment etc.).</li> </ul> <p>Repeating the request for expressions of interest from landholders with river frontage could be a worthwhile exercise to promote the benefits of restoration and identify potential new sites. A cycle of every 5 years may be appropriate to gauge interest. Costs of additional restoration or fencing works have not been included. On receipt of nominations by interested parties, these costs can be estimated.</p> <p>Keep track of developments associated with the planned Pacific Highway upgrade as the currently proposed route traverses the Tuckombil Canal which is one area noticeably devoid of riparian vegetation at present. There may be opportunities for riparian restoration in coordination with site remediation work post-construction. This will be a highly visible stretch of the river and could present an excellent demonstration site for riparian restoration work (Action 4b: Contribute to planning for proposed Pacific Highway upgrade).</p>	
<b>KPIs</b>	<ul style="list-style-type: none"> <li>○ Review and reporting undertaken as part of SoE reporting – 2016, 2020.</li> </ul>

**Action 7c: Aquatic weed management**

<b>Desired Outcome</b>	Provide for holistic approach to aquatic weed management through improvements in catchment management (minimise nutrient export, manage flows, etc.) and also control aquatic weed outbreaks as they occur
<b>Lead Organisation</b>	FNCW, RRCC (depending on location and nature of outbreak)
<b>Support Organisation</b>	RVC, RRCC, OEH, DPI-Fisheries, DPI-Crown Lands, NRCMA
<b>Total Cost Estimate (10 year)</b>	\$83,300 (Evans Head proportion of Richmond River CZMP budget)
<b>Additional Funding Required (10 year)</b>	Nil (included in implementation schedule for the Richmond River CZMP)
<b>Potential Funding</b>	Richmond River CZMP current commitments
<b>Timing</b>	On-going (year 1-10)
<b>Location</b>	Upper Estuary (Tuckombil Canal) and upstream (Rocky Mouth Creek)
<b>DESCRIPTION OF TASKS:</b>	
<p>Aquatic weed control is currently undertaken by RRCC in association with Far North Coast Weeds in the Richmond River catchment. RRCC carry out works as part of routine drain maintenance activities and also in response to landholder requests, and management of aquatic weeds is also required from time to time in areas of the estuary not associated with drainage infrastructure. Continued management of aquatic weeds is required to maintain flows, minimise visual amenity and environmental considerations such as water quality impacts.</p> <p>The following actions recommended in the Richmond River CZMP are supported by this Plan:</p> <ul style="list-style-type: none"> <li>• Agricultural land management;</li> <li>• Vegetation Management;</li> <li>• RRCC drain maintenance activities and ongoing review;</li> </ul> <p>It is recommended that EcoHealth monitoring for the Evans River incorporate observations of any aquatic weeds outbreaks in the estuary (Action 4a: EcoHealth monitoring program).</p>	
<b>KPIs</b>	<ul style="list-style-type: none"> <li>○ Review and reporting undertaken as part of SoE reporting – 2016, 2020.</li> </ul>

## 11.5 Strategy 8: Shorebird Management

Priority: Medium

### Action 8a: Shorebird management

<b>Desired Outcome</b>	Minimise the negative impacts on threatened shorebirds inhabiting the estuary and coastal beaches and ensure their continued survival.
<b>Lead Organisation</b>	DPI-Crown Lands, RVC
<b>Support Organisation</b>	NPWS, OEH, NRCMA
<b>Total Cost Estimate (10 year)</b>	Not estimated – considered to be within RVC's, DPI-Crown Lands and NPWS current activities. No information available on current expenditure.
<b>Additional Funding Required (10 year)</b>	Not estimated
<b>Potential Funding</b>	NPWS
<b>Timing</b>	On-going (Year 1-10)
<b>Location</b>	Evans River lower estuary and Airforce Beach
<b>Objectives:</b>	<p>O1 - To protect and enhance the ecological values</p> <p>O3 - To protect the visual amenity and character of the local area</p> <p>O10 - To maximise the likelihood of success of management strategies</p> <p>O11 - To minimise overall cost of management and ensure value for money</p> <p>O12 - To ensure consistency with other strategic planning instruments and programs</p>
<b>Issues Addressed :</b>	<p>27. There is the potential for disturbance of shorebirds and/or shorebird habitat from boats, vehicles, pedestrians and dogs accessing the beach and estuary in the vicinity of nesting areas.</p> <p>25. Coastal weeds (e.g. Bitou Bush) are encroaching on the Crown Reserve east of Beech Street and west of Broadwater Evans Head Road.</p> <p>26. Pest fauna species have been identified in coastal areas and along the riparian zone of the estuary (cane toad, foxes and cats) and have potential to impact ecosystem health through predation and out-competing native species for food and habitat resources.</p>
<b>DESCRIPTION OF TASKS:</b>	
<p>Consider further management actions outlined in the <i>Threatened Species (Pied Oyster Catcher) Management Strategy</i> (DOL, 2007) as relevant to Evans Head coastline and Evans River estuary including:</p> <ul style="list-style-type: none"> <li>• Fox baiting programs on both public and private lands;</li> <li>• Raising community awareness and involvement in the protection of the Pied Oyster Catcher and other shorebirds.</li> <li>• Improved management of 4WD vehicles and horse riding on beaches (could involve permit system similar to that in place at Seven Mile Beach in Lennox Head);</li> <li>• Rationalisation of beach access tracks (refer Strategy 11: Public Access); and</li> <li>• Scientific research is encouraged into sustainable visitor use and the ecology of pipis as a food source for Pied Oystercatchers.</li> <li>• Consultation with OEH Threatened Species Unit regarding on-going shorebird protection activities.</li> <li>• Implement the EASP as needed to respond to coastal erosion events, maintain dune heights etc.</li> </ul>	
<b>KPIs</b>	<ul style="list-style-type: none"> <li>○ Evaluation of effectiveness of existing strategy as part of SoE reporting – 2016, 2020.</li> </ul>

## 11.6 Strategy 9: Coastal Dune Management

Priority: High

### Action 9a: Dune management

<b>Desired Outcome</b>	Enhance the environmental, cultural and social values of coastal ecosystems and improve resilience of coastal dunes to provide coastal erosion protection
<b>Lead Organisation</b>	DPI-Crown Lands, RVC
<b>Support Organisation</b>	OEH, Evans Head Landcare Group, NRCMA
<b>Total Cost Estimate (10 year)</b>	\$50,000
<b>Additional Funding Required (10 year)</b>	Nil (\$5,000 p.a. included in RVC's current funding to Land care Groups)
<b>Potential Funding</b>	NSW Coastal Management Program, DPI-Crown Lands, RVC
<b>Timing</b>	On-going (Year 1-10)
<b>Location</b>	Evans Head coastal dune areas
<b>Objectives:</b>	<p>O1 - To protect and enhance the ecological values</p> <p>O2 - To protect cultural heritage values</p> <p>O3 - To protect the visual amenity and character of the local area</p> <p>O4 - To maintain and improve public access and use</p> <p>O5 - To minimise and manage risk to public health and safety</p> <p>O6 - To minimise and manage risks to community assets</p> <p>O8 - To adequately plan for management of known future risks</p> <p>O9 - To provide efficient and effective management</p> <p>O10 - To maximise the likelihood of success of management strategies</p> <p>O11 - To minimise overall cost of management and ensure value for money</p> <p>O12 - To ensure consistency with other strategic planning instruments and programs</p>
<b>Issues Addressed :</b>	<p>25. Coastal weeds (e.g. Bitou Bush) are encroaching on the Crown Reserve east of Beech Street and west of Broadwater Evans Head Road.</p> <p>26. Pest fauna species have been identified in coastal areas and along the riparian zone of the estuary (cane toad, foxes and cats) and have potential to impact ecosystem health through predation and out-competing native species for food and habitat resources.</p> <p>28. Severe storms currently erode the dunes along the beach affecting dune vegetation</p> <p>30. By 2100 the shoreline is predicted to be landward of the existing Salty Lagoon catchment boundary. Salty Lagoon is a freshwater wetland and seawater intrusion would significantly impact this coastal ecosystem.</p> <p>6. There is a risk of oceanic inundation if the current dune heights along the coast are not maintained. Areas seaward of Beech Street are of particular importance and if the dune was breached in this area, oceanic inundation could extend southwards into the low-lying Silver Sands Holiday Park.</p>

**DESCRIPTION OF TASKS:**

The current activities managed and regulated by existing Crown Lands and Council services are encouraged to continue outside but complementary to the CZMP process, while ensuring consistency with the CZMP. These tasks include:

- Continued support of local Landcare groups including the provision of equipment and funding; and
- Crown Land Managers to consult with NPWS to determine appropriate strategies to coordinate pest management activities in adjacent land parcels.

Complementary works that are recommended as part of other strategies are:

- The rationalisation of beach access tracks in Evans Head is discussed in Strategy 11: Public Access;
- Dune management works as recommended as part of Coastal Risk Strategies (Section 10); and
- Notify National Parks that by 2100 the shoreline is predicted to be landward of the existing Salty Lagoon catchment boundary.

Current Council funding of \$5,000 per year to Local Land care Groups is considered to be appropriate for the existing level of activity. If further works are required, for example as a result of changes due to access track rationalisation or coastal protection strategies, it may be necessary for Council or suitable contractor to carry out additional dune management works.

- KPIs**
- Review and reporting undertaken as part of SoE reporting – 2016, 2020.

## 11.7 Strategy 10: Climate Change Adaptation

Priority: Fundamental

**Table 18: Summary of climate change adaptation actions**

<p><b>Objectives:</b></p> <p>O1 - To protect and enhance the ecological values</p> <p>O7 - To promote sustainable development</p> <p>O8 - To adequately plan for management of known future risks</p> <p>O12 - To ensure consistency with other strategic planning instruments and programs</p>				
<p><b>Issues addressed:</b></p> <p>22. There is a risk that natural upslope migration of estuarine wetlands (mangroves and saltmarsh) due to sea level rise will be curtailed by anthropogenic constraints (roads, agriculture, urban development etc.)</p> <p>23. Increased estuary water levels due to sea level rise will affect riparian and other low-lying vegetation in the freshwater reaches of the estuary.</p> <p>24. The habitat of the endangered Oxleyan Pygmy Perch (OPP) may be impacted by sea level rise.</p>				
Action (short name)	Total Cost Estimate (10 year)	Timing	Location	Lead Responsibility
Climate change adaptation	\$8,300	Ongoing	Estuary-wide	Richmond River CZMP Committee, RVC
OPP habitat mapping	\$10,000	Medium term (Year 4)	Estuary-wide	DPI-Fisheries

**Action 10a: Climate change adaptation**

<b>Desired Outcome</b>	Catchment and estuary specific information regarding climate change is used to facilitate adaptation to climate change
<b>Lead Organisation</b>	Richmond River CZMP Implementation Committee , RVC
<b>Support Organisation</b>	OEH, DPI-Fisheries, NRCMA, DPI-Crown Lands
<b>Total Cost Estimate (10 year)</b>	\$8,300 (Evans Head proportion of Richmond River CZMP budget)
<b>Additional Funding Required (10 year)</b>	Nil (included in implementation schedule for the Richmond River CZMP)
<b>Potential Funding</b>	Richmond River CZMP current commitments
<b>Timing</b>	On-going
<b>Location</b>	Estuary-wide
<b>DESCRIPTION OF TASKS:</b>	
<p>The climate change adaptation tasks are:</p> <ul style="list-style-type: none"> <li>• Consider the impacts of climate change as part of each management option and strategy.</li> <li>• Coordinate with and support the current investigations recommended as part of the Climate Change Strategy in the Richmond River CZMP including assessment and mapping of tidal inundation extent upstream of Elm Street Bridge and planning for sea level rise and climate change impacts.</li> </ul>	
<b>KPIs</b>	<p>Applicable Richmond River CZMP KPIs:</p> <ul style="list-style-type: none"> <li>○ Sea-level rise tidal inundation maps produced and available by December 2012;</li> <li>○ Estuarine habitat transgression in response to Sea Level Rise (SLR) identified and strategic plan to cater for habitat migration developed by June 2014;</li> <li>○ Richmond River estuary climate change resource base developed and made available to decision makers within the catchment by June 2014.</li> <li>○ Review and update of resource base on an annual basis.</li> </ul>



**Action 10b: Oxleyan Pygmy Perch habitat risk mapping**

<b>Desired Outcome</b>	Determine the risk to OPP habitat from sea level rise
<b>Lead Organisation</b>	DPI-Fisheries
<b>Support Organisation</b>	OEH, RVC, NRCMA, DPI-Crown Lands
<b>Total Cost Estimate (10 year)</b>	\$10,000
<b>Additional Funding Required (10 year)</b>	\$10,000
<b>Potential Funding</b>	NSW Estuary Management Program, DPI-Fisheries, RVC
<b>Timing</b>	Short-term (year 4)
<b>Location</b>	Estuary-wide
<b>DESCRIPTION OF TASKS:</b>	
<p>Examine RVC's OPP habitat mapping and habitat restoration works in relation to predicted tidal inundation extents with sea level rise to determine the risk to habitats. Depending on the results of this assessment it may be necessary to conduct management to ensure protection of the species.</p> <p>The tidal inundation mapping incorporating sea level rise scenarios has not yet been completed for areas upstream of Elm Street Bridge. It will be necessary to obtain tidal inundation mapping completed as part of the Richmond River CZMP before completing risk assessment of OPP habitats. Tasks required are:</p> <ul style="list-style-type: none"> <li>• Overlay mapped OPP habitat areas with predicted tidal inundation extents;</li> <li>• Identify habitat areas at risk; and</li> <li>• Recommend actions to manage risks.</li> </ul> <p>The budget cost estimate for this action is based on the completion of a desktop risk assessment only. The need for remediation or protection works and costs for this component will be determined as an outcome of the risk assessment. An estimate of \$10,000 has been allowed for this task.</p>	
<b>KPIs</b>	<ul style="list-style-type: none"> <li>○ OPP Habitat Risk Assessment completed by June 2017</li> </ul>

## 12. COMMUNITY USES STRATEGIES

### 12.1 Strategy 11: Public Access

Priority: Medium

**Table 19: Summary of public access actions**

<p><b>Objectives:</b></p> <p>O1 - To protect and enhance the ecological values</p> <p>O3 - To protect the visual amenity and character of the local area</p> <p>O5 - To minimise and manage risk to public health and safety</p> <p>O4 - To maintain and improve public access and use</p> <p>O6 - To minimise and manage risks to community assets</p> <p>O7 - To promote sustainable development</p> <p>O8 - To adequately plan for management of known future risks</p>				
<p><b>Issues addressed:</b></p> <p>32. The existing jetty on the northern foreshore of the river, on the downstream side of Elm Street Bridge, is in poor condition. Its current state of disrepair represents a significant risk to safety.</p> <p>33. A number of informal access tracks to the beach are causing disturbance to dune ecosystems (adding to destabilisation of dunes, disturbance of vegetation etc.)</p> <p>34. Severe storms currently erode the dunes along the beach affecting beach access points.</p> <p>35. By 2050 the shoreline is predicted to be landward of existing beach access points</p> <p>38. The lower Evans River has significant shoaling and sand build-up and this is an ongoing issue for navigation through the bar.</p> <p>39. The upper Evans River has significant shoaling and sand build-up is an ongoing issue for navigation through the upper reaches.</p> <p>2. The Evans River estuary training walls are vital coastal infrastructure that are currently impacted during severe storms and this is predicted to be exacerbated into the future under sea level rise.</p>				
Action (short name)	Total Cost Estimate (10 year)	Timing	Location	Lead Responsibility
Rationalisation of beach access tracks	\$15,000	Short-term (year 2-3)	Shark Bay, Main Beach, Airforce Beach	RVC
Repair or remove the Jetty behind the Evans Head RSL Club	\$10,000	Short-term (year 2)	Lower Estuary	RVC
Boating navigation in the lower estuary	Not Estimated	Ongoing (year 1-10)	Lower Estuary	DPI-Crown Lands

**Action 11a: Rationalisation of beach access tracks**

<b>Desired Outcome</b>	Minimise the disturbance to coastal dune ecosystems caused by a number of informal access tracks to the beach while creating better quality accesses for those that remain.
<b>Lead Organisation</b>	RVC
<b>Support Organisation</b>	OEH, DPI-Crown Lands, NRCMA
<b>Total Cost Estimate (10 year)</b>	\$15,000
<b>Additional Funding Required (10 year)</b>	\$15,000
<b>Potential Funding</b>	NSW Coastal Management Program, RVC
<b>Timing</b>	Short-term (year 2-3)
<b>Location</b>	Shark Bay, Main Beach, Airforce Beach
<b>DESCRIPTION OF TASKS:</b>	
<p>The recommended tasks are:</p> <ul style="list-style-type: none"> <li>• Conduct an audit of beach access tracks to assess: <ul style="list-style-type: none"> <li>○ Track purpose (e.g. pedestrian, vehicle, emergency, Evans Head SLSC access, etc.)</li> <li>○ Location, alignment and proximity to facilities, services, community buildings and residential areas;</li> <li>○ Construction of the track (e.g. materials, fencing, surface covering, etc.);</li> <li>○ Level of use – may need to conduct community consultation to establish this;</li> <li>○ Condition and level of maintenance required;</li> <li>○ Risk to public safety – are safety risks such as steep slopes, broken tracks or materials sticking out of the sand; and</li> <li>○ The level of disturbance associated with the track (e.g. weed encroachment, location of blow outs and destabilised sand, proximity to sensitive environments such as nesting sites, etc.).</li> </ul> </li> <li>• Consult with the local community to assess the level of use of tracks and identify opportunities for rationalisation;</li> <li>• Consider coastal hazard lines in relation to track location and ongoing viability of tracks and potential for adaptations to coastal erosion and shoreline recession. Also consider the coastal hazard scenarios discussed in Section 10.</li> <li>• Based on the results of the audit, identify: <ul style="list-style-type: none"> <li>○ Tracks to be closed and revegetated;</li> <li>○ Tracks to remain and be maintained or formalised and upgraded to provide appropriate level of access with minimal disturbance; and</li> <li>○ Carry out track closure, revegetation and formalisation work. The community should be notified of track closures in advance of works through notices and local media. Signage should be used to notify public of closures and formalisation works.</li> </ul> </li> </ul> <p>A budget estimate of \$15k has been allowed for the audit of beach tracks including limited community consultation. Works required for closures and formalisation will depend on the outcomes of the audit.</p>	
<b>KPIs</b>	<ul style="list-style-type: none"> <li>○ Track audit completed by December 2014</li> <li>○ Rationalisation of tracks commenced by August 2015</li> </ul>

**Action 11b: Repair or remove the jetty behind the Evans Head RSL**

<b>Desired Outcome</b>	Remove the risk to public safety currently posed by the dilapidated structure
<b>Lead Organisation</b>	RVC
<b>Support Organisation</b>	OEH, DPI-Crown Lands, Evans Head RSL
<b>Total Cost Estimate (10 year)</b>	\$10,000
<b>Additional Funding Required (10 year)</b>	\$10,000
<b>Potential Funding</b>	NSW Estuary Management Program, RVC
<b>Timing</b>	Short-term (year 2)
<b>Location</b>	Lower Estuary
<b>DESCRIPTION OF TASKS:</b>	
<p>Document the heritage status of the structure and any associated requirements relating to modification or removal of the structure. This will involve:</p> <ul style="list-style-type: none"> <li>• Consultation with the Evans Head RSL Club;</li> <li>• Investigation of local and state heritage registers;</li> <li>• Document heritage status and determine any approval requirements for modification or removal;</li> <li>• Determine appropriate actions based on findings of heritage study. This may involve signage to warn of the danger, removal of the structure completely or rebuilding of the jetty.</li> </ul> <p>Budget estimates have been assigned based on the heritage study component only. Appropriate works required will be assessed as part of the study and costed appropriately. \$10k has been allowed for the study.</p>	
<b>KPIs</b>	<ul style="list-style-type: none"> <li>○ Heritage study completed by June 2015</li> </ul>

**Action 11c: Boating navigation in the lower estuary**

<b>Desired Outcome</b>	To maintain a safe navigable entrance through dredging programs wherever possible, and in times when this is not viable, provide adequate warnings about bar conditions to minimise risks to public safety.
<b>Lead Organisation</b>	DPI-Crown Lands
<b>Support Organisation</b>	RVC, Marine Rescue
<b>Total Cost Estimate (10 year)</b>	Not estimated – dredging is undertaken on priority basis around NSW
<b>Additional Funding Required (10 year)</b>	Not estimated
<b>Potential Funding</b>	NSW Government’s Minor Ports and River Entrance Programs, RVC
<b>Timing</b>	On-going
<b>Location</b>	Lower Estuary
<b>DESCRIPTION OF TASKS:</b>	
<p>On-going evaluation of the need for channel dredging:</p> <ul style="list-style-type: none"> <li>• Monitor stakeholder complaints/comments (e.g. commercial fishing fleet);</li> <li>• Liaison with Marine Rescue regarding incidents;</li> </ul> <p>Undertake feasibility assessment if/when required (these costs not included in implementation schedule):</p> <ul style="list-style-type: none"> <li>• Hydrographic surveys;</li> <li>• Determine likely effectiveness and longevity of dredging works; and</li> <li>• Determine appropriateness of use of dredged material as fill for Silver Sands Holiday Park (subject to outcomes of the strategy for the park; see Action 2a)</li> </ul> <p>Funding opportunities:</p> <ul style="list-style-type: none"> <li>• Ensure that Evans River navigability issues are considered in state wide dredging program.</li> </ul> <p>Stakeholder notification:</p> <ul style="list-style-type: none"> <li>• In the absence of a funded dredging program, the focus for management should be the continuation of monitoring of bar conditions and the issuing of warnings and public notifications.</li> </ul>	
<b>KPIs</b>	<ul style="list-style-type: none"> <li>○ On-going liaison (including advisory notices as appropriate) with stakeholders is achieved</li> <li>○ Evans River issue status is updated regularly for consideration in funding allocation.</li> </ul>

## 12.2 Strategy 12: Recreation

### Priority: High

This recreational use strategy recognises a number of existing management initiatives and programs with regard to recreational fishing, boating and swimming. Continued support and promotion of existing activities is recommended to address issues related to recreation identified by this Plan. Some issues associated with recreational use such as public access and boating navigation were addressed in Strategy 11: Public Access.

#### Action 12a: Recreational use

<b>Desired Outcome</b>	Continued recreational use of the Evans River estuary and coastline with no adverse impacts on the environment, cultural values or public health and safety.
<b>Lead Organisation</b>	RVC, Richmond River CZMP Implementation Committee
<b>Support Organisation</b>	OEH, DPI-Fisheries, DPI-Crown Lands, NSW Maritime
<b>Total Cost Estimate (10 year)</b>	\$6,300 (Evans Head proportion of Richmond River CZMP budget)
<b>Additional Funding Required (10 year)</b>	Nil (included in implementation schedule for the Richmond River CZMP)
<b>Potential Funding</b>	Richmond River CZMP current commitments
<b>Timing</b>	On-going
<b>Location</b>	Evans River estuary and coastline
<b>Objectives:</b>	<p>O1 - To protect and enhance the ecological values</p> <p>O2 - To protect cultural heritage values</p> <p>O3 - To protect the visual amenity and character of the local area</p> <p>O4 - To maintain and improve public access and use</p> <p>O5 - To minimise and manage risk to public health and safety</p> <p>O6 - To minimise and manage risks to community assets</p> <p>O7 - To promote sustainable development</p> <p>O12 - To ensure consistency with other strategic planning instruments and programs</p>
<b>Issues Addressed :</b>	<p>40. Community concern about potential conflicts between different estuary uses such as swimming and motorised watercraft.</p> <p>41. There is concern that motorised water craft contributes to estuary health pressures including bank erosion caused by boat wash and damage sensitive habitats (e.g. propeller or anchor damage to seagrass beds).</p> <p>42. There is concern about observed decreases in recreational fish and crab catches in the Evans River.</p> <p>43. There is concern about decrease in number of pipis on the beach and impacts of commercial harvesting</p> <p>44. While recreational water quality is generally of a very high standard at monitored swimming locations (ocean beaches and river); poor results are occasionally measured in response to rainfall, particularly in the Evans River (near revetment wall).</p>

**DESCRIPTION OF TASKS:**

It is recommended that DPI continue to work with the Evans Head Fishing Classic organisers to ensure ongoing implementation of management measures and development of further measures to mitigate any adverse impacts on fish stocks.

The *Pied Oystercatcher Management Strategy* (Department of Lands, 2007) contains a suite of actions to address issues related to declines in pipi numbers. It is recommended that this CZMP supports and promotes the implementation of these actions.

It is recommended that RVC continue Beachwatch monitoring.

It is recommended that RVC support the development of the Richmond River CZMP “Action 9a: Develop strategic plan for estuary usage”, ensuring that key issues for the Evans River are considered and accounted for in management planning. This includes issues regarding usage of motorised water craft and potential conflict between passive recreational use and environmental damage from wake and propellers. Consultation with Roads and Maritime Services will be necessary with regard to restrictions and enforcement.

**KPIs**

- Review and reporting undertaken as part of SoE reporting – 2016, 2020.

### 12.3 Strategy 13: Cultural Heritage Management

Priority: High

**Table 20: Summary of cultural heritage actions**

<p><b>Objectives:</b></p> <p>O2 - To protect cultural heritage values</p> <p>O3 - To protect the visual amenity and character of the local area</p> <p>O6 - To minimise and manage risks to community assets</p> <p>O7 - To promote sustainable development</p> <p>O12 - To ensure consistency with other strategic planning instruments and programs</p>				
<p><b>Issues Addressed:</b></p> <p>45. There are a number of significant Aboriginal cultural sites in the study area that are not currently identified and recorded/mapped by AHIMS (OEH's Aboriginal Heritage Information Management System).</p> <p>46. Beach erosion, coastal recession and bank erosion processes could potentially impact on cultural sites of significance. There is concern that there are sites that have not yet been identified and mapped and impacts are not fully known.</p> <p>47. Bank erosion has impacted Gumma Garra, an Aboriginal site in the lower estuary. This is likely to be exacerbated by future increases in tidal inundation due to sea level rise.</p>				
Action (short name)	Total Cost Estimate (10 year)	Timing	Zones	Lead Responsibility
Identification and recording of Aboriginal cultural heritage sites	\$8,300	Medium term to long-term (years 3-8)	Estuary-wide	Richmond River CZMP Implementation Committee
Cultural site management plans	\$12,900	Medium term to long-term (years 3-10)	Estuary-wide	Richmond River CZMP Implementation Committee



**Action 13a: Identification and recording of Aboriginal cultural heritage sites**

<b>Desired Outcome</b>	Identify and register sites that are currently known to community members but not recorded on planning registers to ensure the appropriate level of protection
<b>Lead Organisation</b>	Richmond River CZMP Implementation Committee
<b>Support Organisation</b>	OEH, BSC, LCC, RVC, Aboriginal representatives/ groups
<b>Total Cost Estimate (10 year)</b>	\$8,300 (Evans Head proportion of Richmond River CZMP budget)
<b>Additional Funding Required (10 year)</b>	Nil (included in implementation schedule for the Richmond River CZMP)
<b>Potential Funding</b>	Richmond River CZMP current commitments
<b>Timing</b>	Years 3-8
<b>Location</b>	Estuary and Coastline
<b>DESCRIPTION OF TASKS:</b>	
<p>This tasks will be implemented in accordance with the APEC principles (Aboriginal People, the Environment and Conservation, DECC, 2008b).</p> <p>Key tasks as part of the Richmond River CZMP are:</p> <ul style="list-style-type: none"> <li>• Review of background information and current registers (e.g. DECCW AHIMS, Council registers);</li> <li>• Consultation with local Aboriginal groups to develop an appropriate methodology to identify and record sites. It will be necessary to consult with a number of different groups in the local area to gain a comprehensive overview.</li> <li>• Undertake the established methods to identify sites that are known and not currently recorded on relevant register (as per issue raised by the EPS); and</li> <li>• Recording of sites on registers available to council planners.</li> </ul>	
<b>KPIs</b>	o Identification and recording of sites by June 2019 (Richmond River CZMP timeframe)

**Action 13b: Cultural site management plans**

<b>Desired Outcome</b>	To provide for effective protection and management of cultural sites and where appropriate provide access and signage to promote the cultural values of the estuary
<b>Lead Organisation</b>	Richmond River CZMP Implementation Committee
<b>Support Organisation</b>	OEH, Aboriginal representatives/groups
<b>Total Cost Estimate (10 year)</b>	\$12,900 (Evans Head proportion of Richmond River CZMP budget)
<b>Additional Funding Required (10 year)</b>	Nil (included in implementation schedule for the Richmond River CZMP)
<b>Potential Funding</b>	Richmond River CZMP current commitments
<b>Timing</b>	Years 3-10
<b>Location</b>	Estuary and Coastline
<b>DESCRIPTION OF TASKS:</b>	
<p>It may be appropriate to develop Cultural Site Management Plans for certain sites. The aim of the plan(s) would be dependent on a range of site specific factors including the type, location and cultural sensitivities. In general cultural plans would aim to both improve the knowledge and understanding of the Aboriginal cultural heritage of the Evans River Estuary, and provide a suite of recommendations and mechanisms for the appropriate management and protection of these important places and values.</p> <p>Consultation is required with local Aboriginal people/groups and organisations that have associations with, or obligations for, cultural heritage matters in the Richmond River Estuary.</p> <p>Key tasks in the development of Cultural Site Management Plans as part of the Richmond River CZMP are:</p> <ul style="list-style-type: none"> <li>• Research and Consultation. A review of any background information including legislative and planning context will be required. It will be necessary to identify and consult with the Aboriginal people and organisations having cultural associations with the site or other links with the area;</li> <li>• Identification of management issues and options in partnership with the Aboriginal stakeholders;</li> <li>• Identification of management directions and actions for the sites (e.g. educational signage, walkways etc.); and</li> <li>• Preparation of the Plan and review by relevant stakeholders.</li> </ul>	
<b>KPIs</b>	<ul style="list-style-type: none"> <li>○ Cultural Site Management Plans for identified sites completed as required (Richmond River CZMP timeframe).</li> </ul>

### **13. IMPLEMENTATION SCHEDULE**

The management strategies have been compiled into a ten year implementation schedule as shown in Table 21. The recommended strategies are tabulated, listing the key actions, responsibilities and indicative costs estimated over the ten year implementation period. The total cost of the CZMP implementation is estimated to be approximately \$4.1 million over ten years. This includes an estimated \$2 million in current funding commitments of concurrent strategies and programs already adopted for the local area and \$2.1 million in additional funding.

**Table 21: CZMP Implementation Program (\$'000)**

Action	Lead Organisation	Support Organisations	Total Cost Estimate (10 year) (\$k)	Estimated current level of funding (10 year) (\$k)	Additional Funding Required (10 year) \$k	Timing of additional funding expenditure over 10 year life of CZMP									
						2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
<b>Strategy 1: Coastline Erosion and Recession</b>															
1a	Coastline recession monitoring	RVC	OEH, DPI-Crown Lands	32.0	30.0	2.0	2.0								
1b	Preliminary feasibility assessment	RVC	OEH, DPI-Crown Lands	150.0		150.0		150.0							
1c	Determine community and stakeholder preferences	RVC	OEH, DPI-Crown Lands	50.0		50.0			50.0						
1d	Implement EASP	RVC	OEH	88.0		88.0	16.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
<b>Strategy 2: Estuarine Inundation</b>															
2a	Inundation studies for Silver Sands Holiday Park	DPI-Crown Lands	RVC, OEH	75.0		75.0		75.0							
2b	Works planning for Silver Sands Holiday Park	DPI-Crown Lands	RVC, OEH	100.0		100.0			100.0						
2c	Address Ocean Drive inundation risks	RVC	OEH, DPI-Crown Lands	4.8		4.8	4.8								
<b>Strategy 3: Bank Erosion</b>															
3a	Kalimna Park to Shark Bay erosion works	RVC	OEH, DPI-Crown Lands, NRCMA	1500.0	172.0	1328.0		500.0	300.0	328.0	200.0				
3b	Foreshore Park bank erosion monitoring	RVC	OEH, DPI-Crown Lands, NRCMA	7.3		7.3	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
3d	Liaison with landholders regarding Doonbah bank erosion	RVC	Private Landholders, NRCMA	1.4		1.4	1.4								
<b>Strategy 4: Monitoring, Evaluation and Review</b>															
4a	EcoHealth monitoring program	RR CZMP Committee	NRCMA, RVC, RRCC, OEH, DPI-Fisheries, DPI-Crown Lands	550.0	550.0										
4b	Contribute to planning for proposed Pacific Highway upgrade	RVC	RRCC, OEH, DPI-Fisheries, DPI-Crown Lands, NRCMA	2.4		2.4		2.4							
4c	Risk assessment of Boat Harbour operations	DPI-Crown Lands	RVC, OEH, DPI-Fisheries, NSW Maritime, NRCMA	20.0		20.0		20.0							
4d	Review of CZMP progress and monitoring of KPIs (SoE Reporting)	RVC	RRCC, OEH, DPI-Fisheries, DPI-Crown Lands, NRCMA	2.8	2.8										
4e	10 year review of CZMP	RVC	RRCC, OEH, DPI-Fisheries, DPI-Crown Lands, NRCMA	50.0		50.0									50.0
<b>Strategy 5: Agricultural Land Management</b>															
5a	Follow up and maintenance of 2010 stock fencing work	RVC	Private Landholders, OEH, NRCMA	25.0		25.0		5.0		5.0		5.0		5.0	5.0
5b	Acid sulfate soil management	RR CZMP Committee	RVC, RRCC, OEH, DPI-Fisheries, DPI-Crown Lands, NRCMA	271.7	271.7										
<b>Strategy 6: Water Cycle Management</b>															
6a	Stormwater Management	RVC	NSW Planning	707.1	707.1										

COASTAL ZONE MANAGEMENT PLAN: EVANS HEAD COASTLINE AND EVANS RIVER ESTUARY

Action	Lead Organisation	Support Organisations	Total Cost Estimate (10 year) (\$k)	Estimated current level of funding (10 year) (\$k)	Additional Funding Required (10 year) \$k	Timing of additional funding expenditure over 10 year life of CZMP													
						2014	2015	2016	2017	2018	2019	2020	2021	2022	2023				
6b	Feasibility study of stormwater drainage improvements at Evans Head Reserve Drain	RVC, DPI-Crown Lands	OEH	30.0		30.0		30.0											
6c	On-going on-site sewerage management inspections and improvements	RVC	n/a	112.2	112.2														
Strategy 7: Vegetation Management																			
7a	Maintenance of 2010 riparian restoration sites	RVC	NRCMA, OEH, DPI-Crown Lands	130.0		130.0		60.0	28.0	14.0	14.0	14.0							
7b	Promotion and support of further riparian restoration works	RVC	OEH, NRCMA, Richmond River CZMP Committee, DPI-Crown Lands, Landcare	2.8		2.8		1.4					1.4						
7c	Aquatic weed management	FNCW, RRCC	RVC, RRCC, OEH, DPI-Fisheries, DPI-Crown Lands, NRCMA	83.3	83.3														
Strategy 8: Shorebird Management																			
8a	Shorebird management	RVC, DPI-Crown Lands, NPWS	OEH, NRCMA	NE	NE	NE													
Strategy 9: Coastal Dune Management																			
9a	Dune management	DPI-Crown Lands, RVC	OEH, Evans Head Landcare Group, NRCMA	50.0	50.0														
Strategy 10: Climate Change Adaptation																			
10a	Climate change adaptation	RR CZMP Committee, RVC	OEH, DPI-Fisheries, NRCMA, DPI-Crown Lands	8.3	8.3														
10b	OPP habitat risk mapping	DPI-Fisheries	OEH, RVC, NRCMA, DPI-Crown Lands,	10.0		10.0			10.0										
Strategy 11: Public Access																			
11a	Rationalisation of beach access tracks	RVC	OEH, DPI-Crown Lands, NRCMA	15.0		15.0		15.0											
11b	Repair or remove the Jetty behind the Evans Head RSL	RVC	OEH, DPI-Crown Lands, Evans Head RSL	10.0		10.0		10.0											
11c	Boating navigation in the lower estuary	DPI-Crown Lands	RVC, Marine Rescue		NE														
Strategy 12: Recreation																			
12a	Recreational use	RR CZMP Committee, RVC	OEH, DPI-Fisheries, DPI-Crown Lands, NSW Maritime	6.3	6.3														
Strategy 13: Cultural Heritage																			
13a	Identification and recording of Aboriginal Cultural Heritage sites	RR CZMP Committee	OEH, RVC, Aboriginal representatives/ groups	8.3	8.3	NE													
13b	Cultural site management plans	RR CZMP Committee	OEH, RVC, Aboriginal representatives/ groups	12.9	12.9	NE													
Totals				4110.6	2008.9	2101.7	25.0	877.5	486.7	365.7	222.7	27.7	10.1	13.7	8.7	63.7			

Note: Years correspond to end of financial year i.e. 2014 is Year 1 (start 1<sup>st</sup> July 2013, end 30<sup>th</sup> June 2014) etc.

Shaded cells = Denotes the occurrence of actions with no additional costs allocated as part of this CZMP

NE = Not Estimated

## GLOSSARY AND ABBREVIATIONS

Acid sulfate soils (ASS)	Acid sulfate soils are the common name given to soils containing iron sulfides. In Australia, the acid sulfate soils of most concern are those which formed within the past 10,000 years, after the last major sea level rise. 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 is a geodetic datum for altitude measurement in Australia. According to Geoscience Australia, "In 1971 the mean sea level for 1966-1968 was assigned the value of 0.000m on the Australian Height Datum at thirty tide gauges around the coast of the Australian continent".
Anoxic	An oxygen-free environment.
Anthropogenic	Any phenomenon caused by human activities.
Aquatic	Living or growing in water, not on land.
Benthic	Belonging to the bottom, or sediments, of the estuary.
Blackwater	A collective term used to describe low oxygen water emanating from backswamp areas, drains and floodplains. The term usually refers to low oxygen flood waters receding from floodplain after extended periods of backswamp flooding.
CAP	Catchment Action Plan
Chlorophyll-a	The green pigment in plants used to capture and use energy from sunlight to form organic matter (see photosynthesis). Concentrations of chlorophyll-a in the water column are used as an indicator for phytoplankton and benthic algae biomass. It provides a useful proxy indicator of the amount of nutrients incorporated into phytoplankton biomass, because phytoplankton have predictable nutrient-to-chlorophyll ratios.
Con	The disadvantage of something or an argument against a course of action (see Pro).
CZMP	Coastal Zone Management Plan
DECCW	former (NSW) Department of Environment, Climate Change and Water (now OEH)
Diffuse Source Pollution	Non-point source pollution such as sediment or nutrients from catchment runoff or groundwater inputs.
DLWC	former Department of Land and Water Conservation
DNR	former Department of Natural Resources
Down-drift	The direction of the prevailing movement of littoral material. On the east coast of Australia the prevailing down-drift direction is north.
DPI	(NSW) Department of Primary Industries
Ecosystem	Refers to all the biological and physical parts of a biological unit (e.g. an estuary, forest, or planet) and their interconnections.
EMP	Estuary Management Plan
LEP	Local Environmental Plan
LPMA	former Land and Property Management Authority (now DPI- Crown Lands)
MHL	Manly Hydraulics Laboratory
Monosulfidic Black Ooze (MBO)	An iron sulfide compound formed as a by-product of sulfate reduction. MBOs commonly form in acid environments with high organic matter supply and have a high chemical oxygen demand.
NPWS	National Parks and Wildlife Service
NRCMA	Northern Rivers Catchment Management Authority

OEH	Office of Environment and Heritage
OPP	Oxleyan Pygmy Perch a small freshwater fish that occurs in the vicinity of the Evans River and has been listed as 'endangered' under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 and the NSW Fisheries Management Act 1994.
Point Source Pollution	A single point of pollutant discharge. For example, effluent from a sewage treatment plant.
POM	(Evans Head Coastal Reserves) Plan of Management (2010).
Pro	The advantage of something or an argument in favour of a course of action (see Con).
Reticulated Sewage System	Sewage piped to a centralised sewage treatment plant for treatment and disposal.
RRCC	Richmond River County Council
RVC	Richmond Valley Council
SEPP	State Environmental Planning Policy
SLSC	Surf Life Saving Club
SQIDs	Stormwater Quality Improvement Devices
SSHPP	Silver Sands Holiday Park
Still Water Level	The level of the sea with motions such as wind waves averaged out—averaged over a period of time such that changes in sea level, e.g., due to the tides, also get averaged out.
STP	Sewage Treatment Plant. Raw sewage is collected from homes and businesses and transported via a network of pipes and pump stations to the sewage treatment plant, a centralised system for treatment and disposal.
Terrestrial	Living or growing on land (not aquatic)
Turbidity	A measure of the amount of light-attenuating particles in a water body.
Up-drift	The direction which is opposite that of the prevailing movement of littoral material. On the east coast of Australia the prevailing up-drift direction is south.
WSUD	Water Sensitive Urban Design - an integrated approach to the management of stormwater quality and quantity. It seeks to incorporate sound stormwater management principles into the design of the development during the planning stages to minimise the need for "end of pipe solutions".
ZRFC	Zone of Reduced Foundation Capacity - Zone located adjacent to and landward of an erosion escarpment in unconsolidated dunal systems where load bearing capacity is reduced.

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