eurobodalla shire council

MORUYA RIVER, MUMMUGA LAKE AND WAGONGA INLET ESTUARINE COASTAL MANAGEMENT PROGRAM

Prepared by Salients, Coastal Environment
and the University of Newcastle
for Eurobodalla Shire Council

Final for Certification

Salients

Coastal Environment

THE UNIVERSITY OF NEWCASTLE AUSTRALIA

MORUYA RIVER, MUMMUGA LAKE AND WAGONGA INLET ESTUARINE COASTAL MANAGEMENT PROGRAM

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EXECUTIVE SUMMARY

Eurobodalla Shire Council recognises Aboriginal people as the original inhabitants and custodians of all land and water in the Eurobodalla and respects their enduring cultural and spiritual connection to it. Eurobodalla Shire Council acknowledges the Traditional Owners of the land in which we live. Council pays respect to Elders past, present and future.

The people of the Yuin Nation are the traditional custodians of the land we now know as Eurobodalla Shire. Yuin people have lived in the area for thousands of years and have an enduring custodianship and connection over the land and waterways of Eurobodalla.

The Moruya River, Mummuga Lake and Wagonga Inlet estuaries and catchments lie within the Eurobodalla Local Government Area. Eurobodalla Shire Council has adopted multiple Plans of Management for the estuaries of Eurobodalla, including Moruya River and Wagonga Inlet. While works have been completed in the catchments of Mummuga Lake, there is no formal estuary plan which considers current land use within the catchments.

Council is responsible for preparing Coastal Management Programs (CMPs) in accordance with the requirements of the *Coastal Management Act 2016* and the Coastal Management Manual. This is advantageous to Council as a gazetted CMP unlocks funding opportunities via the NSW Government's Coast and Estuary Grants funding stream. Further, a gazetted CMP will provide a degree of exemption from liability to local councils under Section 733 of The Local Government Act 1993. Through the CMP process Council has opportunities to engage with the community in decision making to ensure that a strategic and coordinated approach is taken to managing the coastal zone within the Local Government Area.

The location of the three estuaries, their catchments and the coastal zone of the Eurobodalla Shire is shown in Figure E1.

Council and the local community place a high value on the 'clean', 'beautiful' and 'healthy' coastal environment of the Eurobodalla Shire. There is an overriding desire to protect and sustainably manage the estuaries of the Eurobodalla Shire in a responsible manner for both current and future generations. Council wishes to promote coastal management actions that help local communities thrive socially, culturally, and economically. Balancing the environment with the community's aspirations can be complex given the threats and challenges facing the estuaries. These include sea level rise, population growth, pollution, the impacts of livestock grazing, uncontrolled public access to sensitive habitats, and the administrative and organisational barriers of multiple government agencies having a role in coastal management.

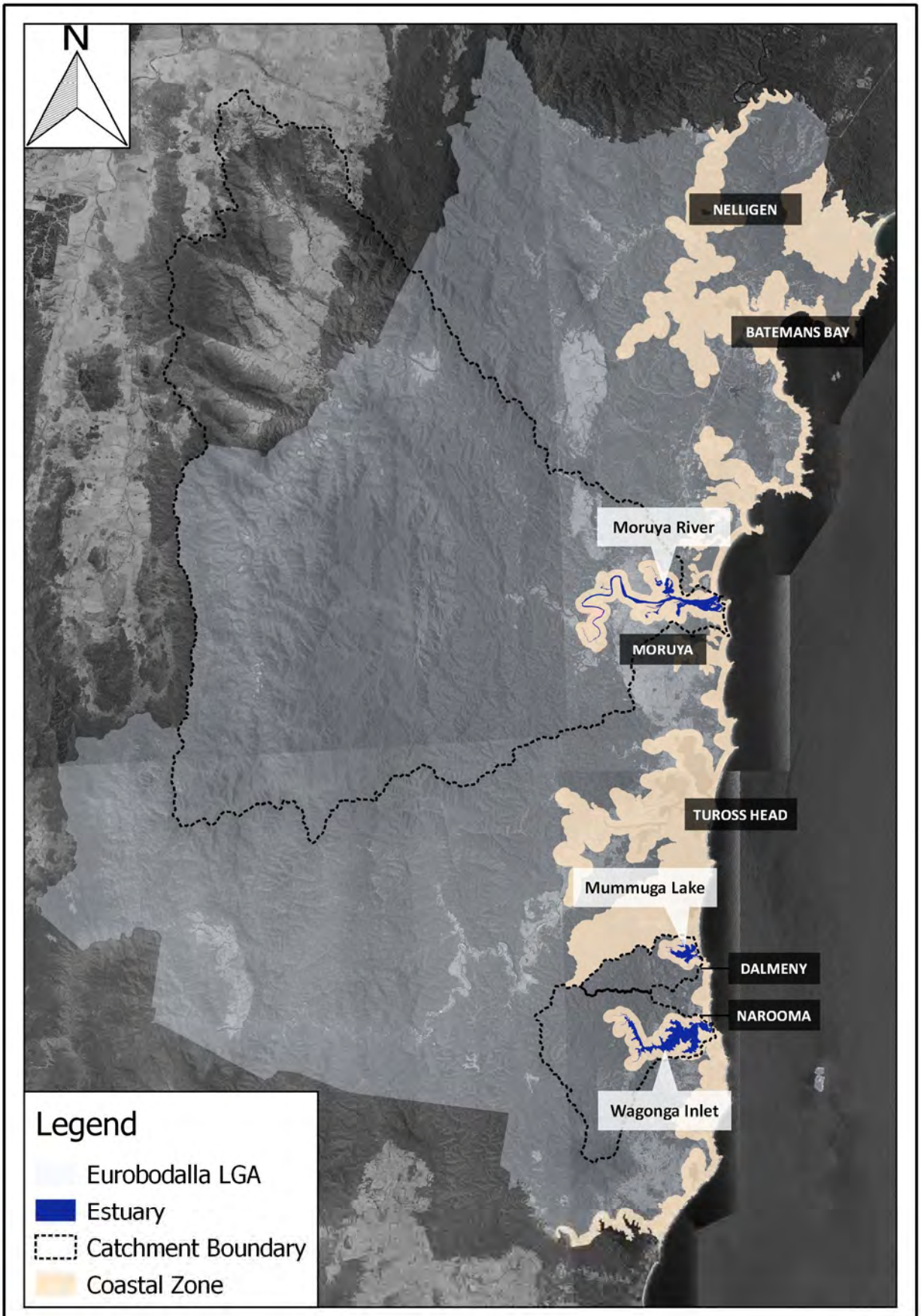

Figure E1: Locality Plan

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APPROX SCALE

Coastal Management Program for Moruya River, Mummuga Lake and Wagonga Inlet	REV A	DRAWN EN	CHECK DJW
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The purpose of this Estuarine Coastal Management Program (ECMP) is to set the long-term strategy for coordinated management of the coastal zone surrounding the estuaries of the Eurobodalla Shire. The ECMP aims to provide strategic direction and specific management actions to address the priority risks to the ecological, social, and economic values associated with the estuaries. A Business Plan in Section 6 provides a program for the delivery of the management actions including funding sources, the formal commitment of public authorities responsible for delivery, and an implementation schedule.

The NSW government's Coastal Management Manual outlines a five-stage cyclical process for developing a CMP (see Figure E2). The steps followed in developing this ECMP are summarised herein, with a detailed account provided in the accompanying documents.

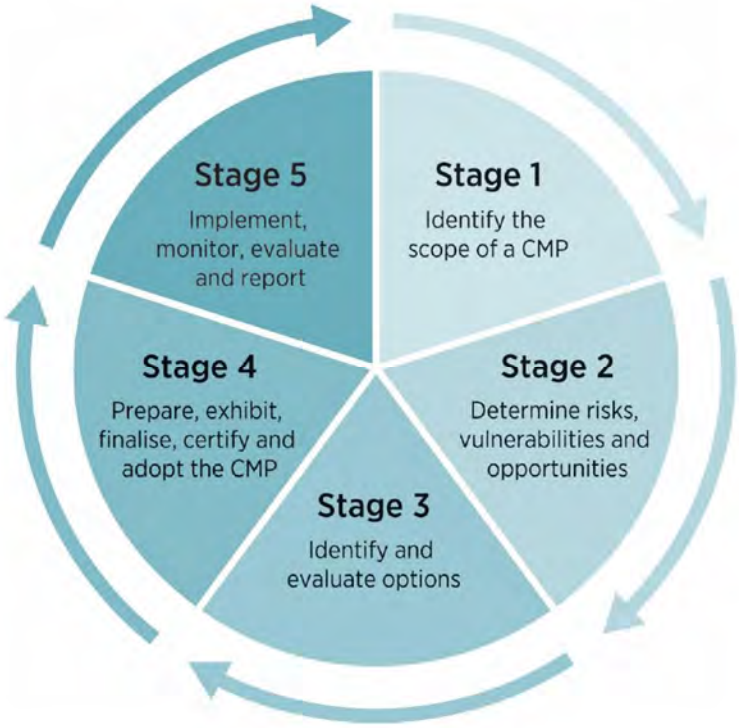

Figure E 2 Stages in Preparing and Implementing a CMP (Source: NSW Government, 2018a)

Stakeholder and community engagement is an important feature of the process. The community were engaged via drop-in sessions during the scoping study phase, and through direct face-to-face consultation and an online survey during subsequent preparation of the CMP in Stages 2 and 3. Stakeholders from public authorities participated in workshops and meetings, particularly during Stages 1 and 3 of the process to ensure agreement and commitment to actions relevant to their operational responsibilities.

The CMP outlines four sets of actions. The first set addresses those issues that are important across all three estuaries. The remaining three sets of actions relate to the specific issues associated with the three estuaries in turn. There are 33 management actions in total (Overarching: 7 actions, Moruya River: 7 actions, Mummuga Lake:

7 actions, Wagonga Inlet: 12 actions). Eurobodalla Shire Council is responsible for twenty-three of these actions, with responsibility for the remaining actions divided between South East Local Land Services, NSW National Parks and Wildlife Service, DPE – Planning, DoI – Industry and Batemans Marine Park.

The estimated cost of program delivery over a four-year period is 2,859,500. Eurobodalla Shire Council and South East Local Land Services have committed to providing approximately 11% and 21% of the total funding respectively. Remaining funds are reliant on successful grant applications through the NSW State Government Coast and Estuary, Fisheries Habitat Management and Floodplain Management grants schemes, as well as funding from The Nature Conservancy. More detail on the actions and cost arrangements is provided in the Business Plan presented in Section 6 of the ECMP.

The implementation and reporting of ECMP actions are to be enacted by Council through the Integrated Planning and Reporting (IPR) System. Under the IPR framework, actions from strategic plans such as the ECMP, are to be included in Council's Delivery and Operational Plan. Progress and outcomes of the ECMP will be reported to stakeholders and the community via Council's Annual Report. The ECMP includes the formation of a multi-agency advisory committee to assist in making sure that these requirements are met.

The Estuarine Management Advisory Committee will be established upon certification of the ECMP. The Committee will be chaired by Council and will include of staff from Council, South East Local Land Services, Department of Primary Industries (Fisheries), Department of Planning, Industry and Environment (EES), Batemans Marine Park, Transport for NSW and Department of Planning and Environment (DPE) – Crown Lands.

The ECMP will be formally reviewed in 2026, at the end of the four-year delivery period. That review must consider the extent to which actions proposed have been implemented, progress on actions that go beyond the four-year period and whether the strategic management approach requires review.

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1 INTRODUCTION

1.1 The Eurobodalla Estuarine CMP

The purpose of this Estuarine Coastal Management Program (ECMP) is to set the long-term strategy for co-ordinated land management within the coastal zone surrounding the estuaries of the Eurobodalla Shire.

Council intends to cover all the major estuaries of Eurobodalla within the scope of a comprehensive ECMP. This will be completed cumulatively, starting with Wagonga, Mummuga and Moruya. These 3 estuaries were chosen initially due to the age or lack of a current plan of management. In comparison, more recent studies and plans are available for other estuaries in Eurobodalla, such as Tomaga River, Tuross River/Coila Lake and the Clyde River.

Considering recent statewide coastal reforms, it is timely to examine estuary dependent economic activity and any shift in the social dynamic of the estuaries and their catchments in recent years. The development of the ECMP is helping Council understand changing views and expectations within the community regarding how Eurobodalla Shire's estuaries are managed.

Eurobodalla Shire Council has adopted multiple Plans of Management (POM) for the Estuaries of Eurobodalla in the past, including Moruya River and Wagonga Inlet. While works have been completed in and around Mummuga Lake, there is no formal estuary plan which considers current land use within its catchment.

The location of the three estuaries and their catchments within Eurobodalla Shire is shown in Figure 1. The *coastal zone* within Eurobodalla Shire, including areas associated with other estuaries and the open coast (not covered by this ECMP) is also shown. The area considered by this ECMP is entirely within the Eurobodalla Local Government Area.

Development of the ECMP began in 2018, with a draft of the supporting *Scoping Study* for the Moruya River, Mummuga Lake and Wagonga Inlet (included as Appendix A) prepared in early 2019. Preparation of the draft ECMP followed, during 2020, including ongoing consultation with the community and state government stakeholders. Following feedback from government stakeholders, the present Exhibition Draft was prepared in the second half of 2021.

The Estuaries CMP has been developed in accordance with the requirements of the *Coastal Management Act 2016* (the CM Act) and Coastal Management Manual (2018).

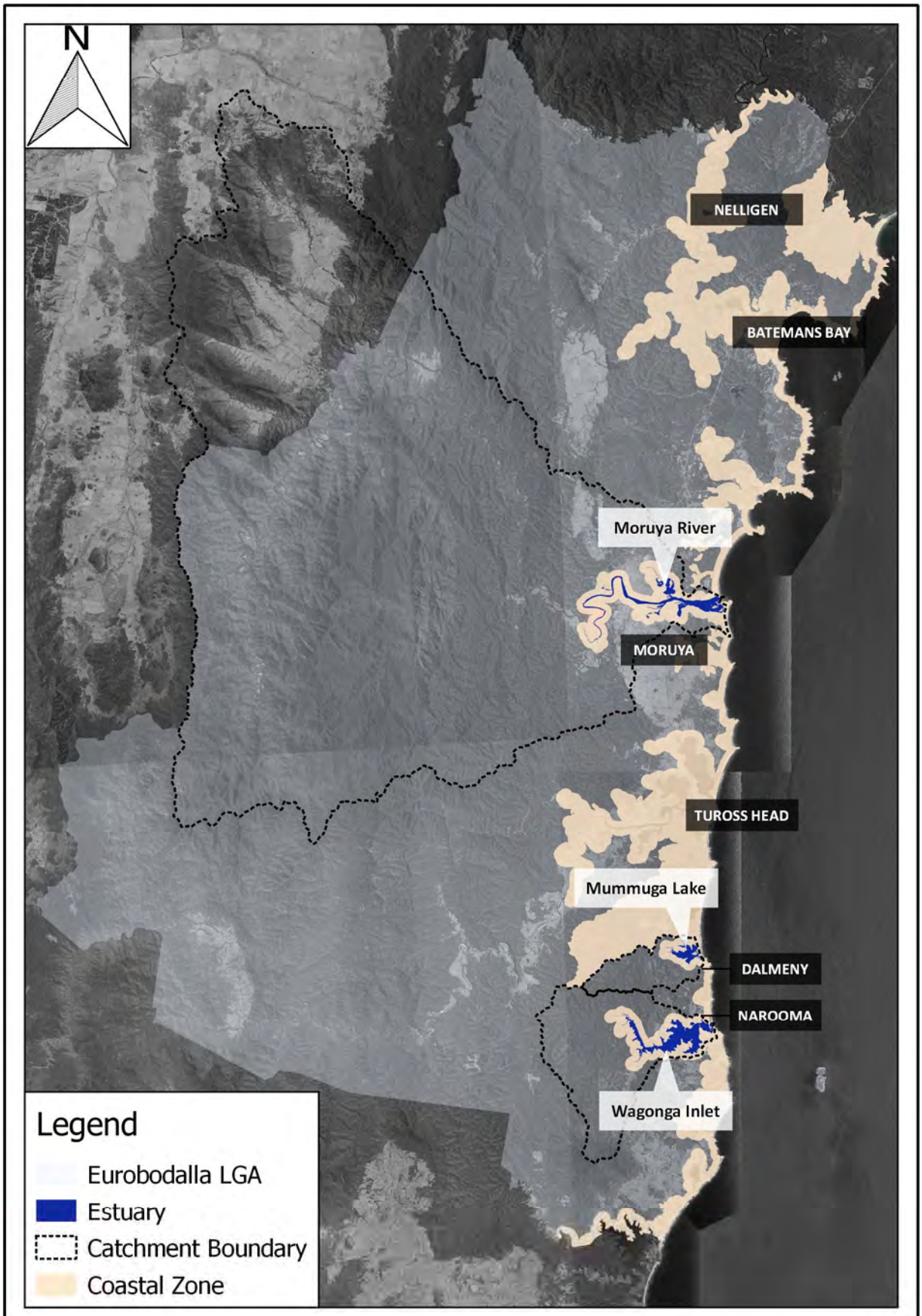

Figure 1: Locality Plan

0 5 10 15 km

APPROX SCALE

Coastal Management Program for Moruya River, Mummuga Lake and Wagonga Inlet	REV A	DRAWN EN	CHECK DJW	Salients
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The coastal zone is defined by the CM Act and includes four coastal management areas:

1. Coastal wetlands and littoral rainforests area.
2. Coastal vulnerability area.
3. Coastal environment area.
4. Coastal use area.

The CM Act outlines management *objectives* for each of these areas. For the objectives to be addressed, the corresponding coastal management area should ideally be mapped in the State Environmental Planning Policy (Resilience and Hazards) 2021 RH SEPP. Importantly, this CMP was prepared prior to commencement of the RH SEPP. The RH SEPP replaced several other State Environmental Planning Policies, including State Environmental Planning Policy (Coastal Management) of 2018. Throughout this document, the coastal management provisions and maps associated with the RH SEPP are referred to as the "CM SEPP".

As of late June 2022, there are no maps available for the coastal vulnerability area around the subject estuaries.

This limitation was identified by the Scoping Study and would, ideally, have been addressed by completing studies to derive the maps before preparation of the ECMP. Council was unable to allocate additional funding to complete the underpinning studies and produce the required maps. The work required to address these data gaps has been identified as priority actions for completion during implementation of the ECMP.

Considering that the coastal vulnerability area is being addressed in this manner, the remaining focus for management around the estuaries, particularly considering the findings and identified risks from the Scoping Study are as follows:

- Primary focus: Coastal wetlands and coastal environment areas.
- Secondary focus: Coastal use and littoral rainforest areas[2].

[2] There are, presently, no littoral rainforests mapped in the CM SEPP around the estuaries subject to this ECMP. Therefore the *"littoral rainforest area"* is not presently relevant. A potential area has been identified in Flying Fox Bay. The littoral rainforest area may become relevant in time and incorporated during review of the ECMP.

The degree of focus applied to the different areas varies between estuaries. The way an estuary is used by the community, the amount of surrounding development, and nature of threatening processes makes the management of each estuary unique.

Given that the CM Act also addresses management of the open coast, there are several objectives within the CM Act that do not readily apply to estuaries. Where appropriate, these objectives have not been given weight when examining risks and deciding on management actions while developing this ECMP.

1.2 Why is this ECMP Required?

Estuaries are complex for a variety of reasons. We do not understand the physical, chemical and ecological behaviour of estuaries as well as we would like, and there are competing desires around the way they are used and managed, and the way that land surrounding them is developed.

A review of the Eurobodalla Community Strategic Plan (Eurobodalla Shire Council, 2017) indicates that Council and the local community place a high value on the 'clean', 'beautiful' and 'healthy' coastal environment of the Eurobodalla Shire. There is an overriding desire to protect and sustainably manage the estuaries of the Eurobodalla Shire in a responsible manner for both current and future generations. Council wishes to promote coastal management actions that help local communities thrive socially, culturally, and economically.

Eurobodalla residents have an innate connection to the water. Consultation has identified that good water quality, access for recreation and sporting activities, and maintenance of natural beauty are important to the local community. This ECMP incorporates input from the community and various government stakeholders responsible for estuary management in the Eurobodalla Local Government Area.

Considering its key focus on estuary management, the ECMP concentrates on achieving the following objects of the CM Act:

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

- To facilitate ecologically sustainable development in the coastal zone and promote sustainable land use planning decision-making.
- To mitigate current and future risks from coastal hazards, taking into account the effects of climate change.
- To promote integrated and co-ordinated coastal planning, management, and reporting.
- To ensure co-ordination of the policies and activities of government and public authorities relating to the coastal zone and to facilitate the proper integration of their management activities.
- To support public participation in coastal management and planning and greater public awareness, education and understanding of coastal processes and management actions.
- To facilitate the identification of land in the coastal zone for acquisition by public or local authorities in order to promote the protection, enhancement, maintenance and restoration of the environment of the coastal zone.
- To support the objects of the Marine Estate Management Act 2014.

Consistent with the Marine Estate Management Act, the following purposes are also supported:

- To promote the co-ordination of the exercise, by public authorities, of functions in relation to the marine estate.
- To provide for the management of the marine estate of New South Wales in a manner that:

  (i) Promotes a biologically diverse, healthy and productive marine estate.

  (ii) Facilitates:

  - *economic opportunities for the people of New South Wales, including opportunities for regional communities, and*
  - *the cultural, social and recreational use of the marine estate, and*
  - *the maintenance of ecosystem integrity, and*
  - *the use of the marine estate for scientific research and education.*

While not a focus, the coastal vulnerability area (CVA) cannot be completely ignored. The ECMP has been prepared to be consistent with Council's current management of coastal hazards. Further coastal hazard studies are still required to determine the extent of the CVA (see actions Mo3, Mu1 and Wa2). Council

intends to undertake the mapping of the CVA for Moruya River, Mummuga Lake and Wagonga Inlet following adoption and certification of this ECMP.

1.3 Roles and Responsibilities of Council and Public Authorities

Council is responsible for preparing CMPs for the coastal zone within the boundaries of Eurobodalla Shire in accordance with the requirements of the CM Act and the Coastal Management Manual (NSW Government, 2018a). Council must then implement those CMPs through their *Integrated Planning & Reporting* program and/or land use planning system according to New South Wales law. The CMP must be monitored and reported on, with annual reporting required for planned actions and their outcomes over the period covered by the CMP. The land use planning controls adopted by Council within the coastal zone should give effect to the management objectives identified in the CMP.

Other public authorities must have agreed to any actions that are either identified as their responsibility in the CMP, or that affect their land or assets before a CMP can be certified. When preparing, developing or reviewing other plans of management, public authorities must have regard to the CMP, wherever it might be relevant and/or influence their operations.

1.4 Integration of Flood and Coastal Management Programs

The Narooma Floodplain Risk Management Study & Plan (FRMSP) is currently (Late 2021) being prepared and covers areas immediately adjacent to and including Wagonga Inlet and Mummuga Lake. The FRMSP will still be in draft form when this CMP is adopted. The FRMSP examines several areas around Wagonga Inlet and Mummuga Lake where there are low lying parcels of land and roads running parallel to the edge of the inlet that are subject to flooding. There are records of flooding at some of these locations during relatively frequent flood events (~10% AEP).

The outcomes of the FRMSP may result in changes to the management of the Wagonga and Mummuga estuaries within the lifespan of this CMP, and the actions in this CMP should be adjusted to be compatible with these wherever possible.

As part of the Narooma Flood Study and Narooma FRMSP process, tidal inundation extents will be provided to Council which will assist in completing actions WA2 and MU1 of this CMP.

1.5 How was the ECMP Developed?

The CM Act states that a coastal management program needs to be prepared in accordance with the Coastal Management Manual. The Coastal Management Manual (NSW Government, 2018a) outlines a 5-stage process as shown Figure 2.

1.5.1 Stage 1 Identify the Scope of the CMP

Appendix A contains the Scoping Study, which is the outcome of Stage 1 of the process. The primary purpose of a scoping study was to identify the required focus for the CMP (as outlined above), and the steps required in preparing that CMP. The scoping study considered existing information to review any progress already made in managing issues in coastal areas. Key tasks completed as part of the scoping study process were:

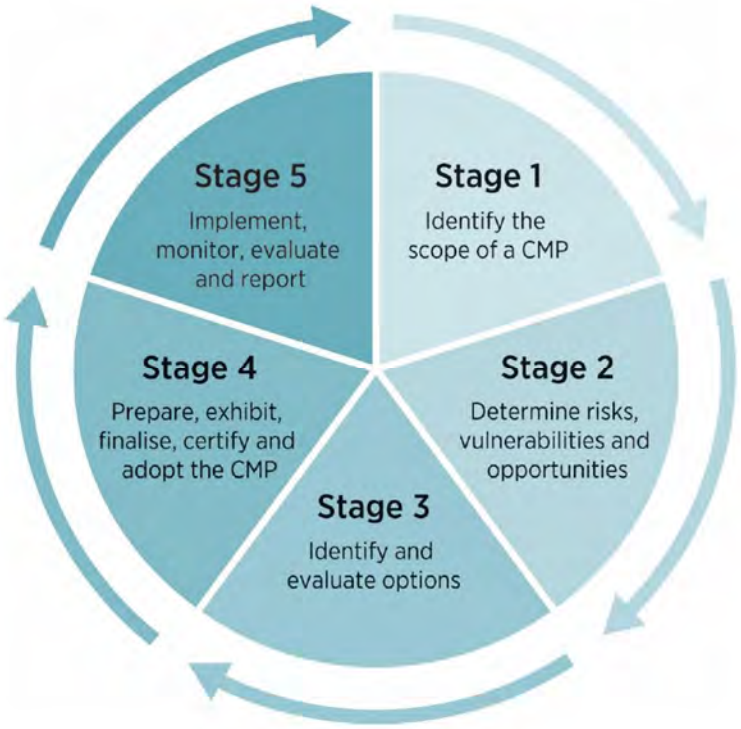


Figure 2 Stages in Preparing and Implementing a CMP (Source: NSW Government, 2018a)

- Gathering an understanding of the community and identifying stakeholders. Developing an engagement strategy for later stages and beginning development of a shared understanding of the existing coastal management situation. Identifying the organisations and communities that need to be involved in the CMP process and who holds responsibility for various issues that are likely to be involved.

- Determining the strategic context of coastal management for the area being considered and establishing the purpose, vision, and objectives of the CMP, identifying an appropriate scope, and expected key outcomes from the CMP.
- Determining the spatial extent of management areas (and which of the four management areas) need to be considered by the CMP.
- Considering where coastal management areas overlap and how the hierarchy of management objectives outlined in the CM Act would operate. For the present ECMP, objectives relating to coastal wetlands are more important than those relating to the coastal environment area (where those areas overlap). These in turn are more important than the objectives relating to the coastal use area.
- Reviewing the issues already identified, current coastal management arrangements and progress with existing actions. Determining where further or different action is required via a first-pass risk assessment.
- Identifying the knowledge gaps and preparing the business case for filling those gaps. The business case also includes a forward program for preparing the coastal management program.

An important overarching concern for estuaries is how any population growth within the catchment is going to be managed alongside changes in demographics. Existing and projected population growth over the next 15 years is provided in Table 1, alongside recent aging trends which show a population which ages throughout the main townships surrounding the three subject estuaries. The population has tended to age one year for every calendar year that passes. The aging demographic needs to be considered in terms of actions to enable access to the estuary, associated facilities, and services.

Table 1 Demographics and Change

Locality	Population 2022 (via Forecast)	Population 2036 (Forecast)	Change in Population	Median Age 2011	Median Age 2016
Urban Moruya / Moruya Heads	3774	4732	+25.36%	46	51
Dalmeny	2037	2197	+7.85%	53	59
Narooma/North Narooma	3665	4029	+9.94%	53	59

Moruya is of particular interest, with relatively rapid growth expected as facilities and infrastructure such as the new hospital and Moruya Bypass are constructed. Moruya is going to become an increasingly important centre for the region.

Growth is also expected to be significant within the Mummuga catchment following the sale of approximately 40 hectares of land, with a view of a large low density residential development. It is too early to forecast the impacts this will have upon population growth in Dalmeny, but it is likely that growth here will outpace the anticipated 0.91% PA average growth forecast for the rest of Eurobodalla between 2016 and 2036

The impacts of population growth need to be managed, but they are uncertain. There are clearly recognised links between urban growth and impacts on water quality and / or potential destruction of important ecosystems. These impacts need to be minimised, offset, or balanced in some other way to address possible losses in biodiversity. Similar impacts can arise from major infrastructure, but in practice impacts from these larger projects seem to be somewhat easier to address.

The role of overall, strategic planning to manage population growth and ongoing development is important in this regard, and it is vital that high level decisions regarding significant facilities and infrastructure consider potential impacts such as determining whether a proposed road corridor is going to affect the extent of potential tidal inundation in future, and hence the natural adaptability and migration of coastal wetlands. This overall concern has been carried through the CMP development process and is reflected in risks and actions addressing the planning for population growth and the implementation of significant infrastructure and facilities.

Due to constraints on Council resources and funding, completion of the full suite of Stage 2 studies that would ideally have informed the CMP was not possible. For this reason, several important studies have been presented as actions within the CMP, such as mapping of the vulnerability areas.

Some of the studies that are yet to be completed could inform potential changes to the extents of coastal areas in the CMP. Aside from assessing and mapping the coastal vulnerability area, there are also actions which could potentially lead to the introduction of littoral rainforest mapping (Flying Fox Bay, Wagonga Inlet), and modifications to the coastal wetland mapping through:

- Additional effort to inform current and historical extents of wetlands within Mummuga Lake.
- Additional effort to provide for the mapping of potential migration pathways for coastal wetlands as sea levels continue to rise.

There is already some recent mapping of estuarine macrophytes in Wagonga Inlet and around Moruya River (Elgin Associates, 2018) which could inform changes to the Coastal Wetland Maps within the CM SEPP.

To change the extent of coastal management areas in the CM SEPP, a *planning proposal* would need to be prepared by Council to support the changes. If such changes were proposed, the CMP would need to identify the proposed amendments and present the evidence supporting those amendments.

For the present ECMP, evidence to support amendments to the CM SEPP Maps is either incomplete (in the case of coastal wetlands) or does not yet exist (coastal vulnerability). Actions which aim to fill these knowledge gaps are included within the ECMP, but no planning proposal is proposed at this stage.

1.5.2 Stage 2 Risks, Vulnerabilities and Opportunities

Two small studies were completed as part of Stage 2:

1. A review of the Estuary Health Risk Dataset3 for Wagonga Inlet and Mummuga Lake (Appendix B1), noting that the dataset did not provide outputs for Moruya River. Ultimately, it was determined that the "Risk-based Framework" methodology used (OEH, 2017) would need to be revisited for some locations where risks have been identified. In revisiting the methodology, a more local-scale determination of water quality objectives and, potentially, modification of aspects of the methodology should be considered. Several sites throughout New South Wales are presently being assessed in more detail as part of actions under the Marine Estate Management Strategy, and the findings of those ongoing studies should be used to inform any changes to the approach.
2. A review of tidal inundation extents surrounding the three estuaries for future sea level rise of 0.5, 1.0 and 1.5m. The data, provided by Department of Planning and Environment (DPE), was part of the dataset used to underpin the coast wide tidal inundation exposure assessment (OEH, 2018). For our purposes, we have assessed the increase in inundation that would occur around the key wetland complexes mapped by the CM SEPP for the subject estuaries. The assessment highlighted the importance of managing upslope migration of coastal wetlands downstream of Moruya, with particular importance indicated for the wetland complex surrounding Malabar Creek. As sea levels rise, this wetland will expand greatly across the Mullenderee Floodplain to the west of the existing mapped wetland. Opportunities exist here to offset losses of wetland from other areas. Further technical studies are required to understand the implications of sea-level rise on coastal wetlands. Actions have

[3] https://www.environment.nsw.gov.au/research-and-publications/publications-search/nsw-estuary-health-risk-dataset

been included in the ECMP and will inform potential amendments to the mapped extents of coastal wetlands in the CM SEPP.

Appendix B contains more detail regarding the methodology and key findings of the Stage 2 studies.

Following completion of the two studies, and in conjunction with ongoing consultation, the preliminary risk assessment completed during the scoping study was upgraded. To ground the risk assessment in the requirements of the CM Act, all risks were categorised in terms of the coastal management area of most relevance to the risk and the relevant objectives from the CM Act which are affected, or potentially affected by the risks.

The risk assessment is provided in Appendix D, alongside categorisations for likelihood and consequence and the assessment of risks into extreme, high, moderate, or low risk categories.

Understanding a level of risk alone is not enough to enable assessment of when and how mitigative action should be undertaken. An understanding of the time frame over which a certain risk may impact helps to understand the urgency with which a risk should be addressed.

The CMM requires that different time frames be considered by a CMP, including Immediate, 20, 50 and 100 years. While it could be argued that this type of assessment is more useful for assessments of coastal vulnerability, particularly with continuing sea level rise, it is also useful to assess broad time frames to help drive actions associated mitigating risks to estuarine/environmental values.

The risk assessment in Appendix D contains coarse assessments of time frames for emergence of the risk, and time frames for an impact requiring action. For the sake of consistency with the CMM, the time frames required by the CMM have been applied in an indicative manner. The urgency expressed by the time frames has been used as a guide in the assessment and timing of management actions designed to address the risks as part of Stages 3 and 4 of the CMP process.

1.5.3 Stage 3 Identify and Evaluate Options

Through ongoing consultation and the risk assessment process, potential management options have been identified. A discussion regarding the different options is presented in the risk assessment.

Options identified as part of ongoing consultation and arising from the risk assessment were subjected to evaluation as presented in Appendix E. The evaluation comprised two stages:

- A filtering exercise of the 'long-list', where options were assessed against a series of 'road-blocks' such as being out of scope of a CMP, clearly infeasible or already being addressed as part of another

process by Council. Examples of actions being addressed elsewhere by Council include recreational maritime facilities, which are currently the subject of studies by both Council and Transport for NSW (TfNSW).

- A thorough, detailed assessment against all objects and objectives of the CM Act regardless of the coastal management area to which it corresponds. The consideration of all objectives was made to assess overall benefit, noting that some benefits extend beyond the coastal management area boundaries represented by the CM SEPP. One example is the rehabilitation of coastal wetland areas, which has benefits to overall ecological functioning and water quality in an estuary. In addition, an informed cost estimate was made, based on experience with similar works undertaken in other localities and/or standard published rates. The scale of impact was also scored to derive a scaled impact score and different management options were ranked based on the scaled impact score and the cost estimate.

Utilising both the objects and objectives of the CM Act as criteria to categorise risks and assess management actions, the links between different management actions in promoting and enacting the varied foci and goals of the CM Act are clear. The performance of each shortlisted management option has been scored in terms of overall performance against those aspects of the CM Act, with detailed tables resulting from that process presented in Appendix E.

Taking advantage of opportunities as they arise should not be stifled by the CMP process. Adaptability is important, alongside a general awareness among estuary management agencies of where other agencies are active.

During later stages of development of this ECMP, several additional management actions which were accepted by the relevant stakeholders as being feasible, viable, practical and highly likely to provide suitable benefits were identified. While these were not subject to the detailed assessment outlined above, the management actions have been qualitatively considered and align with the objectives of the CMP, promote the objects of the CM Act and are consistent with the objectives of the CM SEPP. These actions have been included within the ECMP providing that a responsible agency for the action and funding source could be confirmed. These were Actions Mo7, Wa11 and Wa12, and components of Action Mu3 and Wa5.

An overarching management action proposed by this ECMP is that representatives from all the key agencies meet regularly to share information and ensure that overall effort from state and local

government is coordinated, cohesive and informed. It is through this regular contact that we expect that flexible, adaptive, and sometimes opportunistic management action can be accommodated.

1.5.4 Stage 4: Prepare, Exhibit, Finalise and Certify

The ECMP has been prepared under the guidance of Eurobodalla Shire Council and the Department of Planning and Environment (DPE). Furthermore, other state government agencies have been contacted to confirm that they are committed to supporting execution of the ECMP, including providing funding where necessary and possible.

A CMP must be placed on public exhibition and any comments of relevance considered and addressed. Following exhibition, the CMP is finalised and submitted to Council for adoption. Once adopted by Council, the CMP is forwarded to the Minister for Local Government for certification.

1.5.5 Community and Stakeholder Engagement

Consultation has been an important feature through Stages 1 - 3 of the CMP development process. During Stage 1, as outlined in Appendix A (Sections 3.2, 4.2 and 5.2 of that Appendix), the following tasks were completed in 2018:

- Three community workshop/drop-in sessions in Narooma and Moruya.
- A stakeholder meeting held in Narooma.

These activities underpinned the identification of issues considered in the preliminary risk assessment during the scoping study.

Additional consultation was completed to accompany Stages 2 and 3 of the CMP development process during 2020, including:

- An online survey drafted by Council and Salients and managed by Council which took responses between August and September 2020.
- Site meetings held in late August with Local Aboriginal Land Councils, Oyster Farmers, representatives from other community groups and state government agency representatives.
- Ongoing teleconferencing, telephone, and email correspondence with state government agencies during September-November 2020.

The outcomes of these later stages of consultation are summarised in Appendix C to this ECMP. Additional review of drafts by government stakeholders and exhibition of the document were also completed during Stage 4 of ECMP preparation.

1.6 Whether the CMP identifies recommended changes to the relevant planning controls, including any proposed maps

The Coastal Management Manual, as a mandatory requirement, specifies that a section must be included in a CMP with the title *"Whether the CMP identifies recommended changes to the relevant planning controls, including any proposed maps"*. This section addresses that requirement.

In summary:

> Amendments to the CM SEPP Mapping are not recommended by the present ECMP and a planning proposal is not yet required. Once the studies required by the ECMP are complete, a planning proposal covering all coastal management areas should be prepared if required.
>
> This ECMP does not recommend any changes to existing planning controls, although these may arise once the studies required by this ECMP are completed.

1.7 Maps

The Coastal Management Manual, as a mandatory requirement, specifies that a section must be included in a CMP with the title *"Maps"*. This section addresses that requirement.

Maps are inserted into the relevant sections of the CMP as shown in Table 2.

Table 2 Schedule of Maps

2 OVERARCHING ISSUES AND ACTIONS

2.1 A Snapshot of Key Issues

There are several issues that are important across all three estuaries, including common problems experienced at all sites and overall management of estuaries throughout the local government area, particularly keeping an eye on long-term outcomes. Herein, we have highlighted the "extreme" and "high" risk issues identified by the ECMP development process. Several "moderate" level risk issues are also addressed by actions in the ECMP.

2.1.1 Long Term Migration Capacity of Coastal Wetlands

ASSESSED RISK LEVEL

Extreme

RELATED ACTIONS

EM1, EM2, Mo2, Mo3, Mu1, Mu2, Wa2, Wa7

Sea levels offshore of New South Wales continue to rise over time. As this happens, tide levels within estuaries will also continue to rise. The different ecosystems that comprise coastal wetlands inhabit tidal "niches" relating to the frequency of inundation or depth of water where they can survive. As tide levels rise, the frequency of inundation of different areas will increase and, as a result, there will be a tendency for coastal wetlands to spread further out across the floodplain.

As mean tide levels rise over time, the interface between Mangroves and saltmarsh is changing
Ryans Creek Wetland, Moruya

Similarly, areas previously inhabited by these ecosystems will be 'drowned' out if they are inundated too frequently. In several locations in NSW, a process whereby mangroves are encroaching upslope into areas inhabited by saltmarsh is already known to be occurring. The balance of vegetation in coastal wetlands is incredibly important for several reasons, including the filtering and trapping of sediments and for fisheries.

Ensuring coastal wetlands continue to thrive into the future is vitally important, but there still exist data gaps that need to be addressed to make sure that this can be planned for. In NSW, local councils are responsible for adopting an appropriate sea level rise projection. This sea level rise projection needs to be revisited as the scientific understanding of climate change and sea level rise improves and new scientific information becomes available.

2.1.2 Potential Loss of Aboriginal Heritage Sites due to Sea Level Rise

ASSESSED RISK LEVEL

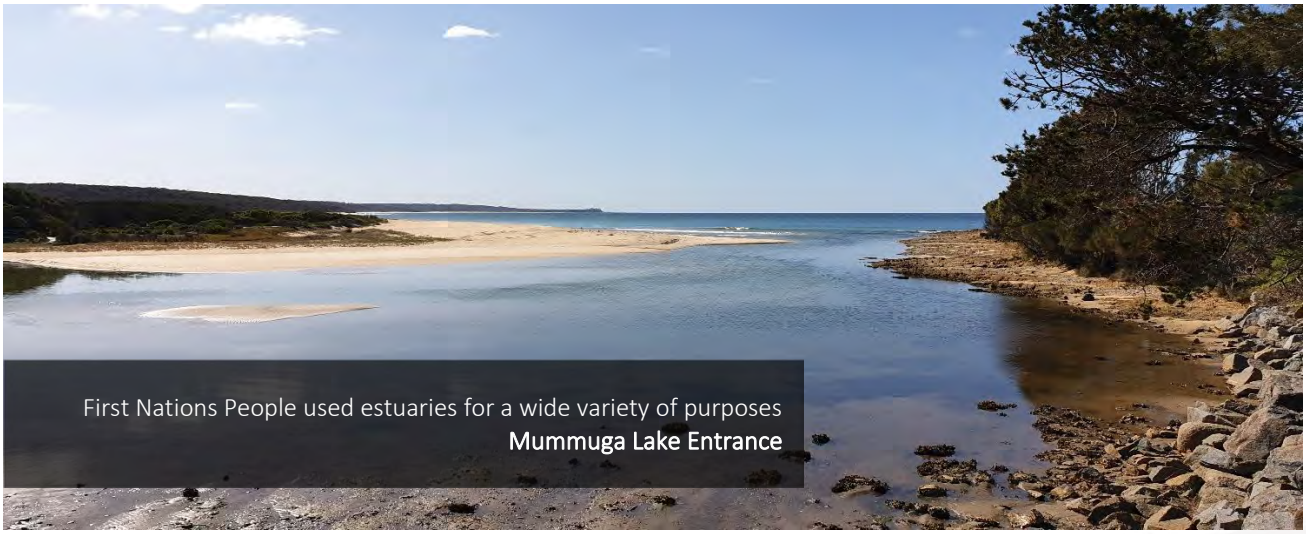
Extreme

RELATED ACTIONS

EM1, EM3

The rise of sea level is highly likely to gradually inundate heritage sites of importance to the Aboriginal people of the Eurobodalla Shire. Estuaries have been utilised extensively by the Aboriginal people as a source of food and for cultural purposes for millennia. For this reason, they are often a hot spot for cultural and heritage sites.

Based on consultation completed with Local Aboriginal Land Councils and Aboriginal representatives during the preparation of this CMP, we are aware that a relationship with the land for food and ceremonial purposes continues to this day. Most of the south coast of NSW, stretching from Bundeena on the southern outskirts of Sydney to Eden, is presently subject to a Native Title application by the Yuin People (see Section Appendix F.17 of the Scoping Study for further information). This includes the coastal strip, estuaries, and offshore waters.



First Nations People used estuaries for a wide variety of purposes
Mummuga Lake Entrance

Any actions undertaken on Crown Land will need to be undertaken in accordance with the requirements of the *Native Title Act 1993* and the *Aboriginal Land Rights Act 1983*.

It is important that potential impacts of future sea level rise on heritage sites be discussed, and a way forward determined by, and in cooperation with, the local Aboriginal people of the Eurobodalla Shire.

2.1.3 Population Growth

ASSESSED RISK LEVEL

High

RELATED ACTIONS

EM4, EM5, Mo2, Mo3, Mu1, Mu6, Wa2

Population growth will mainly be reflected in expansion and/or intensification of urban development. There are recognised links between urban growth and impacts on water quality and/or potential destruction of important ecosystems. Eurobodalla Shire Council is currently incorporating increased erosion, runoff, and pollution considerations into the DCP requirements for large scale developments, such as the development south-west of Mummuga Lake. Development code requirements will include monitoring of impacts from the development and measures to ensure that sediment and pollution are managed on-site and do not impact waterways. Similar impacts can arise from the major infrastructure required to accommodate a growing population, but in practice impacts from these larger projects seem to be somewhat easier to manage. These matters are ideally addressed at a high level, and through strategic development. It is important that all strategic decisions consider the issues raised in this ECMP and make appropriate allowances to ensure ecologically sustainable development.

There should also be mandatory requirements for riparian setbacks and replanting and management of tributaries leading to the estuaries, in both the lower and upper catchments. The current pollutant targets in the DCP should also be reviewed to ensure that they will provide adequate protection with the growing pressure of development.

Urban development around the estuaries is typically of overall low impact at present, but ongoing population growth and development is expected in the next 15 years
Narooma
Courtesy Andrew Williams, DPE

2.1.4 The Need for Coordination

ASSESSED RISK LEVEL

High

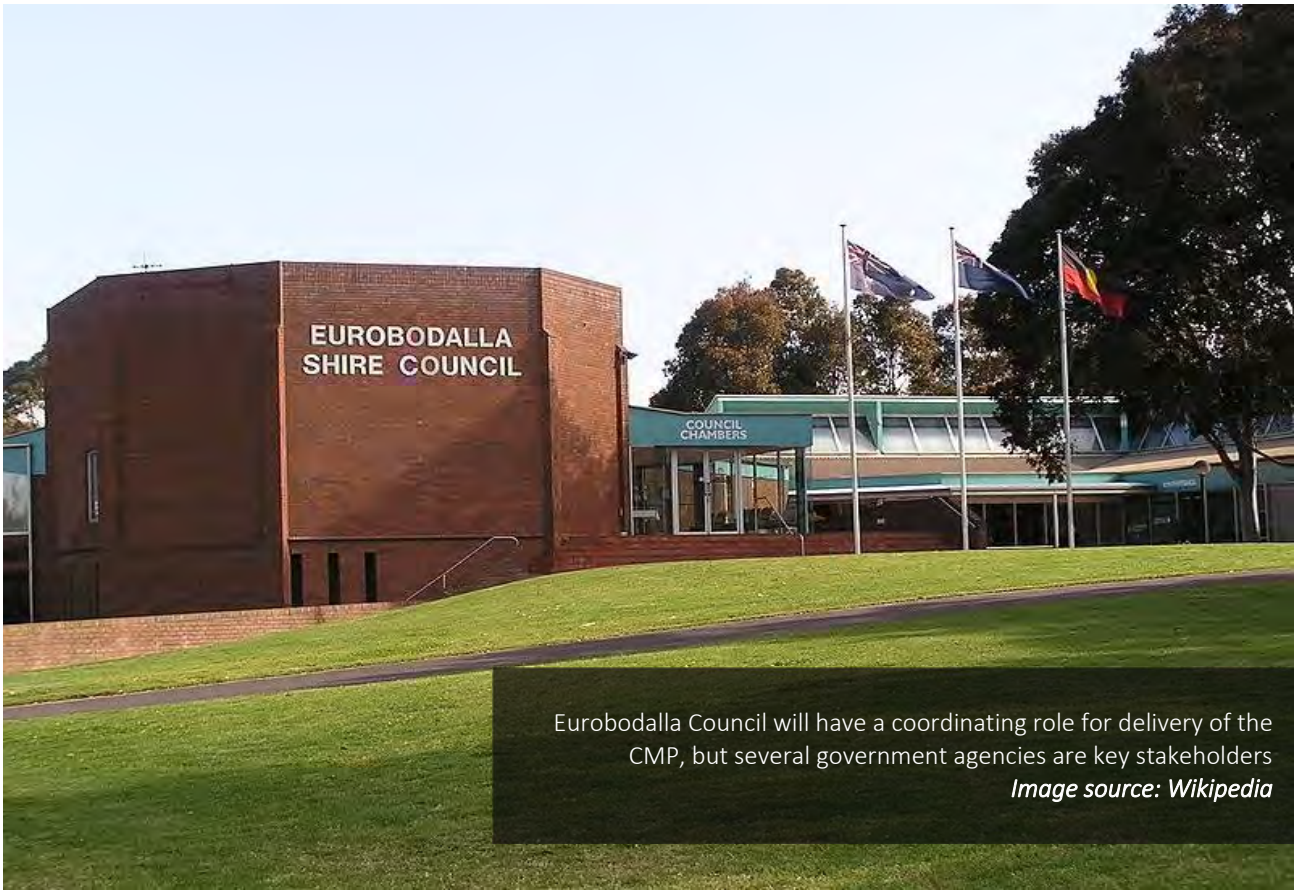
RELATED ACTIONS

EM5

There exist administrative and organisational barriers to managing estuaries in NSW.

There are already strong contacts between different state government departments and Council at the local level and these have tended to remain resilient to reorganisation and restructuring that occurs at higher levels in government departments.

Delivery of the ECMP will require a formalised commitment, particularly given the agreements for funding and timing that underpin the ECMP. It is important that the CMP is cognisant of key legislative and management responsibilities. The identification of key land managers and legislative responsibilities helps to achieve a coordinated and integrated approach to coastal zone management.



Eurobodalla Council will have a coordinating role for delivery of the CMP, but several government agencies are key stakeholders
Image source: Wikipedia

2.1.5 Litter from Urban Stormwater

ASSESSED RISK LEVEL

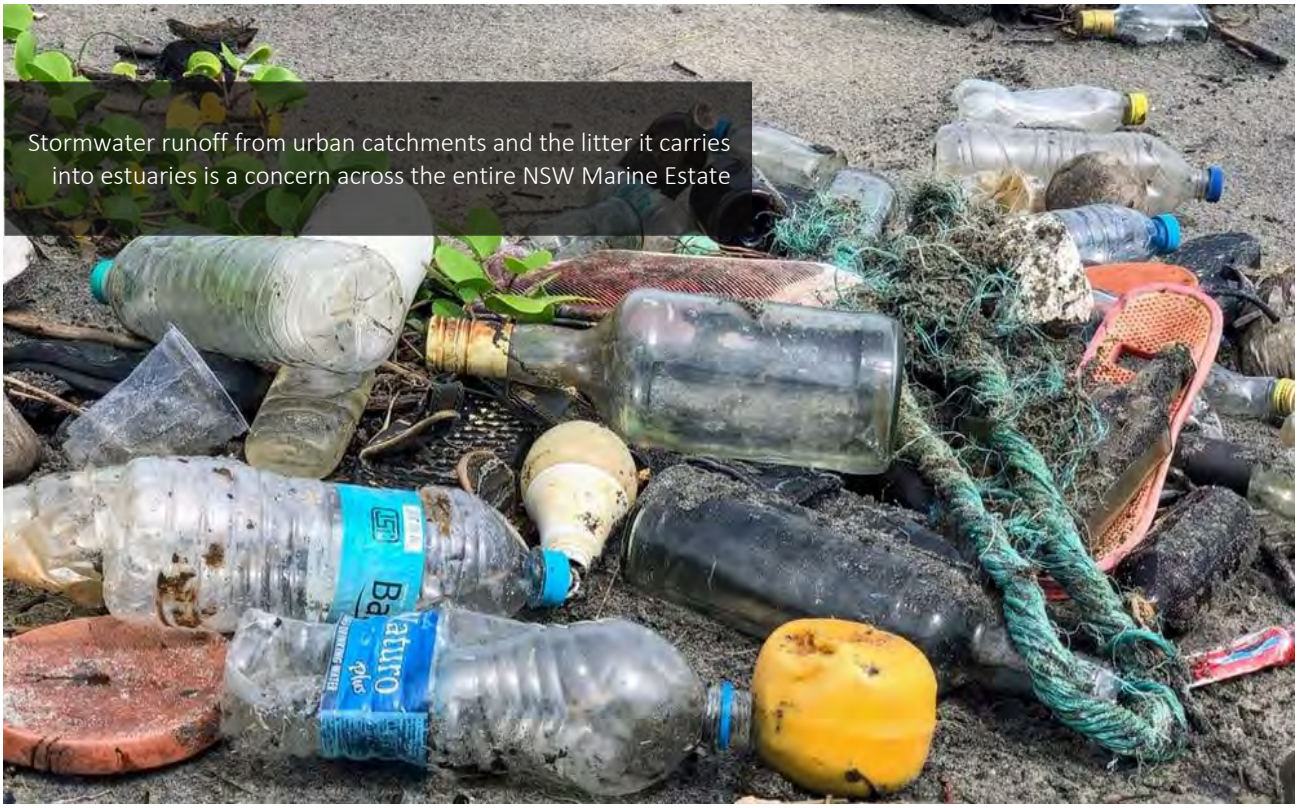
High

RELATED ACTIONS

Mu6, Wa9

Initiative 1 of the Marine Estate Management Strategy (MEMS) is "*Improving water quality and reducing litter*" to benefit marine habitats, wildlife, and the community. The MEMS was developed under the *Marine Estate Management Act 2014* and strongly interacts with the framework for coastal management in NSW.

Options to address areas of concern relating to litter within the estuary have been included in the ECMP.



Stormwater runoff from urban catchments and the litter it carries into estuaries is a concern across the entire NSW Marine Estate

2.1.6 Working towards a Planning Proposal

ASSESSED RISK LEVEL

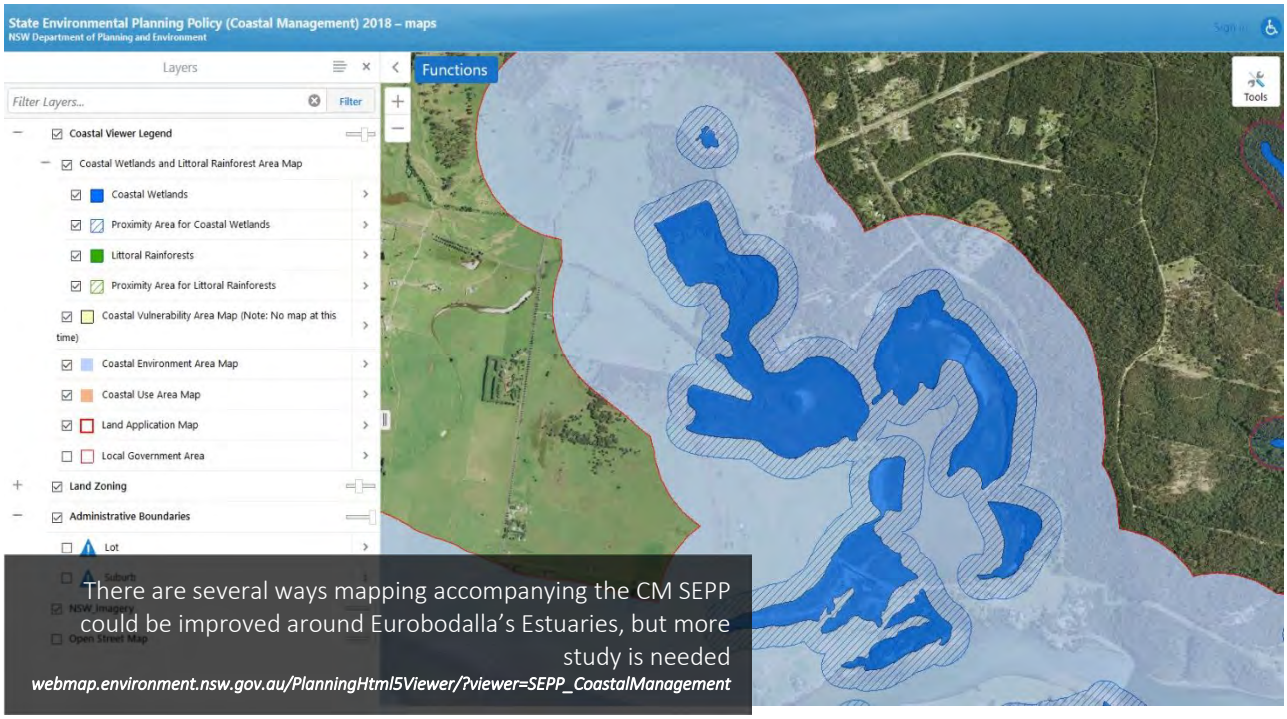
Extreme

RELATED ACTIONS

EM1, EM6, Mo2, Mo3, Mu1, Mu2, Wa2, Wa7

The existing CM SEPP maps, which define the coastal zone and its constituent coastal management areas were developed by the NSW State Government. In some respects, such as the extent of coastal wetlands and potentially littoral rainforests (at Flying Fox Bay, Wagonga Inlet), these are incomplete or out of date. In other matters, such as the coastal vulnerability area associated with tidal inundation inside estuaries, the existing information required to draw these maps does not yet exist and studies are needed to fill this gap.

A Planning Proposal will eventually be required to recommend changes to the CM SEPP Maps.



2.2 Actions to Be Implemented by Eurobodalla Shire Council and / or Public Authorities

2.2.1 Action EM1: Future Tidal Inundation Mapping to Inform other Actions

This action requires a different approach for each of the estuaries and is to be implemented as an adjunct to Council's existing Floodplain Risk Management Process (FRMP). The individual actions for each estuary are detailed below, in the sections dedicated to each estuary. It is important that the required modelling considers a range of normal tidal planes, including High High Water Solstice Springs (HHWSS), Mean High Water (MHW) and Mean High Water During Springs (MHWS) and Mean Tide Level.

As part of the FRMP, hydraulic models are established but often not calibrated to tidal behaviour, as the focus is directed towards extreme catchment flooding. Calibration of existing models to extreme storm surge and tidal behaviour may be required before completing the required mapping.

For maximum utility, it is recommended that simulations cover scenarios incorporating open coast sea level rise values of 0.3, 0.6, 0.8, 1.0 and 1.2m. The benefit of this approach is that it provides flexibility in modifying the extent of inundation maps that would inform, for example, a change to the adopted extent of the coastal vulnerability area if Council chooses to change its adopted sea level rise projection in future. Updated maps can be derived by processing existing model results and a consultant needn't be engaged to execute new flood model simulations to derive the updated extents.

Intermittently Opening and Closing estuaries (i.e., ICOLLs) such as Mummuga Lake require special consideration as they experience times when they are non-tidal. To properly account for the natural water level variation, periods when the entrance is open need to be considered alongside periods when the entrance is closed. Ideally, a continuous water level record would be available, and Action Mu7 aims to fill this data gap for Mummuga Lake.

Outputs from the studies should include vector GIS layers of the extent of inundation for each scenario/tidal plane combination and raster data sets of the depth of inundation.

2.2.2 Action EM2: Mapping of Migration Pathways for Coastal Wetlands

Coastal wetland migration pathways, under a future sea level rise scenario, need to be mapped. However, to properly examine this, the results from Action EM1 (and its subordinate Actions Mo3, Mu1 and Wa2) will need to be completed. In addition, the study of historical coastal wetland extents at Mummuga Lake (Action Mu2), to rationalise differences in wetland extents during open and closed entrance conditions should also be completed.

The migration pathways assessment will consider and identify potential barriers to coastal wetlands expanding across the landscape as sea levels rise. The rate of potential sea level rise over time frames of 20, 50 and 100 years are to be considered, and likelihoods associated with different wetland extents at different future times are to be assessed. In addition to the area over which the wetlands expand, consideration needs to be given to the loss of mangrove and saltmarsh vegetation where they can be "drowned out".

This action aligns with Initiative 2 (Action 2.3.2) of the Marine Estate Management Act (MEMA), which targets Estuary-specific intertidal marine vegetation management strategies. An opportunity exists to link this action with the upcoming Department of Primary Industries (DPI) marine vegetation mapping strategy. That strategy will involve mapping predicted and potential migration paths for mangrove and saltmarsh at various sea level heights in an interactive map. The map will identify areas important for protection both at the present time and for various future sea levels.

The timing of this action will need to carefully consider how the statewide mapping is being rolled out to avoid duplication of effort where possible. Communication with DPI-Fisheries should continue to maximise efficiency.

2.2.3 Action EM3: In Consultation with Local Aboriginal Representatives Undertake Preliminary Mapping of "At-Risk" Aboriginal Heritage sites around Estuaries

Preliminary discussions with local First Nations representatives, council officers and DPE have highlighted a concern that there are many Aboriginal heritage sites that are low lying and susceptible to loss with sea level rise. Some sites may already be threatened and the extent of the threat from sea level rise has not been assessed.

Council has access to sites recorded on the AHIMS database, and preliminary inundation extent analyses completed by OEH (2018). These data are enough to provide a preliminary assessment of the degree of the threat. That assessment would be suitable for initiating discussions with Council's local Aboriginal Advisory Committee and Local Aboriginal Land Council representatives to ascertain an appropriate way forward. This is important as the AHIMS database is known to be an incomplete register for various reasons and culturally important areas exist which aren't recorded in that management system.

2.2.4 Action EM4: Appropriately Planning for Population Growth and Identifying Offsets

The Environmental Planning and Assessment Act (1979) provides the legal framework for planning in NSW and facilitates effective planning through consideration of social, economic, environmental and cultural factors. Both State and Local Government have a role in this process. State government is responsible for the development and implementation of strategic plans and infrastructure projects, whereas Council manages local development and planning outcomes. Specific matters around Moruya which are imminent and will require special consideration from both state and local government in fulfilling these planning roles include:

- Moruya's population is forecast to increase by around 30% in the next 15 years. Decisions need to be made around where these people will reside.
- The Princes Highway Moruya Bypass for which the impact of the selected route is presently being considered (as of late September 2021).

- The proposed Moruya Hospital to the east of the Moruya TAFE campus between Albert Street and the Princes Highway.

The flat terrain and presence of coastal wetlands throughout the Moruya floodplain mean that all these matters have the potential to impact or block the ability of wetlands to adapt and migrate as sea levels rise.

Discussions with the Planning section of DPE have indicated that wetland migration pathways are an issue of interest, and they can be considered as part of the environmental impact assessment for state significant projects. The planning process for large infrastructure projects should consider avoidance of impacts on wetlands, including future migration pathways, or the adoption of suitable mitigative strategies such as offsets where a conflict is identified.

Similarly, future urban development in and around all estuaries needs to be approached with care to ensure that appropriate measures are taken to prevent the decline of water quality.

During the development of this CMP, a portion of R2 zoned land in the Mummuga Lake catchment was sold, with an intention to develop the land in the coming years. This land had been previously earmarked in the Eurobodalla Settlement Strategy 2006 to be zoned R2 Low Density Residential and identified as land release area, a recommendation that was incorporated into Eurobodalla's Local Environmental Plan (LEP) in 2012.

As outlined in the LEP, this land cannot be developed until a Development Control Plan (DCP) is in place. During this DCP process Council will seek input from the community and government agencies to ensure appropriate measures are out in place to protect waterways within the Mummuga Lake catchment. Factors such as water sensitive urban design, density, public facilities and services, stormwater, bushfire and flooding mitigation, recreation areas, transport, and pedestrian networks, commercial and retail, landscaping, and assessment of conservation significance must all be considered within this DCP.

Any development will be subject to an Area Plan that specifies water quality objectives and development controls for stormwater and erosion management that align with ANZECC guidelines.

In relation to the ECMP, population growth will require ongoing consideration when implementing and reviewing its actions. This will form part of the Monitoring, Evaluation and Reporting (MER) plan included in this ECMP. Coordination and execution of the MER Plan will be the responsibility of the Estuarine Management Advisory Committee (see Action EM5). Development review activities carried out by the Committee are to be recorded against this action as part of the MER Plan.

2.2.5 Action EM5: Establish Estuarine Management Steering Committee and Meet Regularly

A formalised, government agency based advisory committee is to be formed, meeting bi-monthly to assist in resolving difficulties around estuary management throughout the Eurobodalla. The committee is to be focussed on the operational requirements of delivering the ECMP, will be chaired by Council and is to comprise staff from the following agencies:

- Council.
- South East Local Land Services.
- Department of Primary Industries (Fisheries).
- Department of Planning, Industry and Environment (EES).
- Batemans Marine Park.
- TfNSW.
- DPE – Crown Lands.

The committee will be responsible for the following:

- Ensuring that there is broad understanding across government of ongoing Estuary Management matters in the Eurobodalla Shire.
- Identifying and assessing additional management actions that should be considered for completion as part of the ECMP, as new issues arise and/or funding becomes available.
- Ensuring that relevant outcomes from the Eurobodalla Shire Council Bushfire Recovery Action Plan are integrated into the CMP through an interim review.
- Recording and tracking the progress of different Management Actions to facilitate subsequent reporting by Council.
- Grant funding opportunities from State and Federal Government vary from year to year, and a primary role of the committee will be to identify these opportunities and to access additional funding to carry out or expand upon the actions identified in this CMP.
- To ensure that all relevant parties are suitably familiar with new information, such as the outcomes of studies arising from Marine Estate Management Strategy initiatives, so that informed advice can be provided, and actions can be coordinated.

- Reviewing major future development applications in the context of the objectives of the CM Act, including those required to accommodate increasing population while protecting the overall ecological integrity and water quality within the estuaries from decline.

Some of these activities may require external assistance from research organisations and/or independent consultants. The committee should also consider consistency between the Local Strategic Planning Statement, the Local Environment Plan, Development Control Plan and the CM SEPP.

Where problems are identified, actions should be taken by the Committee aiming to rectify these inconsistencies in a way that is consistent with the CM Act. In many cases, this may take the form of appropriate correspondence to the agencies that would normally take responsibility for the identified inconsistency.

There is some flexibility in works that can be undertaken under the CMP. This is particularly the case for the Foreshore and Wetland Restoration and Environmental Protection Plans for Moruya and Wagonga Inlet (Mo1 and Wa1). Implementation of works at different sites under these plans is often dependent on the willingness of private landowners to participate, so timing and precise location of works cannot always be prepared in advance. The Committee will be responsible for documenting progress on those actions and the reasons behind decisions made in scheduling or pursuing rehabilitation or protection works.

This committee will have a very important role in tracking progress against the original CMP as part of the monitoring, evaluation and reporting program. It will be prudent to invite other agencies to attend this committee from time to time, when actions requiring those agencies input or authorisation are being considered.

While the function of this committee is firmly focused on government agency operations and responsibilities, there is a clear overlap with the scope of the Coastal and Environmental Management Advisory Committee (CEMAC) which includes community representatives. For this reason, there may be occasions when the two committees can come together for efficiency. However, their roles should remain distinct.

2.2.6 Action EM6: Investigate and validate CM SEPP mapping and update where required using a planning proposal

One overriding aim of the CMP is to prepare a planning proposal for modification of the CM SEPP maps as necessary to accommodate a more robust consideration of sea level rise and the effects of increased inundation by rising tides.

There are several related management actions which need to be completed to prepare a single planning proposal to support future planning around Eurobodalla's estuaries (see actions EM1, Mo2, Mo3, Mu1, Mu2, Wa2, Wa7).

Some of these studies will take time, but for efficiency and to minimise rounds of consultation with the community, it is seen as advantageous to combine these into a single planning proposal. It is likely that the planning proposal could be prepared around five years into the Program as laid out in the Business Plan.

Where feasible, planning proposals relating to CM SEPP mapping should occur concurrently with a commensurate update to Council's LEP.

3 MORUYA RIVER ISSUES AND ACTIONS

3.1 Key Estuary Management Objectives for Moruya River

The coastal zone associated with the Moruya River is shown in Map 1.

Relevant objectives for the estuary have been extracted from the *Coastal Management Act 2016* based on the management issues present. These were then considered as part of the risk assessment presented in Appendix D. Following that exercise, the "key" objectives, being those most associated with "extreme" or "high" level risks for this estuary, were identified.

The selected objectives were assigned a "focus" rating (very strong, strong, moderate, or minor) based on the risk assessment outcomes. The focus rating can be considered a qualitative measure of the total effort that the Program contains to achieve that objective. These are presented in Table 3.

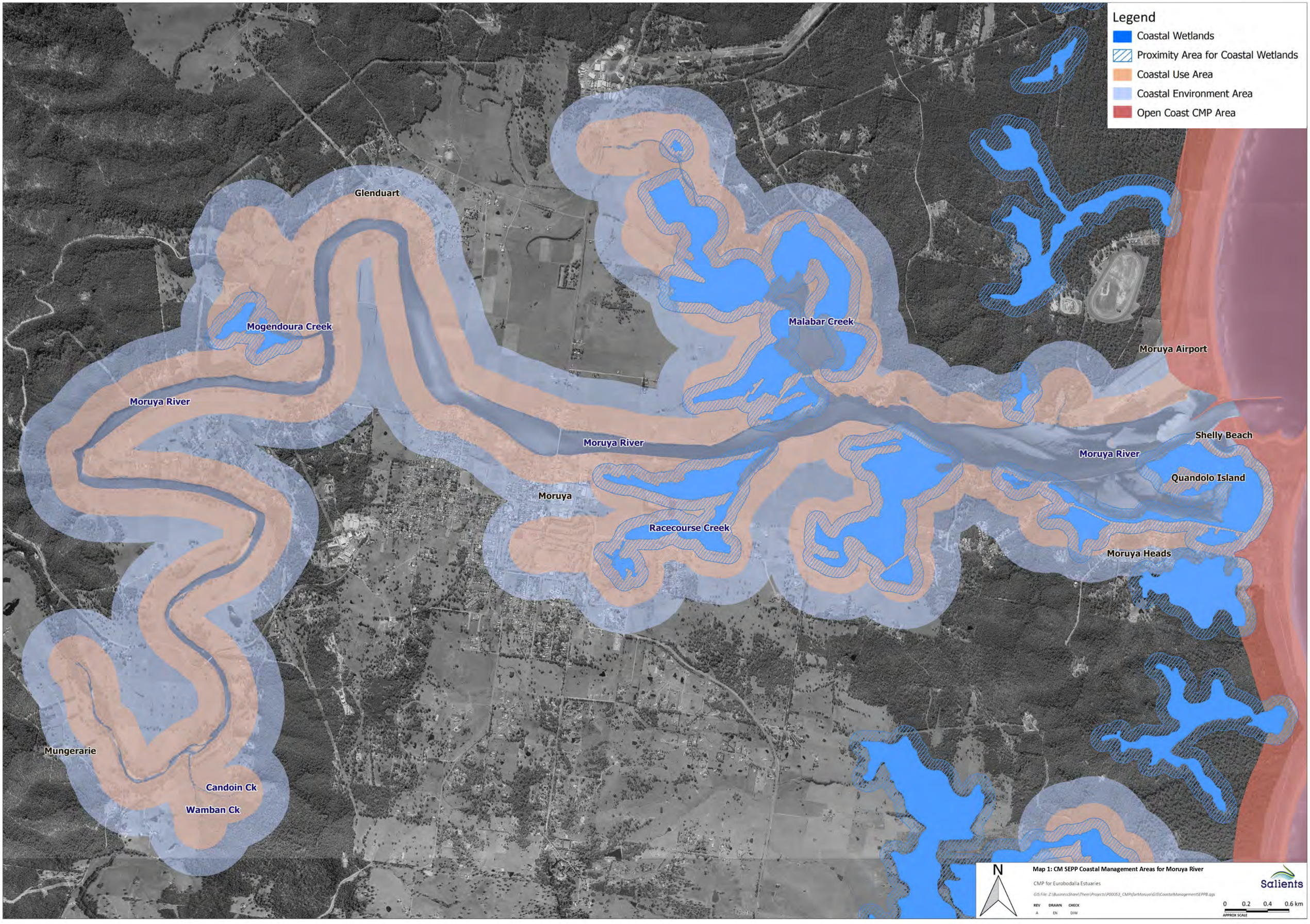
The priority scores in Table 3 are directly related to the coastal management area to which each objective applies in the CM Act. For example, objectives associated with the coastal wetlands area have a priority score of 1, whereas those associated with the coastal use area have a priority score of 4.

3.2 A Snapshot of Issues

The key issues identified by the risk assessment process are outlined below and presented in Map 2. More information about these issues is presented in the Scoping Study (Appendix A).

Table 3 Key Objectives and Classification for Moruya River Estuary

Objective	CM Area	Focus	Priority
To protect coastal wetlands in their natural state, including their biological diversity and ecosystem integrity.	Wetlands	Strong	1
To promote the rehabilitation and restoration of degraded coastal wetlands.	Wetlands	Strong	1
To improve the resilience of coastal wetlands to the impacts of climate change, including opportunities for migration.	Wetlands	Strong	1
To protect and enhance the coastal environmental values and natural processes of the estuary, and enhance natural character, scenic value, biological diversity and ecosystem integrity.	Environment	Moderate	3
To reduce threats and improve the resilience of the estuary, including in response to climate change.	Environment	Moderate	3
To maintain and improve water quality and estuary health.	Environment	Moderate	3
To support the social and cultural values of the estuary.	Environment	Moderate	3
To maintain and, where practicable, improve public access, amenity and use of foreshores.	Environment	Moderate	3


Legend
Coastal Wetlands
Proximity Area for Coastal Wetlands
Coastal Use Area
Coastal Environment Area
Open Coast CMP Area
Glenduart
Mogendoura Creek
Moruya River
Malabar Creek
Moruya Airport
Moruya River
Shelly Beach
Moruya River
Quandolo Island
Moruya
Racecourse Creek
Moruya Heads
Mungerarie
Candoin Ck
Wamban Ck
N
Map 1: CM SEPP Coastal Management Areas for Moruya River
CMP for Eurobodalla Estuaries
GIS File: Z:\BusinessShare\Them\Projects\P00053_CMPsforMoruya\GIS\CoastalManagementSEPPB.qgs
REV DRAWN CHECK
A EN DJW
Salients
0 0.2 0.4 0.6 km
APPROX SCALE

Note that some key issues occur in multiple areas. Locations indicated on map are representative locations.

Coastal wetlands are expected to migrate over time

A better understanding of Malabar Lagoon is required

Perception of higher tides from training of the entrance and deepening around the entrance

Potential future acid drainage from floodplains

Uncontrolled / informal public access to the foreshores

Impact of weir below North Head Dr is not well understood

Impacts on navigation from sediment from the ocean

Areas around Moruya Heads are used by migratory waders

Extent of future tidal inundation is uncertain

Perception of poor water quality in Racecourse Creek

Ongoing commercial fishing of the estuary

Grazing causes damage to coastal wetlands

Inconsistencies between CM SEPP Mapping of coastal wetlands and on-ground wetland vegetation

Stock access to foreshores impacts health of riparian zones

N

Map 2: Representative Locations of Key Issues for Moruya River

CMP for Eurobodalla Estuaries

GIS File: Z:\BusinessShare\Them\Projects\P00053_CMPsforMoruya\GIS\CoastalManagementSEPP8.qgs

REV	DRAWN	CHECK
A	EN	DW

Salients

0 0.2 0.4 0.6 km

APPROX SCALE

3.2.1 *Uncertain Extent of Future Tidal Inundation around Moruya River Estuary*

ASSESSED RISK LEVEL

Extreme

RELATED ACTIONS

EM1, Mo3

Understanding the future tidal inundation extents for the Moruya River Estuary is of particular importance given the large flat expanses of floodplain adjacent to the estuary, particularly downstream of Moruya. For future planning purposes, this needs to be better understood.

Malabar Lagoon and its tributary creeks are expected to expand to inundate additional parts of the Mullenderee Floodplain in future

3.2.2 *Considering the Future Migration Pathways of Wetlands around Moruya River Estuary*

ASSESSED RISK LEVEL

Extreme

RELATED ACTIONS

EM1, EM2, Mo3, EM6

As sea levels rise, areas of this floodplain, including locations adjacent to the Ryans/Racecourse Creek Wetlands and Malabar Wetland, will be inundated more frequently, resulting in migration of wetlands and estuarine/riparian vegetation. Because of the local topography, this matter is of special interest to the Moruya River.

Wetlands are expected to move across low-lying land adjacent to waterways over time

3.2.3 Ongoing Damage to Coastal Wetlands through Grazing

ASSESSED RISK LEVEL

High

RELATED ACTIONS

Mo1, Mo2

There are several locations around the Moruya Estuary where cattle are presently able to access wetland areas which are trampled and have limited subsequent capacity to recover.

Management of this issue in the past decade by fencing to exclude livestock has been very successful at several locations.

Grazing in saltmarsh areas surrounding wetlands causes significant damage

3.2.4 Mismatch between Mapped Wetland Vegetation and that Existing on Ground

ASSESSED RISK LEVEL

High

RELATED ACTIONS

EM1, EM2, EM6, Mo2

Ground truthed mapping completed by Elgin Associates (2018), based on field work completed in 2017, has demonstrated that wetland vegetation extents at several locations around the Moruya Estuary extend beyond the mapped extents currently provided for in the CM SEPP. This new data will need to eventually be incorporated into the CM SEPP, although it may be superseded by considerations of wetland migration pathways in a future with additional sea level rise.

3.2.5 A Need to Better Understand Malabar Lagoon

ASSESSED RISK LEVEL

High

RELATED ACTIONS

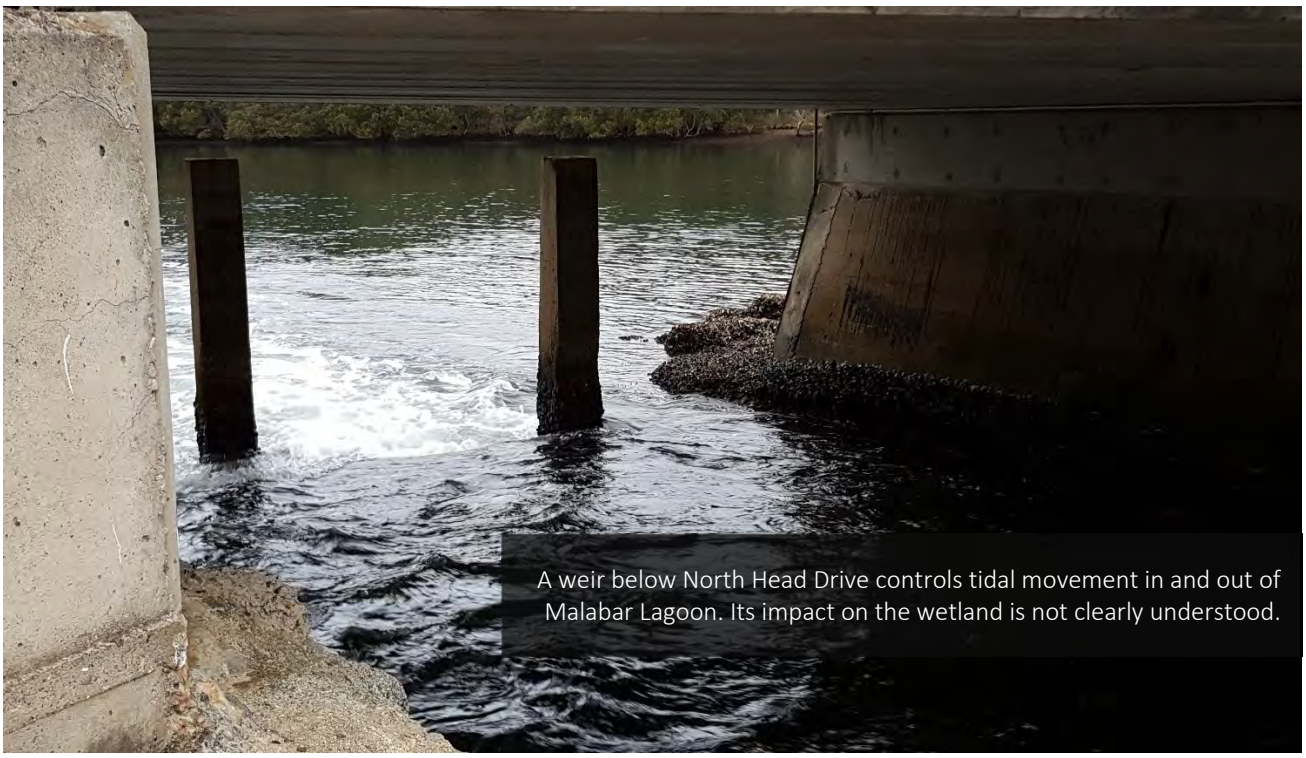
Mo2

A better understanding of estuarine processes in and around the Malabar Lagoon Wetland is considered important to the Moruya Estuary, as:

- It is the only part of the estuary given the highest level of protection under the zoning for the Batemans Marine Park (Sanctuary Zone) in an estuary that is otherwise open for commercial fishing.

- Exchange between the main river and the wetland is presently constrained by a weir, which has an unknown impact on ecological function (including fish passage).
- The construction of North Head Drive has further constrained exchange between the main river and the wetland.
- There are, reportedly, several barriers to inundation of the upper extents of the wetland and the effect of these is currently poorly understood.
- The area surrounding the lagoon is the area where sea level rise will cause the largest migration of wetland vegetation over time (See Appendix B2) in the Moruya system.
- Much of the wetland is fringed by privately owned land that is grazed and those landowners should be consulted regarding how adaptive land use practices could facilitate improved environmental outcomes for the estuary.

Council and LLS have spent some effort in recent years to work on fencing areas that were previously used for grazing. However, effective management of this area requires a better baseline understanding of the processes that make Malabar Lagoon an important site.



A weir below North Head Drive controls tidal movement in and out of Malabar Lagoon. Its impact on the wetland is not clearly understood.

3.2.6 Desire for a Healthy, Vegetated Riparian Zone

ASSESSED RISK LEVEL

High

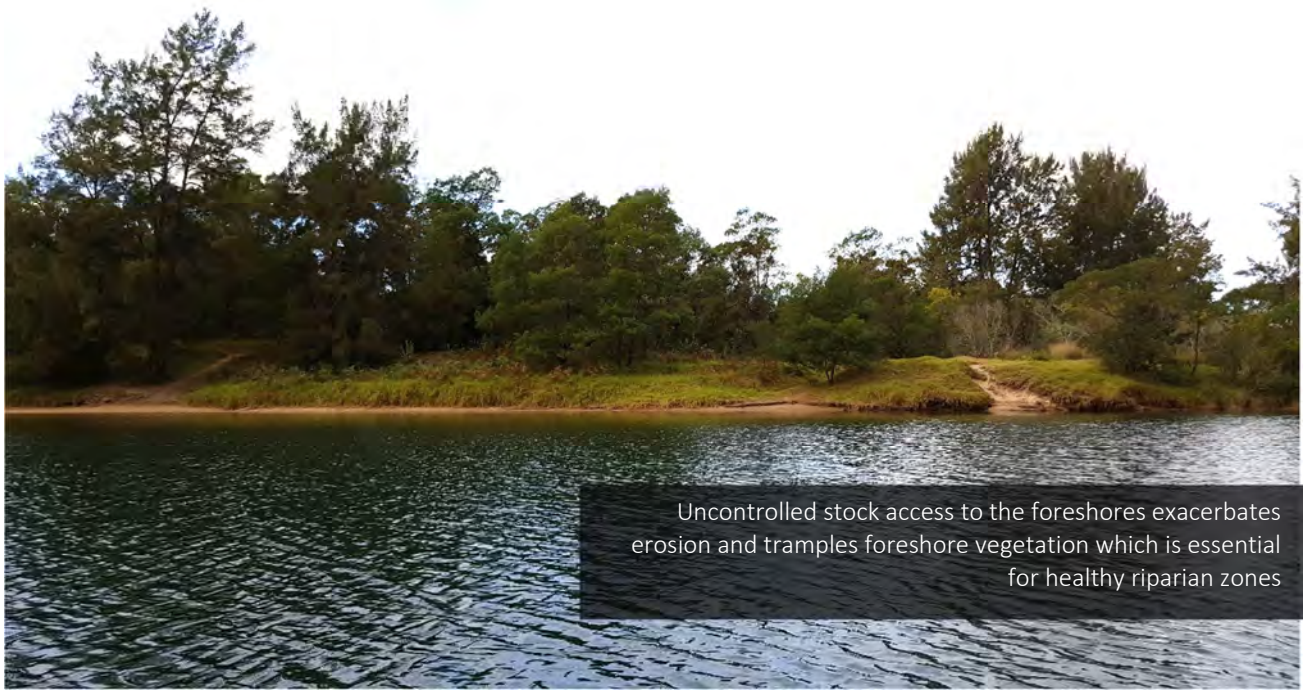
RELATED ACTIONS

Mo1

Council and LLS have also put substantial effort into the rehabilitation and maintenance of riverside riparian zones along the Moruya River involving revegetation, fencing and erosion protection works.

The degradation of native riparian vegetation is considered a key threatening process under part 7A of the *Fisheries Management Act 1994*. Riparian vegetation is vital to healthy and productive fisheries – a matter of particular importance for the Moruya River. Being an estuarine waterway, the NSW Policy and Guidelines for fish habitat conservation and management (Department of Primary Industries, 2013) classifies the Moruya Estuary as a "major key fish habitat" (CLASS 1) and the preference of those guidelines is that a 100m wide buffer zone be established.

In several locations, particularly in the reaches of the estuary upstream of Moruya and commonly on the inside of bends on private land, stock have free access to the waterway, which damages the banks, can destroy native vegetation, and enables the establishment of weeds. Ongoing environmental repair, consulting with private landowners where required, is a continued recommendation for the management of the Moruya River.



Uncontrolled stock access to the foreshores exacerbates erosion and tramples foreshore vegetation which is essential for healthy riparian zones

3.2.7 Use of areas around Moruya Heads by Migratory Waders

ASSESSED RISK LEVEL

High

RELATED ACTIONS

Mo6

Several sources including the National Parks and Wildlife Service and Birdlife Australia[4] indicate that the area around the entrance to the river, near Moruya Heads and including Quandolo Island and the training walls, are used by several important species of migratory waders and shorebirds. While much of the area is contained within the Eurobodalla National Park, access by the public to sensitive areas is of some concern. Appropriate signs warning of the use of the area by migratory waders and shorebirds is indicated as a first step in managing this issue.

The Breakwater, training walls and wetlands at Moruya Heads are used by migratory waders

3.2.8 Other Issues

Several other issues which are of importance also require ongoing vigilance. Action is warranted in some cases, particularly if relatively easy and cost-effective actions which will almost certainly have a positive impact can be identified. Some of these matters are also, at least partly, being managed through other processes. Several of the 'moderate' risks identified in Appendix D for the Moruya Estuary will be addressed by the overarching actions outlined in Section 2.2. The remaining issues of note are:

[4] https://birdata.birdlife.org.au

- Potential future acid drainage from the floodplains of the Moruya River.
- Ongoing influx of sediment from the ocean at Moruya Heads and its interaction with navigation.
- A perception that tidal ranges are increasing, possibly affected by training of the entrance and gradual deepening of the area around the entrance.
- Issues relating to uncontrolled/informal public access to the foreshores of the estuary.
- Ongoing commercial fishing within the Moruya Estuary.
- A perception of poor water quality in Racecourse Creek.

3.3 Actions to Be Implemented by Eurobodalla Shire Council and/or Public Authorities

The actions forming part of the program are outlined below and presented in Map 3. Most of the Moruya River estuary below mean high water mark is Crown land, as are several foreshore reserves. Appendix F contains a list of key areas of Crown land relevant to the actions contained in this section.

3.3.1 Action Mo1: Foreshore and Wetland Restoration and Environmental Protection Plan

During preparation of this Program, dedicated consultation with the staff from LLS and Council was undertaken, with data captured from field inspections discussed and used to prepare a preliminary *Foreshore and Wetland Restoration and Environmental Protection Plan*. Map 4 shows the locations of works, including works within areas mapped as CM SEPP wetlands. The layers used to construct this map have been provided to Council for future reference and updating as this sub-program progresses.

There are, broadly, three different types of works targeted:

- Riparian corridors, including revegetation, reconstruction, and fencing. Ideally, up to 100m wide riparian corridors would be established, but experience has shown that aiming for around 30m is more palatable for private landowners.
- Fencing of low-lying areas where saltmarsh is likely to establish if grazing is excluded.
- Maintenance work, which typically involves weeding and replanting, where required, of native vegetation.

In addition to the above, Council will continue to supplement these actions by routinely utilising native species in roadsides, reserves and parks adjoining waterways.

The works identified by this action all constitute environmental protection works in the context of the CM SEPP. Any structural works identified by this action constitute coastal protection works as defined under the CM Act, and those works are therefore subject to the development consent requirements of s27 of the CM Act. Where coastal protection works are carried out by or on behalf of a public authority and are identified in a certified CMP, those works are permissible under clause 2.16 (2) (a) (i)of the RH SEPP, and where this is the case require an REF to be considered by the determining authority.

Standard rates used by LLS have been used to cost the restoration options. The work is difficult to schedule for the following reasons:

- Progress is often dependent on the willingness of private landowners to participate.
- Funding sources, such as seasonal grants opportunities, are not always amenable to taking advantage of a willing landowner.

Aside from private land, Council is also responsible for the management of riparian zones including those around Yarragee, Glenduart, Riverside Park and Ryans Creek.

Potential sources of funding for works include:

- Private land: Local Land Services.
- Public land: DPE Grants streams (Coasts and Estuaries, Environmental Trust) and Local Land Services.

For the reasons outlined above, it is difficult to precisely program when works at a given site will be achievable. The time estimates and costs provided in the Business Plan are based on the experience of LLS and Council over recent years and it is estimated that works shown in Map 4 would take around 5 years to complete.

Council will take the lead role in administering the Foreshore and Wetland Plan, with LLS providing support and project management services, particularly on Private Land. Council will keep up to date records, as described in Section 7 and works will be coordinated through the Estuarine Management Advisory Committee established and operated through Action EM5.

Note that some management actions apply to multiple areas. Locations indicated on map are representative locations.

GLENDUART

MORUYA AIRPORT

Action Mo2

Scientific, Hydraulic, Heritage and Migration Feasibility Study of Malabar Wetland

Action Mo7

Stabilise Banks through Restoration of Rock Walls at Brierley's Boat Ramp and Russ Martin Park

Action Mo3

Map Coastal Vulnerability Area for Moruya

MORUYA

SHELLY BEACH

TORAGY POINT

QUANDOLO ISLAND

Action Mo5

Assess Historical Changes to Tides

Action Mo6

Provide Interpretive and Educational Signage around Quandolo Island / Eurobodalla National Park

MORUYA HEADS

Action Mo1

Foreshore and Wetland Restoration and Environmental Protection Plan

MUNGERARIE

Action Mo4

Deua River Sediment Delivery Assessment

N

Map 3: Management Actions for Moruya River Estuary

CMP for Eurobodalla Estuaries

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REV	DRAWN	CHECK
A	EN	DW

Salients

0 0.2 0.4 0.6 km

APPROX SCALE

ID	PRIORITY	COMMENT
		PROPERTIES
P1(2)	2	Some areas fenced but not others.
P2(2)	2	Monitor existing foreshore fencing and repair as required.
P3(2)	2	Monitor existing foreshore fencing and repair as required.
P4(2)	2	Monitor existing foreshore fencing and repair as required.
P5(3)	3	Council Reserve has burned and recovery is promising. Monitor.
P6(1)	1	Target for resolution of Crown lease arrangement to allow into public hands, enabling reinstatement of riparian zone.
P7(3)*	3	Maintenance: stock exclusion.
P8(1)	1	Requires fencing for stock exclusion.
P9(3)*	3	Previous work: maintain stock exclusion.
P10(3)*	3	Previous work: maintain stock exclusion.
P11(3)*	3	Has been fenced. Needs monitoring and possibly modification of elevations to encourage establishment of vegetation.
P12(2)*	2	Maintenance (weed control) required.
P13(2)*	2	Maintenance: weed control and ongoing exclusion of livestock.
P14(2)	2	Maintenance (weed control).
P15(2)*	2	Maintenance: (fencing and stock exclusion).
P16(2)*	2	Maintenance: ongoing stock exclusion and management of Sharp Rush (J. Acutus).
P17(1)*	1	Area requires fencing to protect saltmarsh, swamp oak and paperbark.
		FORESHORES
F1(2)	2	Weed control required
F2(1)	2	Revegetation, weed control and fencing required
F3(1)	1	Fencing required, some areas fenced but not others
F4(1)	1	Needs fencing, some areas fenced but not others
F5(2)	2	Check legality of clearance works
F6(2)	2	Fencing: stock exclusion
F7(2)	2	Maintenance: weeding of previous works
F8(1)	1	A target for riparian vegetation and widening where required
F9(1)*	1	To be fenced to exclude stock
F10(1)	1	Requires fencing to exclude stock
F11(1)*	1	Fencing to exclude stock
F12(1)	1	Fencing required
F13(1)	1	Fence to avoid stock crossing
F14(1)	1	Fencing required
F16(1)	1	Council to stop mowing this area.
F17(2)	2	Requires maintenance – vegetation and weeding
F18(2)	2	Negotiate with Golf Club to remove weeds (willow & privet)
F19(2)	2	Erosion at isolated locations along here may need treatment.

* Requires works within the CM SEPP coastal wetlands area

3.3.2 Action Mo2: Scientific, Hydraulic, Heritage and Migration Feasibility Study of Malabar Wetland

A detailed study of Malabar Lagoon is a desirable outcome of the ECMP. The action has been assessed as providing significant benefit at an estimated cost of $250,000, to be implemented subject to availability . The Malabar Wetland is of importance to the State Government as a sanctuary zone in the Batemans Marine Park.

Eurobodalla Shire Council and stakeholders will work towards sourcing appropriate funding as CMP delivery progresses. As the CMP was being finalised, there was ongoing consideration of potential routes for the Princes Highway bypass of Moruya. Depending on the routes that are investigated, this detailed study may well be warranted as part of that ongoing process.

This study would aim to identify priority targets for restoration works and offset areas, and then recommends these actions be carried out as part of action Mo2. The need for the study is outlined under Section 3.2.5 and would include the following strands:

- Hydraulic assessment including modelling with and without the weir and a variation of the constraint at North Head Drive (e.g., would a longer bridge help?). The potential for installing a fishway or other controlling structure should also be assessed. The study should identify existing floodplain blocking structures and assess their impact. Data loggers may need to be installed to collect data for model calibration.
- Sea level rise assessment, determining the extent to which the floodplain could be inundated under several sea level rise scenarios for varying levels of connectivity between the wetland and the river.
- Ecosystem assessment, including potential use of the wetland for important commercial species, if fish passage were improved.
- Floodplain soils assessment, including testing for the presence of acid sulfate soil to determine whether increased inundation and/or drainage of the area is likely to result in acid leachate.

- One-on-one consultation with fringing landowners to explain the work that is being completed and the reasons why, as the study progresses, and to discuss what may happen in future and what options might be considered regarding the future land use.
- Identify sites of concern and specific management actions to address the risks to Malabar Wetland highlighted by the study.

3.3.3 Action Mo3: Map Coastal Vulnerability Area for Moruya

Action EM1 describes broad parameters surrounding the application of existing flood models to look at tidal inundation under future sea level rise scenarios. In the case of Moruya River, it is expected that a flood model presently being applied to assess the Moruya Bypass options on behalf of TfNSW will eventually be used in a revised Flood Study for the Moruya Area. As part of that study, it is recommended that the model be calibrated to replicate measured tidal behaviour and tidal planes mapping be completed, as outlined under Action EM1.

Some follow-up work will be required to translate the outputs into actual extents of tidal inundation related to the coastal vulnerability area, and some additional thought will need to go into achieving this, hopefully based on an emerging standard of practice in the next few years. It is not expected that the revised flood study would be undertaken until 2023/24, and it could be co-funded under DPE's Floodplain Management Grants program.

3.3.4 Action Mo4: Deua River Sediment Delivery Assessment

Upstream of the tidal limit, the waterway which flows into the Moruya River is known as the Deua River.

The Scoping Study (Appendix A) revealed a concern that the amount of sediment flowing from the Deua River had been enhanced beyond natural levels. Consideration of activity within the catchment indicates that this may be a result of gold mining in and around Araluen from the mid-1800s. Following the 2019/2020 bushfire season, concerns were also raised that the severity of the fire would enhance the amount of sediment carried by runoff into the Deua River.

The nature, scale and severity of this problem is not presently well understood. At the time of drafting this ECMP, ongoing recovery works are underway, including preparation of the *South East Catchment and Waterways Fire Recovery Plan*. While it appears that the Fire Recovery Plan has not considered sediment delivery from the Deua River, analyses have been undertaken of different rivers and the outcomes from those assessments should be used to scope and guide a suitable study for the Deua.

3.3.5 Action Mo5: Assess Historical Changes to Tides

Tidal range inside an estuary increases when an entrance is initially trained. However, there is anecdotal evidence that the tidal range in the Moruya River is continuing to increase. Given the availability of data records for tide gauges in Moruya, a study and documentation of results is required. Preliminary 'tidal planes' analysis was completed by the NSW Government's Manly Hydraulics Laboratory (MHL) during drafting of the ECMP, but more detailed analysis should be completed to:

- Remove any effects of ongoing sea level rise.
- Normalise calculated tidal ranges inside the estuary against the corresponding tidal ranges in the Ocean.
- Consider the possible effects of entrance scour during flood events and subsequent infilling of the entrance with sand on tidal range measured from year to year.

This study is relatively minor in nature and, based on the preliminary assessment by MHL, it is not expected that there are significant ongoing changes resulting from entrance training. The expected purpose of the study is to document the available evidence and avoid management effort being distracted in future with claims about a continuing increase in tidal range due to entrance training.

3.3.6 Action Mo6: Provide Interpretive and Educational Signage around Quandolo Island / Eurobodalla National Park

To provide notification to the public using the Eurobodalla National Park around Moruya Heads, signs shall be installed in appropriate locations to advise people of the presence of important migratory waders and shore birds.

The work identified by this action constitutes environmental protection works in the context of the CM SEPP.

3.3.7 Action Mo7: Stabilise banks through restoration of rock walls at Brierley's Boat Ramp and Russ Martin Park.

Two sections of failing rock wall have been identified for repair. These are:

- Adjacent to the Moruya Swimming Pool; and
- At the new Brierley's Boat Ramp Facility.

Any structural works identified by this action constitute coastal protection works as defined under the CM Act, and those works are subject to the development consent requirements of s27 of the CM Act.

Where coastal protection works are carried out by or on behalf of a public authority and are identified in a certified CMP, those works are permissible under clause 2.16 (2) (a) (i)of the RH SEPP, and where this is the case require an REF to be considered by the determining authority.

4 MUMMUGA LAKE ISSUES AND ACTIONS

4.1 Key Estuary Management Objectives

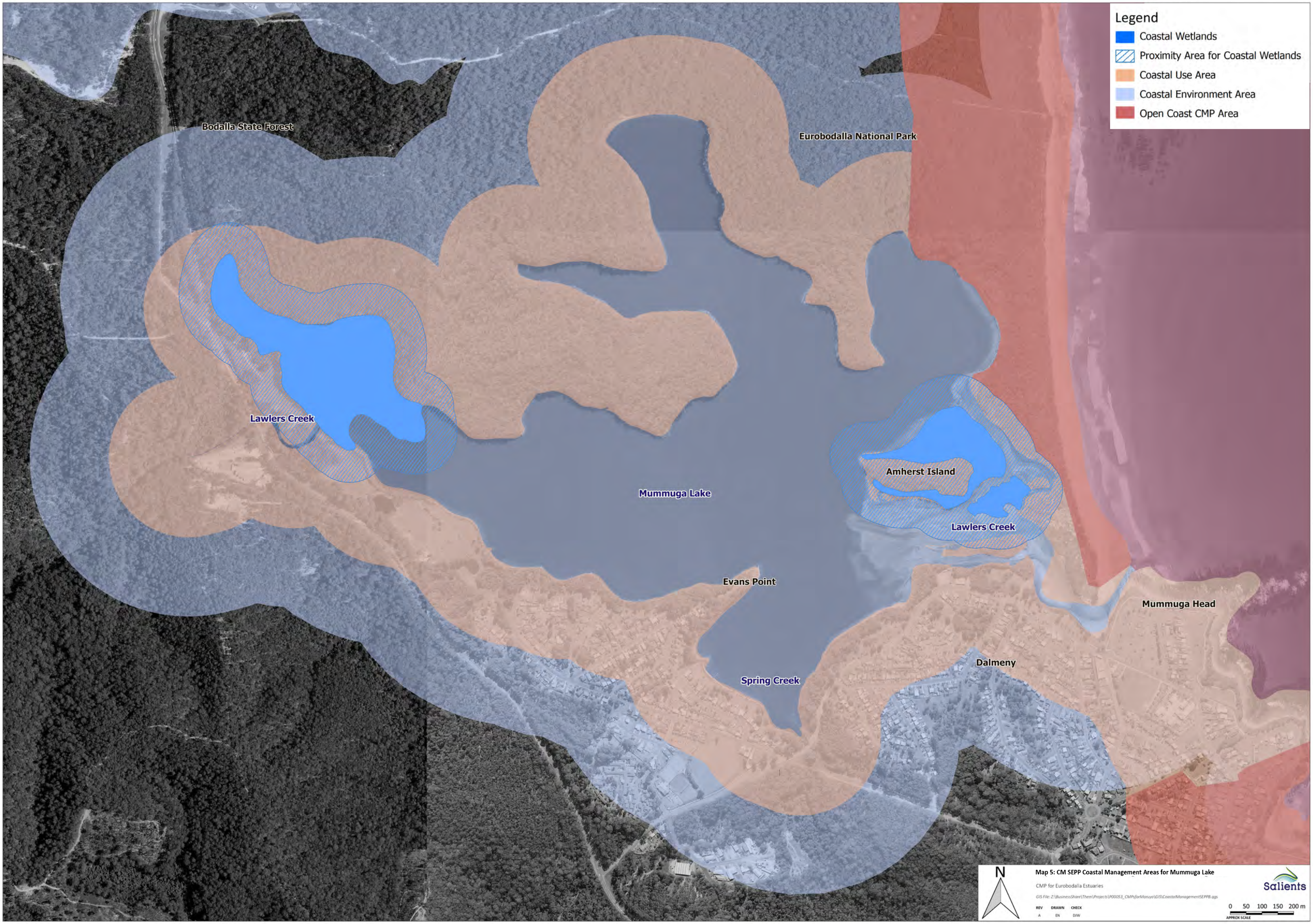
The Coastal Zone Associated with Mummuga Lake is shown in Map 5.

Relevant objectives for the estuary have been extracted from the *Coastal Management Act 2016* based on the management issues present. These were then considered as part of the risk assessment presented in Appendix D. Following that exercise, the "key" objectives, being those most associated with "extreme" or "high" level risks for this estuary, were identified.

The selected objectives were assigned a "focus" rating (very strong, strong, moderate, or minor) based on the risk assessment outcomes. The focus rating can be considered a qualitative measure of the total effort that this Program contains to achieve that objective. These are presented in Table 4.

Table 4 Key Objectives and Classification for Mummuga Lake

Objective	CM Area	CMP Focus	Priority
To protect and enhance the coastal environmental values and natural processes of the estuary, and enhance natural character, scenic value, biological diversity and ecosystem integrity,	Environment	Moderate	3
To reduce threats and improve the resilience of the estuary, including in response to climate change	Environment	Moderate	3
To maintain and improve water quality and estuary health	Environment	Moderate	3
To support the social and cultural values of the estuary	Environment	Moderate	3
To maintain and, where practicable, improve public access, amenity and use of foreshores.	Environment	Moderate	3
To protect and enhance the scenic, social and cultural value of the coast by ensuring development: • is of an appropriate type, bulk and scale for its location • avoids or mitigates against adverse impacts on heritage values • supports and/or incorporates water sensitive urban design • incorporates adequate public open spaces for recreation and associated infrastructure	Use	Moderate	4


Legend
Coastal Wetlands
Proximity Area for Coastal Wetlands
Coastal Use Area
Coastal Environment Area
Open Coast CMP Area
Bodalla State Forest
Eurobodalla National Park
Lawlers Creek
Mummuga Lake
Amherst Island
Lawlers Creek
Evans Point
Mummuga Head
Dalmeny
Spring Creek
N
Map 5: CM SEPP Coastal Management Areas for Mummuga Lake
CMP for Eurobodalla Estuaries
GIS File: Z:\BusinessShare\Them\Projects\P00053_CMPsforMoruya\GIS\CoastalManagementSEPPB.qgs
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Salients
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APPROX SCALE

The priority score in Table 4 directly relates to the coastal management area to which that objective applies in the CM Act. For example, objectives associated with the coastal wetlands area have a priority score of 1, whereas those associated with the coastal use area have a priority score of 4.

4.2 A Snapshot of Issues

The key issues identified by the risk assessment process are outlined below and presented in Map 6.

4.2.1 Considering the Extent of Future Tidal Inundation around Mummuga Lake

ASSESSED RISK LEVEL

Extreme

RELATED ACTIONS

EM1, EM2, Mu1, Mu2, EM6

The future tidal inundation extents for Mummuga Lake are of some importance to inform planning decisions and to gain an appreciation of how the wetlands in and around the lake will migrate as sea levels rise. There are some low-lying areas adjacent to the Lake that are already prone to flooding when the lake is closed to the ocean. This is expected to be exacerbated as sea levels rise. For future planning purposes, this needs to be better understood.

As mean tide levels rise over time, some fringing areas will be inundated more frequently
Mummuga Lake, Dalmeny

Note that some key issues occur in multiple areas. Locations indicated on map are representative locations.

BODALLA STATE FOREST

EUROBODALLA NATIONAL PARK

CM SEPP coastal wetlands mapping does not match full extent of wetlands

Entrance management and public understanding of effects on water quality

Overfishing within Mummuga Lake

AMHERST ISLAND

Poor condition of boat ramp and car park

Damage/erosion exacerbated by informal access around the entrance and Mummuga Headland

Extent of future tidal inundation is uncertain

Management of saltmarsh / damage from vehicular access

EVANS POINT

MUMMUGA HEAD

DALMENY

Stormwater runoff from urban catchments

N

Map 6: Representative Locations of Key Issues for Mummuga Lake

Salients

GIS File: Z:\BusinessShare\Thrm\Projects\P00053_CMPforMoruya\GIS\CoastalManagementSEPPB.qgs

REV	DRAWN	CHECK
A	EN	DJW

0 50 100 150 200 m

APPROX SCALE

4.2.2 *Informal Access around the Entrance and Mummuga Headland, Dalmeny*

ASSESSED RISK LEVEL

Extreme

RELATED ACTIONS

Mu3

Following site inspections and meetings with key stakeholders on site, several issues have been identified around the southern foreshores of the Mummuga Lake entrance and extending out onto the adjacent headland.

The key issues are:

- The foreshore protection provided in the immediate vicinity of the entrance seems to have been placed without considering the impact that waves may have on this structure.
- There are lengths of foreshore inside the entrance that are now over steepened due to severe erosion, and vegetation has been substantially undermined and is at risk of collapsing into the channel.
- Informal access across the crest of the foreshore and down the slope in several locations has the potential to enhance erosion and cause bank instability.
- Informal access down the slopes adjacent to the entrance and the northern edge of Mummuga Headland is poorly managed and damage to sites of significance to the local Aboriginal community has been noted and is continuing.
- In some locations, the over steepened slope and lack of a barrier at the crest may pose a safety risk to the public.

Informal access around the entrance exacerbates erosion and damages sites of heritage significance
Mummuga Lake, Dalmeny

4.2.3 Management of Saltmarsh around Southern Foreshores of Mummuga Lake

ASSESSED RISK LEVEL

High

RELATED ACTIONS

Mu4, Mu5

Semi formalised vehicular access is provided through foreshore vegetation around 100m west of the tennis courts. This allows relatively easy access for vehicles onto one of the largest salt marsh areas along the southern foreshores of the lake based on mapping by Elgin Associates (2018). The saltmarsh is present within the Eurobodalla National Park and the Batemans Marine Park and is clearly being damaged by ongoing vehicular access.

An additional area where saltmarsh rehabilitation activities have been undertaken historically by Council exists to the rear of properties along Myuna and Attunga Streets, adjacent to the main body of the lake. Inspection of this site in 2018 indicated that the plantings were reasonably robust, although there was some variability, with some areas being mowed and Kikuyu invading the landward edge of the saltmarsh in others. There is an opportunity here to engage with the community and collaborate on a way forward to managing this area.

Vehicular access is damaging saltmarsh areas within the Eurobodalla National Park
Mummuga Lake, Dalmeny

4.2.4 Stormwater Runoff from Urban Catchments

ASSESSED RISK LEVEL

High

RELATED ACTIONS

Mu6

Improving water quality was the top issue of concern for the local community, based on analysis of the survey completed in 2020. However, limited data provided for review by DPE, from samples collected in 2014 and 2015, indicates that overall quality is good, although a sparse cover of macroalgae was present during one of the sampling dates.

Water quality within coastal lakes, even relatively undisturbed ones such as Mummuga, can vary significantly from season to season depending on rainfall patterns and the state of the entrance. The variability is mostly natural and communities which live around the fringes of these lakes often struggle with this variability. It is not uncommon for a system such as this to have relatively 'good' water quality for a few years and then for conditions to change (rainfall/runoff, entrance condition) such that the quality rapidly deteriorates. Furthermore, what constitutes 'good' water quality for recreational purposes (swimming, boating) is not necessarily optimal for a healthy thriving ecosystem.

The opportunity exists to put some effort into analysing and explaining the context and importance of urban stormwater from Dalmeny to the local community. Any study undertaken can also be used to inform future planning for the expected increase in population at Dalmeny over the next 15 years (~10%). The upcoming Dalmeny Land Release will be subject to an area plan that specifies water quality objectives and development controls for stormwater and erosion management that align with ANZECC guidelines.

Recent changed within the catchment need to be kept in consideration; approximately 40 hectares of land marked for development for several years has recently been sold within the Mummuga Lake catchment. Developments without adequate stormwater, erosion or runoff controls can directly impact water quality within a water body through increased quantities of pollutants, sediment and organic compounds that disrupt the natural equilibrium. Council have stated that the development can only proceed once a Development Control Plan (DCP) is in place. It is through this DCP that stormwater controls, water quality objectives and a number of other factors with the potential to impact Mummuga Lake and its tributaries will be detailed - this will occur with rigorous consultation with the community, local Aboriginal stakeholders and state government agencies.

The DCP will place a high priority on water quality objectives (using the ANZECC guidelines), ensuring stormwater and sewerage are designed with sufficient capacity. Council will assess the development against the requirements of the Marine Estate Management Act (as Mummuga Lake is a part of the

Batemans Marine Park) and the CM SEPP. Both the Act and the SEPP have specific requirements around consideration of the impact of development, which Council must uphold.

Management of stormwater is an ongoing concern expressed by the community
Mummuga Lake, Dalmeny

4.2.5 Boating Access

ASSESSED RISK LEVEL
High

RELATED ACTIONS
EM5

General concerns were expressed by some in the community that there is a lack of access to the lake for boating, resulting in informal access at several locations and damage to foreshores. Certainly, the boat ramp at Attunga St (Evans Point) is in relatively poor condition and the overall facility does not lend itself to intensive use. Runoff from the road here is poorly managed and erosion of sediment from informal parking and unsealed manoeuvring areas would be contributing some sediment to the Lake.

However, discussions with Council staff and TfNSW have indicated that this boat ramp is unlikely to be a priority for upgrade soon. We note that both Council and TfNSW are in the process of reviewing maritime facilities in the Eurobodalla Shire.

The situation should continue to be monitored by the Estuarine Management Advisory Committee (see Action EM5). While no action is proposed under this Program, Council may consider taking steps to reduce the impact of informal parking at the site, potentially paving some areas to facilitate boat turning at the facility.

Boat ramp at Evans Point and associated car parking facilities are in a relatively poor state

4.2.6 Other Issues

Several other issues of importance also require ongoing vigilance. Action is warranted in some cases, particularly if relatively easy and cost-effective solutions with a high likelihood of a positive impact can be identified. Some of these matters are also, at least partly, being managed through other processes. Several of the 'moderate' risks identified in Appendix D for Mummuga Lake will be addressed by the overarching actions outlined in Section 2.2. The remaining issues of note are:

- Existing CM SEPP mapping does not completely match the full extent and variability of coastal wetlands.
- Concerns relating to overfishing within the lake.
- Entrance management, including raising the community's awareness on the variability and effectiveness of entrance opening to improve water quality. At the time the CMP was being prepared, NPWS was working on updating their entrance management policy for Mummuga.

4.3 Actions to be Implemented by Eurobodalla Shire Council and/or Public Authorities

The actions forming part of the ECMP are outlined below and presented in Map 7. A substantial area of Mummuga Lake falls within the Eurobodalla National Park and actions should be undertaken in consultation with NPWS.

Note that some management actions apply to multiple areas. Locations indicated on map are representative locations.

Legend
Estuary
Coastal Wetlands

Bodalla State Forest

Eurobodalla National Park

Amherst Island

Evans Point

Tennis Courts

Mummuga Head

Dalmeny

Action Mu2
Investigate Historical and Future Coastal Wetland Extents for Mummuga Lake

Action Mu6
Water Quality Risk Management Study

Action Mu7
Entrance Management

Action Mu1
Map Coastal Vulnerability Area for Dalmeny

Action Mu4
Prevent Vehicular Access to Saltmarsh Area Near Tennis Courts

Action Mu3
Foreshore and Headland Access Management Plan

Action Mu5
Engage with the Community on Saltmarsh Management- Myuna and Attunga Streets

Action Mu7
Install Water Level Recorder to assist Entrance Management

N

Map 7: Management Actions for Mummuga Lake Estuary

CMP for Eurobodalla Estuaries

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Salients

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APPROX SCALE

4.3.1 Action Mu1: Map Coastal Vulnerability Area for Dalmeny

Action EM1 describes broad parameters surrounding the application of existing flood models to look at tidal inundation under future sea level rise scenarios. In the case of Mummuga Lake, there is a pre-existing model of the estuary, and the Floodplain Risk Management Study and Plan (FRMSP) was being developed alongside this ECMP.

An additional study will need to be commissioned to replicate measured tidal behaviour and produce the requirements for mapping tidal planes outlined under Action EM1. However, current tidal behaviour and its variability need to be better understood, and this will require the capture of a water level record from inside the lake (refer to Action Mu7).

Some follow-up work will be required to translate the outputs into actual extents of tidal inundation related to the coastal vulnerability area, and some additional thought will need to go into achieving this, hopefully based on an emerging standard of practice in the next few years. It is not expected that the new study would be undertaken until 2025/26, and it could be funded under DPE's Coast and Estuaries Grants program.

4.3.2 Action Mu2: Investigate Historical and Future Coastal Wetland Extents for Mummuga Lake

Action EM1 provides broad coverage for this action. However, some additional effort should be undertaken at Mummuga Lake. During the scoping study, it was recognised that differences existed between the wetland extents in the CM SEPP and those which were present from other mapping exercises and aerial photography. ICOLLs exhibit variable behaviour and salinity changes in response to the entrance condition, general rainfall patterns, and the volume of water retained behind a closed entrance barrier.

The extent of seagrasses and saltmarsh can be expected to also vary significantly at some locations within Mummuga Lake over time. A study is to be undertaken, including updating and ground truthing the existing condition of vegetation and completing aerial photo / satellite image interpretation to gain a better understanding of the natural variability of different types of wetland vegetation around Mummuga Lake. The study would also assist in identifying how wetland vegetation may respond over time to rising sea levels.

DPI Fisheries intends to repeat seagrass mapping to build upon historical data in the Eurobodalla region. Although Mummuga Lake, Wagonga Inlet and Moruya River are not identified as priority estuaries, it would

be advantageous for Council to utilise the standard DPI seagrass mapping methodology for accurate comparison over time.

4.3.3 Action Mu3: Foreshore and Headland Management and Access Management Plan

An access management and landscape plan for Mummuga Headland, the southern foreshore of Mummuga Lake (east of the Tennis Courts) and the adjacent parkland is required. The plan should consider the following:

- Substantial cultural heritage values, and the possibility of installing informative signage. The local Aboriginal community should be involved in development of the plan.
- The need to rationalise access including railings at the top of the slope by fencing or otherwise separating foot traffic from areas where existing middens could be damaged.
- Provision of safe access down the face of the slope where necessary to address safety issues arising from steep, informal tracks.
- Removal of unstable trees from eroding slopes.
- Assessment of existing structures, particularly where exposed to ocean waves, against coastal engineering standards and development of concepts for improving / replacing those structures. Detailed design and construction can follow as needed.
- Revegetation of areas at the crest of the slope with suitable low relief native species to discourage access down slopes in areas other than those identified for formal access.

Elements of work that have been identified, by Council, as suitable for action are presented in Map 8. An allowance for funding of those actions has been incorporated into the Business Plan. When undertaken, those actions should remain cognisant of the overall *Foreshore and Headland Access Management Plan* to ensure consistency.

The southern foreshore area adjacent the entrance is Crown land reserved for public recreation and managed by Council. This action should be pursued in consultation with DPE – Crown Lands.

4.3.4 Action Mu4: Prevent Vehicular Access to Saltmarsh Area near Tennis Courts

Bollards are to be installed on Council land to prevent vehicular access onto the area of saltmarsh near the tennis courts on Mort Avenue. Initially, 3-5 standard timber bollards may suffice, although if these are vandalised a more robust solution may be required.


Maintain existing rock wall
Formalise access, stabilise and revegetate banks
Revegetation: low relief bank stabilising vegetation
N
Map 8: Foreshore and Headland Management and Access Management Plan
CMP for Eurobodalla Estuaries
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DRAWN EN
CHECK DJW
Salients
0 10 20 30 40 m
APPROX SCALE

In addition, the short, unsealed track which leads from Mort Avenue and through the foreshore vegetation will be removed and planted out with turf, to eliminate the perception that vehicular access is permitted. In consultation with NPWS, signs may be erected to notify the public that the saltmarsh is at least partly located within the National Park, and to highlight the sensitivity of this area.

4.3.5 Action Mu5: Engage with Community on Saltmarsh Management, Myuna and Attunga Streets

Council and DPI will engage with the community, where properties on Myuna and Attunga St back on to the area of previously rehabilitated saltmarsh. This is likely to take some time and effort to gain a mutual agreement on the importance of the saltmarsh and to develop a way forward in terms of future management.

The destruction of saltmarsh which exists on public land without a permit is an offence under the *Fisheries Management Act 1994*. At other locations, following consultation, an agreement has been reached whereby markers are installed to identify the boundary to which mowing is allowed and DPI Fisheries issues a permit for landowners to mow to that boundary, but not beyond.

Following agreement and implementation of the markers, Council, DPI, and the Batemans Marine Park will ensure that the following occur:

- Regular maintenance to prevent infestation of the salt marsh with grasses and other escapees from residents' back yards.
- Robust monitoring and compliance activities including fines as required.

4.3.6 Action Mu6: Water Quality Risk Management Study

The "Risk-based Framework" methodology (OEH, 2017) shall be used to examine the water quality issues that are a concern for the community. While the methodology has been applied across the NSW coast more broadly, it needs to be revisited with a more local focus. Storm water quality management should include ongoing revisions to the current protections included in the DCP and when developing future Area Plans for urban development areas, such as the Dalmeny Land Release. The DCP for the Dalmeny Land Release should be informed by and updated as a recommendation of the Water Quality Risk Management Study.

In modifying the approach taken, the study is to incorporate the findings from risk-based framework studies being completed at several estuaries on the NSW coast under the Marine Estate Management Strategy.

Importantly, the community needs to be involved in this study from an early stage to ensure that their concerns are being adequately accounted for and addressed by the study.

The study will be used to inform an urban stormwater management strategy which considers ongoing growth of the population surrounding Mummuga Lake.

4.3.7 Action Mu7: Entrance Management

An entrance management plan is presently being prepared for NPWS, which is the lead agency responsible for entrance management at Mummuga.

Discussions with NPWS have identified the need for a near real time permanent water level recorder to support entrance management activities. Such a recorder would have multiple benefits for the lake (see Action Mu1). Recorders such as these are normally installed and managed by DPE.

NPWS and Council are also collaborating at present regarding replacement of the pedestrian bridge across the entrance channel, and this bridge may be upgraded to enable earth moving machinery to cross the bridge, providing better flexibility during entrance opening operations.

This action involves ongoing communication between agencies regarding entrance management activities and the installation of a permanent water level recorder.

5 WAGONGA INLET ISSUES AND ACTIONS

5.1 Key Estuary Management Objectives

The coastal zone associated with Wagonga Inlet is shown in Map 9. Relevant objectives for the estuary have been extracted from the *Coastal Management Act 2016* based on the management issues present. These were then considered as part of the risk assessment presented in Appendix D. Following that exercise, the "key" objectives, being those most associated with "extreme" or "high" level risks for this estuary, were identified.

The selected objectives were assigned a "focus" rating (very strong, strong, moderate, or minor) based on the risk assessment outcomes. The focus rating can be considered a qualitative measure of the total effort that the Program contains to achieve that objective. These are presented in Table 5.

The priority score in Table 5 directly related to the coastal management area to which that objective applies in the CM Act. For example, objectives associated with the coastal wetlands area have a priority score of 1, whereas those associated with the coastal use area have a priority score of 4.

Table 5 Key Objectives and Classification for Wagonga Inlet

Objective	CM Area	CMP Focus	Priority
To protect coastal wetlands and in their natural state, including their biological diversity and ecosystem integrity,	Wetlands	Very Strong	1
To promote the rehabilitation and restoration of degraded coastal wetlands	Wetlands	Very Strong	1
To improve the resilience of coastal wetlands to the impacts of climate change, including opportunities for migration	Wetlands	Very Strong	1
To protect and enhance the coastal environmental values and natural processes of the estuary, and enhance natural character, scenic value, biological diversity and ecosystem integrity,	Environment	Strong	3
To reduce threats and improve the resilience of the estuary, including in response to climate change	Environment	Strong	3

Objective	CM Area	CMP Focus	Priority
To maintain and improve water quality and estuary health	Environment	Strong	3
To support the social and cultural values of the estuary	Environment	Strong	3
To maintain and, where practicable, improve public access, amenity and use of foreshores.	Environment	Strong	3
To protect and enhance the scenic, social and cultural value of the coast by ensuring development: • is of an appropriate type, bulk and scale for its location • avoids or mitigates against adverse impacts on heritage values • supports and/or incorporates water sensitive urban design • incorporates adequate public open spaces for recreation and associated infrastructure	Use	Moderate	4

5.2 A Snapshot of Issues

The key issues identified by the risk assessment process are outlined below and presented in Map 10.

5.2.1 Considering the Extent of Future Tidal Inundation around Wagonga Inlet

ASSESSED RISK LEVEL

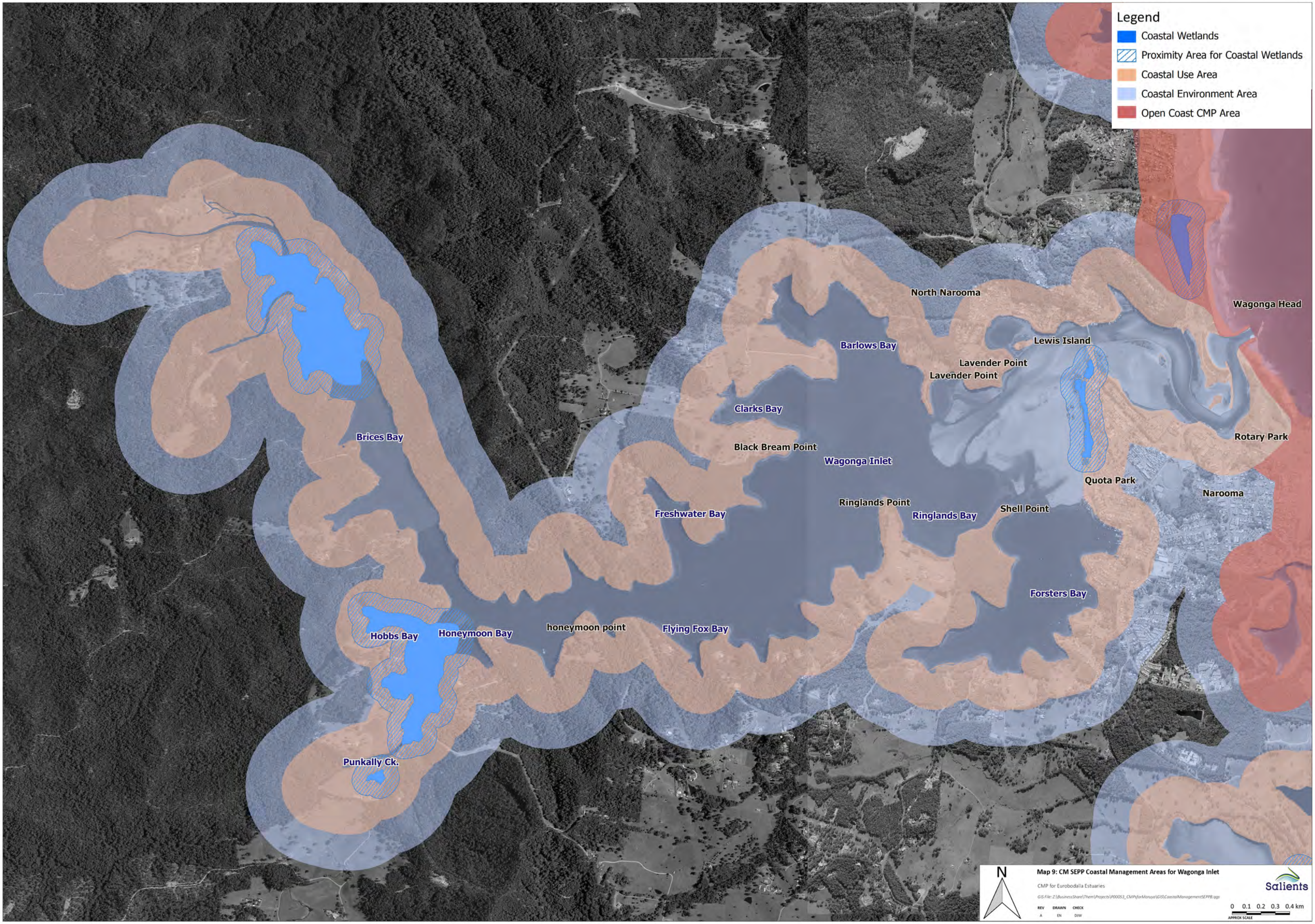
Extreme

RELATED ACTIONS

EM1, EM2, Wa1, Wa2, Wa7, EM6

Understanding the future tidal inundation extents around Wagonga Inlet is important for the following reasons:

- There exists low lying development in and around Narooma, particularly at Narooma Flats, which is already experiencing some impacts from more frequent flooding and tidal inundation.
- Due to topography, the future migration of wetlands is constrained (see also Section 5.2.2).


Legend
Coastal Wetlands
Proximity Area for Coastal Wetlands
Coastal Use Area
Coastal Environment Area
Open Coast CMP Area
North Narooma
Wagonga Head
Barlows Bay
Lewis Island
Lavender Point
Lavender Point
Clarks Bay
Brices Bay
Black Bream Point
Rotary Park
Wagonga Inlet
Quota Park
Narooma
Ringlands Point
Freshwater Bay
Ringlands Bay
Shell Point
Forsters Bay
Hobbs Bay
Honeymoon Bay
honeymoon point
Flying Fox Bay
Punkally Ck.
N
Map 9: CM SEPP Coastal Management Areas for Wagonga Inlet
CMP for Eurobodalla Estuaries
GIS File: Z:\BusinessShare\Them\Projects\P00053_CMPsforMaruya\GIS\CoastalManagementSEPPB.qgs
REV DRAWN CHECK
A EN DJW
Salients
0 0.1 0.2 0.3 0.4 km
APPROX SCALE

Note that some key issues occur in multiple areas. Locations indicated on map are representative locations.

Management of Brices Bay Historic Wharf

Steep topography will limit migration of coastal wetlands as sea levels rise

Mowing to the rear of wetlands prevents saltmarsh from establishing

Entrance channel instability

Lack of waterside maritime facilities in Narooma

Sedimentation and pollution from Punkally Creek catchment

Extent of future tidal inundation is uncertain

Perception of poor water quality within Forsters Bay

NORTH NAROOMA
LEWIS ISLAND
LAVENDER POINT
BLACK BREAM POINT
WAGONGA HEAD
ROTARY PARK
QUOTA PARK
NAROOMA
RINGLANDS POINT
SHELL POINT
HOBBS POINT
HONEYMOON POINT

N

Map 10: Representative Locations of Key Issues for Wagonga Inlet

CMP for Eurobodalla Estuaries

GIS File: Z:\BusinessShare\Them\Projects\P00053_CMPsforMoruya\GIS\CoastalManagementSEPP8.qgs

REV	DRAWN	CHECK
A	EN	DJW

Salients

0 0.1 0.2 0.3 0.4 km

APPROX SCALE

The issue of how tidal inundation will evolve is compounded by the behaviour of the entrance. The entrance to Wagonga Inlet was trained in the latter half of the 1970s. Since that time, the entrance has been scouring, tending towards a minor fall in mean lake level and less super-elevation of tides. Partly offsetting this tendency is a gradual rise due to rising mean ocean water levels (sea level rise).

Inundation at the Corner of Lynch St and Nichelsen St, Narooma

5.2.2 *Considering the Future Migration Pathways of Wetlands around Wagonga Inlet Estuary*

ASSESSED RISK LEVEL

Extreme

RELATED ACTIONS

EM1, EM2, Wa1, Wa2, Wa6, Wa7, EM6

Increasing mean tidal levels is an important issue for wetlands around Wagonga Inlet. Neilsen and Gordon (2017) have analysed tidal records and estimated that the mean spring tide range in the estuary has increased in recent decades by 3mm/yr. This has flow on effects, such as a threefold increase in the rate that saltmarsh is being lost from the estuary since the entrance was trained. The loss of saltmarsh from Wagonga Inlet is a cause for considerable concern, and future management of areas where saltmarsh may migrate requires an understanding of potential pathways for that migration.

Wetlands around Wagonga Inlet are expected to suffer from 'coastal squeeze' as sea levels rise. Existing development and steep topography will limit their upslope migration

5.2.3 Mangroves – Narooma Flats

ASSESSED RISK LEVEL

High

RELATED ACTIONS

Wa6

The area of concern stretches from the southwestern edge of the Princes Highway Bridge, adjacent to Riverside Drive, down to approximately McMillan Road. It is presently fringed by a (typically) 30-50m wide stand of riparian mangroves. The grassed reserve to the rear of this stand of mangroves is being mowed, preventing the establishment of saltmarsh in this area.

Mowing of areas to the rear of wetlands near Narooma Flats is preventing saltmarsh from establishing

5.2.4 Entrance Channel Instability

ASSESSED RISK LEVEL

High

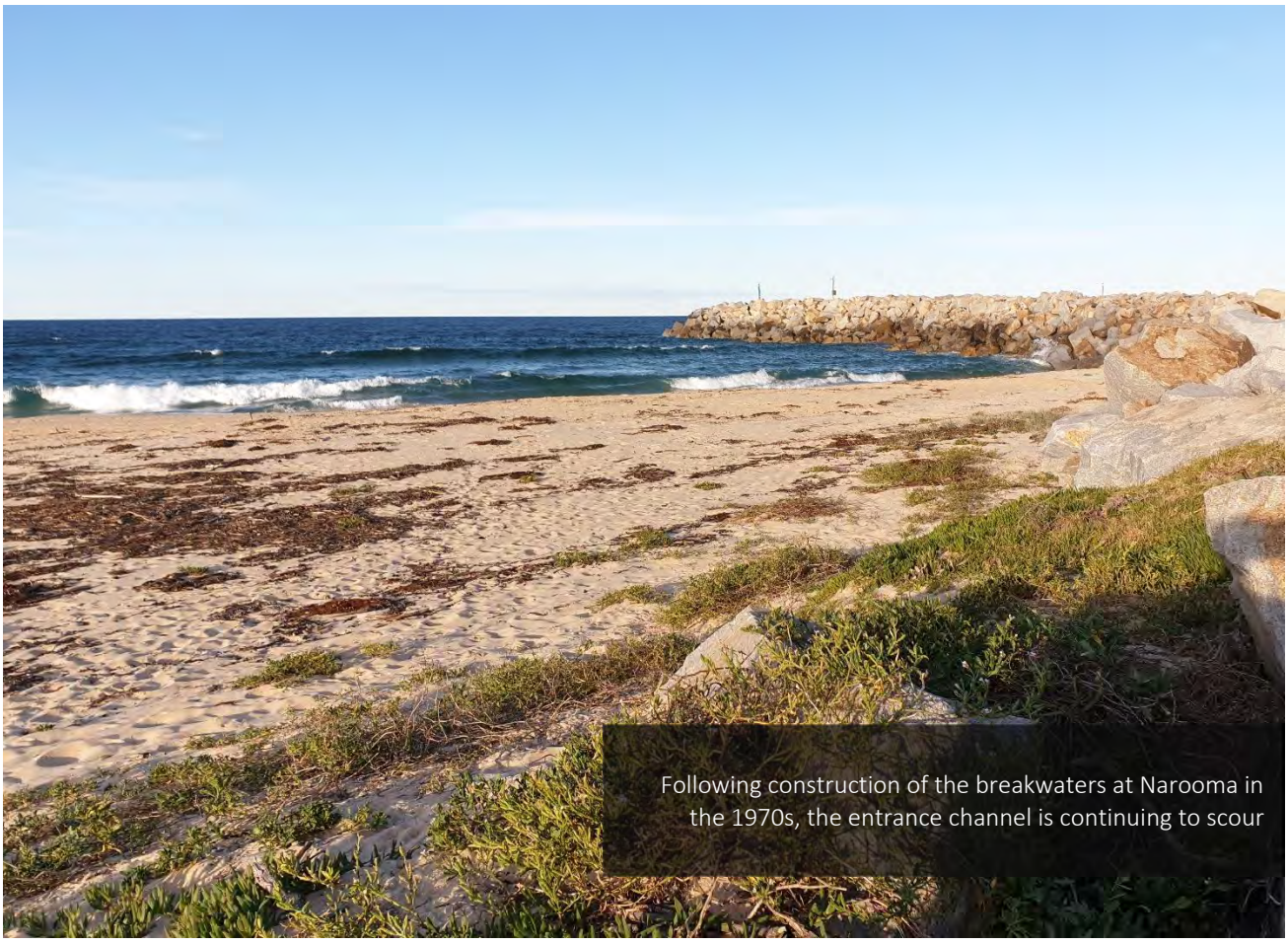
RELATED ACTIONS

Wa7, Wa8

As noted under Section 5.2.2, training of the entrance in the late 1970s has resulted in ongoing change as the entrance channel becomes deeper and larger in response.

There are a series of ongoing impacts that will need management. Navigation of the entrance channel upstream of the Princes Highway Bridge is variable and unreliable. Related to this, overall deepening of the channel is resulting in the net movement of sand upstream along the channel and depositing onto the dropover into the deeper part of the estuarine basin. The sand tends to move upstream in waves, which explains why navigation in the area can be unreliable.

Lewis Island is located adjacent to the northern side of the channel, upstream of the bridge, and the ongoing erosion of the southern shoreline of this island and its relationship to dynamics inside the entrance channel is not yet well understood.



Following construction of the breakwaters at Narooma in the 1970s, the entrance channel is continuing to scour