



**MIDCOAST**  
council



**MANNING  
RIVER**  
ESTUARY &  
CATCHMENT



# MANAGEMENT PROGRAM 2021-2031

Looking after the river we love



## ACKNOWLEDGEMENT OF COUNTRY

We acknowledge the traditional custodians of the land on which we work and live, the Gathang-speaking people and pay our respects to all Aboriginal and Torres Strait Islander people who now reside in the MidCoast Council area. We extend our respect to elders past and present, and to all future cultural-knowledge holders.

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### Thank you

Thank you to the many stakeholders who assisted Council to prepare this program. Special thanks go to the members of the Manning River ECMP Reference Group, the Technical Advisory Group, the Biripi community and our colleagues at Hunter Local Land Services.

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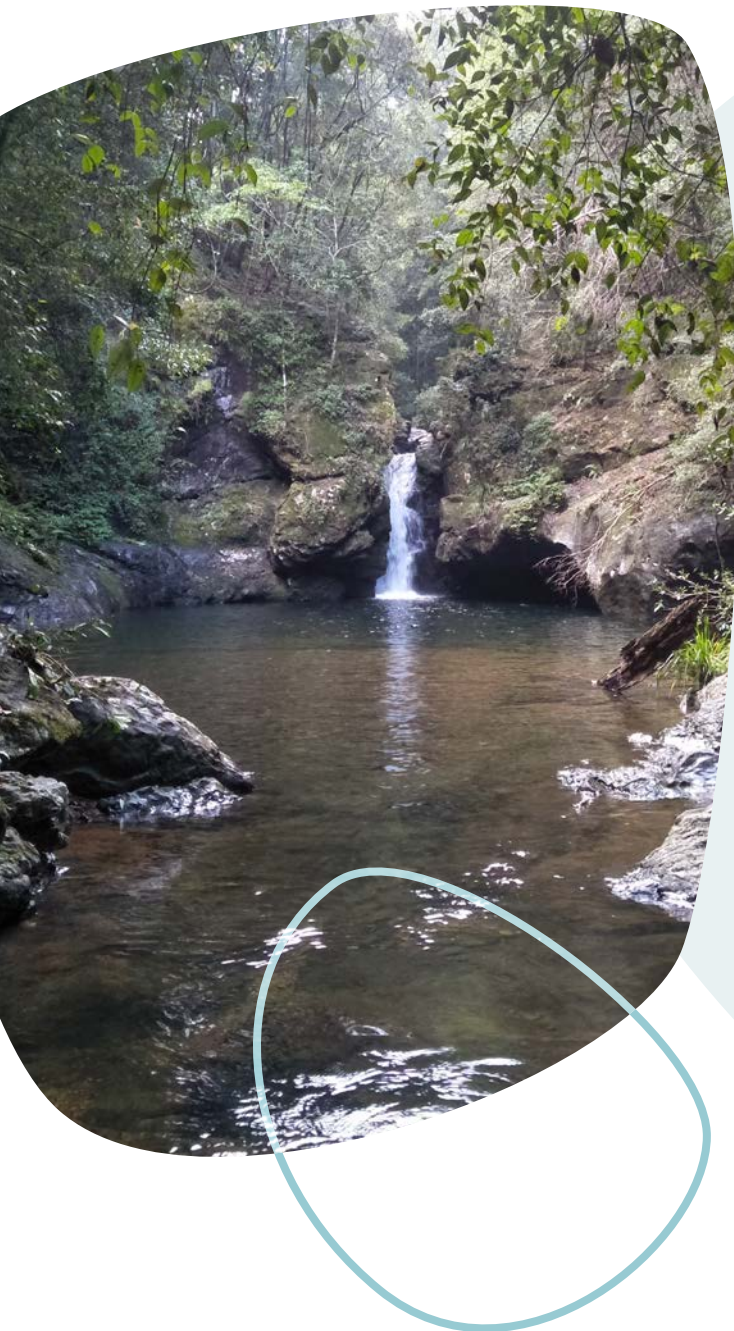
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Version	Purpose of Document	Reviewed by	Date
2	Adoption by Council	Gerard Tuckerman	14 July 2021

# ACRONYMS

<b>AEP</b>	Annual Exceedance Probability for floods (1% AEP means 1 % chance of a flood of that magnitude occurring in any given year, roughly equivalent to a 1 in 100-year event)	<b>M&amp;E</b>	Monitoring and evaluation
<b>AHD</b>	Australian Height Datum (essentially mean sea level is zero)	<b>MC2T</b>	Mid Coast 2 Tops Landcare Connections
<b>CM</b>	Coastal Management	<b>MCC</b>	MidCoast Council
<b>CMM</b>	Coastal Management Manual	<b>MERI</b>	Monitoring, evaluation, reporting and improvement
<b>CZMP</b>	Coastal Zone Management Plan	<b>NPWS</b>	New South Wales National Parks and Wildlife Service
<b>CSP</b>	Community Strategic Plan	<b>NRAR</b>	Natural Resources Access Regulator
<b>DCP</b>	Development Control Plan	<b>OBMP CMP</b>	Old Bar - Manning Point Coastal Management Program
<b>DPIE - Crown Lands</b>	Department of Planning, Industry and Environment - Crown Lands	<b>PASS</b>	Potential Acid sulfate soil
<b>ECMP</b>	Estuary and Catchment Management Program	<b>SEPP</b>	State Environmental Planning Policy
<b>FAWNA</b>	For Australian Wildlife Needing Aid	<b>S.M.A.R.T</b>	Specific, Measurable, Attainable, Realistic, Timely
<b>FRMS</b>	Floodplain Risk Management Study	<b>SQID</b>	Stormwater Quality Improvement Device
<b>Hunter LLS</b>	Hunter Local Land Services	<b>TARA</b>	Threat and Risk Assessment
<b>LEP</b>	Local Environmental Plan	<b>TAG</b>	Technical Advisory Group
<b>LG</b>	Local Government	<b>TIDE</b>	Taree Indigenous Development and Employment
<b>LGA</b>	Local Government Area	<b>WSUD</b>	Water Sensitive Urban Design
		<b>WQ</b>	Water Quality





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# ANNEXURES

A set of supporting documents has been prepared to underpin the Manning River Estuary and Catchment Management Program (ECMP). These documents are annexures to the ECMP and will be submitted to the NSW Government for certification.

Throughout this document you will see a series of highlighted boxes that direct you to the annexures which include:

- Annexure A: The Manning River ECMP Scoping Study (MCC 2020)
- Annexure B: The Manning River ECMP Stakeholder Consultation Report (MCC 2021)
- Annexure C: Birrbay Voices - Aboriginal Consultation Report (PTLALC 2021)
- Annexure D: The Manning River ECMP Farmers Consultation (NBA Consulting 2019)
- Annexure E: The Manning River ECMP Community Values Report (MCC 2020)
- Annexure F: The Manning River ECMP Coastal Wetlands Mapping Report (Ecological 2019)
- Annexure G: The Manning River ECMP Spatial Risk Assessment (EES 2020)
- Annexure H: Manning Rapid Site Assessment Report (EES 2020)
- Annexure I: The Manning River ECMP Issue Analysis Report (2021)
- Annexure J: The Manning River ECMP Management Actions – Practice Notes (MCC 2021)
- Annexure K: The Manning River ECMP Management Options Evaluation Report (Salients 2021)
- Annexure L: The Manning River ECMP Monitoring, Evaluation and Reporting Program: Water Quality and Ecosystem Health (MCC 2021)
- Annexure M: Evidence for a future Planning Proposal to amend the CM SEPP – Coastal Wetlands (Locale Consulting 2021)



## OUR VISION

“The Manning River, its tributaries and the estuary give life to our community connecting the mountains to the sea. Together we manage the catchment holistically and respond to a changing climate - safeguarding environmental, social, cultural and economic values.”

## EXECUTIVE SUMMARY

**The Manning River (Djarii Bila)** is the lifeblood of our community. From the mountains to the sea, (Balgarr-abirang-Gurrwa-gu), freshwater to saltwater (Bathu-garibang-Girambit-gu) - the river connects our landscape and our community. The estuary is important for oyster-growing, fishing, tourism and recreation. Up-river the Manning and its tributaries provide water for drinking, stock and irrigation. Our community loves the cool water and beautiful scenery, feeling a cultural and spiritual connection to the river. These values all depend on healthy ecosystems and clean water.

**Our dependence on the river brings vulnerability.** In the three years it has taken to develop the Manning River Estuary and Catchment Management Program (Manning River ECMP) we have experienced extreme lows and highs. In 2019, a record-breaking drought saw the upper Manning river run dry. Drinking water was trucked to Gloucester and farmers were hit hard. Then came bushfires that burnt 244,173 ha, representing 30% of the catchment. In 2021 we experienced a major flood, charging down the river and inundating the floodplain. Climate modelling tells us these extremes, along with sea level rise, will become more frequent in our lifetime. We need to start preparing now. Improving ecosystem health is the best way to make our natural assets resilient to extreme events.

**MidCoast Council has worked together with stakeholders** to develop the Manning River Estuary and Catchment Management Program. It sets out a ten-year action program for Council, our community and partner organisations to improve the health and resilience of the Manning River and estuary.

## WHY THE COASTAL MANAGEMENT ACT?

The Manning River ECMP was prepared under the Coastal Management Act 2016. This requires Councils to prepare coastal management programs to achieve the objects of both the Coastal Management Act and the Marine Estate Management Act.

Coastal management programs identify issues, the actions required to address them, how and when those actions will be funded and implemented. Some of these issues are coastal in nature. Others originate up-river change in the catchment to throughout the system. For example, diffuse-source run-off of nutrients and sediments from the freshwater catchments affect water quality in the coastal zone and marine estate.

Achieving the NSW Government's objectives for healthy coastal areas and a thriving marine estate will require management actions throughout the system. For this reason, the Manning River ECMP is a whole-of-catchment program recognising that the fresh and saltwater systems are connected and what happens upstream impacts on the estuary and marine receiving waters. It will primarily address the impact of land-use on water quality and ecosystem health.

Following adoption by Council, the Manning River ECMP will be submitted for certification under the NSW Coastal Management Act. Certification will enable Council to seek co-investment from the NSW Government.

## WHERE ARE THE “COASTAL” AREAS IN THE MANNING RIVER?

**The Coastal Management Act is concerned with the estuarine reaches** of the Manning River, from the tidal limit upstream of Wingham to the dual entrances at Harrington and Farquhar Inlets. The estuary covers an area of approximately 32 km<sup>2</sup> and features 115 km of inter-connecting channels and islands.

**The Manning River ECMP covers a Planning Area commencing 2 km inland** from the open coast at both entrances and extending to the top of the catchment. It does not cover Harrington and the Farquhar Inlet entrances.

**Concurrent to development of the Manning ECMP, Council is preparing the Old Bar - Manning Point Coastal Management Program** (Old Bar – Manning Point CMP). The Old Bar – Manning Point CMP covers from the open coast 2 km inland. The Old Bar-Manning Point CMP will deal mostly with the influence of oceanic water on land.



## MANNING RIVER ESTUARY & CATCHMENT Management Program

The NSW Coastal Management Act 2016 identifies four coastal management areas to be managed for social, cultural and economic well-being:

- Coastal Wetlands and Littoral Rainforest
- Coastal Environment Area
- Coastal Use Area
- Coastal Vulnerability Area.

Except for the Coastal Vulnerability Area, these areas are mapped in the Coastal Management State Environmental Planning Policy (SEPP).

As the Manning River ECMP is a whole-of-catchment program, we have included two additional areas for our program. These are:

**The Manning Estuary Floodplain:** the low-lying area downstream of Taree covering 2,060km<sup>2</sup>.

**The Manning River Catchment:** The Manning River originates in the Barrington Tops and flows 261 km to the Tasman Sea. Its vast catchment covers an area of approximately 8,420km<sup>2</sup> with 16 major tributaries.

## VALUABLE NATURAL ASSETS

**Our most valuable natural assets are coastal wetlands and riverbank vegetation.** Together these habitats work hard to keep our waterways clean and healthy. They provide ecosystem services which have a social and economic value for our community. Protecting and restoring these assets will pay real dividends for resilience and prosperity.

## COMMUNITY AND STAKEHOLDER ENGAGEMENT

**Council is committed to engaging with our community** to ensure the Manning River is inclusive, captures local knowledge and reflects aspirations and concerns. In all, over 300 people have been involved in development of this program. Groups consulted included:

- The Manning River ECMP Reference Group
- The ECMP Technical Advisory Group
- Delivery partners both within and external to Council
- The Aboriginal community
- Community Interest and Industry Groups
- Farmers
- The wider community

**Our community told us that what they value most in the Manning River** is healthy aquatic ecosystems, which underpin all other values. This was closely followed by visual amenity and then cultural and spiritual values. Riverbank vegetation and instream habitat were selected as the most important environmental features of the Manning River. To protect these and other values, we developed a set of themes and objectives as shown overleaf.



*Our River – Our Future by Mark Gutterson  
Winner - Manning River Photography Prize*



**The project team conducted a risk assessment to identify which threats** occurring in the catchment have the highest likelihood of impacting on the values identified. The top threats are:

- Lack of stewardship
- Failure to account for long term impacts of climate change
- Clearing and degradation of coastal wetlands
- Floodplain drainage and Acid Sulfate Soil (ASS)
- Clearing and degradation of riparian vegetation and adjacent habitat
- Agricultural diffuse source run-off.

**Through a series of issue papers and discussion groups**, we analysed the activities, stressors and impacts for key issues driving these threats. This issue analysis was used to inform the ECMP Action Program set out in this document. The Action Program brings together 36 management actions in a format that is measurable and targeted. It sets the direction for Council, our community and partner organisations to improve the health of the Manning River, the estuary and its catchment.

**At its heart this program involves working in partnership with landholders** to manage impacts and improve the health of our waterways.

The top priority actions are:

- Engaging our community to promote understanding and commitment to stewardship of the catchment
- Supporting landholders and land managers to implement regenerative practices that contribute to improved catchment and estuarine health
- Implementing key priority acid sulfate soil management actions from the draft Manning River Floodplain Prioritisation Study 2021
- Protecting and/or rehabilitating coastal wetlands
- Improving the condition and extent of riparian and estuarine shoreline vegetation.

**Once adopted, the Manning River ECMP will be implemented** through Council's Integrated Planning and Reporting Framework and Land Use Planning program, and through the activity of our partner agencies.

**Working together with partners, stakeholders and our community** to implement the Manning River ECMP will help us protect and improve the ecological health of this vital natural asset and support the social, cultural and economic values of the region.

# THEMES AND OBJECTIVES OF THE MANNING RIVER ESTUARY AND CATCHMENT MANAGEMENT PROGRAM



## 1: STEWARDSHIP

Engage with the community, build capacity and support partnerships to promote understanding, connection and stewardship



## 2: WATER QUALITY AND ECOSYSTEM HEALTH

Manage the Manning River catchment and its estuary holistically to maintain and improve water quality and ecosystem services



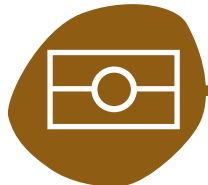
## 3. CLIMATE CHANGE

Understand, mitigate, adapt and build resilience to current and future hazards including the impacts of climate change



## 4. BIODIVERSITY

Protect and conserve natural character and biological diversity



## 5. ABORIGINAL CUSTODIANSHIP

Acknowledge and support Aboriginal peoples' spiritual, social, customary and economic connection to the Manning River catchment and its estuary



## 6. SOCIAL AND ECONOMIC VALUES

Manage the Manning River catchment and its estuary to maintain and improve social, cultural, and economic opportunities and benefits



## 7. LAND USE PLANNING

Facilitate ecologically sustainable development and promote sustainable land use planning decision-making



## 8. GOVERNANCE

Build stakeholder partnerships for good governance and integrated management



## OUR VISION:

**“The Manning River, its tributaries and the estuary give life to our community connecting the mountains to the sea. Together we manage the catchment holistically and respond to a changing climate - safeguarding environmental, social, cultural and economic values.”**

# 1. INTRODUCTION LOOKING AFTER THE RIVER WE LOVE

Throughout history human settlement has hugged rivers and estuaries. Middens on the shoreline speak of Aboriginal campsites and shellfish banquets. For European settlers, waterways provided food, transport routes, water for drinking and farming, and places to enjoy scenic beauty and outdoor fun. These all depend on healthy habitats and clean water.

Our dependence on the river brings vulnerability. In the three years it has taken to develop the Manning River Estuary and Catchment Management Program (Manning River ECMP) we have experienced extreme lows and highs. In 2019, a record-breaking drought saw the Manning run dry. Drinking water was trucked to Gloucester and farmers were hit hard. Then in 2021 came a major flood, charging down the river with incredible force: flooding homes, flattening vegetation and dropping loads of mud, silt and gravel on the paddocks. Climate modelling tells us these extremes will become more frequent in our lifetime, something we need to start preparing for now.

Healthy riparian vegetation and coastal wetlands connected to the floodplain won't save us from extreme weather events, but they will buffer us from impact and help make our environment, our community and our economy more resilient. The ecosystem services provided by nature sustain our use of the river in good times and reduce impacts when extreme events occur.



**"WE NEED THE RIVER  
AND THE RIVER  
NEEDS US."**

**Councillor Len Roberts,  
Chair Manning River ECMP  
Reference Group**

## **1.1 ABOUT THIS PROGRAM**

MidCoast Council has worked together with stakeholders to develop the Manning River Estuary and Catchment Management Program (Manning River ECMP). It sets out a ten-year action program for Council, our community and partner organisations to improve the health of the Manning River. It has a strong focus on the estuary and takes a whole-of-catchment approach, recognising that the freshwater and saltwater systems are connected and what happens at the top of the catchment affects the marine receiving waters.

While the ECMP includes actions across the whole catchment, it remains a Coastal Management Program for the purposes of gazettal under the CM Act and has been developed in accordance with the mandatory requirements of the Coastal Management Manual (Part A).

**Following adoption by Council, the Manning River ECMP will be submitted** for certification under the NSW Coastal Management Act. Certification will enable Council to seek co-investment from the NSW Government.

The link between the Manning River ECMP and the Coastal Management Act is explained below.

## 1.2 MEETING NSW GOVERNMENT LEGISLATION

The coastal management framework was reformed over the past decade, with the Coastal Management (CM) Act introduced in 2016 and coming in to force in 2018 with introduction of the CM SEPP.

The Coastal Management Framework is shown in Figure 1.

Two Acts of Parliament were introduced which guide our ECMP:

- The Coastal Management (CM) Act 2016
- The Marine Estate Management (MEM) Act 2014

These Acts along with the Environmental Planning and Assessment Act are the key legislative tools to manage the interaction of coastal processes and hazards, population growth, coastal lifestyles and sensitive natural environments of the open coast and estuaries.

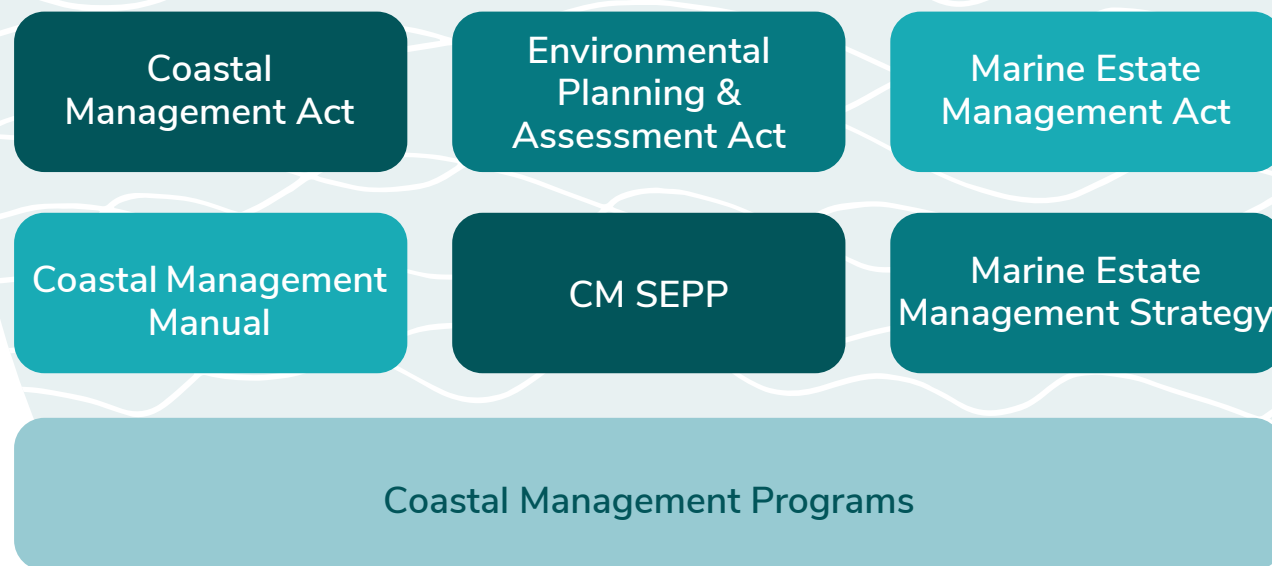


Figure 1: The NSW Coastal Management Program

By meeting the requirements of the CM Act, the Manning River ECMP will be eligible for co-funding through the Coast and Estuary Program at an investment rate of 2:1. Combined with MidCoast Council's Environment Levy and other investment streams, this will help us look after the river we love and depend on.

### 1.2.1 The Coastal Management Act

The CM Act recognises that the NSW coast is one of our greatest assets, with unique natural features, values and resources that support our way of life. It requires all Councils to prepare Coastal Management Programs that will sustainably manage this dynamic and diverse landscape for the people of New South Wales.

The associated State Environmental Planning Policy (Coastal Management) 2018 (CM SEPP) establishes a framework to manage development and land use planning in the coastal zone.



The CM SEPP defines the coastal zone as four (sometimes overlapping) coastal management areas, which are mapped in the SEPP. These four areas are found in the Manning River ECMP Planning Area, hence our decision to prepare the Program under the Coastal Management Act. The four areas are:

**Coastal wetlands and littoral rainforest area** – coastal wetlands or littoral rainforests that were previously protected by SEPP 14 and SEPP 26, plus a 100-metre buffer for each.

**Coastal vulnerability area** – areas subject to coastal hazards such as coastal erosion and tidal inundation. Coastal Vulnerability Area mapping has not been completed in the Planning Area.

**Coastal environment area** – areas with natural features such as beaches and headlands, coastal lagoons and estuarine waters.

**Coastal use area** – land adjacent to coastal waters, estuaries and coastal lakes and lagoons, where urban coastal development may be found.

The Manning River ECMP addresses risk in these Coastal Management Areas, along with two management areas we have added in recognition of their importance to overall environmental and estuarine health:

**The Manning estuary floodplain** – the low-lying floodplain area downstream of Wingham.

**The Manning River catchment** – the Manning River and its tributaries which flow into the estuary.

Seeking certification and co-funding under the Coastal Management Act, the Manning River ECMP puts actions in place that will help meet the objects of the Act. These relate to:

- ecosystem integrity and resilience
- supporting social, cultural and Aboriginal values and access
- maintaining a vibrant economy
- ecologically sustainable development and land use planning
- mitigating current and future risks from climate change
- supporting the objects of the Marine Estate Management Act 2014.

You can find out more detailed information about Coastal Management Programs at <https://www.environment.nsw.gov.au/topics/water/coasts/coastal-management/programs>.

### 1.2.2 The Marine Estate Management Act

As shown in Figure 1, the Marine Estate Management Act sits side-by-side with the Coastal Management Act to protect our marine estate. The marine estate includes the estuaries, coastal wetlands, coastline and receiving waters of the Pacific. This Act aims to achieve “a healthy coast and sea, managed for the greatest well-being of the community, now and into the future.”

A comprehensive Threat and Risk Assessment (TARA) was prepared by the State Government to underpin management strategies for the marine estate. This assessment covered the whole state of NSW, with the Manning included in the northern region. Agricultural diffuse-source runoff was ranked as the third highest priority threat to environmental assets and the second highest priority threat to social, cultural and economic benefits at both the state-wide level and in the northern region, which includes the Manning.

Recognising these risks, the Manning River ECMP Reference Group which was established by Council to provide stakeholder input for the program called for a whole-of-catchment approach, following the principles of Total Catchment Management.

### 1.2.3 The Environmental Planning and Assessment Act

The EP&A Act 1979 was amended in 2017. Its objects are concerned with facilitating ecologically sustainable development that conserves natural heritage while promoting development of land for economic and social outcomes.

A Ministerial Planning Direction under Section 9.1 of the Environmental Planning and Assessment Act 1979 accompanies the Coastal Management SEPP. It requires that planning proposals within the coastal zone need to be consistent with Coastal Management Programs (or CZMPs that continue to apply) including maps developed as part of these programs, or evidence obtained through similar processes or studies.

Management Actions in Section 7.7 of the Manning River ECMP will be implemented under the EP&A Act.



Photo: Sunset in paradise by Megan Gavenlock



## 1.2.4 The Local Government Act

The Local Government (LG) Act 1993 provides a legal framework for local government in NSW, setting out responsibilities and powers of councils and facilitating engagement with, and accountability to the community. Under the LG Act, Councils' regulatory responsibilities include planning and development control under the EP&A Act.

Chapter 13 of the LG Act requires Council to prepare a Community Strategic Plan, Delivery Program and Operational Plan as part of the Integrated Planning and Reporting (IP & R) Framework. Most of the actions in the Manning River ECMP will be delivered through this framework.

Management Actions in Sections 7.1 – 7.6 and 7.8 Manning River ECMP will be implemented under the EP&A Act.

## 1.3 OUR PLANNING AND MANAGEMENT AREAS

### 1.3.1 The Planning Area

A coastal management program may be made in relation to the whole, or any part, of the area included within the coastal zone. MidCoast Council is preparing one Estuary and Catchment Management Program and two Coastal Management Programs that together cover the entire Manning marine estate. The three Planning Areas are shown in Figure 2 overleaf.

The Manning River ECMP Planning Area was set out in our Scoping Study (Annexure A). It covers the Manning River catchment commencing 2 km inland from the open coast at both river entrances and extends to the top of the catchment. It does not cover the open coast and river entrances at Harrington and Farquhar Inlet.

The Manning River ECMP addresses issues and establishes management actions for all Coastal Management Areas mapped in the Coastal Management SEPP 2018 within the Planning Area.

Concurrent to the development of the Manning River ECMP, a Coastal Management Program is being prepared for Old Bar - Manning Point. The Old Bar -Manning Point Coastal Management Program (OBMP CMP) Planning Area covers from the open coast two km inland, including both river entrances.

Following completion of the (Draft) OBMP CMP, an Open Coast CMP will be prepared to replace the certified and gazetted Manning Valley CZMP 2018. It will include Harrington and the north entrance of the Manning River.

### WHAT'S IN A NAME?

Under the Coastal Management Act, CMP means Coastal Management Program.

For this document, ECMP stands for Estuary and Catchment Management Program.

This reflects the whole-of-catchment approach we are taking to protect the health of the estuary, and has been given the OK by our liaison officers in the NSW Government.

The rationale for developing three separate CMPs to cover the Manning River Estuary is that the threats, risks and issues affecting each of these Planning Areas are different and require detailed attention that will be better handled in separate programs.

The NSW Government identified some 15 open coast hazard sites along the NSW coastline where the impact of coastal hazards and the risk to assets are particularly high. The Old Bar / Manning Point Beaches are identified as high-risk open coast hazard sites. Hence Council is developing the Old Bar Manning Point CMP as a high priority and conducting detailed investigations to develop the best options to manage these risks.

We have distinguished between the Old Bar-Manning CMP and the Open Coast CMP northward from the entrance at Harrington because these Planning Areas represent separate secondary sediment compartments: the Manning River sediment compartment for the former, and the Tacking Point – Crowdy Head for the latter.

While all three programs will meet the mandatory requirements of the Coastal Management Act and address coastal hazards within their respective Planning Areas, the Manning River ECMP will have a strong focus on the impact of land based activities on water quality in waterways of the Manning system and the OBMP CMP will cover coastal processes and the impacts of oceanic water on the land. The CMP's are inter-related and there will be ongoing communication between the programs, including integration through the IP & R Framework.

## MANNING COASTAL MANAGEMENT PROGRAM PLANNING AREAS

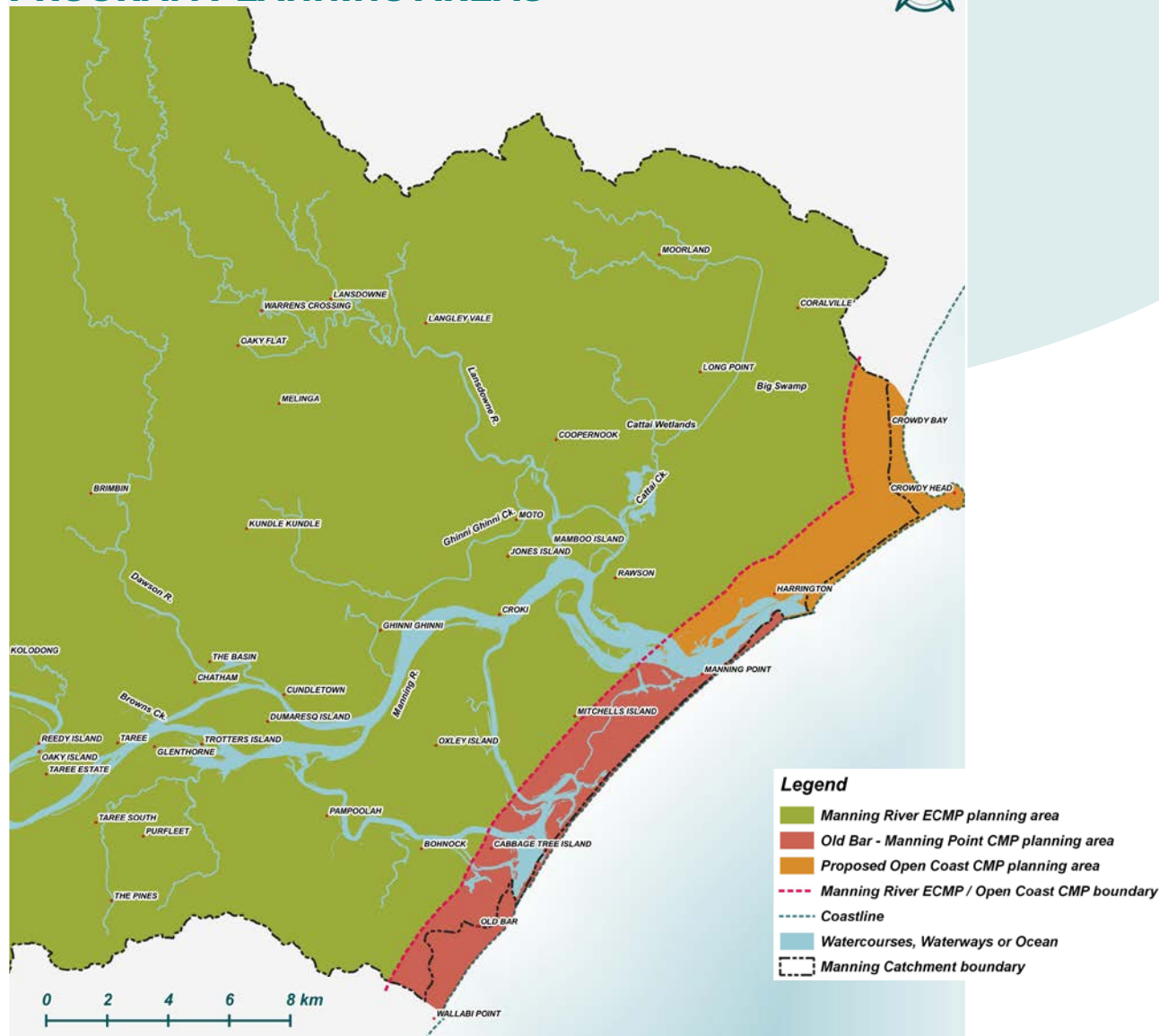


Figure 2: Map of the Planning Areas for the three separate Coastal Management Programs

## MANNING CATCHMENT SEPP (COASTAL MANAGEMENT) 2018

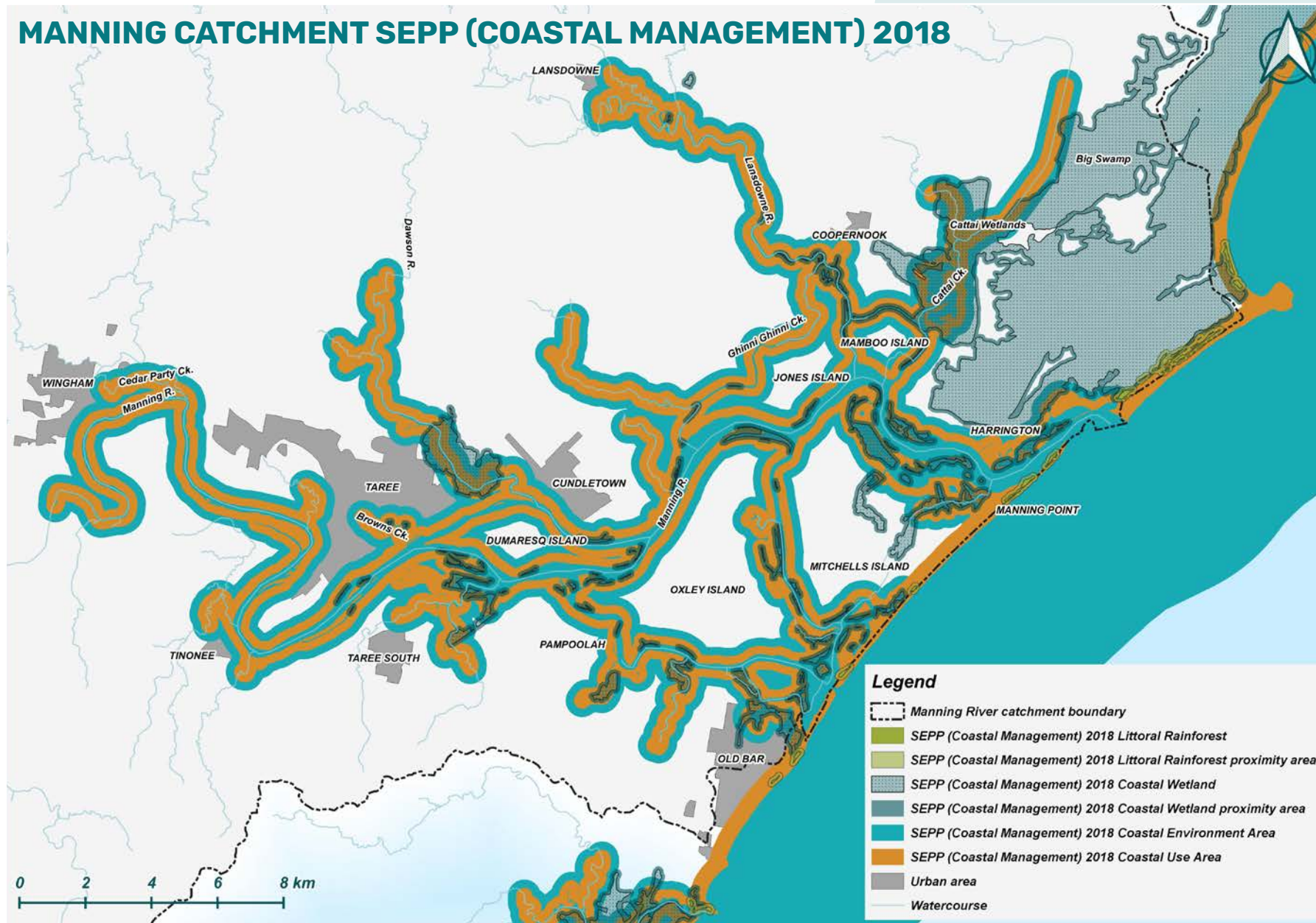


Figure 3 Manning Catchment SEPP 2018 (Coastal Management)



### 1.3.2 The Manning River ECMP Management Areas

Within the Planning Area for the Manning River ECMP, there are six Management Areas; four from the Coastal Management SEPP (see Figure 3) and two which we added to ensure the high-risk acid sulfate soils of the floodplain are appropriately managed and diffuse-source run-off and other stressors from the freshwater catchment are addressed. These are:

**Coastal wetlands and littoral rainforest areas (CWLRA)** – Coastal wetlands play a crucial role in attenuating pollutants, storing carbon, providing habitat for fish and shorebirds and mitigating the impact of flood on the estuary. There are significant areas of coastal wetland covered by the Manning River ECMP, including Big Swamp, Cattai Wetlands, Crowdy Lagoon, Dawson Wetlands and Cooperook Wetlands.

There are no areas of littoral rainforest within our Planning Area.

**Coastal Environment Area (CEA)** – The CEA for the Manning River ECMP covers estuarine waters from the tidal limit at Abbots Falls upstream of Wingham to the edge of our Planning Area, 2 km inland from the dual entrances at Harrington and Farquhar Inlets. The estuary is shown in Figure 4.



**Coastal Use Area (CUA)** – this is land adjacent to the estuary, where urban coastal development may be found, such as the estuarine foreshores of Wingham, Taree and Cundletown. The Coastal Use Area was mapped in the MidCoast LGA as a 500 metres landward extent from the open ocean boundary and a 250 metres landward extent from the boundaries of estuaries.

**Coastal vulnerability Area (CVA)** – these are areas subject to seven coastal hazards defined by the CM Act: beach erosion, shoreline recession, entrance instability, coastal inundation, coastal cliff or slope instability, tidal inundation, erosion and inundation of foreshores caused by tidal waters and wave action.

The Coastal Vulnerability Area has not yet been mapped for the Manning Planning Area. Council uses coastal hazard lines, foreshore set-backs and flood zones to control development in areas subject to hazards. Within the Manning River ECMP Planning Area there is a coastal setback line on the foreshore in Cundletown (Figure 5).

**The Manning Estuary Floodplain** – The Manning River spills onto a vast, low-lying floodplain area downstream of Taree. It is 2,060 km<sup>2</sup> in size and includes the catchments of Dingo Creek and the Lansdowne River. The floodplain is elevated to less than 2m AHD and in some places is below sea-level. It has a history of dairy farming with some townships and rural dwellings. There are extensive coastal wetlands and acid sulfate soils.

**The Manning River Catchment** – The Manning River originates at 1,570m above sea level in the Gondwana World Heritage Area of the Barrington Tops and flows 261 km to the Tasman Sea. Its vast catchment covers approximately 8,420 km<sup>2</sup> with 16 major tributaries. Of these the Gloucester River, Barnard River and Nowendoc River join the Manning upstream of Mount George, with their catchments contributing 1,930 km<sup>2</sup>, 1,830 km<sup>2</sup> and 1,650 km<sup>2</sup> respectively to the total Manning River catchment area (Figure 6).

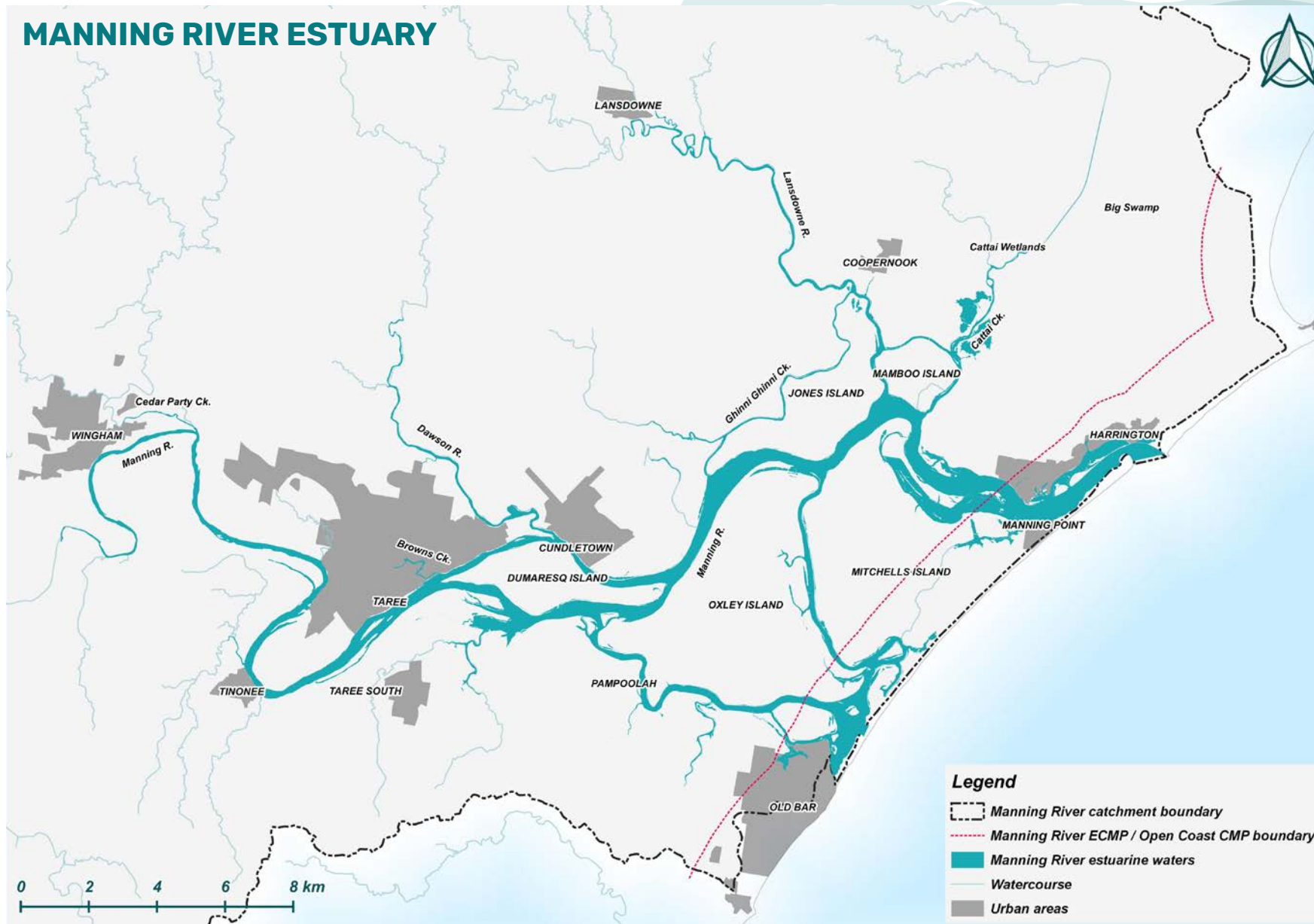


Figure 4: Map of the Manning River Estuary

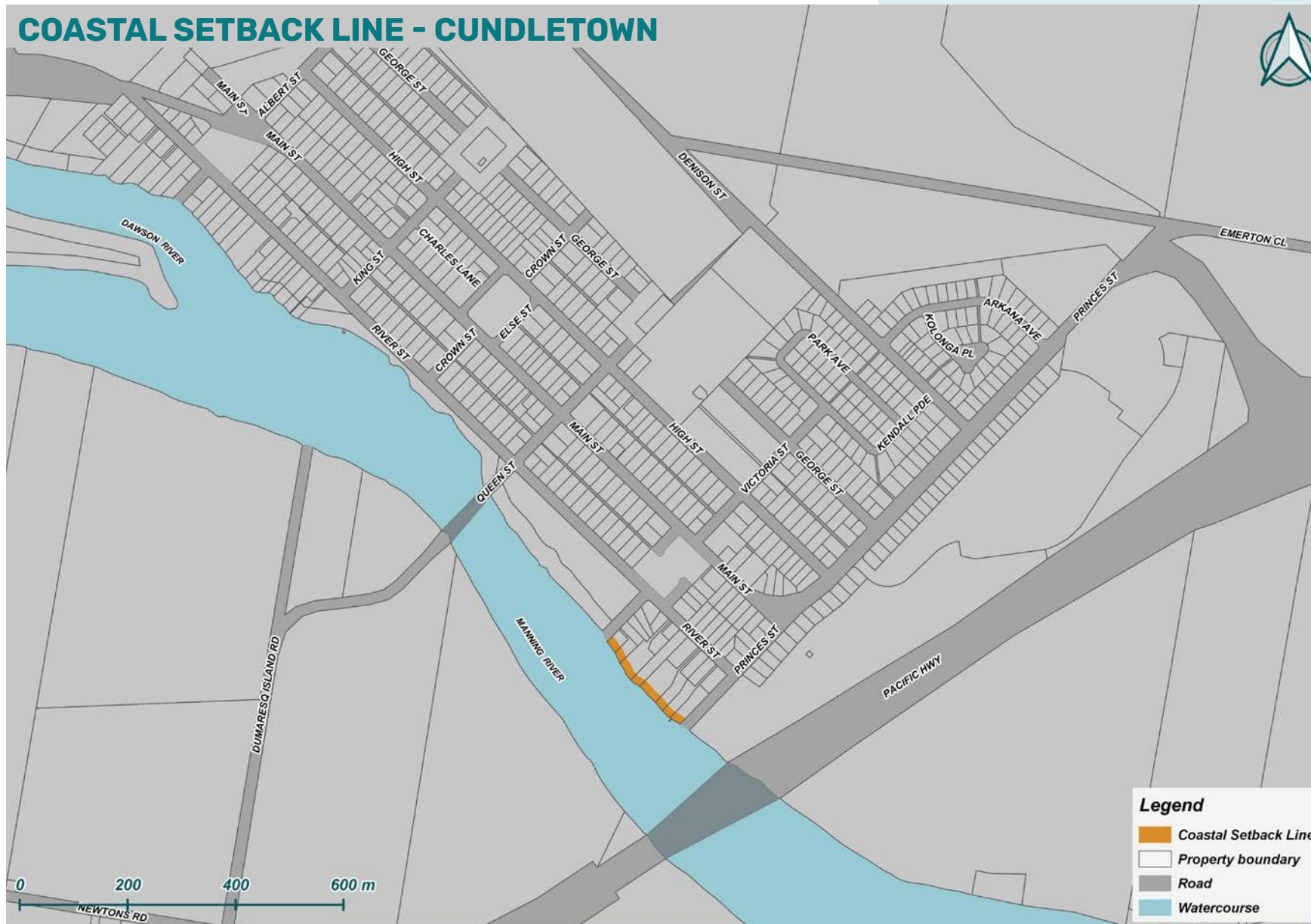


Figure 5: Map of the Coastal Setback line at Cundletown

# MANNING RIVER CATCHMENT

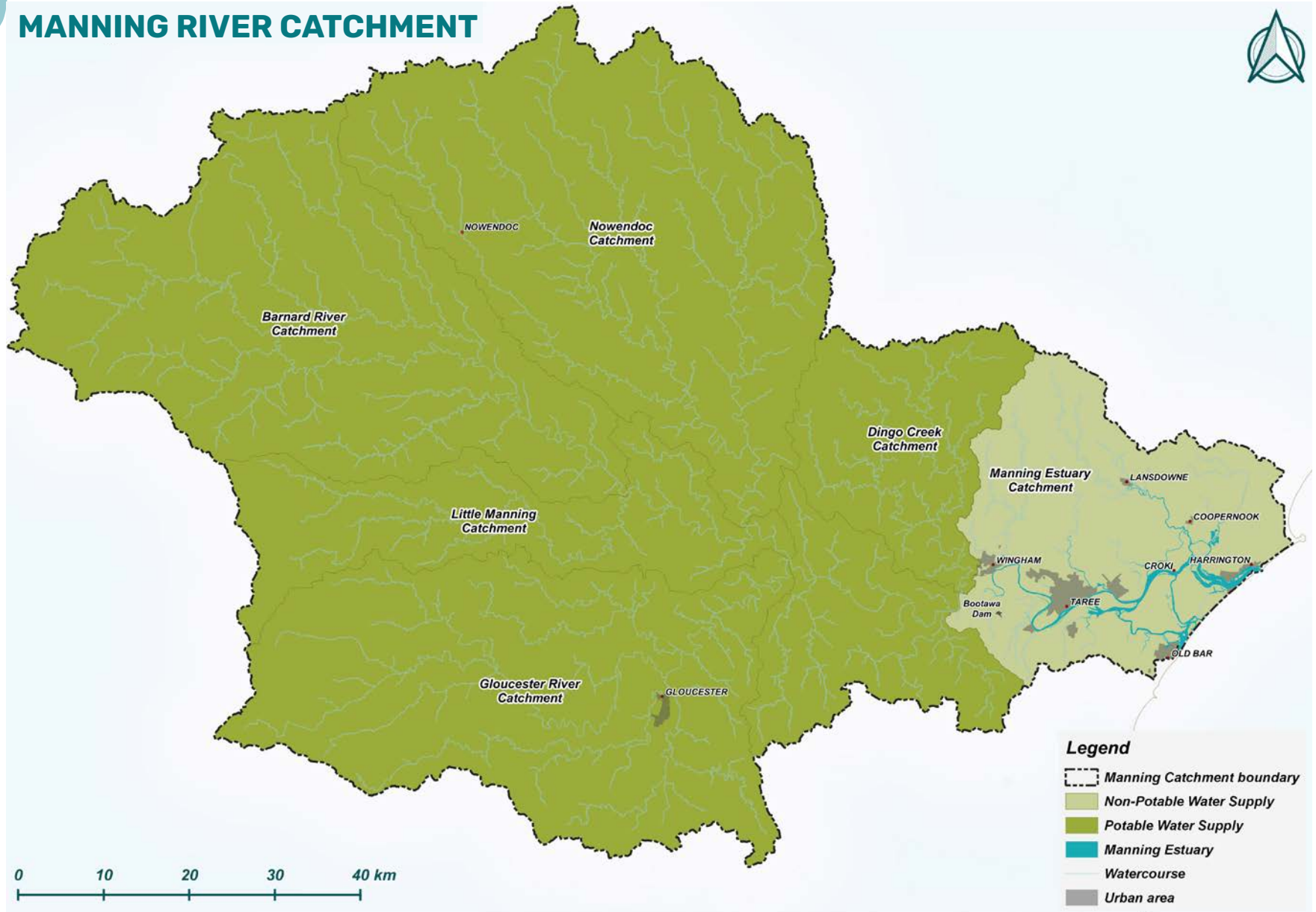


Figure 6: Map of the Manning Catchment showing potable supply catchment and the estuary

## 1.4 HOW THE PROGRAM WAS PREPARED

Under the CM Act 2016, local councils are responsible for preparing CMPs to protect the coastal zone and marine estate. The entire Manning Estuary and coastal zone is within the MidCoast Council Local Government Area, along with most of the river catchment. MidCoast Council therefore led development of the Manning River ECMP.

Council's project team members are shown in Appendix 1. The team followed the stages set out in the Coastal Management Manual, which are shown in Figure 7. Tasks completed in each stage are shown opposite.

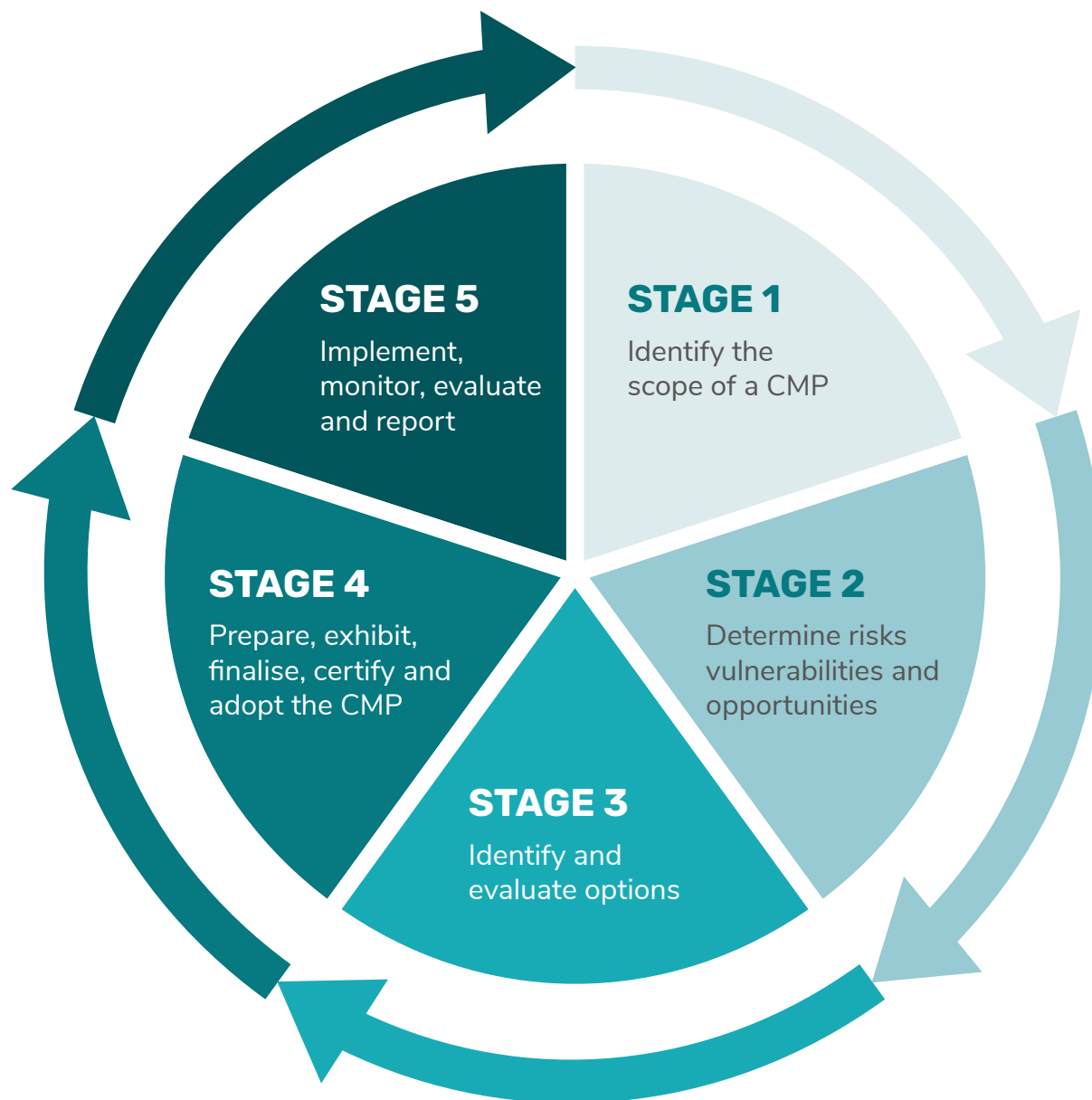


Figure 7: The five stages of a Coastal Management Program

## Stage 1: Scoping Study and community values

Stage 1 was undertaken in 2018-19. Tasks undertaken included:

- Establishing a governance framework
- Preparing a stakeholder engagement strategy
- Consulting our community on values
- Determining key issues and spatial extent
- Undertaking a first pass risk assessment
- Completing a literature review
- Identifying knowledge gaps.

The results of Stage 1 were presented in the Manning River and Estuary CMP Scoping Study (Annexure A), which was reviewed by representatives of the Department of Planning, Industry and Environment and revised in-line with their recommendations.

## Stage 2: risks, vulnerabilities, research to address knowledge gaps

In Stage 2 we commissioned detailed studies to identify, analyse and evaluate risks, vulnerabilities and opportunities. All studies are available on the Our Manning River web page. They include:

- Coastal wetlands mapping and assessment to ground-truth the CM SEPP at fine scale
- A Rapid Site Assessment covering 206 sites across the entire Manning catchment, surveying water quality and ecosystem health
- A second pass Spatial Risk Assessment by the Department of Planning, Industry and Environment. This included an Estuary Health Risk Model and assessment of erosion risks to riparian vegetation
- A social science project, in which a consultant interviewed farmers to understand their barriers and drivers for catchment management activities
- An issue analysis including review of existing management arrangements, what's working, what's not, opportunities.



*Photo: A scientist from the NSW Government undertaking water quality testing for our rapid site assessment in 2020.*

### Stage 3: analyse issues, identify and evaluate management options

In Stage 3 the project team and consultants from two firms completed the work that underpins the Manning River ECMP, in consultation with our stakeholders. Tasks completed included:

- Developing local vision and objectives and confirming the ECMP's strategic direction.
- Identifying management options.
- Evaluating management options for technical and legal feasibility, financial viability, and acceptability to stakeholders and the community.
- Selecting and prioritising the management actions that proceeded into the ECMP.
- Developing the Business Plan.
- Documenting evidence to support a future planning proposal to amend the Coastal Management SEPP (Coastal Wetlands Area).

### Stage 4: writing, exhibiting and adopting the ECMP

Building on all the work of Stages 3-4, MidCoast Council prepared the Manning River ECMP. Objectives and management actions are grouped around eight themes shown in Figure 8.



Photo: Cal Dunn, Burrell Creek

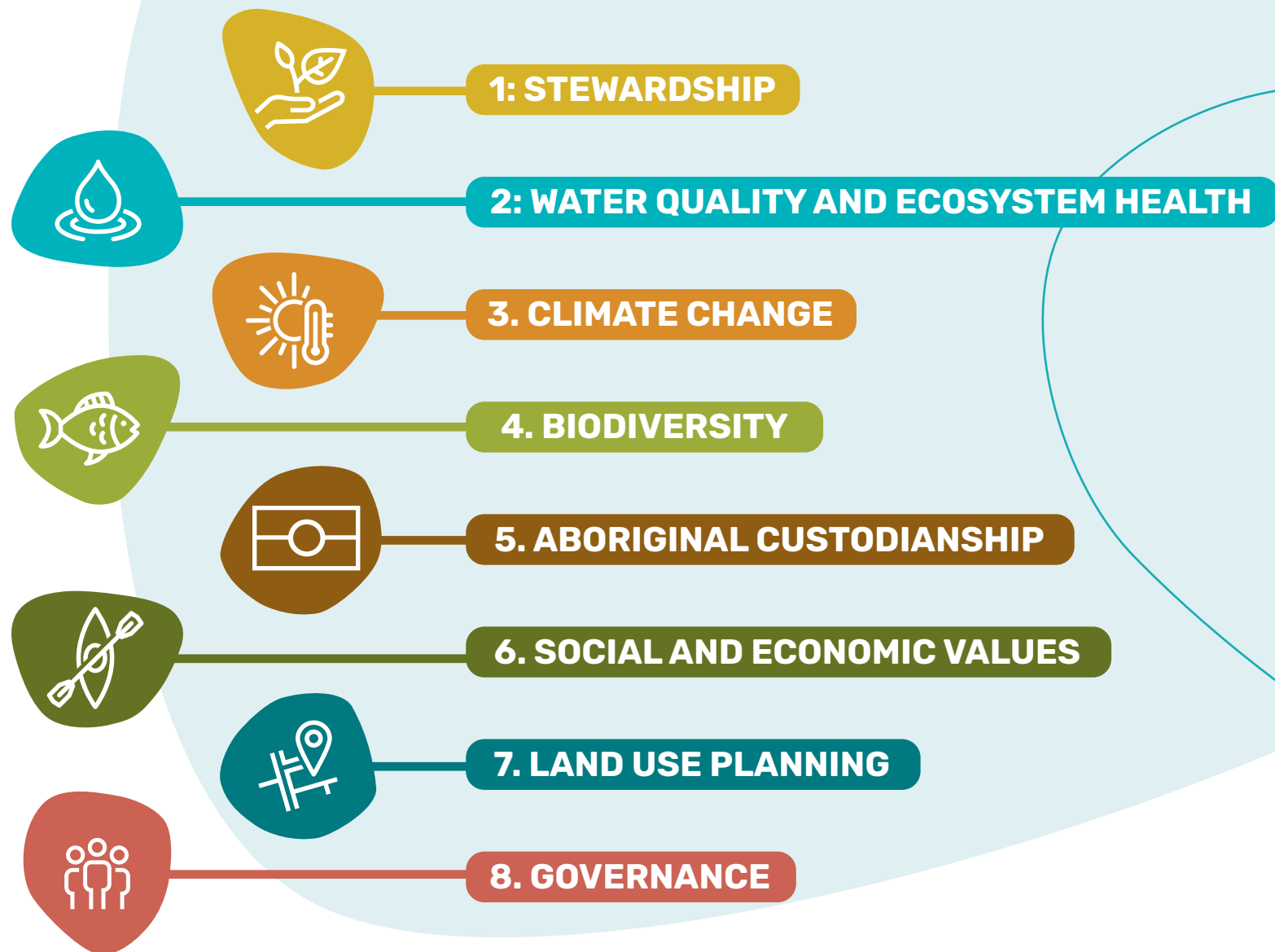


Figure 8: Themes of the Manning River and Estuary ECMP

## 1.5 HOW WILL THE ECMP BE IMPLEMENTED?

### 1.5.1 Council delivery mechanisms

The Manning River ECMP is a multi-stakeholder program with actions led by MidCoast Council and other NSW government agencies. Council's actions have two delivery mechanisms, as described in section 1.1.4:

- MidCoast Council's Integrated Planning and Reporting Framework (IP&R Framework)
- Land-use Planning framework

The IP&R Framework was introduced to New South Wales Councils in 2012. It links Council operations with community aspirations by starting with a 10-year Community Strategic Plan that is implemented via the 4-year Delivery Program and 1-year Operational Plans. The framework can be seen in Figure 9.

Most of the ECMP actions led by Council will be delivered through the IP&R Framework.

The Land-use Plan includes the Local Environmental Plan (LEP), Development Control Plans (DCPs) and a Local Strategic Planning Statement. Since the amalgamation of Great Lakes, Greater Taree and Gloucester Shire Councils in 2016, MidCoast Council has commenced developing a clear, consistent, region-wide planning framework across the entire LGA. It will be guided by the forthcoming Rural Strategy, which will set the strategic direction for all our rural, environmental and waterway zones.



Figure 9: The Integrated Planning and Reporting Framework

This is significant as rural and environmental lands cover around 95% of the MidCoast Local Government Area, including most of the land and water covered by the Coastal Management SEPP.

Manning River ECMP actions to be implemented through Council's Land-use Planning framework are shown in Theme 6: Land-use Planning.

The new Land-use Plan, when complete, will work together with the Manning River ECMP actions in the IP&R Framework to implement the objects of the Coastal Management Act along with Council and our community's goals for the floodplain and catchment.

### 1.5.2 The ECMP Governance Structure

Implementation of the Manning River ECMP will be led by MidCoast Council's Natural Systems team. A governance structure with three groups will foster integration between agencies and Council teams, ongoing technical advice and community collaboration. The groups are described below, and the ECMP governance structure is shown in Figure 10.

**Manning River ECMP Community Reference Group:** Community-based strategic input will continue to be provided through the Manning River ECMP Reference Group, a formal committee of Council. A review and appointment of the Reference Group will take place following the Council election in September 2021. The review will consider transferring government agencies currently represented in the Reference Group to the proposed ECMP Working Group. It is an action of the ECMP to increase Aboriginal representation by appointing a second person from the Gathang-speaking community.

**Manning River ECMP Technical Advisory Group (TAG):** Technical advice will continue to be provided by the Manning River ECMP Technical Advisory Group, which will be assisted by several multi-stakeholder thematic groups currently being established in the MidCoast Region. Representatives from these groups will advise and liaise with the ECMP Working Group to ensure adaptive program implementation is based on the best evidence, and projects are integrated across Council departments and other agencies. Thematic groups could include Water Quality, Water Resilience and the Manning River Helmeted Turtle Steering Committee. Industry representatives would be welcome additions to these groups.

**Proposed Manning River ECMP Working Group:** Following the Council election in September 2021, consideration will be given to establishing an operational ECMP Working Group. This group would focus on delivering ECMP actions along with monitoring, evaluation and reporting. It could be made up of representatives from each agency designated as a lead in the action program, along with Council personnel from allied programs leading actions that will contribute to delivery of the ECMP. The Working Group would report to the Community Reference Group.

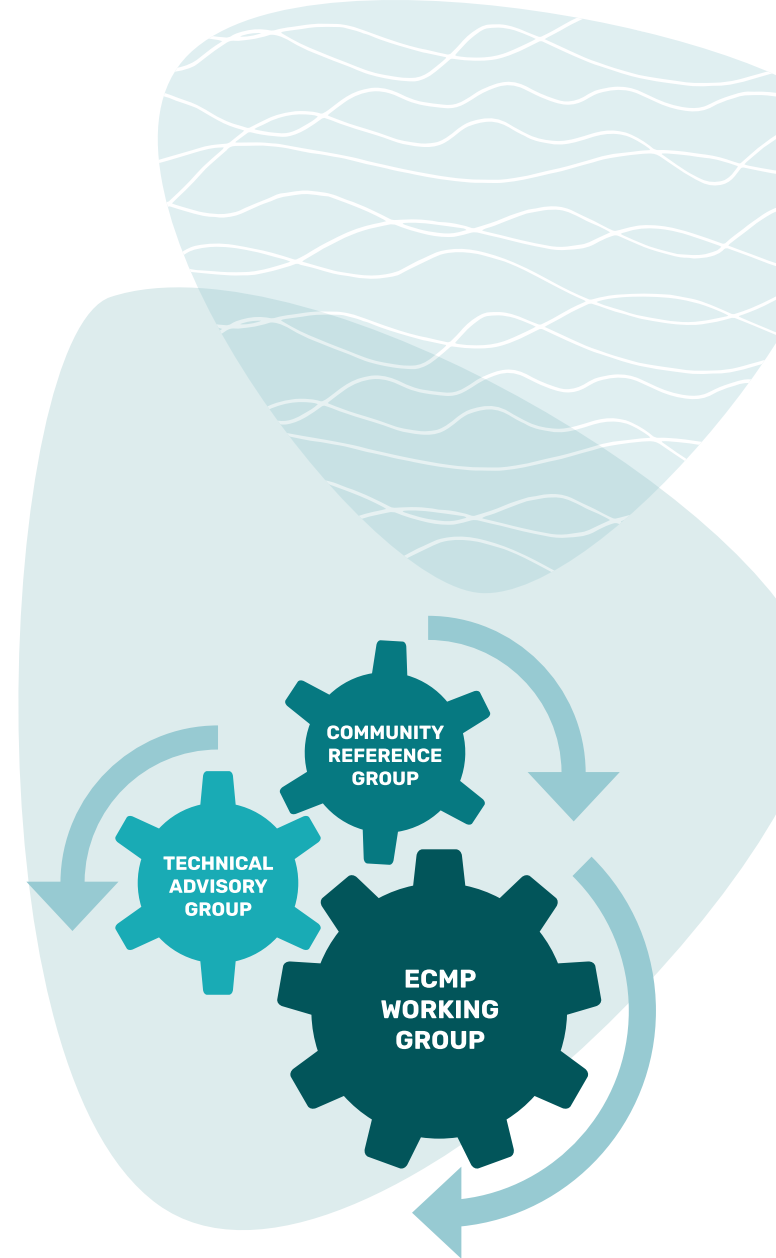


Figure 10: Option for the Manning River ECMP Governance Structure



## 2. COMMUNITY CONSULTATION

**MidCoast Council is committed to taking a participatory approach** to catchment management. Meaningful participation occurs when the local, scientific and cultural knowledge of stakeholders and local communities is used to inform the program and they are part of the decision-making process.

**There is a diverse range of stakeholders in the Manning region** sharing management responsibilities for the river and the estuary. These include multiple government agencies, community stakeholders and private landowners. Similarly, within Council there are numerous teams whose programs and interests influenced development of the Manning River ECMP. Representatives from the community, environmental, agricultural and government sectors were consulted at every stage of the process. The social and economic characteristics of the Manning community shown below were used to identify key stakeholders for consultation.

### 2.1 THE MANNING COMMUNITY

**Approximately 50,000 people live in the Manning River Catchment**, of which 34,000 people reside within the estuarine or coastal landscape of the catchment. Major population centres include the towns of Gloucester, Wingham and Taree, with coastal villages including Harrington and Old Bar. The Australian Bureau of Statistics (2018) forecasts growth of approximately 18% concentrated on the coast by 2036. Seasonal tourism adds another 870,000 visitors a year, also concentrated in the coast and estuary.

**Approximately 7% of the community are Aboriginal/Torres Strait Islanders.** All the estuary and most of the catchment is Biripi land, with Kamilaroi, Worimi and Geawegal also represented (Horton 2018). Water is an intrinsic and inseparable element in the physical, cultural, economic and spiritual existence of Aboriginal people. Aboriginal consultation for the Gloucester Sub-region Biosphere Assessment Program expressed the view that “water sustains and nourishes all living creatures, it carries the past and the future, it holds knowledge and secrets.”<sup>1</sup>

1: Constable & Love 2015

**The MidCoast 2030 Community Strategic Plan (CSP)** is a roadmap for the future of the MidCoast Council area. In the development of the CSP, other key government plans and legislative frameworks were considered, in particular the NSW State Plan, the Hunter Regional Plan, the Local Government Act 1993 and the Integrated Planning and Reporting Guidelines, to ensure that there is alignment and the community is working towards a shared vision.

The Vision of the CSP, which is consistent with the Manning River ECMP, is:

**“We strive to be recognised as a place of unique environmental and cultural significance. Our strong community connection, coupled with our innovative development and growing economy, builds the quality of life we value.”**

## 2.2 OUR STAKEHOLDER CONSULTATION PROGRAM

Council was committed to engaging with our community throughout the planning process. We used the Public Participation Spectrum (IAP2 2018) to assign participation levels for stakeholder and community engagement. The spectrum sets out the level of consultation for each target group from inform to consult, collaborate and empower, and our commitment to acknowledging and using community feedback. A diagram of the spectrum is provided in Appendix 2. Unless otherwise shown below, formal consultation has been documented in the Manning River Estuary CMP Stakeholder Consultation Report (MCC 2021 - Annexure B) available on Council's web site. Groups are described below.

**The Manning River ECMP Reference Group:** a formally appointed committee of Council with 15 members made up of 10 community representatives, four government agency representatives and the CEO of the Purfleet-Taree Local Aboriginal Land Council (LALC). Community members recruited via an advertising campaign represent beef, dairy and oyster farmers, Landcare, Coastcare, recreational fishing and broad community interests.

Agencies represented include:

- Hunter Local Land Services (LLS)
- Department of Planning, Industry and Environment (DPIE) – Water, Floodplains and Coast team
- DPIE – National Parks and Wildlife Service
- Transport for NSW – Maritime

The ECMP Reference Group was established in December 2019 and was co-chaired by Councillors Len Roberts and Katherine Smith. The group met five times between December 2019 and July 2021, with minutes presented to Council for adoption.

The level of IAP2 participation with the Manning River ECMP reference group was involvement.

**The ECMP Technical Advisory Group:** an informal group with meetings held as needed. Members represent a range of Council teams, government agencies and academic institutions. The Group met four times between November 2018 and May 2020. Members also participated in workshops held for issue analysis and management options.

The IAP2 level of participation was collaboration.

**Delivery Partners:** Within Council there are many teams with programs aligned to the objectives of the Manning River ECMP. Hunter LLS is a major partner in the program, along with other State government agencies, industry groups and non-government organisations such as Mid Coast 2 Tops Landcare.

In July-August 2020, we held a series of 12 discussion groups for delivery partners to analyse issues developed for the ECMP. These discussion groups considered existing management practices, what's working and what's not, opportunities and management options.

In February-March 2021 a further 9 workshop sessions were held to firm up management actions and convert them to S.M.A.R.T format (Specific, Measurable, Attainable, Realistic, Timely).

The IAP2 level of participation was involvement and collaboration.

**Aboriginal Consultation:** the Purfleet-Taree Local Aboriginal Land Council (LALC) was engaged to consult with the Biripi community. The consultation project was led by LALC CEO Joedie Lawler. A survey instrument was used as a starting point and input was gained via three workshops and a series of one-on-one interviews. In total 48 people were surveyed across the catchment area, including members of the PTLALC and its Board, Taree Indigenous Development and Employment (TIDE), local members of the Aboriginal Education Consultative Committee, an Aboriginal commercial fishing family and other Biripi community representatives.

The Gathang word for Biripi is Birrbay. Birrbay Voices: Aboriginal Consultation Report (PTLALC 2021 - Annexure C) is available on Council's website.

Other Aboriginal representatives consulted were Council's Aboriginal Community Development Officers, the Manning Aboriginal Community Working Party and the Hunter LLS Senior Aboriginal Liaison Officer.

The IAP2 level of participation was consultation and involvement.

**Community and Industry groups:** Consultation with groups was primarily via the membership of our ECMP Reference Group, who represented a range of groups as shown below:

- Mid-Coast Dairy Advancement Group
- MidCoast Young Dairy Network
- Manning Delta Advisory Group
- North Oxley Island Drainage Union
- MCC Floodplain Committee
- Manning Delta Landholders Group
- Taree West Fishing Club
- Manning River Oyster Farmers Association
- Mid Coast 2 Tops Landcare
- Manning Coastcare

Other community interest groups consulted during the planning process included the Women in Dairy group, Gloucester Environment Group, Friends of Browns Creek, NSW Farmers Association and the Manning River Turtle Conservation Group.

The IAP2 level of participation was consultation.

**Farmers:** Nick Bullock from NBA Consulting was engaged to consult farmers about the barriers and drivers for catchment management practices, and how Council and other agencies can support and incentivise farmers to adopt best practice. Face-to-face and phone interviews were conducted with 24 Manning River catchment beef and dairy cattle farmers. Responses were analysed for common themes. Two workshops were held, one with the farmers' group "Women in Dairy" and the second with MCC, Hunter Local Land Services and Landcare personnel. The Manning River ECMP Farmers Consultation Report (NBA Consulting 2019 - Annexure D) presents the themes, provides analysis of the responses against a literature review, and concludes with recommendations for targeted programming of MCC resources

The IAP2 level of participation was consultation.

**Public consultation:** In 2018, Council's catchment officers commenced awareness-raising activities by speaking and running stalls at a range of community events throughout the catchment.

Between 29 August and 11 December 2019, the ECMP project team hosted a participatory public consultation on the theme of community values, nine consultation events were held from the top to the bottom of the catchment, attracting 251 participants. The Manning Community Values Report (MCC 2019 - Annexure E) provides a record of this consultation and is available on the Our Manning River web page.

The IAP2 level of participation was consultation.

The diagram of the consultation program is shown in Figure 11 overleaf. Full membership details for each group are provided in Appendix 3.



# OVERVIEW OF CONSULTATION



Figure 11 The consultation program

## 2.3 WHAT OUR COMMUNITY TOLD US

### 2.3.1 Community Values

In the values survey completed by 122 participants, the three top values identified were:

- Healthy aquatic ecosystems
- Visual amenity
- Cultural and spiritual value.

Thematic analysis of responses at our community workshops found the following key themes:

#### Environmental Values: “water is life”

- River Health: healthy aquatic and riparian ecosystems and good water quality underpin all other uses.
- Plants and wildlife – biodiverse habitats for the full suite of flora and fauna communities.

“Water is life... we share the river as a central part of the wild ecosystem that provides habitat for us and all wildlife from iconic animals to tiniest microbes.”

#### Social Values: “it’s my happy place”

- Sensory experiences: connecting to nature in wild spaces.
- Sanctuary and peace.
- Stories and history –cultural connections to the river and estuary for the Aboriginal community and settlers across multiple generations.
- Great Outdoors – recreational use for fun, fitness and well-being.

“Connecting to nature and myself, watching and experiencing animal and plant life, amazing sunsets, moon-rises and skies!”

#### Economic Values: “the river provides”

- Livelihoods: The Manning is a “working river” supporting primary production – oysters, dairy and beef.

“There’s a deep sense of history – childhood days, parents, grandparents, great-grandparents who have farmed this land, lived, worked and relaxed along the river.”

## Values Map

When participants were invited to participate in a value mapping exercise, by far the most frequently selected areas were the estuary and the coast. This matches with the higher population density in the estuary. On the other hand, there were no significant differences between values selected for the upper catchment and values for the estuary and coast. People swim and enjoy boating (including kayaking) throughout the catchment. They value the riffles and pools of the headwaters and the sheer immensity of the estuary.

Figure 12 shows the values map for the Manning River catchment.

Community values for our waterways guide the water quality standards we need to meet to support those values. The values map developed for the ECMP builds on earlier work by the NSW Office of Environment and Heritage (OEH), which established the NSW Water Quality Objectives. These are the agreed environmental values and long-term goals for NSW's surface waters. They set out:

- the community's values and uses for our rivers, creeks, estuaries and lakes (ie healthy aquatic life, water suitable for recreational activities like swimming and boating, and drinking water); and
- a range of water quality indicators to help us assess whether the current condition of our waterways supports those values and uses.

Water Quality Objectives set for Fresh and Estuarine surface waters have been used in the Monitoring and Evaluation program for the Manning River ECMP

You can see the original values map at <https://www.environment.nsw.gov.au/ieo/Manning/caag.htm>  
An updated version is currently in production by the NSW Government will be available later in 2021.

Photo: participants at a values workshop at Manning Regional Art Gallery

# MANNING RIVER CATCHMENT

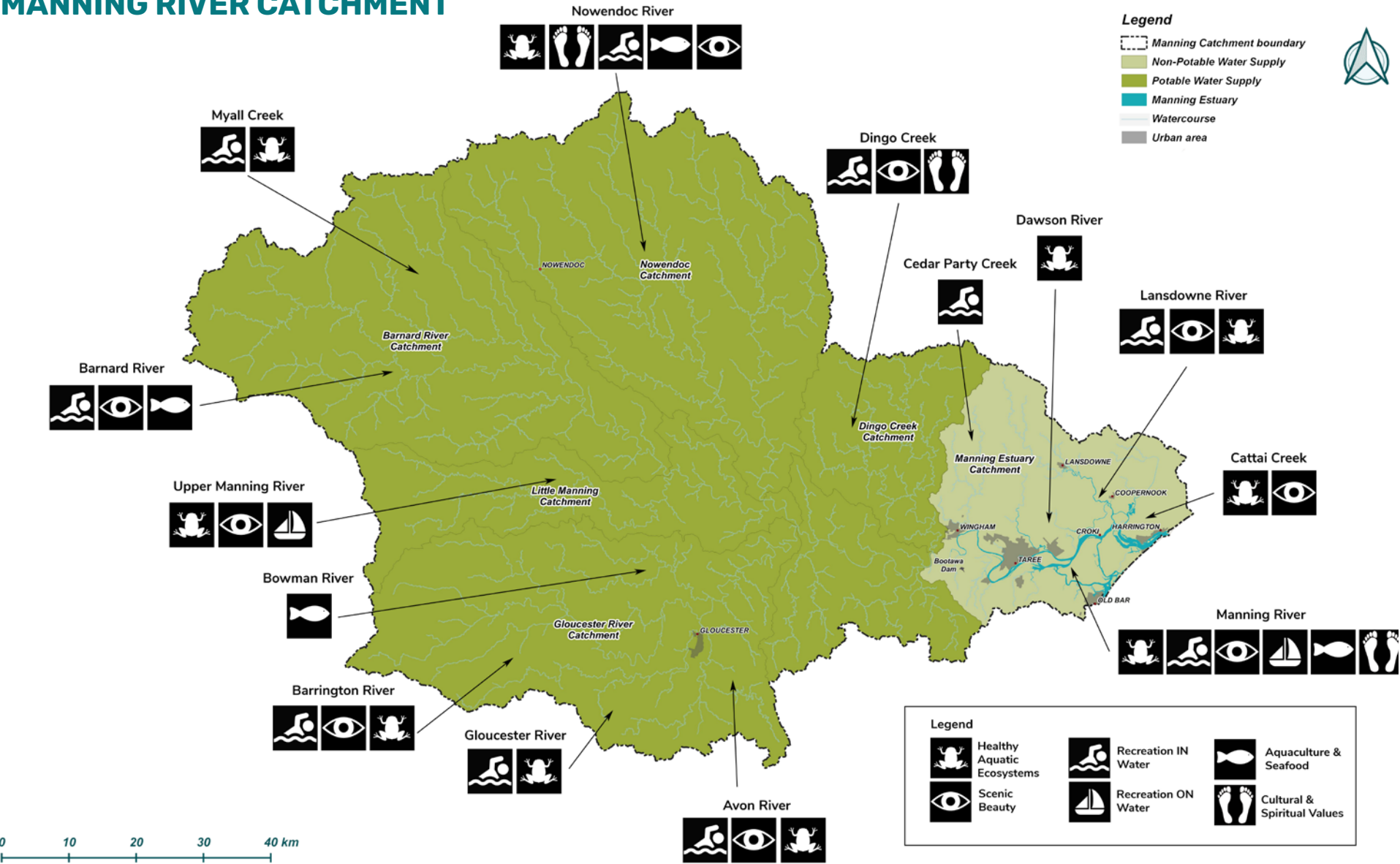


Figure 12: Values our community ascribed to each subcatchment



### 2.3.2 The ECMP Reference Group

During the COVID-19 lockdown our project team conducted one-on-one interviews with the community representatives on the Manning River ECMP Reference group. Topics discussed included vision, issues, opportunities and management options. Some of the key points are reported below, with the full report included in Annexure B available on Council's website at [www.midcoast.nsw.gov.au/ourmanningriver](http://www.midcoast.nsw.gov.au/ourmanningriver)

#### Environmental Vision

**Ecosystem health:** "A river in which intact and effective ecological processes are maintained, with the physical characteristics of a river in good condition, clothed in a healthy riparian strip."

**Resilience:** "We maintain function, adapt and respond to a changing climate."

**Manage holistically:** "The catchment will be cared for and managed as a whole."

**A wild river:** "The wild character of the river is preserved."

**Clean water:** "We maintain clean water, which the rest of life flows from."

#### Social/cultural vision

**The river is life:** "The river is the lifeblood of our community – we drink from it, eat fish, use it for recreation. The river serves us, and we serve it."

**Recreation and wellbeing:** "We value the river's aesthetics and social attributes. The community enjoys, appreciates and experiences the river and the environments around it."

**Sustainable use, decision-making and management:** "Continue to protect what we have and use it sustainably."

**Awareness, appreciation and understanding:** "It's the responsibility of everyone to respect and understand our iconic river system...to appreciate it, utilise it, and do their bit to keep it clean."

**Partnerships, working together:** All stakeholders need to work together so we can benefit from the river for business and leisure.

## Economic Vision

**Manage sustainably for economic benefit:** “A healthy system that everyone can benefit from for their business and recreation.”

**Oysters:** “Great estuary = great oyster industry.”

**Farming:** “The river is very important to the farming community.”

**Tourism-recreation:** “Fishing, tourism and lifestyle are extremely important to the economy of the area.”

## Managing Hazards

**Be proactive and prepared:** “Evidence-based science helps us understand, plan and prepare for hazards.”

**Climate Change:** “Climate Change is happening – we need to be proactive and make decisions and changes to minimise the impact of hazards.”

## Key Issues

Issues identified by the Reference Group were closely aligned with issues identified through the Threat and Risk Assessment. They included:

- Education and stewardship
- Sediment and erosion control
- Loss of riparian vegetation and coastal wetlands including seagrass
- Acid sulfate soil (ASS) discharge
- Agricultural impacts – soil degradation, irrigation, run-off
- Pathogens from sewerage, OSSMs and animal effluent
- Climate Change - extreme events, sea level rise, coastal inundation.
- Weed control
- Stormwater including litter and plastics.



*Photo: members of the Manning River ECMP Reference Group and Council's project team*

### 2.3.3 Farmer consultation

Farmers are part of the cultural life and social fabric of the Manning catchment. Many farmers have a stewardship ethic and manage their land to promote ecological health and reduce agricultural impacts. Supporting farmers to maintain the health of the landscape and reduce negative impacts is a key focus for the ECMP.

Farmers told us that actions for waterway protection must also have advantages for farm management and productivity. Win-win solutions are more likely to be adopted. Motivators for change will need to resonate with the goals of individual farmers, recognising that goals differ depending on the life stage, values and aspirations of the farmer, the position of the farm within the catchment, their individual and industry specific husbandry practices and their own resource management. To be effective, a proposed solution must address the identified problem without creating another set of problems. The ongoing maintenance costs to the landholders must be factored into project design.

Farmers support a holistic approach to protecting waterways and improving water quality. The preferred mix of practices would include improving soil health; promoting good pasture cover; rotational grazing; and providing shade, water and stock attractants away from waterways along with the more traditional stock exclusion fencing of riparian areas.



*Photo: Dairy farmer Sam Nicholson is a member of the Manning River ECMP Reference Group*

### 2.3.4 Biripi consultation

Aboriginal people refer to their tribal areas as Country. According to the Birrbay Voices report:

“Country is important for identity. It is important for culture, cultural practices and our own healing. Building strong partnerships to share knowledge and care for Country will assist in healing our people.”

Joedie Lawler, CEO of the Purfleet-Taree Aboriginal Land Council explains the connection of the Biripi people to the river:

Birrbaygal Biripi People are known as the guyiwan, the shark people. We are connected to Water through our tribal totem. Water is the life source of all country and all living things. As garuwagal bathuGal (Saltwater Freshwater people) we maintain our healing from the water. It connects us to culture, our LORE and our land Birrbay Barray (Biripi country).

As Birrbaygul we follow the Matriarch LORE of our mother’s bloodline. We descend under Mirakeet or winmara worima, the coastal and the mountain clans. Each Family group have bloodline totems that they are responsible to protect. We are connected to this totem by blood. Our responsibility is the conservation of these species. Some are water totems, others land and some air - fish, animals and birds

Djarri Bila (the Manning River) and the estuaries provide us with food and medicine. It is important for our people to always maintain a connection and responsibility for the health of the entire system from the mountains to the sea. We follow LORE and the signs of mother earth through the seasons, taking only what we need to protect the longevity of all living things. For generations our people have been engaged in the river through fishing, swimming and the knowledge of those places along the river with special meaning. It is important for us to maintain spiritual and close connection to the water. We describe our country as where the leaves touch the water from the mountains to the sea.



These are the key messages from the Aboriginal consultation:

### Access:

“The river system is important to Birrbay people. Our country is bound by where the leaves touch the water from the mountains to the sea”.

**Concerns:** “We used all the river in the old days. There were agreements with the local farmers to access through their property. Now there’s limited access to areas that have been used for generations due to private ownership.”

### Ecosystem health and cultural resources:

“Medicine and food for our people and ceremonies depend on the health of the river system”

**Concerns:** degradation of cultural food resources including prawns, cobra worm, fish and shellfish; bag limits and restrictions on use of pipis.

### Water quality and testing:

“If our river dies our culture dies. Our connection to Country, to the water of the river and the salt of the sea is important to who we are.”

**Concerns:** monitoring, regulation and compliance for pollution events including contamination of sediments.

### Natural flow of the River:

“Keeping it flowing and healthy is important to all of us, both black and white.”

**Concerns:** impacts on the natural flow of the river through extraction.

### Continued engagement:

“Include Aboriginal people in the process from start to finish, not as an afterthought.”

**Concerns:** lack of engagement leading to lack of trust. “It is important and our responsibility for our children to have a clear connection to country, to know who they are as Birrbay people and to understand their responsibility to care for country. To know their culture and what our Country offers.”

Recommendations from the Biripi consultation have informed the ECMP management actions.



#### Find out more:

The results of our stakeholder consultation are available on Council’s web site at [www.midcoast.nsw.gov/ourmanningriver](http://www.midcoast.nsw.gov/ourmanningriver)

- Annexure B: The Manning River Estuary CMP Stakeholder Consultation Report (MCC 2021)
- Annexure C: Birrbay Voices: Aboriginal Consultation Report (PTLALC 2021)
- Annexure D: The Manning River Estuary CMP Farmers Consultation (NBA Consulting 2019)
- Annexure E: The Manning River Estuary CMP Community Values Report (MCC 2020)

### 3. OBJECTIVES, PRINCIPLES, PROGRAM LOGIC

The objectives, principles and program logic for the Manning River Estuary and Catchment Management Plan build on:

- the Coastal Management and Marine Estate Management Acts
- the Coastal Management Manual

**Our local objectives**, while aligned to the objects of the CM Act, were developed to meet our local context through consultation with stakeholders. The Manning River ECMP Objectives are shown overleaf.

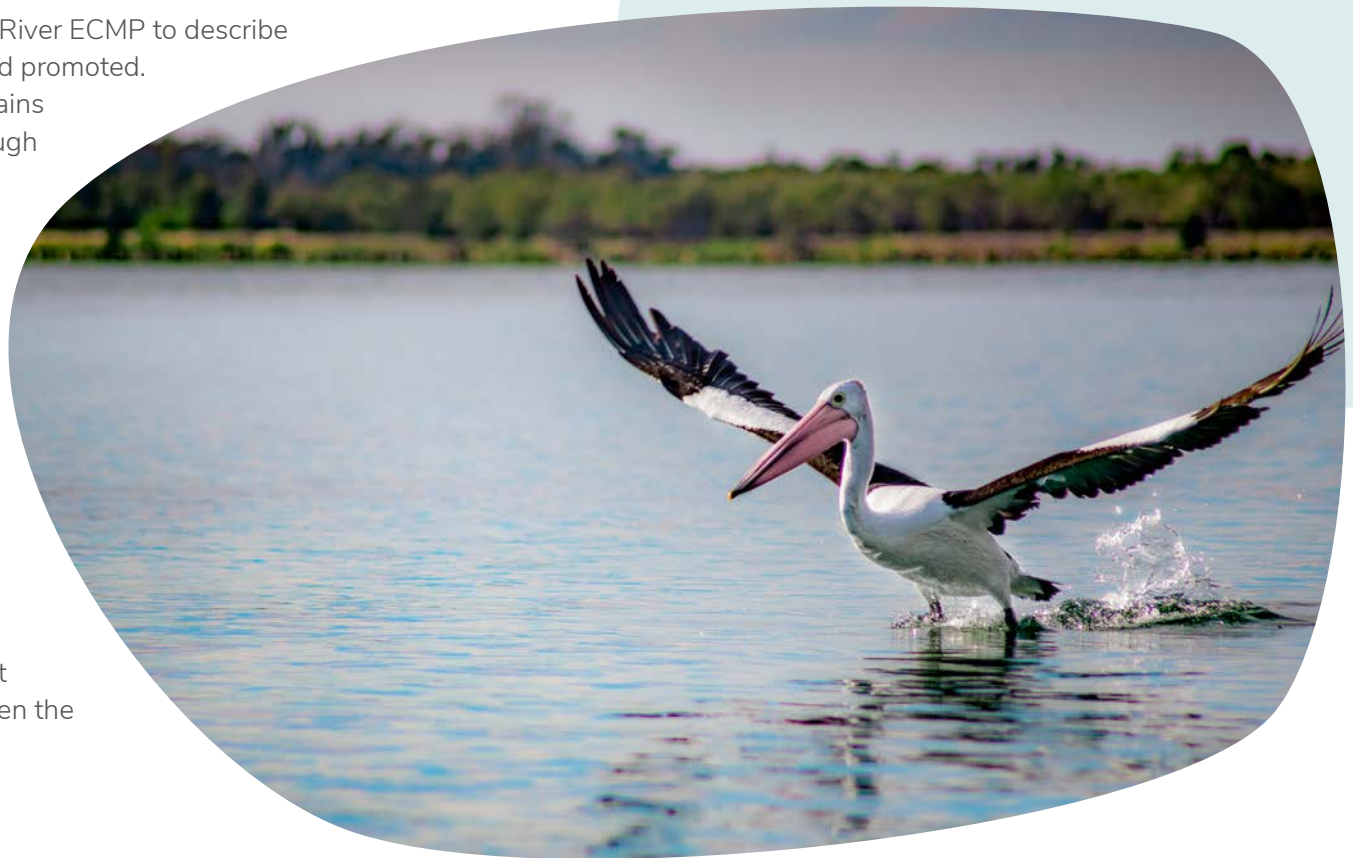
The Coastal Management Manual requires the Manning River ECMP to describe how the objects of the CM Act have been considered and promoted. Appendix 5 sets out each object of the CM Act and explains how the object has been considered and promoted through the Manning River Estuary ECMP. It shows alignment between the Objects of the Act, the local objectives of the ECMP, risks, issues and the actions that address them.

A problem tree (Figure 13) and program logic model (Figure 14) have been developed to guide the Manning River ECMP.

**The problem tree** is a visual representation of the focus problem: declining water quality, ecosystem health and resilience. It shows the causes and effects that lead to environmental, social and economic impacts.

**The program logic** sets out the activities that comprise the program, and the changes that are expected to result from them. It visually represents the relationships between the program inputs, goals and activities.

Photo: Taking flight by Naomi Clarke



## 3.1 OBJECTIVES



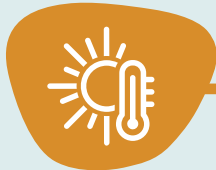
### 1: STEWARDSHIP

Engage with the community, build capacity and support partnerships to promote understanding, connection and stewardship



### 2: WATER QUALITY AND ECOSYSTEM HEALTH

Manage the Manning River Catchment and its Estuary holistically to maintain and improve water quality and ecosystem services



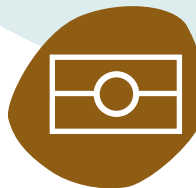
### 3. CLIMATE CHANGE

Understand, mitigate, adapt and build resilience to current and future hazards including the impacts of climate change



### 4. BIODIVERSITY

Protect and conserve natural character and biological diversity



### 5. ABORIGINAL CUSTODIANSHIP

Acknowledge and support Aboriginal peoples' spiritual, social, customary and economic connection to the Manning River Catchment and its Estuary



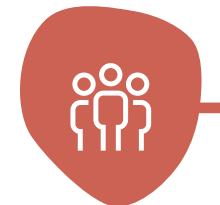
### 6. SOCIAL AND ECONOMIC VALUES

Manage the Manning River Catchment and its Estuary to maintain and improve social, cultural, and economic opportunities and benefits



### 7. LAND USE PLANNING

Facilitate ecologically sustainable development and promote sustainable land use planning decision-making



### 8. GOVERNANCE

Build stakeholder partnerships for good governance and integrated management

## 3.2 PRINCIPLES

**Ecologically Sustainable Development:** using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased. Since 1997 the Local Government Act has required Councils to implement the principles of Ecologically Sustainable Development into their operations and decision making.

**Integrated Water Management:** Coordinated land, water and natural resource management, with attention to maintaining ecosystem services for social and economic welfare.

**Strength-based Community development:** An approach to development based on harnessing community skills and assets. The Manning River ECMP project team will seek inclusive engagement opportunities with community participants including Aboriginal people, young people, elders, long-term landowners, newcomers and visitors.

**Risk management:** This involves identifying, assessing and managing risks that will create uncertain outcomes for program objectives.

**Systems Thinking:** An approach to problem solving which recognises complexity. Solutions seek to address multiple interactions in the system.

**Total Catchment Management:** The coordinated and sustainable use and management of land, water, vegetation and other natural resources, on a water catchment basis, to balance resource use and conservation.

**Regenerative farming:** Goes beyond sustainable farming, aiming to restore agricultural landscapes to full health. This encompasses restoring soil health and biodiversity, re-charging aquifers and reducing reliance on high-cost artificial inputs.<sup>2</sup>

**Rehydration of the landscape:** This involves reinstating more natural biophysical landscape functions and soil organic content to improve water infiltration and reliability.<sup>3</sup>

**Nara:** This is a Gathang word meaning "listen to learn." It means listening and learning from elders, and for this program extends to Aboriginal and non-Aboriginal community walking together to manage the river we love.

**Adaptive Management:** a systematic approach to improving natural resource management by learning from management outcomes and making changes to improve the ecological response and reduce stressors.



2: Massey, C. 2020

3: Hurditch, 2015

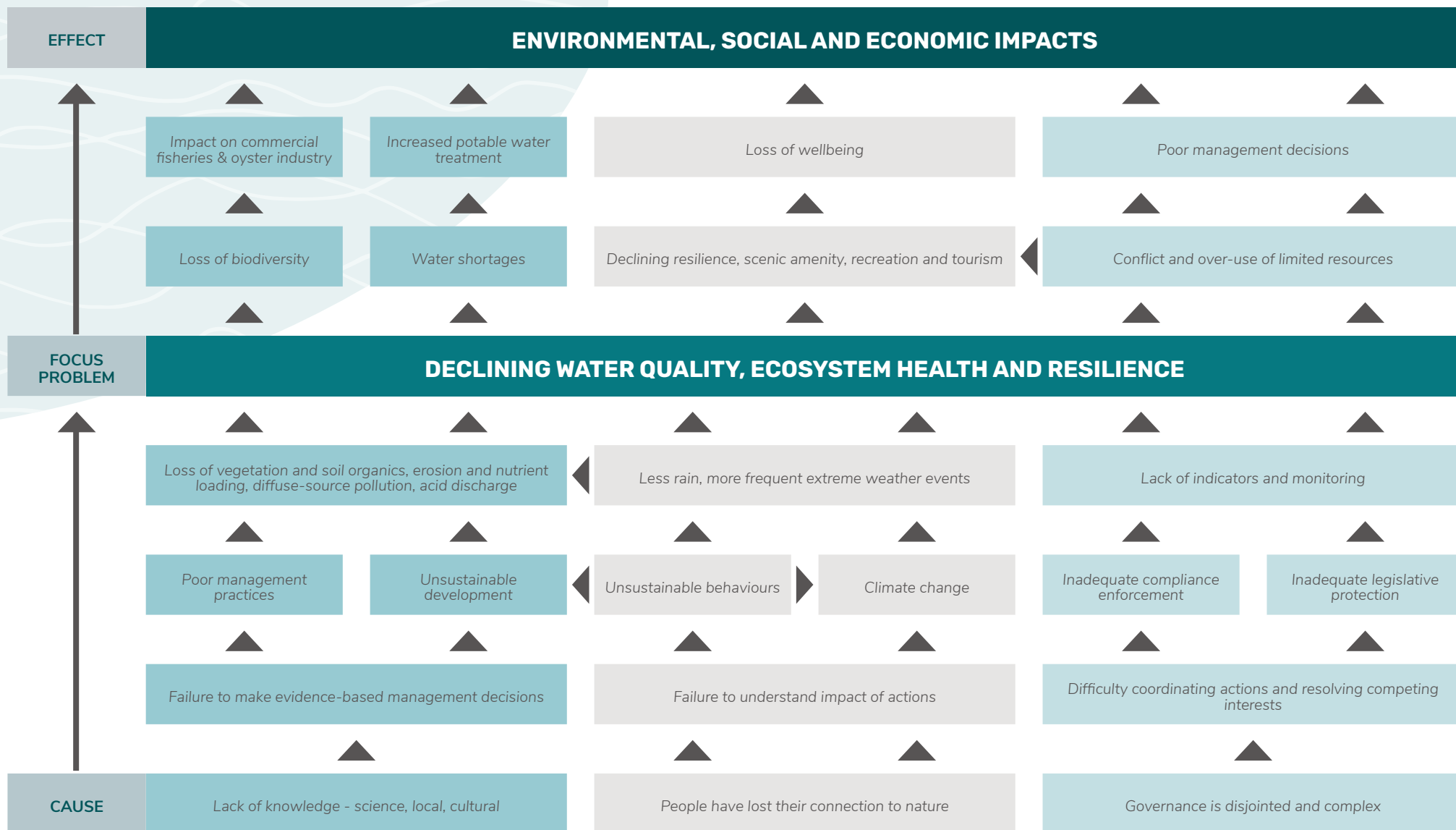


Figure 13: Problem tree

<b>GOAL</b>	“The Manning River, its tributaries and the estuary give life to our community connecting the mountains to the sea. Together we manage the catchment holistically and respond to a changing climate - safeguarding environmental, social, cultural and economic values”				
<b>ULTIMATE OUTCOMES 50 YEARS</b>	Manning catchment, river, estuary and marine receiving waters are healthy and resilient		The connection between river ecosystem health, a sustainable economy and a healthy community is widely understood, valued and supported		Cohesive NRM management, continuous improvement and partnerships are “business as usual” in the Manning catchment
<b>INTERMEDIATE OUTCOMES 10 YEARS (2030)</b>	Improved land management practices reduce pressures on ecosystem health and resilience		The community adopts sustainable behaviours and best practice for land and water management		CMP is implemented with strong partnerships between responsible agencies
<b>SHORT-TERM OUTCOMES 5 YEARS (2025)</b>	Evidence-based science informs ongoing management of the catchment and estuary		Improved community understanding and commitment to catchment values, function and stewardship. Stewardship program in place		M&E provides feedback and learning
<b>ACTIVITIES</b>	WQ and Ecosystem Health actions Biodiversity actions Land-use Planning actions		Stewardship actions Aboriginal Custodianship actions Economic and Social Values actions		Governance actions
<b>ACTIVITIES</b>	WQ and Ecosystem Health MER	Science program	Stakeholder engagement	Confirm strategic direction	ECMP Monitoring, Evaluation and Reporting (MER)
<b>FOUNDATION ACTIVITIES</b>	Literature review, gap analysis, Threat and risk assessment Issue analysis		Stakeholder analysis Engagement Strategy		Establish project team and governance

Figure 14: Program Logic Model

## 4. CHARACTERISTICS OF THE ESTUARY AND ITS CATCHMENT

### 4.1 THE ESTUARY AND CATCHMENT

The Manning estuary is a mature wave dominated barrier estuary covering an area of approximately 32.3 km<sup>2</sup> (Roy et al 2001). From the tidal extent at Abbots Falls up-river of Wingham, the estuary is a single channel to Taree then spills over an extensive floodplain with a complex of inter-connecting channels approximately 115 km in length. Six islands lie between the north and south entrances.

The estuary's average flushing time is 31.6 days, compared to a State-wide median of 9 days (Roper et al. 2011). The long residence time of fresh water makes the estuary particularly sensitive to the accumulation of catchment inputs (Roper et al. 2011). The Manning River estuary has been rated as having medium sensitivity to freshwater inflows (NSW Govt. 2016 p. 10).

There is a moderately significant tidal pool in the main channel of the river directly downstream of Wingham. Despite being affected by daily tidal movements, the tidal pool is primarily fresh and sustains some commercial water extraction.<sup>4</sup>

Estuaries are highly productive water bodies where freshwater and saltwater meet. Estuaries are the “nurseries of the sea.” Their sheltered waters provide vital nesting, breeding and feeding habitats for many species of fish, shellfish, aquatic plants and birds. Most commercially valuable fish species depend on estuaries at some point during their development.<sup>5</sup>

The Manning River originates at 1570 m above sea level in the Gondwana World Heritage Area of the Barrington Tops and flows 261 km to the Tasman Sea on the mid-north coast of NSW.<sup>6</sup> Its catchment covers an area of approximately 8,420 km<sup>2</sup> with 16 major tributaries, of which 11 are freshwater and 5 are estuarine.

The Manning River is one of Australia's few large river systems not to be dammed for water supply purposes anywhere along its 261km length and there are no significant on-stream storages on the river.<sup>7</sup>

The Manning has a mean annual discharge of 1,854 GL/yr. During the Rapid Site Assessment of the Manning catchment at the height of the 2019 drought the major flow centres were posited to be the Barrington Tops, Gloucester Tops and the New England Tablelands as well as regional and local groundwater.<sup>8</sup>

4: Betteridge & Rabbidge, 2016

5: NSW Government, Why estuaries are important, 2020

6: Betteridge & Rabbidge, 2016

7: Betteridge & Rabbidge, 2016

8: Swanson, 2020

The Water Services department of MidCoast Council has extensively monitored catchment hydrology, identifying:

- The Barrington-Gloucester Catchment supplies between 25 - 58% of the flow
- The Nowendoc Catchment supplies between 12 - 33% of the flow
- The Barnard Catchment supplies 8 - 32% of the flow
- The Little Manning supplies less than 7% of the flow
- Dingo Creek contributes 1 - 10% of the flow.

In the Manning River, the source of water at high flows is variable and depends on the location of rainfall. During low flows the Barrington River is the major source of water to the Manning<sup>9</sup>.

The entire Manning River and its tributaries have been designated as Key Fish Habitat by the Department of Primary Industries – Fisheries (DPI-Fisheries), recognising its importance to the sustainability of recreational and commercial fishing industries, the maintenance of fish populations generally and the survival and recovery of threatened aquatic species.<sup>10</sup>

9: Midcoast Water, 2011

10: NSW Department of Primary Industries, 2020



**Healthy waterways support our local towns and communities. They keep them thriving. They put food on our tables, support our outdoor lifestyle and local economy while providing homes for wildlife, trees and plants of every sort. With healthy waterways our communities have a healthy, vibrant future.**



## 4.2 NATURAL ASSETS

**Coastal wetlands** are known as the kidneys of the landscape, filtering and attenuating pollutants to keep the estuary water clean. They are like sponges, soaking up floodwater and releasing it slowly, mitigating the impact of floods on the estuary. Mangroves stabilise shorelines. Coastal wetlands store carbon, helping to mitigate increases of greenhouse gases in the atmosphere. Coastal wetlands are biodiversity hotspots, providing habitat for migratory shorebirds and nursery habitat for many fish, crustaceans and molluscs, including species of commercial and recreational value. Wetlands also provide opportunities for nature-based tourism and have Aboriginal cultural significance, historical significance and importance for science and education.

While the majority of coastal wetlands in the Manning have been drained and modified, wetlands of considerable conservation significance still occur.<sup>11</sup> These include:

- Large areas of mangrove forest and brackish wetlands in areas such as Cattai Wetlands, Big Swamp and Cooperbrook Swamp
- Large wetlands at Dawson wetlands, Kundle Kundle and Manning Point
- Crowdy Lagoon in Crowdy Bay National Park which is classified as a high priority Groundwater Dependent Ecosystem (GDE)<sup>12</sup> and is listed as a nationally important wetland
- Forested wetlands with swamp mahogany, broadleaved paperbark and swamp oak<sup>13</sup>
- Estuarine and near-shore marine systems made up of coastal mangroves, salt marshes and sea-grass beds which rely on the submarine discharge of groundwater<sup>14</sup>
- Seagrass meadows.

A study conducted in Stage 2 of the ECMP mapped 13 types of coastal wetlands in the Manning including broad-leafed paperbark swamps, freshwater wetlands, reedlands, saltmarsh and grey mangrove forest (Annexure F: The Manning River ECMP Coastal Wetlands Mapping Report, Ecological 2019). The study found that:

- 69% of the remaining coastal wetlands are in good condition
- 19% are in fair condition
- 12% are in poor/very poor condition

The majority (86%) of all wetland types mapped are identified and protected under State or Commonwealth legislation.

11: EcoLogical Australia Pty Ltd, 2019

12: NSW Government - Office of Water, 2009

13: MidCoast Council, 2020

14: Geosciences Australia, undated



*Photo: Coastal wetlands are the kidneys of the landscape*

**Freshwater wetlands** contribute to base flow of the river.<sup>15</sup> Some of these wetlands such as the alpine swamps in the Barrington Tops are high priority Groundwater Dependent Ecosystems.<sup>16</sup>

**Groundwater aquifers** are found throughout the Manning catchment.<sup>17</sup> They make a significant contribution to baseflow in the river (Pers. Comm. Dr. Peter Serov, August 2019). Groundwater “commonly provides an important and reliable source of water to many ecosystems and can be the main factor controlling the distribution of ecosystem types” (Geoscience Australia). Up-river alluvial aquifers and coastal sand

aquifers have significant connectivity to surface water.<sup>18</sup> Understanding the connection between groundwater and surface water is important when regulating groundwater use, recognising that draw-down of the aquifer influences surface water flows.

**Groundwater Dependent Ecosystems** are ecosystems that depend on groundwater for some or all their water requirements. Coastal wetlands and estuarine and near-shore marine systems such as coastal mangroves, salt marshes and sea-grass beds in the Manning River Estuary are classified as Groundwater Dependent Ecosystems, as they rely on the submarine discharge of groundwater (Geoscience Australia).

**Healthy in-stream condition** contributes to conservation of aquatic fauna such as the Platypus and Manning River Helmeted Turtle, and the productivity of fisheries including commercial species. Water sources with high instream value in the Manning Catchment include sections of the Upper, Mid and Lower Manning; Upper and Lower Gloucester and Barrington; Upper Barnard, Bowman and Nowendoc Rivers (NSW Govt. 2016 p. 12-14).

**Riparian vegetation** plays a central role in stabilising waterways, reducing channel boundary erosion, filtering diffuse-source run-off and providing habitat. Riparian vegetation helps maintain water quality by reducing the amount of pollutants entering the waterway. It serves as a physical buffer, slowing down overland flow and mitigating the negative impacts of flooding.<sup>19</sup> All of these ecosystem services benefit the estuary.

15: Midcoast Water, 2011 16: NSW Government - Office of Water, 2009 17: Commonwealth of Australia, 2017-18  
18: Betteridge & Rabbidge, 2016 19: Swanson, 2020

Vegetated riparian areas are also very important for biological connectivity. Intact and connected riparian vegetation provides dispersion corridors for wildlife and sequesters carbon, mitigating the impact of climate change. Managing riparian vegetation is a primary tool for catchment-scale improvements.<sup>20</sup>

**Terrestrial vegetation has an important role to play** in soil organics, erosion control, providing shade for livestock away from watercourses, driving the local water cycle and hydrating the landscape. It will be managed through Council's Biodiversity Framework.

**Rivers, riparian zones and estuaries are exceptionally biodiverse** because they form transition zones between aquatic and terrestrial ecosystems. MidCoast Council's draft Biodiversity Framework provides a full listing of biodiversity assets and management strategies in the Manning region. The focus for the ECMP is on aquatic and riparian fauna, particularly listed threatened species within the Planning Area. These include:

- The endangered (NSW) Manning River helmeted turtle whose entire known range is confined to the Manning catchment
- The iconic platypus reported to be nearing threatened-species status<sup>21</sup>
- A maternity camp of vulnerable grey-headed flying fox in a patch of Sub-tropical Lowland Rainforest (EEC) at Wingham Brush. Flying foxes are keystone pollinators of over 50 native tree species and are critical to the survival of riparian vegetation
- At least twenty-five species of fish in the freshwater reaches<sup>22</sup>. Migratory fish play a critical role in keeping our rivers, wetlands and oceans healthy by supporting a complex food web. Populations are declining globally.<sup>23</sup>

**Freshwater refuge pools** play a critical role in supporting local and regional biodiversity. Deep freshwater pools and springs are home to an array of fauna, forming biodiversity hotspots. Aquatic wildlife species retreat to, persist in and expand from refuge pools under changing environmental conditions.<sup>24</sup>

Around 18.5% of the Manning River estuary and catchment is protected in the National Park estate. Subcatchments with the highest levels of protection are the middle Barnard River, Myall Creek, Barrington and Rowley's Rivers. Lower levels of protection through conservation reserves can be seen in the middle Manning River and Burrell, Bakers and Belbora Creeks which have no reservation. Cedar Party Creek and Bowman River also have very low percentages of reserved land. Figure 15 shows the percentage of reservation for each of the subcatchments in the Manning valley.

**“The remaining native vegetation remnants are very important – we need to improve and maintain them.”**

Noel Piercy, Member, ECMP Reference group



*Turtle photo courtesy of Gary Stephenson.*

20: Pietsch, Daley, Stout, & Brooks, 2019 21: University of New South Wales, 2020 22: Bishop, 2016 23: World Fish Migration Foundation, 2020 24: Keppel et al, 2011

## NATIONAL PARKS IN THE MANNING CATCHMENT

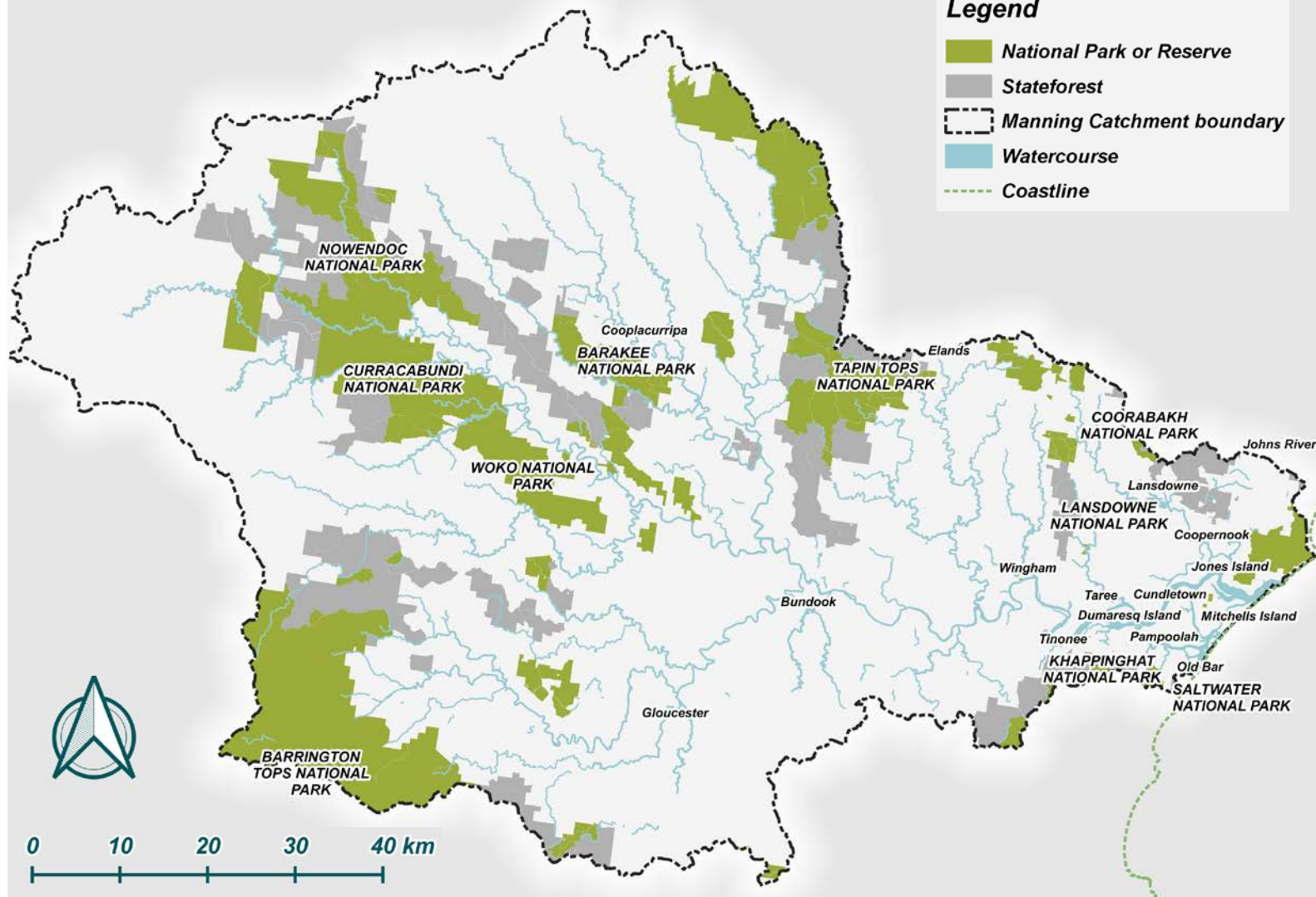


Figure 15: National Parks make up 18.5% of the Manning catchment

Significant biodiversity assets occur on private lands. A workshop held in Wingham in February 2020 was attended by 77 landholders from the Manning catchment. In an evaluation survey of the workshop participants, 43% of respondents listed biodiversity conservation as their highest priority, while a further 40% listed a mix of biodiversity and productivity.



## 4.3 WATER QUALITY

Water clarity in the estuary is strongly influenced by catchment runoff. It fluctuates with extreme weather conditions (drought and flood) and corresponding changes to catchment inputs. Water quality monitoring results show improved clarity during times of drought and high turbidity in flood conditions.

Annual Water Quality Report Card monitoring results suggest that the Manning estuary is heavily influenced by diffuse source runoff from the catchment, indicated by the response of algal levels to changes from nutrient inputs.

**The estuary is acting as a nutrient sink**, with consistently high Chlorophyll-a concentrations. Elevated algae concentrations are an ongoing issue throughout the Manning catchment and will continue to be unless nutrient inputs are managed.

**High turbidity levels are evident after periods of rainfall** especially in the Middle and Upper Manning estuary sites showing an increase in sediment inputs from the catchment.

**Freshwater inputs to the estuary have elevated levels of nutrients, sediment and algae**, recorded through long-term water quality monitoring at the Bootawa offtake by MidCoast Council's Water Services team.

### 4.3.1 Water quality results in the estuary

MidCoast Council engages the Department of Planning, Industry and Environment (DPIE) to undertake annual water quality monitoring in the estuary, which is made public in the annual Water Quality Report Card.

A healthy waterway can generally be characterised by low turbidity and low levels of algae and provides habitat for a wide range of plants and animals. Therefore, two key indicators of estuary health are monitored independently by DPIE: Chlorophyll-a (the amount of algae in a water sample) and turbidity (the water clarity).

- 5 sites in the Manning River estuary are monitored annually from Tinonee southwest of Taree to Farquhar Inlet, as shown in Figure 16.
- 3 of the 5 sites have been sampled each year since 2014 over the spring/summer period, with Dawson River estuary and Farquhar Inlet added to the monitoring in 2019.
- The data collected in the Manning are compared to reference sites in NSW for similar types of estuaries to grade the condition of the estuary.



Figure 16: Water quality monitoring sites in the estuary

The overall ecological condition of the Manning River Estuary has been good since monitoring commenced in 2014, scoring a B-grade on most occasions.

**However, there is a trend towards increased algal growth** throughout the estuary. In the 2020 Report Card it was noted that apart from the Lower Manning estuary, algal levels continued to be much higher than desired; this was particularly noticeable in the Dawson River and Upper Manning estuaries.

**Lower Manning estuary** - There is a trend towards increasing algal levels in the Lower Manning estuary since sampling began in 2014.

**Mid Manning estuary** - Apart from periods of drought where there are lower catchment inputs there is a trend towards increasing algal levels.

**Upper Manning estuary** - Trend towards algae increasing each year (apart from periods of drought) leading to a drop in overall grade from a B to a C (good to fair) in 2020.

The Manning River estuary can be impacted heavily by extreme conditions such as drought and flood due to the changes these conditions bring to runoff levels and therefore the nutrient inputs.

### 4.3.2 Water quality results in the freshwater catchment

MidCoast Council's Water Services team undertakes monthly water quality monitoring at six locations in the Manning freshwater catchment. Using this data to characterise water quality within the catchment is challenging due to its large and diverse geography, its dynamic nature and the relative paucity of water quality data compared to the scale of the system. Even at the sub-catchment spatial scale landscape influences such as riparian vegetation condition, landscape modification, and land-use cause great variation in water quality. Nevertheless, a review of past investigations along with existing water quality information provides some understanding of water quality characteristics in the freshwater reaches of the Manning River.

The results below collate four years of data from 2015-2018, recorded at the water monitoring station at the Bootawa offtake in the Manning River downstream from the confluence of Dingo Creek (Figure 17). The discussion presents key characteristics of ecosystem stressors including nutrients (nitrogen and phosphorus), turbidity, and an ecological indicator chlorophyll-a. River flow is presented against these key characteristics because the flow rate influences water quality.

As catchment specific thresholds for these analytes are yet to be determined for the Manning catchment, the default ANZECC aquatic ecosystem triggers for lowland east flowing coastal rivers have been used as a benchmark.

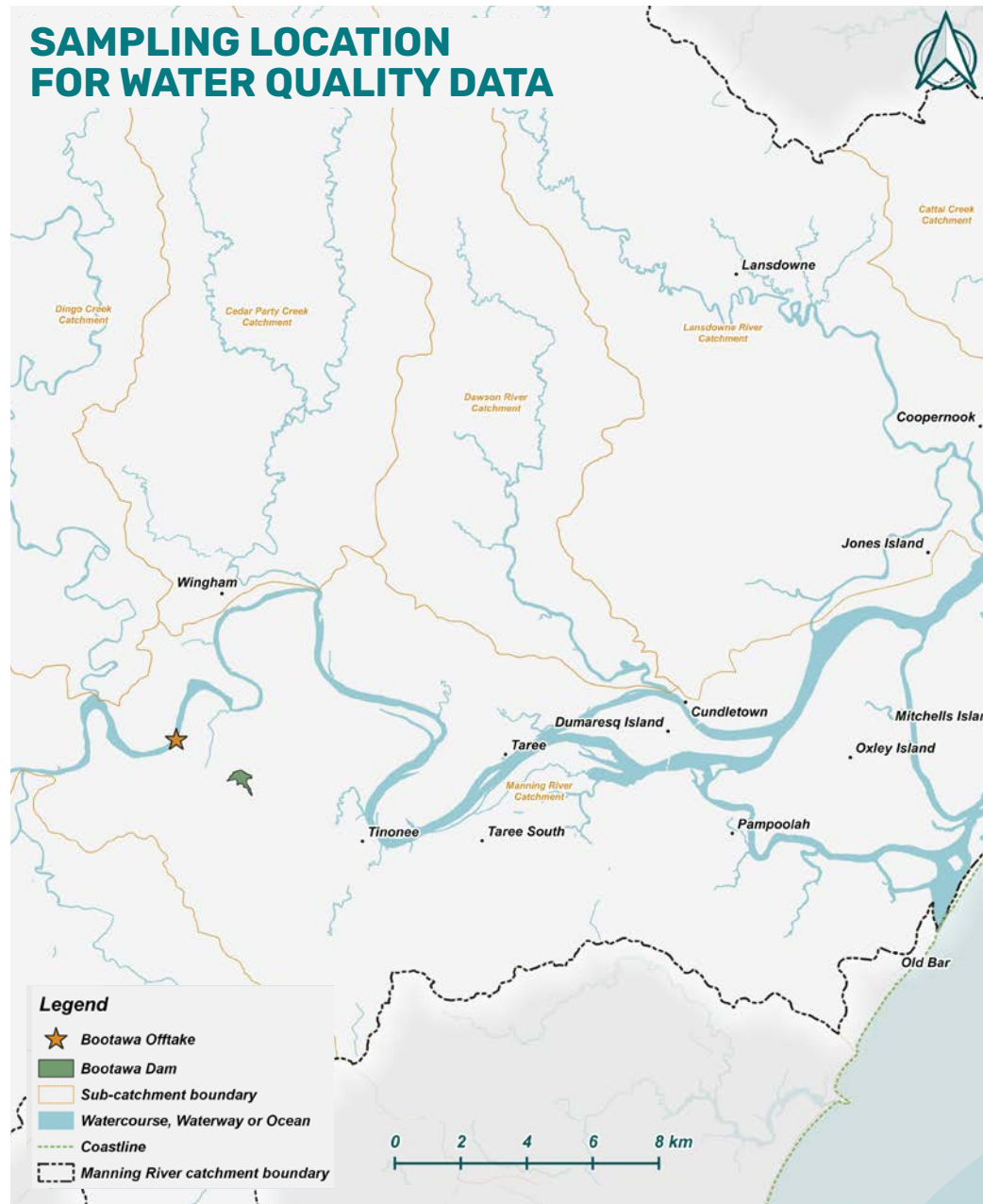


Figure 17: The sampling location for water quality data

Figure 18: Manning River TN and TP readings from 2015-18

## MANNING RIVER TOTAL NITROGEN & PHOSPHOROUS

**Nutrients are elevated.** Total nitrogen exceeded the ANZECC total nitrogen trigger of 350 ug/L approximately twice a year with three results for the period exceeding 800 ug/L. Total phosphorus levels exceeded the ANZECC trigger of 25 ug/L in a similar manner.

Nutrient levels are greatly influenced by erosion and sediment migration to the waterway, as suggested by the apparent correlation with higher river flows.

Total nitrogen and phosphorus results for the 2015-2018 period are represented in Figure 18.

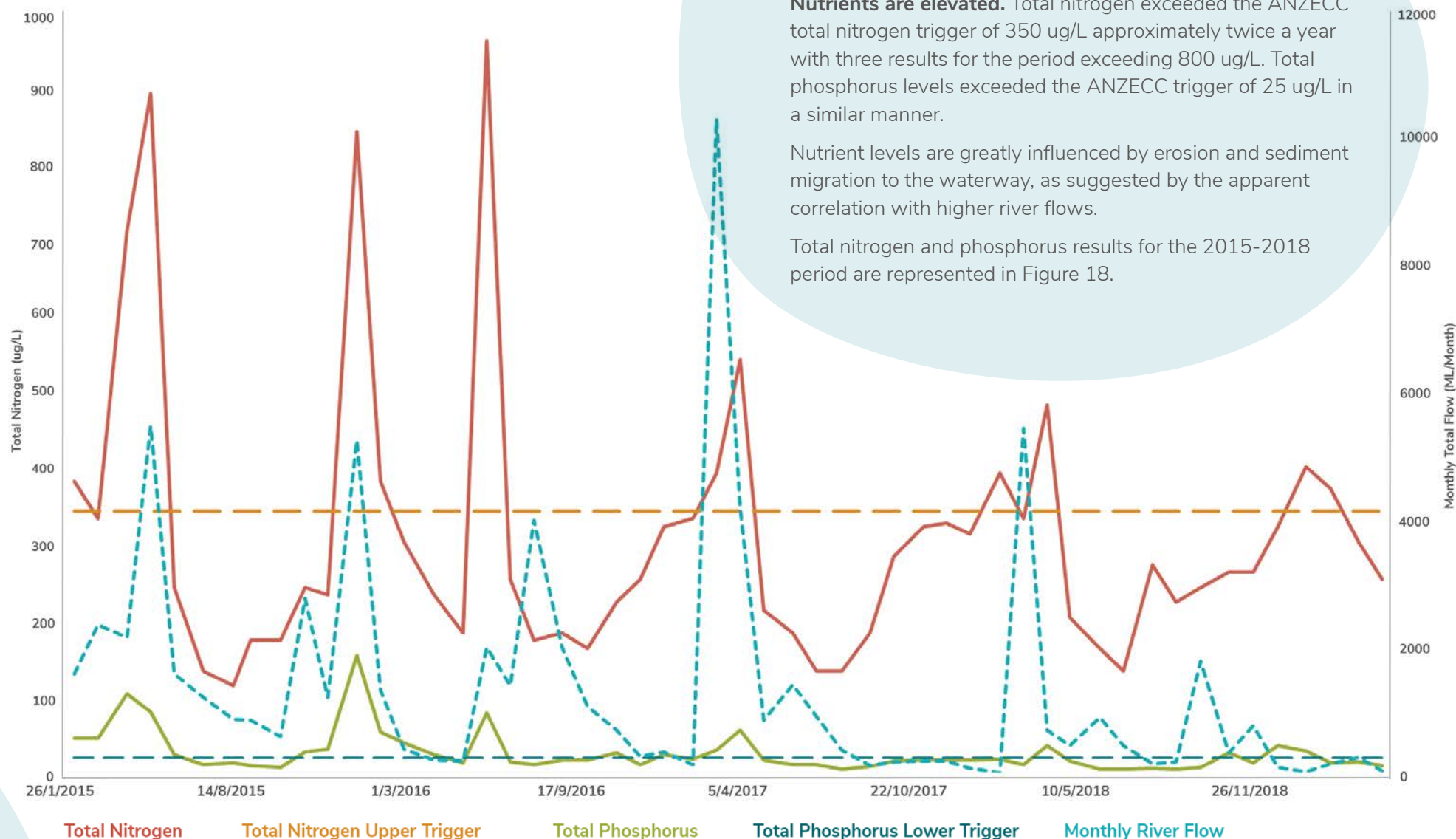
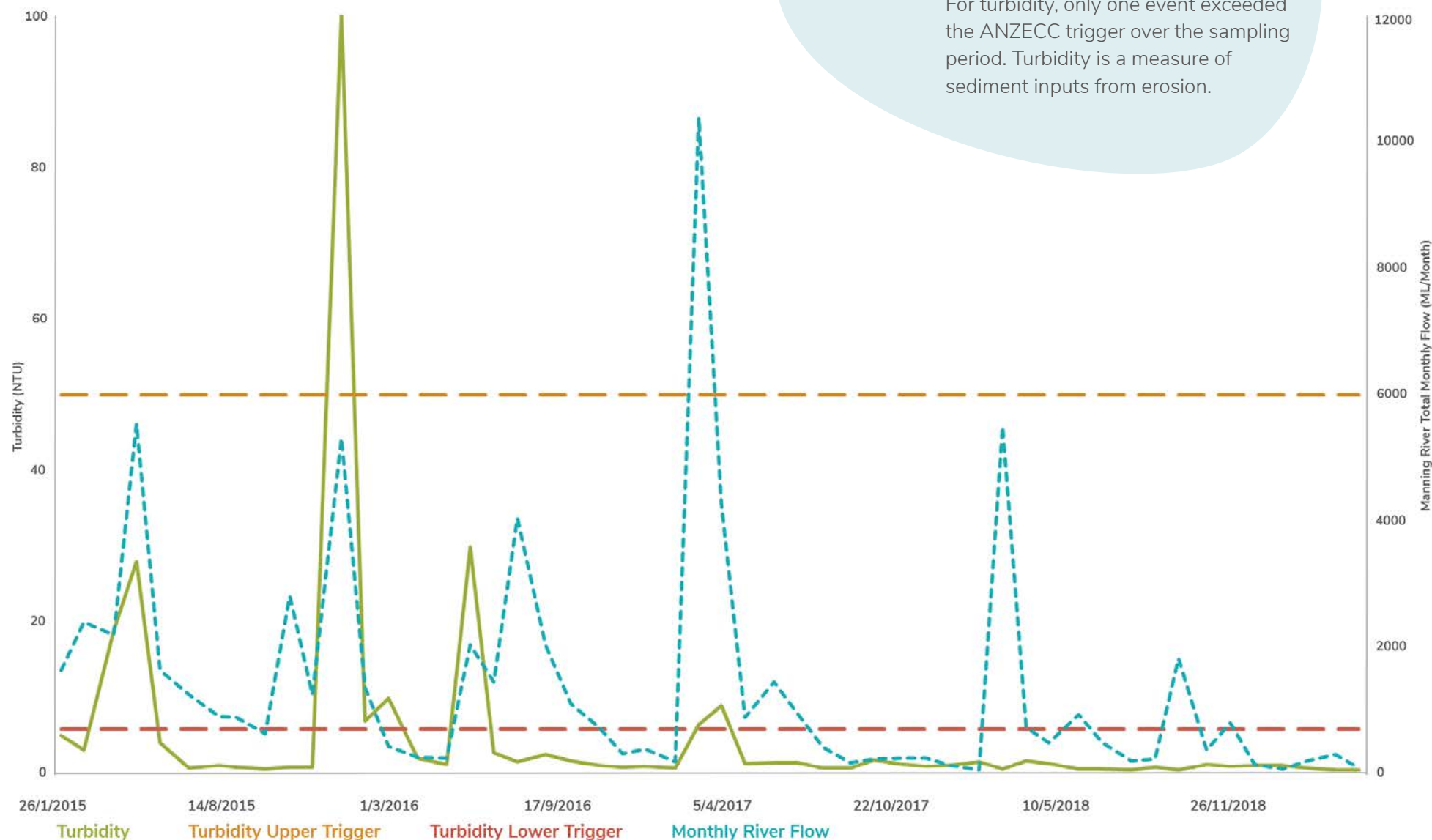


Figure 19: Manning River turbidity for the period 2015-2018.

## MANNING RIVER TURBIDITY

For turbidity, only one event exceeded the ANZECC trigger over the sampling period. Turbidity is a measure of sediment inputs from erosion.



## MANNING RIVER - CHLOROPHYLL A

Chlorophyll-a exceeded the ANZECC trigger on several occasions but generally results are below 3 ug/L. Chlorophyll-a is a marker for algae levels, which are driven by nutrients. The data set suggests higher chlorophyll-a levels generally occurred during low flow events. This may align with variables such as higher water temperature. Low flow conditions may also present less of a physical threat to algal growth.

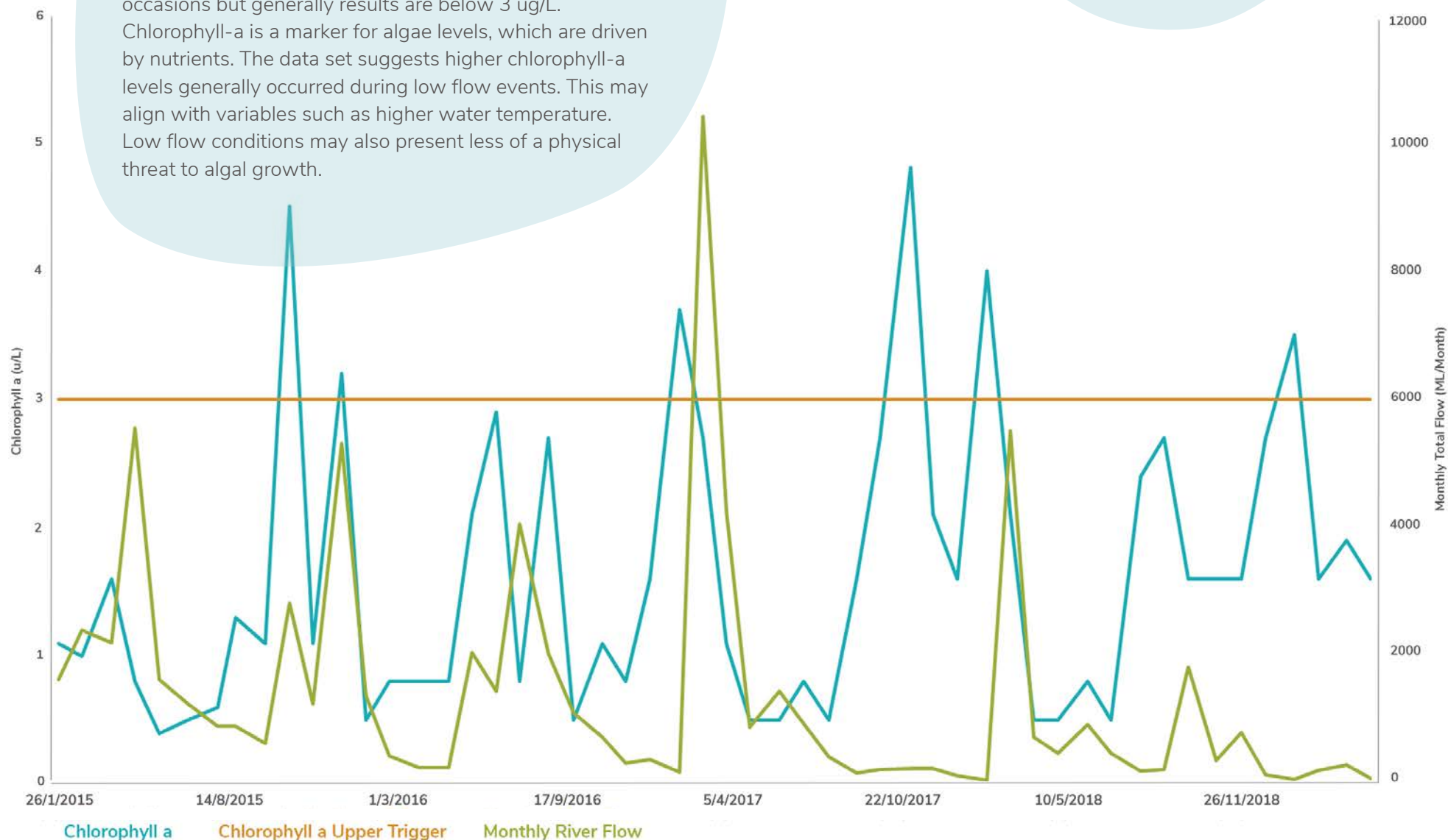


Figure 20: Manning River chlorophyll-a for the period 2015-2018

Algae caused by excess nutrients and high temperatures in the stagnant water of Dewitt Creek during the 2019 drought



**In summary, the data suggests nutrient loading is the biggest issue**, along with algae blooms which are caused by high nutrients. However, nutrients are mobilised by sediment inputs. The data correlates with the Rapid Site Assessment conducted in 2019, which found most of the 175 sites assessed in the freshwater catchments were rated as having poor to fair instream condition. Instream condition scores in both fresh and estuarine subcatchments showed indicators of elevated nutrients from fertilised pastures and crops, manure, and stock defecation (Swanson 2020).

## MANNING CATCHMENT STOCK INTENSITY

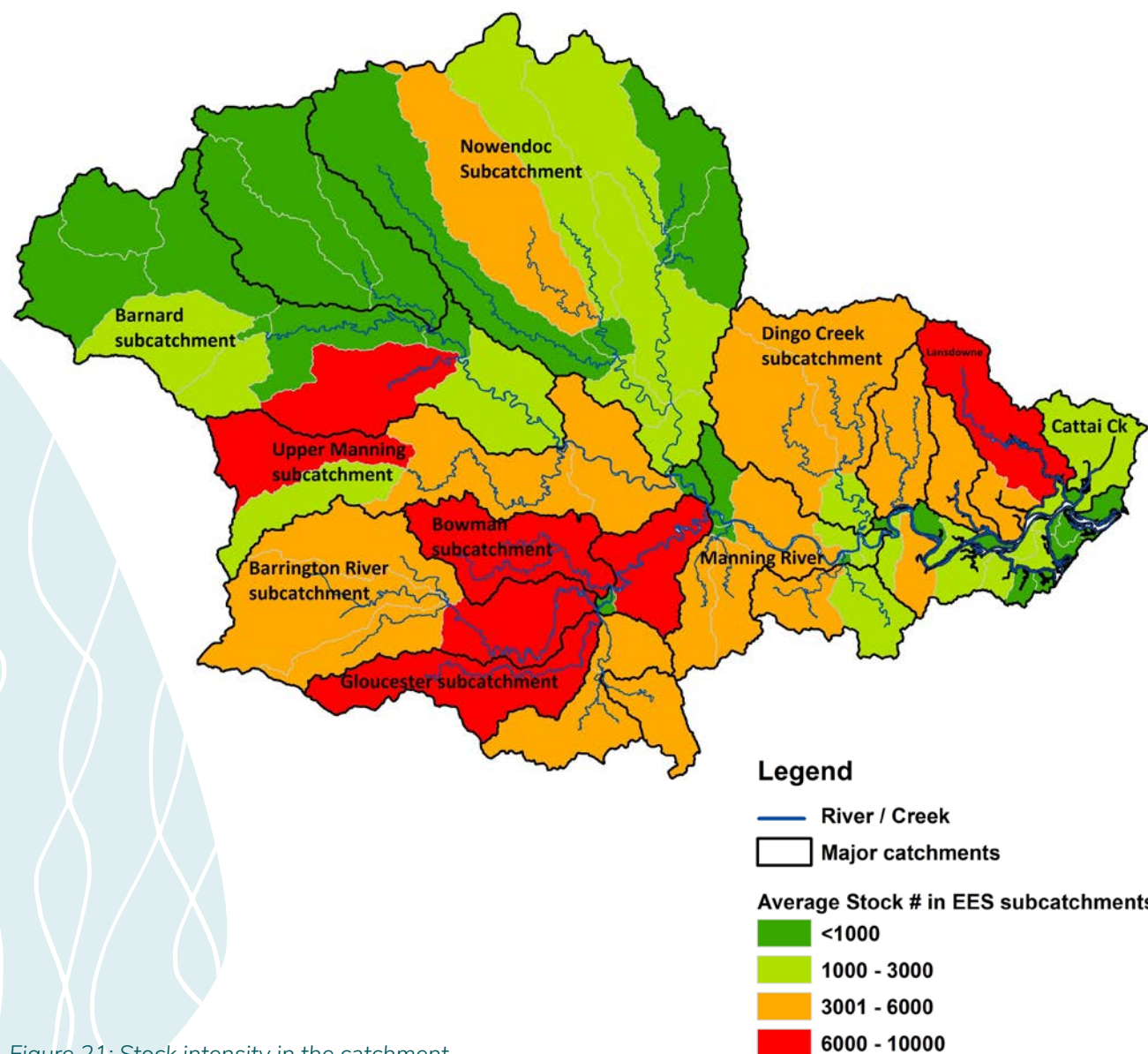


Figure 21: Stock intensity in the catchment

## 4.4 LAND USE AND REGIONAL ECONOMY

The most significant land-uses and economic activities in the MidCoast region are agriculture (beef, dairy), aquaculture, fishing, forestry, urban and rural residential development, tourism and conservation reserves (18%).

Agriculture is a widespread land-use throughout the Manning River catchment and estuary, contributing to our regional economy, identity and cultural way of life. Dairy and beef grazing dominate, with localised areas of sheep and poultry farming. Approximately 12% of the catchment is classified as Grazing Modified Pasture in the NSW Land Use Map 2017.<sup>25</sup> Stock intensity for cattle and sheep varies across the catchment as shown in Figure 21.<sup>26</sup> Based on Annual Stock Return data (2009-2018), relatively high stock numbers are found in the Barnard, Upper Manning, Barrington, Gloucester, Bowman and Lansdowne subcatchments, with moderate stock numbers in the Nowendoc, Manning, Dingo Creek and Dawson. Poultry rates are highest in the North East and South West of the catchment but are localised.<sup>25</sup> While horses aren't included in stock intensity, there are some large equine properties in the Manning catchment with irrigated and fertilized pastures. The oyster industry was established in the Manning in 1871 and produced 66,414 dozen oysters in 2019-20. Our community and tourism industries benefit from healthy food produced locally, with farmer's markets and farm-to-fridge programs gaining in popularity.

25: Swanson R. , 2020 26: MidCoast Council, 2020

**Primary industries play an important role in food security and exports.** They are the sixth biggest employer in the region but make a significantly higher contribution to Gross Regional Product when compared to the healthcare, retail and hospitality sectors (DPC 2018).

**The Manning regional economy is intrinsically linked to the natural values of the catchment and estuary.** Industries directly dependent on environmental values include agriculture, aquaculture, fishing, forestry and tourism. Combined, these industries contribute gross revenue of \$817 million per annum to the wider MidCoast Region, with agriculture and tourism both injecting over \$210 million per annum each as shown in Table 1.

**The tourism industry** across the whole MidCoast region is valued at \$211.4 million each year, employing up to 1500 full-time equivalent employees. Visitors spend about \$31 million per year.

**The combined gross revenue** these industries contribute to the MidCoast economy is \$817 million per annum, as shown in Table 1 (Saphere Group 2018). The dependence of these sectors on healthy land and water is recognised in the MidCoast Regional Economic Development Strategy (2018).

Industry	Gross Revenue (per annum)
Agriculture (dairy, beef, sheep)	\$217.048 million (MCC area)
Forestry	\$10.134 million (MCC area)
Tourism	\$211.4 million (Manning Catchment 2014) \$570.4 million (MCC area)
Aquaculture & fishing	\$19.816 million (MCC area)
<b>Total</b>	<b>\$817.398 million (MCC area)</b>

Table 1: Gross revenue of major industries in the MidCoast Region  
Reference: MidCoast Regional Economic Development Strategy 2018-2022



**“Sustain and support the fishing industry. The fish co-op in Taree is all local – prawns and fish from our river, sold to our local community.”**

Noel Piercy, ECMP Reference Group

Photo: Clem Collier

## 4.5 POPULATION PROJECTIONS AND LAND USE

The latest population projections from the NSW Planning Portal (March 2021) state that the population of the MidCoast region is projected to rise from 91,800 in 2016 to 100,100 in 2041. In the Manning River ECMP Planning Area, Taree (including Cundletown) has a population growth of 0.33% per year and current undeveloped residential-zoned land could provide 652 dwellings. The demand for dwellings by 2036 was stated as being 536 at the current population projection and 643 under a high growth scenario (draft Urban Land Monitor review 2021).

Development for infrastructure, housing and commercial use is managed by Council's Land Use Planning team under the Environmental Planning & Assessment Act 1979. Documents currently being developed include:

- Urban Land Monitor Review
- Housing Strategy
- Rural Strategy
- Local Environmental Plan and Development Control Plan.

For more information on land use planning see section 8.1.5.





## 5. THREAT AND RISK ASSESSMENT

**Threats and risks to our catchment objectives were assessed in two ways during development of the Manning River ECMP.**

A spatial risk assessment was conducted by the Department of Planning, Industry and Environment's Environment, Energy and Science (EES) branch. This included an Estuary Health Risk Model that rated the risk of sediment and nutrient loading from each subcatchment. The spatial risk assessment informed priority areas shown in the ECMP Action Program.

A Threat and Risk Assessment was conducted by Council's project team, with input from the Technical Advisory Group. The Threat and Risk Assessment informed selection of issues for the Manning River ECMP.

Two previous risk assessments of additional pressures on estuary health done by other investigators were also used to inform the program:

- On-site sewage management system risk assessment (DWC 2018)
- Acidic run-off from acid sulfate soil risk assessment (Glamore et al. 2016)

### 5.1 SPATIAL RISK ASSESSMENT

#### 5.1.1 Method

The Manning River ECMP Scoping Study identified spatial risk assessments of catchment pressures as a priority study for Stage 2. Estuary Health Risk Maps for NSW estuaries had previously been developed by the EES branch of the Department of Planning, Industry and Environment (Dela-Cruz et al. 2019). These maps identified subcatchments that posed the highest risk to water quality in the estuary and showed where land use intensification is best avoided, and more stringent management controls are needed. They also facilitated identification of strategic priorities for managing nutrient and sediment runoff in the catchment.

Council engaged EES to produce an updated and more specific Estuary Health Risk Map for the Manning River estuary and to assess risk of additional pressures in the catchment that may impact on ecological and community values of the river and estuary.

Existing local data and additional field data collected in Rapid Site Assessments during a catchment wide ground-truthing program were used to validate the spatial layers. Four categories were assessed:

- Land Use (and agricultural pressure)
- Geomorphic Condition (freshwater catchment only)
- Instream Condition and
- Riparian Condition.

Each site was assigned a total score for all site attributes within these categories which were summed for an Overall Condition score.

The following risks were assessed in the Spatial Risk Assessment:

- The risk of impact of total nitrogen, total phosphorous and total suspended solids exports from land use on the water quality in the estuary.
- The risk of impact of pathogens from stock on water quality required for the community values of drinking water, aquaculture (oyster farming) and secondary recreation.
- The risk of hillslope erosion and streambank erosion to riparian vegetation.



## 5.1.2 Results

A summary of high risk subcatchments is provided in Table 2. Targeted on-ground works in these subcatchments will have the best chance of improving the health of the Manning estuary by mitigating threats using a holistic approach. The highest risk of impacts from nutrient and sediment inputs, acidic runoff from acid sulfate soil, and pathogen inputs from stock on ecological and community values of the Manning estuary comes from the Lansdowne River catchment.

Risk Assessment	High risk subcatchments	NB: The numbers in brackets (Table 2) relate to numeric identifier codes used for drainage units within each subcatchment. There are 88 numbered drainage units in the catchment. There is considerable variation between and within individual subcatchments, meaning the results cannot necessarily be applied to an entire subcatchment but should be used as a guide to further field investigations.
Estuary Health Risk	Lansdowne River (88, 223), Cedar Party Creek (95) (Figure 22)	
Stock pathogen risk on drinking water quality	Dingo Creek (86), Manning River (99, 105), Barrington River (117), Gloucester River (98, 122)	
Stock pathogen risk on aquaculture	Oxley Island (203), Mamboo Island (204), Jones Island (205), Lansdowne River (88,223) Cattai Creek (93)	
Erosion risk impacting riparian vegetation	Manning River (105,110), Upper Manning River (92, 96), Myall Creek (76), Barnard River (82)	
Acidic runoff	Lansdowne River (88, 223), Cattai Creek (93)	

Table 2: Subcatchments posing the highest risk to ecological and community values

## ESTUARY HEALTH RISK MAP

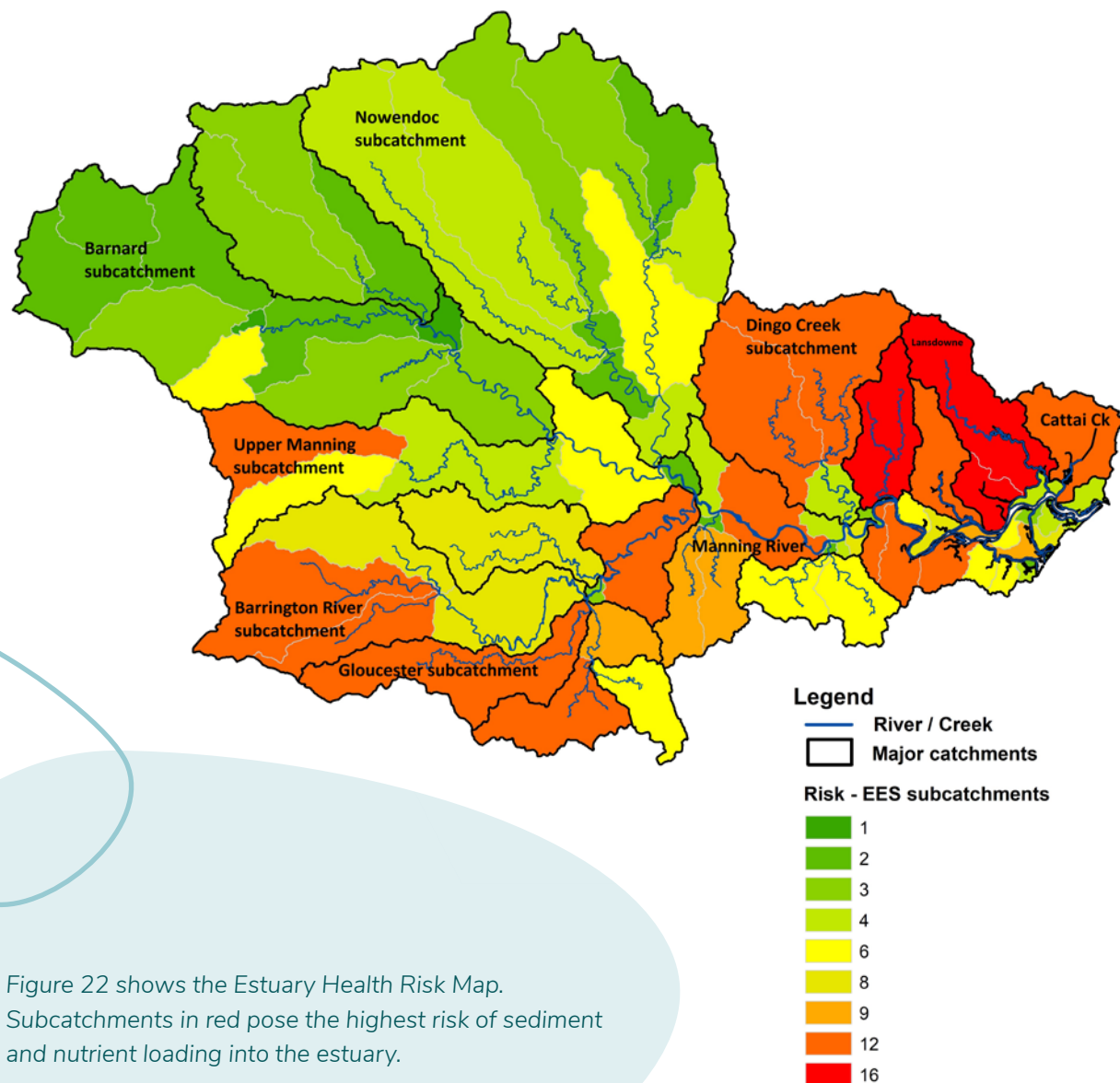


Figure 22 shows the Estuary Health Risk Map. Subcatchments in red pose the highest risk of sediment and nutrient loading into the estuary.

### Find out more:

Find out more on MidCoast Council's web site at [www.midcoast.nsw.gov.au/ourmanningriver](http://www.midcoast.nsw.gov.au/ourmanningriver)

- Annexure G: The Manning River ECMP Spatial Risk Assessment Report (Swanson 2020)
- Annexure H: The Manning River ECMP Rapid Site Assessment Report (Swanson 2020)

**“It’s cool to see there is a lot of research and data being collected. There’s opportunity to use scientific research and data to improve management.”**

Sam Nicholson – dairy farmer



## 5.2 MANNING THREAT AND RISK ASSESSMENT

Key risks and threats to our ECMP objectives for the Manning River estuary and catchment were assessed and ranked using MidCoast Council's risk assessment methodology. Once ranking was complete, a risk tolerance was assigned from low tolerance to moderate and high tolerance. All risks assigned low to moderate tolerance were then nominated as issues for further analysis.

### 5.2.1 Threat and Risk Assessment Method

Several inputs were considered when assessing risks and threats to our objectives and the ECMP Management Areas. The steps included:

- **Review of the NSW Government's Marine Estate Management Strategy** (2018) state-wide Threat and Risk Assessment (TARA) and finer scale TARA for the Northern Region which includes the Manning estuary. These documents assess and rank risks to ecological and socio-economic values.
- **A literature review** for the Manning River estuary and its catchment, conducted for the Stage 1 Scoping Study.
- **A workshop with our Technical Advisory Group (TAG)** to select and assess the risks that related to the Manning estuary and catchment, using best available scientific and local knowledge (MCC 2018). Existing management regimes, research and knowledge gaps were accounted for in the risk assessment.
- **Consultation with the ECMP Reference Group who were invited to identify their top three issues.** Issues that featured most strongly and align with the TAG consensus were acid sulfate soil discharge, sediment and erosion control and managing agricultural impacts. Other issues raised by the Reference Group were flood mitigation, drought resilience and lack of community understanding and stewardship.
- **A more detailed climate change threat and risk assessment** was conducted by Salients Consulting, based on a literature review and consultation with key stakeholders.

Council's Risk Management Framework was used to rate the risks. Scores were assigned to the likelihood and consequence of threats to environmental, social and economic risk, and the risk rating was derived from the matrix below. Management controls were then considered, and the scoring repeated to assess the residual risk.



Acid sulfate soil

Once the Manning Threat and Risk Assessment was complete, tolerance levels of low, moderate and high were assigned to the residual risks. All threats with a residual risk scoring 40 or above were rated low tolerance. These were generally threats with at least one extreme residual risk rating. All threats with medium-high residual risk were rated as having moderate tolerance. To conclude this process, threats with low or moderate tolerance for their residual risk progressed into a more detailed issue analysis. Threats with low-medium residual risk were rated high tolerance. Threats rated with residual risk rated low or moderate tolerance were the issues analysed in detail.

A summary of results for the Manning threat and risk assessment, and the more detailed climate change threat and risk assessment, are shown below.

The full Manning Threat and Risk Assessment (TARA) is shown in Appendix 6.



*Risk Rating = Likelihood Rating x Consequence Rating*

		Risk Consequence Rating				
Risk Likelihood Rating		Insignificant	Minor	Moderate	Major	Severe
		1	2	3	4	5
Almost Certain	5	Medium (5)	High (10)	High (15)	Extreme(20)	Extreme(25)
Likely	4	Medium (4)	Medium (8)	High (12)	High (16)	Extreme(20)
Possible	3	Low (3)	Medium (6)	Medium (9)	High (12)	High (15)
Unlikely	2	Low (2)	Low (4)	Medium (6)	Medium (5)	High (10)
Rare	1	Low (1)	Low (2)	Low (3)	Medium (4)	Medium (6)

Figure 23: MCC Risk rating matrix

## 5.2.2 Manning TARA results, risk tolerance and issues

Threats	Values impacted	Residual Risk Rating	Risk tolerance	Issue
1. Lack of stewardship	Environment Social Economic	High High High	Low	Lack of stewardship
2. Failure to account for long term impacts of climate change (50-100 yrs)	Environment Social Economic	High High High	Low	Climate change
3. Loss and degradation of coastal wetlands	Environment Social Economic	Extreme High High	Low	Loss and degradation of coastal wetlands
4. Floodplain drainage (ASS)	Environment Social Economic	Extreme High High	Low	Floodplain drainage
5. Loss and degradation of riparian vegetation and adjacent habitat	Environment Social Economic	Extreme High High	Low	Loss and degradation of riparian wetlands
6.1 Agricultural diffuse source run-off: Nutrients	Environment Social Economic	Extreme High High	Low	Agricultural impacts
6.2 Agricultural diffuse source run-off: Sediments	Environment Social Economic	Extreme High High	Low	
6.3 Stock in riparian and marine vegetation	Environment Social Economic	High High High	Low	

## 5.2.2 Manning TARA results, risk tolerance and issues continued

Threats	Values impacted	Residual Risk Rating	Risk tolerance	Issue
6.4. Agricultural diffuse source run-off: Pathogens (e.g. E coli)	Environment	Medium	Moderate	Agricultural impacts
	Social	High		
	Economic	High		
7. Modified hydrology/hydraulics and flow regime, Modified freshwater flows	Environment	High	Low	Low and modified flow
	Social	High		
	Economic	High		
8. Entrance modifications, including dredging, opening and permanent entrance training	Environment	High	Low	Entrance modifications
	Social	High		
	Economic	High		
9. Major floods, high tides + storm surge	Environment	Medium	Low	Flood inundation
	Social	High		
	Economic	High		
10.1. Urban stormwater discharge	Environment	Medium	Moderate	Urban stormwater litter, plastics and marine debris
	Social	High		
	Economic	High		
10.2. Water pollution on environmental values litter, solid waste, marine-debris and microplastics	Environment	Medium	Moderate	
	Social	Medium		
	Economic	Medium		
11. Pests and diseases	Environment	High	Moderate	Biodiversity loss
	Social	Medium		
	Economic	Medium		
12. Sewage effluent and septic runoff	Environment	Medium	Moderate	Sewerage and septic
	Social	Medium		
	Economic	High		
13. Unsealed Roads	Environment	Medium	Moderate	Erosion and sediment
	Social	Medium		
	Economic	Medium		

### 5.2.3 Detailed Climate Change Threat and Risk Assessment

Risk (over 20 year Timeframe)		Impact (Social, Environmental, Economic)	Risk Level
CC2:	Due to sea level rise, coastal groundwater levels rise causing low lying roads to fail	Economic	High
CC3:	Ongoing sea level rise will encourage coastal wetlands to migrate upslope and onto adjacent often private land, eventually resulting in wetlands being “squeezed”	Environmental	High
CC6:	Possibility that salt dynamics change and that a salt wedge combined with greater tidal penetration begin to affect potable water offtake upstream of current tidal limit. Quite unlikely over 20 year timeframe, but impacts would be severe (e.g., trucking water into several towns)	Economic	High
CC13:	Impact of higher tide levels and interaction with adjacent groundwater drainage on acid floodplains is poorly understood. Impact of acid drainage events could be very bad for the environment.	Environment	High
CC16:	The potential for unknown weeds or existing weeds from other regions to get a foothold in the Manning catchment could potentially have a devastating impact on parts of the catchment and productivity of agriculture.	Environmental/Economic	High
CC21:	Changes to Environmental Flows due to a drying climate may significantly alter runoff from acid drainage areas	Environmental	High
CC22:	Potential loss of subtidal habitats due to changes in environmental water quality (pH, salinity, temp, flows) with flow on effects to the productivity of fisheries.	Environmental, Economic.	High
Risk (50-100 year Timeframe)		Impact (Social, Environmental, Economic)	Risk Level
CC19:	Over the long term, failure of the present generation to appropriately understand and plan for the impacts of climate change could have unknown, widespread and damaging impacts to future generations. Work is progressing to understand and manage the risks, and this must continue.	Social, Environmental and Economic	High
CC20:	Over long term, significant or complete loss of saltmarsh/wetland habitat due to sea level rise would represent a local ecological disaster and a failure of one of the cornerstone objectives of the CM Act.	Environmental and Economic	Extreme

## 6. SNAPSHOT OF ISSUES

Issues were identified via the Threat and Risk Assessment described above, along with input from the ECMP Reference Group. The project team then prepared a series of issue papers (Annexure I) and hosted 13 discussion groups with stakeholders who had detailed local, scientific or traditional knowledge to contribute. Participants at the discussion groups represented the Technical Advisory Group, ECMP Reference Group, delivery partners from Council and state agencies, Aboriginal stakeholders and community representatives.

The issue papers examined activities, stressors and impacts, as shown in Figure 24. The discussion groups identified stakeholders, existing management options, what's working and what's not, opportunities and management options. A snapshot of the issues is provided below.

### Find out more:

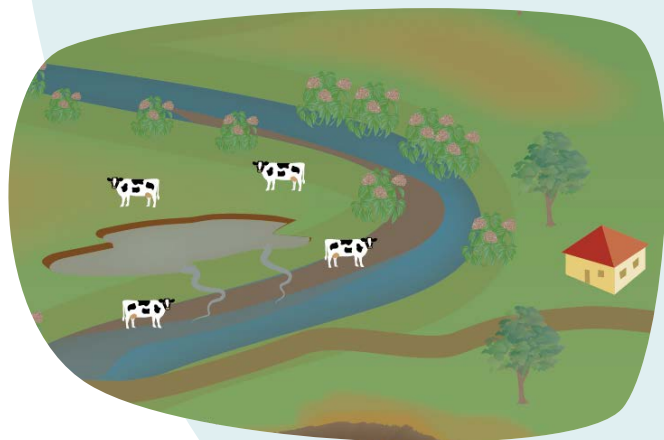
The full results of our issue analysis are available on MidCoast Council's web page at:

[www.midcoast.nsw.gov.au/ourmanningriver](http://www.midcoast.nsw.gov.au/ourmanningriver)

Annexure I: The Manning River ECMP Issue Analysis (MCC 2021)

### ACTIVITY

What we do on the land impacts on the quality of water that runs off. If the quality of the runoff is poor it puts stress on the environment.



### STRESSORS

Stressors are changes to the environment that result from the activity. These can lead to ecological harm. Stressors can include nutrients, acid leachate and sediment in the water (turbidity).



### ECOLOGICAL IMPACTS

Ecological condition grades are a combination of turbidity (water clarity) and algae (measured as chlorophyll) scores.



Figure 24: The relationship between activities, stressors and ecological impacts

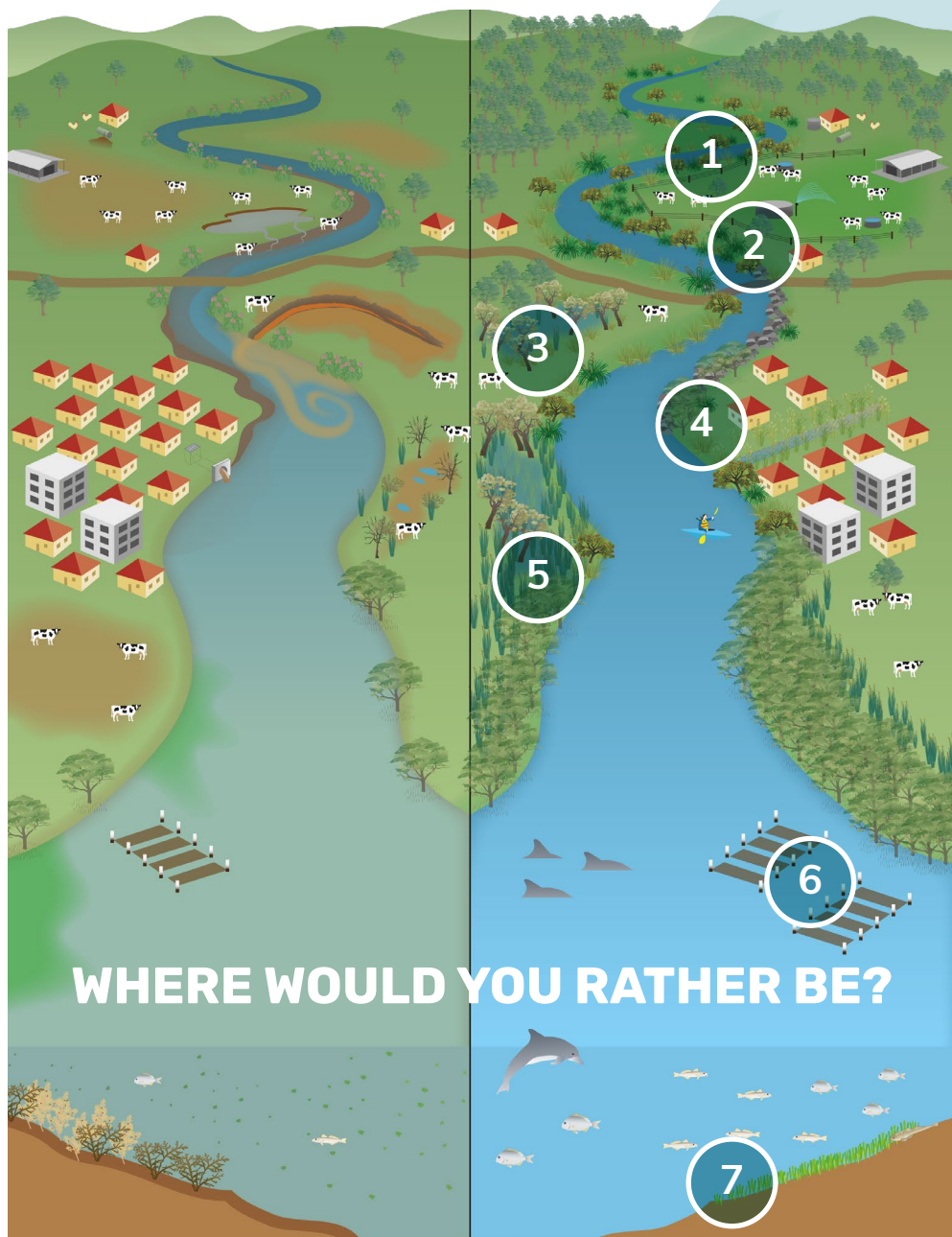
## 6.1 OVERVIEW OF MANAGEMENT AREAS IMPACTED BY EACH ISSUE

The twelve issues below are the focus of management actions in the ECMP. Table 3 shows which of our six management areas are affected.

ISSUE	Catchment	Floodplain & estuary	Coastal Wetlands	Coastal Environment Area	Coastal Use Area	Coastal Vulnerability Area
Lack of stewardship						
Climate change						
Loss of coastal wetlands						
Floodplain drainage & acid sulfate soil						
Loss of riparian vegetation						
Agricultural impacts						
Modified freshwater flows						
Entrance modifications						
Flood, coastal & tidal inundation						
Urban stormwater, litter, marine debris						
Biodiversity loss						
Sewage effluent and septic runoff						
Erosion and sedimentation						

Table 3: CMP and Coastal Management Areas impacted by each issue

A concept diagram showing management of these issues to protect the health of our estuary is shown in Figure 25.



## KEY FEATURES OF A HEALTHY WATERWAY

- 1 Dairy effluent is kept out of waterways and wetlands and used for productive pastures
- 2 River and estuary banks are stable and stock is excluded
- 3 Land is managed to avoid the disturbance of acid sulfate soils
- 4 Stormwater runoff from urban areas is filtered
- 5 Natural wetlands are healthy and filter sediments and nutrients
- 6 Oysters and fishing stocks are healthy
- 7 Seagrass is abundant and algae levels are low

Figure 25: Estuary with negative impacts vs well-managed estuary

**“This is a people issue. It’s the responsibility of everyone to respect and understand our river system. A lot of people don’t get to understand impact of day-to-day decisions. Promote public education and publicise issues affecting the river. Engage with landholders in the catchment to improve decision-making.”**

Chris Scott, member,  
Manning River ECMP Reference group

## 6.2 COMMUNITY STEWARDSHIP

Public participation and stewardship are enshrined in the Coastal Management Act 2016 and feature strongly in the NSW Marine Estate Management Strategy (MEMS).<sup>27</sup>

The need to improve community stewardship and land management practices have been highlighted during our consultation. Education and engagement were proposed as management options across almost all of the issues and identified as a high priority by the Manning River ECMP Reference Group.

Stakeholders called for a cohesive community engagement and education program that fosters understanding, commitment and stewardship to protect the health of the estuary and waterways. Key target audiences will include recreational river users, public and private land managers including new landholders, commercial and lifestyle farmers and the wider community.

An environmental Best Management Practice framework for the agricultural sector will be developed to provide consistent guidance. Local social research on the motivations and challenges for beef and dairy farmers called for a program which builds on existing catchment management efforts, promotes an integrated suite of practices, and demonstrates a production advantage for farmers.<sup>28</sup>

Providing incentives, training and extension advice to develop new concepts and skills; supporting peer-to-peer learning; and negotiating win-win management actions will advance the goals of farmers while influencing culture and practices to improve management of the Manning catchment. The emphasis will be on providing evidence-based guidance that supports land managers to make their own decisions.

**Stakeholders:** MidCoast Council; Hunter Local Land Services; Mid Coast 2 Tops Landcare; MidCoast Dairy Advancement Group, industry groups; National Parks and Wildlife Service; local schools; community groups (e.g. Manning River Turtle Conservation Group, OzFish, birding clubs); Manning Regional Art Gallery; Libraries.

27: NSW Marine Estate Management Authority, 2018

28: Bullock, 2019

## 6.3 CLIMATE CHANGE

The increase in greenhouse gases within the atmosphere, largely caused by the activities of humans, is causing the earth to warm (Figure 26). The ECMP contains actions that will assist effective adaptation to a changing climate. Key threats arising from climate change and their resulting impacts are summarised below.

**The impacts of climate change will continue to increase in intensity.** While uncertain, modelling for northern NSW indicates that impacts will start to have significant environmental, social and economic impacts in about 20 years time (i.e. 2040). Accordingly, it is important to understand the implications of climate change now and start more detailed planning during the first five-years of the Manning River ECMP.

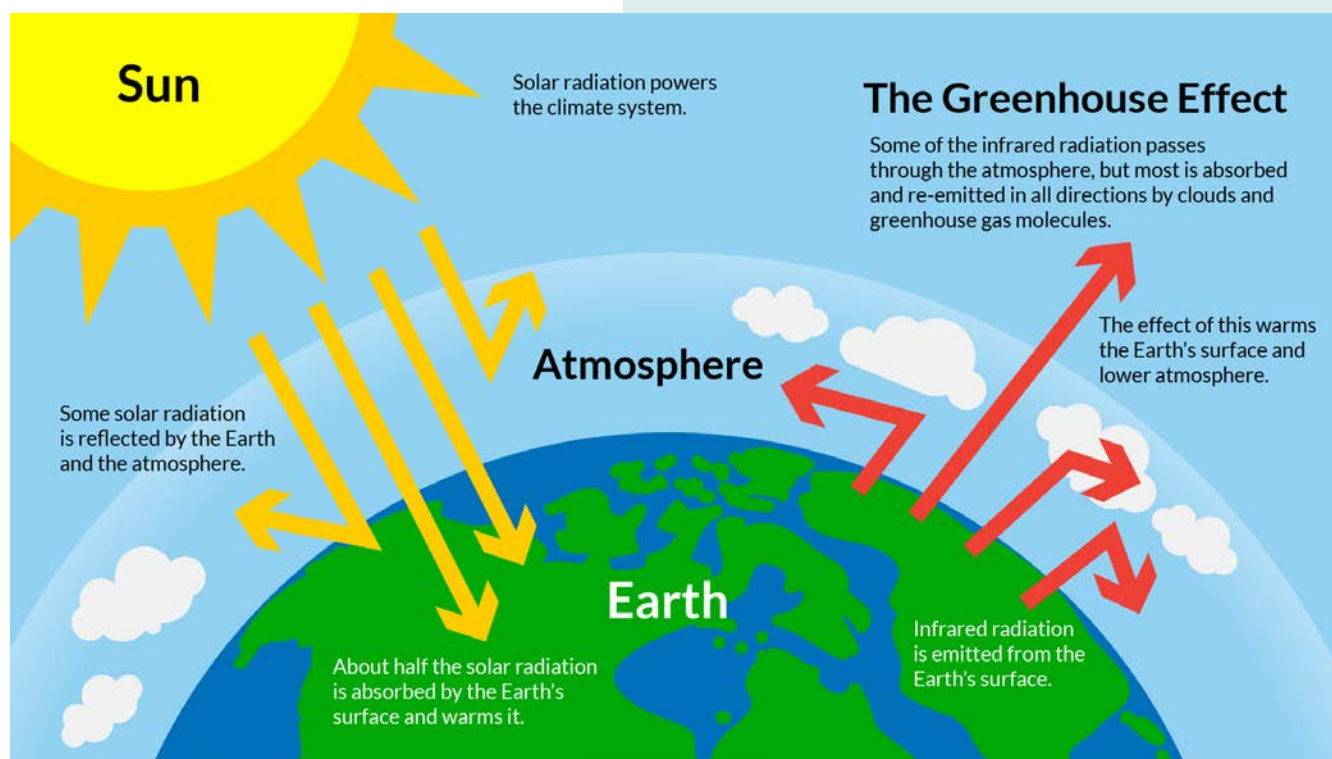


Figure 26: Conceptual diagram of the Greenhouse Effect

### 6.3.1 Key Threats

The following are the key threats facing the Manning estuary and catchment due to climate change.

**Threat 1 - Sea Level Rise:** Sea levels are rising as the Earth warms, mainly due to the expansion of water in the oceans as they warm, and the melting of ice from glaciers and polar ice caps. Therefore, tidal levels in the estuary will also rise.

**Threat 2 - More Intense Extreme Rainfall:** A warmer atmosphere can hold more moisture, leading to more intense rainfall events.

**Threat 3 - Overall Drier Catchment:** The warming climate will also cause the catchment to become drier over time. It is expected that droughts will become more prevalent.

**Threat 4 - Warmer Water:** The water in estuaries will heat up in line with the warming of the planet. One degree Celsius of warming has already occurred, and it is possible that by 2040 the estuary will have warmed by a further degree.

## 6.3.2 Key impacts

### Impacts on Tidal Inundation

Results of the flood modelling completed for MCC in 2016 demonstrate the tidal inundation that will occur for both +0.28m of sea level rise (which could occur by 2040-2050) and +0.98m for around the year 2100. These show that inundation impacts mostly affect low lying areas adjacent to the estuary, including land which has been previously drained for agriculture.

Analysis completed by the NSW State Government indicates that a sea level rise of +0.5m would result in tides inundating around 38 km of local roads and tracks.

The upstream freshwater reaches of the river may be impacted by changes in tide and inundation levels.

### Impacts on Sediment Dynamics

A drier catchment along with more extreme rainfall events will result in more extreme erosion from the catchment.

Proposed entrance modifications at Harrington may cause more sand to be carried into the estuary from the Ocean. The effects would depend on the entrance configuration ultimately adopted. These are presently being considered by Transport for NSW.

### Impacts on Water Chemistry

Water chemistry changes due to climate change will be a complex issue. Some of the key effects are:

- More dissolved CO<sub>2</sub> will lead to a more acidic ocean.
- Changes in tide will affect the generation of acid from acid sulfate soils.
- Less runoff and higher water levels would increase salinity in the estuary.
- Stagnant pools of water on the floodplain (from more tide inundation) may result in algal blooms.

Long-term monitoring and review along with preparation for adaptive management are the most appropriate tools available to face this issue.



## Impacts on Intertidal Habitats, Fish Communities and Ecosystems

Due to rising water levels and tides in the estuary, intertidal habitats, in particular saltmarsh, are expected to migrate upslope. It is also possible that habitats may be less robust in response to the changing environment.

In response to water temperature and sea levels changing, it is expected that fish habitats will change. This is likely to cause changes to fish communities in the estuary.

As the water gets warmer, sub-tropical and tropical species are expected to become more prevalent. Impacts could be mixed, with some new species threatening existing ecosystem functions, and some being of social or economic benefit.

The productivity of estuarine ecosystems is likely to change in response to habitat and fish community shifts. It is a complex issue and difficult to say whether the change will be positive or negative.

Impacts on floodplain drainage and Acid sulfate soil exposure.

Glamore and colleagues (2016) assessed the impact of rising sea levels on the Manning estuary floodplain as projected for 2050 and 2100. Forecasted increases in high tides will reduce drainage, cause overtopping of levees, impact on backswamp connectivity, and affect agricultural productivity in some regions.

The Lower Manning River Drainage Remediation Plan notes that the greater issue for land management will be elevated low tides, which will reduce drainage from low-lying backswamps.<sup>29</sup>

Stakeholders include: MCC; LLS; DPI-Fisheries; Commercial fishery and aquaculture businesses; DPIE-EES; Floodplain land holders; NPWS; Tourism (eg recreational fishing, ecotourism, boating); TfNSW (navigation and waterway access); DPIE - Crown Lands; Local Aboriginal Land Councils, the Aboriginal community (eg impact on heritage sites); research institutions; DPIE-Planning; Federal government departments including the current Department of Agriculture, Water and the Environment.



*Photo: Christine Price. Extreme weather events will become more regular as the climate warms up*

29: Glamore, Ruprecht, & and Rayner, Lower Manning River Drainage Remediation Action Plan, 2016



## 6.4 LOSS AND DEGRADATION OF COASTAL WETLANDS

Coastal wetlands in the Manning estuary are under significant threat from development, modified hydrology and the impacts of climate change. Key activities and stressors include:

- agricultural land use and associated floodplain draining and stock access
- urban development and associated filling
- degradation by pollutants such as acid drainage, increased nutrients and sediment loads
- clearing and fragmentation of vegetation
- climate change (particularly sea level rise) and drought
- weed and pest invasion
- inappropriate fire regimes
- general ignorance of wetlands values<sup>30</sup>.

**Most estuarine habitats including mangroves and saltmarsh were rated poor or fair** in the Rapid Site Assessment.<sup>31</sup> Mangrove extent and connectivity has been reduced to narrow, patchy bands, rarely exceeding 10m wide, providing limited bank protection from high flows and boat wash. Distribution of saltmarsh identified through the Rapid Site Assessments was very low.

**Stock impact on coastal wetlands and fringing vegetation** was found to be a widespread threat to estuary health. Stock frequently have access to estuarine shorelines and wetlands leading to soil degradation, erosion, reduced vegetation and poor water quality.

**Weed abundance within mapped wetlands** was relatively low. Environmental weeds such as Lantana, Bitou Bush, Tree Pear, Coastal Morning Glory and Cassia were becoming established in some wetlands, particularly on the floodplain. Several Swamp Oak and Mangrove Forests were observed to be dominated by an understorey of the invasive weed *Juncus acutus* (Sharp Rush) which should be prioritised for treatment.<sup>32</sup>

**Sambar deer, foxes, hares and gambusia fish** are present in Cattai Wetlands. Deer trample and graze on wetland vegetation. Foxes prey on native species, particularly impacting threatened and migratory shorebirds near the north and south entrances.

**Stakeholders include:** MidCoast Council, Hunter LLS, DPIE, DPI-Fisheries, NSW Government, NPWS, WRL; private landholders, Mid Coast 2 Tops Landcare, DPIE - Crown Lands, Recreational and Commercial Fishers, community.

**Related issues:** Floodplain drainage and acid sulfate soils, biodiversity.

30: Eco Logical Australia Pty Ltd, 2019

31: Swanson, 2020

32: Eco Logical Australia Pty Ltd, 2019

Figure 27: Cattai Wetlands

**“We need to retain, protect  
and restore coastal wetlands.”**

Ian Crisp, Oyster Farmer,  
Member, ECMP Reference group



## 6.5 FLOODPLAIN MANAGEMENT AND ACID SULFATE SOIL

**Acid sulfate soils (ASS) formed naturally on the Manning estuary floodplain** from 6,000 to 3,000 years ago. When waterlogged under natural conditions the soils are harmless. However, when exposed to atmospheric oxygen the soils produce highly acidic runoff (pH < 4.5) containing elevated concentrations of heavy metals such as iron and aluminium.

**The Manning estuary floodplain has 33,797 hectares of potential acid sulfate soil (PASS)** and four areas identified by the NSW government as ASS Hot Spots.<sup>33</sup> Cattai Creek-Pipeclay Canal is classified as one of the worst ASS hotspots on the NSW coast.<sup>34</sup>

**Over the past two centuries an extensive network of drainage channels was installed** on the Manning floodplain to mitigate inundation and flooding, promote dry-land pasture and prevent saline intrusion (Figure 28). As a result, prolonged drying of the floodplain allowed oxygen to penetrate the ASS sediments, acidifying soils and groundwater.<sup>33</sup>

**Following rainfall events extensive floodplain areas can be impacted by acidic runoff** and high concentrations of heavy metals. The drains quickly transport the acid water into the Manning River estuary.

**ASS pollution has significant adverse impacts on water quality,** aquatic species and ecosystems, amenity, oyster production and fish stocks for commercial and recreational fishing.

**The highest priority ASS areas for remediation are Moto, Ghinni Ghinni and Big Swamp** (Figure 29). These three areas contribute 81% of the overall acid drainage risk within the lower Manning floodplain. Ghinni Ghinni Creek, Dickenson's Creek, Lansdowne River and the northern arm of the Manning River downstream of Dumaresq Island are the highest acid impacted surface water areas in the estuary.

**Stakeholders include:** Drainage Unions, MidCoast Council, Hunter Local Land Services (LLS), DPIE, DPI; DPIE - Crown Lands; Mid Coast 2 Tops Landcare; floodplain farmers; fishers and commercial oyster growers; recreational users of the estuary.

**Related issues:** coastal wetlands, agricultural impacts.

33: NSW Government, 1999

34: Glamore, Ruprecht, & and Rayner, Lower Manning River Drainage Remediation Action Plan, 2016



Photo: an acid event in the Manning River

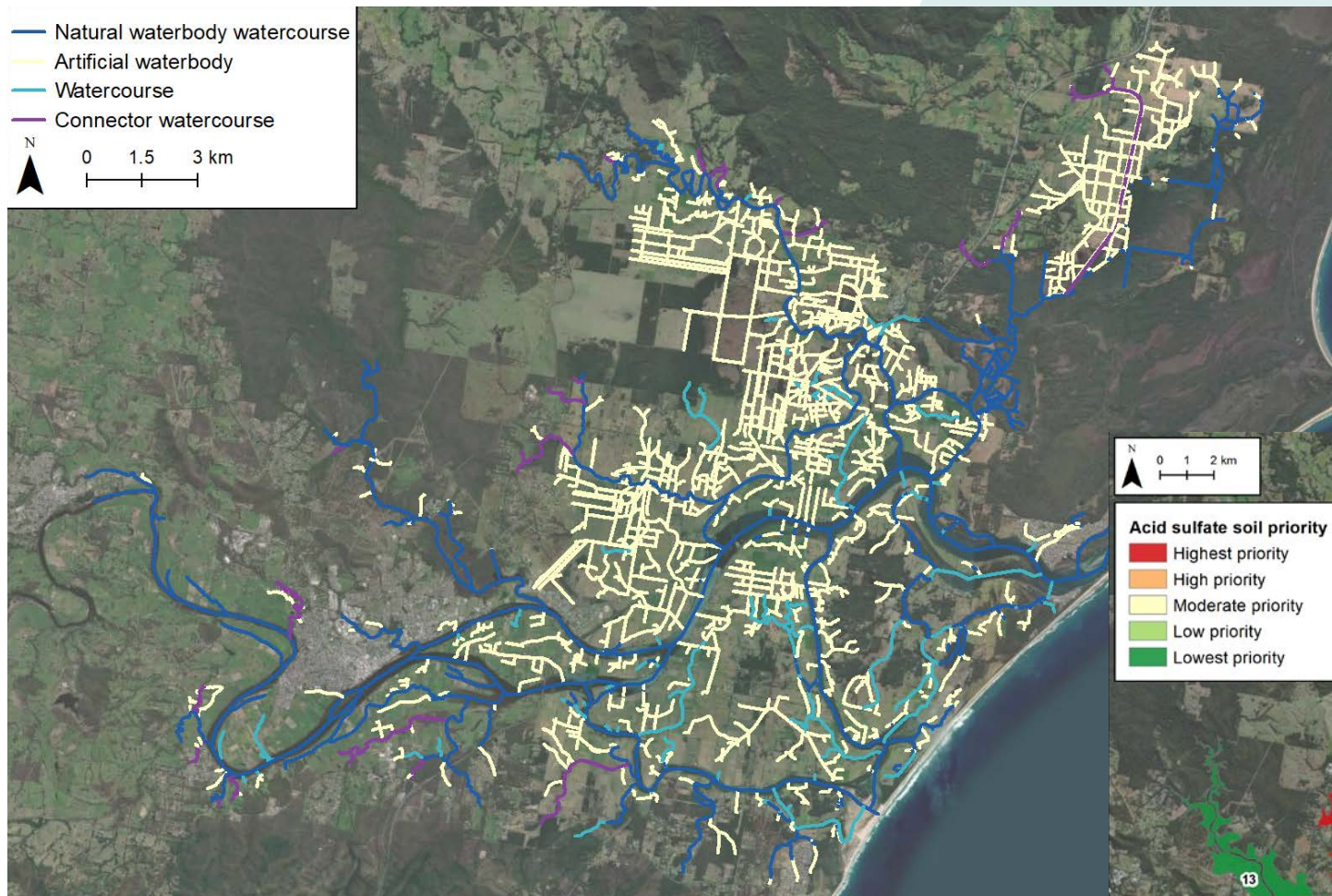


Figure 28: Drainage channels in the Manning River floodplain

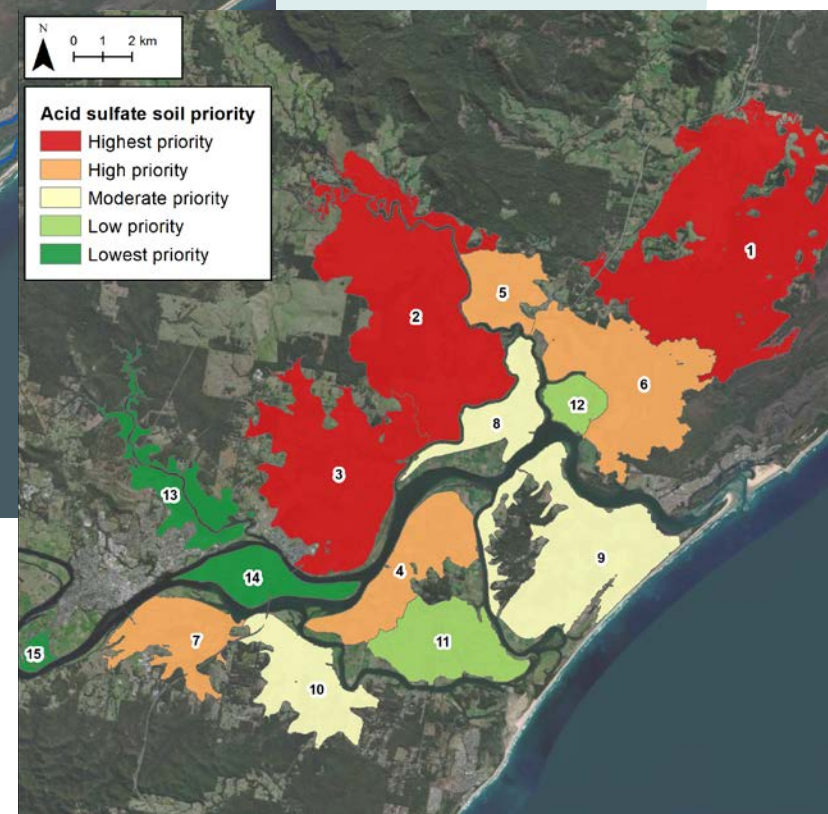


Figure 29: Priority areas for ASS remediation (Glamore et al 2021)

## 6.6 LOSS AND DEGRADATION OF RIPARIAN VEGETATION

**Loss and degradation of riparian vegetation** are significant stressors on river and estuarine health in the Manning. Riparian vegetation was cleared extensively prior to the 1950s, and stock impact on the riparian zone remains a widespread.

**The estuary is severely modified due to substantial clearing of natural vegetation**<sup>35</sup>. During the rapid assessment of the catchment (Swanson 2020), most estuarine sites were rated Poor or Fair, primarily due to the sparse distribution of riparian vegetation (mangroves, swamp oak). In freshwater catchments, the riparian zone was typically a narrow band (less than 10 metres wide) of River Oak, with exotic species dominating the shrub layer.

**Cleared shorelines are exposed to erosion** from high rainfall events, high flows, wind waves, tides and boat wash. The subcatchments with the highest risk from loss of riparian vegetation are the Manning River, Upper Manning River, Myall Creek and Barnard River<sup>34</sup>. The Barnard River has the lowest riparian vegetation cover of any river in the MidCoast region, at 34%. This is reflected in MidCoast Water Services data, which shows the Barnard River contributes excessive levels of turbidity during high rainfall events and is also a significant contributor of nutrients (particularly nitrogen and phosphorus) at all flows.

Impacts from loss of riparian vegetation include floodplain stripping and bank erosion, which have been identified as the largest contributors of sediment in the river<sup>36</sup>. Cleared hillslopes, poor groundcover and poor riparian vegetation are mobilising large amounts of sediment into the system, smothering micro-niches for fauna, reducing instream condition and causing turbidity with consequent impacts on aquatic fauna and flora. Nutrients are transported with sediment into waterways, causing algal blooms.

**Other impacts include declines in terrestrial and aquatic wildlife habitat** and dispersion corridors, and socio-economic impacts such as shallowing of the estuary for boating and higher drinking water treatment costs.

**Stakeholders include:** Hunter LLS, MCC, DPIE - Crown Lands, Forestry Corp, NPWS; Mid Coast 2 Tops Landcare; private property owners in rural and urban areas, MCC (Council owned land), general community (recreation and cultural purposes, cost-bearing)

**Related issues:** Sediment and erosion; agricultural impacts; loss of biodiversity.

**“My vision for the future is a stable catchment that’s well vegetated. Stock are managed and there is a healthy riparian buffer to filter run-off.”**

**Noel Piercy, Member, Manning River ECMP Reference Group**

35: Swanson, 2020

36: Raine & Gardener, 1992



Figure 30: A legacy of land clearing on the Manning River



Figure 31: Bank erosion and remediation on the estuary

## 6.7 AGRICULTURAL IMPACTS

It is crucial that agricultural land is well-managed to prevent negative impacts on the catchment. While many farmers make concerted efforts to reduce their impacts, agriculture continues to be a significant pressure on ecosystem health and water quality in the catchment and estuary.

Activities associated with agriculture such as land-clearing and grazing accelerate the rate of rainwater runoff and erosion, carrying sediments, nutrients, pathogens and agricultural chemicals into waterways of the catchment and estuary.<sup>37</sup>

In the Rapid Site Assessment, instream condition scores in both fresh and estuarine subcatchments showed indicators of elevated nutrients from fertilised pastures and crops, and stock defecation.<sup>38</sup>

Grazing and poor pasture management cause soil degradation including compaction and loss of soil structure and organics, which contributes to runoff by reducing the rate at which rainwater infiltrates in the soil.<sup>39</sup>

Uncontrolled stock access in the riparian and instream zones was found to be a widespread threat to stream and estuary health across the catchment.<sup>40</sup> Stock degrade the riparian zone by disturbing the vegetation and soil, introducing weeds and increasing nutrients and pathogens through defecation. Resulting reductions in the extent, condition and connectivity of riparian vegetation increases the rate and impact of diffuse-source water pollution.<sup>41</sup>

Diffuse agricultural run-off has been nominated as one of the highest priorities for action in the statewide and northern region Threat and Risk Assessment (BMT 2017). The priority agricultural diffuse source pollutants in the Manning catchment are nutrients (nitrogen and phosphorous) and sediments transported into rivers via runoff after rainfall events.

Nutrients stimulate rapid growth of algae and aquatic plants which smother submerged macrophytes, degrading their condition, resilience and diversity. As excess algae block light from lower levels of the water column, it causes die-off of submerged macrophytes which are decomposed by bacteria, reducing dissolved oxygen (Serov et al 2019).

37: NSW Government, 2009

38: Swanson, 2020

39: Gloucester Shire Council, 2015

40: Swanson R., 2020

41: NSW Government, 2009

## HEALTHY LANDSCAPES EQUAL HEALTHY WATERWAYS

Many farmers are actively seeking ways to boost both productivity and environmental sustainability.

Floodplain grazier Peter Longworth has reduced surface water and maximised groundwater levels to reduce acid sulfate run off from his farm.

Peter learnt that much of the fertiliser he applied wasn't available to his pasture grass due to the acid sulfate soils on his farm. He switched to regenerative farming methods to build up soil fertility by increasing organic soil carbon. He is saving on the cost of inputs and reducing chemical run-off into the estuary.

Dairy farmer Julian Biega installed a system that allows the effluent from his dairy farm to be captured, stored and irrigated on his paddocks as necessary.

The system improved productivity on the irrigated paddocks and improved the condition of a salt marsh nearby.



Peter Longworth, grazier

**Sediment is released from eroding, disturbed soils** associated with grazing and cropping. It causes turbidity, decreases light in the water column and reduces the extent and condition of the aquatic plant assemblage in both freshwater and marine systems (Serov et al, 2019).

**Freshwater tributaries with significant diffuse-source run-off inputs from agriculture** include the Little Manning (high phosphorous); the Barnard River (high turbidity, phosphorous, nitrogen); the Bowman and Gloucester rivers (high nitrogen).

Based on results in the Estuary Health Risk Model, nutrient and sediment risks in the estuary are highest in Cedar Party Creek and the Lansdowne River.

**Key impacts of agricultural diffuse-source run-off** on catchment and estuary values are shown in Table 4 below.<sup>42</sup>

PRIORITY PROBLEM		KEY IMPACTS TO ADDRESS
1	Sediment levels exceeding ANZECC Guidelines	<ul style="list-style-type: none"> <li>• smothering of aquatic ecosystems</li> <li>• increased water infrastructure maintenance costs</li> </ul>
2	Nutrient levels levels exceeding ANZECC Guidelines	<ul style="list-style-type: none"> <li>• nuisance weed growth and harmful algalblooms</li> <li>• increased water treatment cots</li> <li>• reduced fishery production (commercial and recreational)</li> </ul>
3	Pathogen levels levels exceeding ANZECC Guidelines	<ul style="list-style-type: none"> <li>• reduced fishery production (acquaculture, commercial and recreational fishing)</li> <li>• human health impacts from aquatic recreation</li> </ul>

Table 4: Key impacts associated with water pollution from diffuse-source runoff.

**Stakeholders include:** Hunter Local Land Services' DPIE Department of Agriculture, MidCoast Council, MidCoast Dairy Advancement Group, NSW Farmers Association, Young Farmers Network, Economic Development Council, Mid Coast 2 Tops Landcare.

**Related issues:** loss and degradation of coastal wetlands and riparian vegetation; floodplain drainage and ASS.

42: NSW Government, 2009

**“There are business advantages and resilience benefits that come from good management. If fertiliser is running off into the river, its money lost to the farmer.**

**We could manage soil better to hold water in the landscape for resilience from drought, flood and climate change.”**

**Kirsty Hughes, member, ECMP Reference Group**



Figure 32: Cattle on the riverbank is a common sight

## 6.8 MODIFIED FLOW

**From an environmental perspective, the full range of flows** are necessary to maintain a healthy river system. These include flood flows to scour channels, rework sediments, and inundate floodplains; medium flows to oxygenate water and allow fish passage; and low flows to maintain connectivity and assist the survival of aquatic and riparian flora and fauna.<sup>43</sup>

**Key stressors on flow rates in the Manning include extraction for potable water and irrigation,** drought, climate change, sedimentation and infilling of deep pools, and increased peak run-off due to land-clearing and urban development.

The total volume of surface water extracted via licenses in the Manning catchment is relatively low, authorised at 78,100 megalitres (ML) from an annual average flow of 2,530,000 ML.<sup>44</sup>

**MidCoast Council's Water Services team delivers potable water and sewerage services to over 40,000 homes across the LGA.** The Manning Water Supply Scheme makes up 90% of water supply in the MidCoast LGA. An entitlement of 17,256 ML/year is allocated to MidCoast Council for potable town water extracted at Barrington and Bootawa.

**The majority of extraction licenses in the catchment are used for irrigation** for beef pasture and dairy farms.<sup>45</sup> Other irrigators include citrus and vegetable growers, turf farms, equine industries and hobby farms.<sup>46</sup> Irrigation in the Manning catchment is below the licensed capacity. Of the 180 irrigation licences only about 20% are active; the balance are 'sleeper' licenses.<sup>47</sup>

**Basic landholder rights for stock and domestic use** are also allowed. All properties with river/creek frontage are entitled to unregulated access for stock and domestic supplies and can store runoff in surface dams up to a volume of 10% of the rainfall falling on the property.

**Extraction from the tidal pool** has the potential to impact on estuary values and requires further study to ensure adequate protection measures are put in place through the Water Sharing Plan.<sup>48</sup>

**Groundwater extraction via bores** can impact on both river base flows and Groundwater Dependent Ecosystems (GDEs). An increase in demand of water from aquifers is likely as a result of increasing insecurity in surface water supply.<sup>49</sup> This could be a significant risk during drought when the base flow through much of the system is made up of groundwater.

**In addition to extraction, drought can be a significant stressor on flow,** as was seen in 2017-19 when the Manning experienced the worst drought since instrumental records began in 1880. Manning River flow fell below 50 megalitres per day (ML/d) for 90 days, compared to the previous record of 26 consecutive days. Council received reports of illegal pumping when cease-to-pump rules were in place, which were investigated by the Natural Resources Access Regulator (NRAR).

43, 44, 45, 47, 48: Betterridge & Rabbidge, 2016

46: MidCoast Council, 2020

49: MidCoast Council, 2019

**Potential impacts caused by reduced freshwater inflows** from water allocations and drought include upstream saline intrusion and hyper-salinity in upstream aquatic habitats, coastal wetlands, riparian zones and groundwater dependent ecosystems.<sup>50</sup>

**Other potential impacts on the estuary include** reduced nutrient and organic inputs for primary production and alterations to the physical features of the estuary mouth.<sup>51</sup>

**The drought of 2019 caused a range of impacts** across environmental, social and economic dimensions. Farming families experienced personal and financial stress, buying feed from as far afield as Victoria and struggling to de-stock as cattle prices plummeted. Much of the catchment ran dry. Platypus and turtles were exposed to predation by foxes. Large river oaks died. There were significant impacts to water quality such as increased salinity and algal outbreaks.

**Water governance is complex, and MidCoast Council has limited influence.** In NSW the key legislation to manage flow and extraction is the NSW Water Management Act 2000 (WMA 2000). It is administered by WaterNSW (rural landholders, rural industries) and the Natural Resources Access Regulator (NRAR). Under the WMA 2000, Water Sharing Plans provide a legal basis for sharing water between the environment and consumptive water users. The sharing of water must protect the water source and its dependent ecosystems as well as basic landholder rights.

The NSW Government's Water Sharing Plan for the Lower North Coast Unregulated and Alluvial water sources (2009) regulates license allocations for town use, farms, irrigators and industry, and reserves environmental water for the overall health of the river and aquifer.

DPIE is responsible for managing and allocating groundwater resources as set out in the Water Sharing Plan. To ensure local impacts are monitored and managed, all applications for new bores and trades are individually assessed. Bores for basic landholder rights (stock and domestic use) are exempt.

DPI Water licences irrigators. Licences set out how much water can be taken; what size pumps and other equipment can be used; where pumps can be located and where water can be applied. During low flow periods, cease-to-pump (CTP) rules protect environmental flows, excluding licences held by local water utilities, licensed stock and domestic users, and licences used for food safety and essential dairy care (Betterridge & Rabbidge, 2016).



**Stakeholders include:** NSW Department of Planning, Industry, and Environment DPIE – Water Planning Group; NSW DPIE – Water and Science Group; Natural Resources Access Regulator (NRAR); MidCoast Council (MCC); Department of Primary Industries DPI – Water; Manning Water Users Association; Barrington Irrigators Group; farmers and irrigators; large water users.

**Related issues:** Biodiversity loss

## 6.9 ENTRANCE MODIFICATIONS

The Manning River ECMP Planning Area commences 2 km up-river of AHD and is a whole-of-catchment program primarily concerned with the impact of land on water. The CMP for Old Bar-Manning Point, which addresses coastal processes will consider the issue of entrance modifications. There will be integration and consistency between the two programs.

At the river entrances, a single breakwater/training wall at the northern entrance at Harrington has created a permanent ocean entrance while Farquhar Inlet is mechanically opened to the ocean when flood trigger levels are reached.<sup>52</sup>

Entrance modification has been included in the issues analysis for both the Manning River ECMP and Old Bar-Manning Point CMP as modifications of the entrance to the Manning River may impact on both coastal and estuary processes.

In March 2020, the Minister for Transport and Roads, together with the Member for Myall Lakes, announced the establishment of the Manning River Taskforce to consider options for providing a permanent entrance to the Manning River. MidCoast Council was a stakeholder to the Taskforce.

In November 2020, following its deliberation, the Taskforce released its report investigating options to improve safety and navigability of the Manning River entrance (Transport for NSW 2020). The following

context is quoted from the report.

“The objective of the Taskforce was to build on a previous study (Manly Hydraulics Laboratory 2018) by providing expert advice to the NSW government about the expected economic benefits that could be generated by a permanent entrance to the Manning River at Harrington, the optimal engineering solution and consideration of how such a proposal could be designed and delivered in the context of the requirements of the Coastal Management Act 2016. The Task Force was also to consider implications for potential improvements at the southern entrance of the river at Farquhar Inlet.”

“The Taskforce was comprised of experts in coastal engineering, maritime infrastructure, coastal management and maritime industry, and was chaired by Transport for NSW - Maritime. The first two options considered were 1) Status Quo/ Do Nothing and 2) Routine Dredging which was described as similar to the status quo.”

“The report then considered option 3) The Southern Entrance Breakwater option consisting of the construction of a southern breakwater to stabilise the entrance between that breakwater and the existing northern breakwater. That is the option which has been generally in the past supported by those seeking to improve safety and navigability of the Manning River Entrance – which is what the Taskforce was set up to investigate.”

“Finally, the report considered another solution 4 the Manning Point Twin Breakwaters. This would involve the creation of a new opening at the narrowest point of the Mitchell Island sand spit. The report suggested that this would be considerably cheaper than option 3.”

“The MidCoast Council has resolved to support the Expert Taskforce and its processes. As indicated in recommendation 1 set out above, before any proposal can proceed to a Final Business Case a more rigorous engineering, constructability and environmental Impact statement will be undertaken.”

The Taskforce report concluded with two recommendations.

**Recommendation 1** was for Transport for NSW to enter the proposed Manning River Entrance Project into the Infrastructure NSW Investor Assurance and NSW Treasury business case process. The development of a Strategic Business Case (SBC) is required to further analyse the optimal engineering outcome, the broader impacts of intervention in the area, and the relative costs and benefits of the identified options. If the benefits are found to outweigh the costs of the project, a more rigorous engineering, constructability, and environmental impact assessment should be undertaken in a Final Business Case prior to a decision to invest in a permanent solution.

52: Parsons, 2010 53: NSW Marine Estate Threat and Risk Assessment Report, BMT WBM, August 2017 54: NSW Marine Estate Management Authority, July 2018 55 (Nielsen & Gordon, 2008)

**Recommendation 2 provided for an extensive stakeholder consultation** process that includes the local community and impacted industries and stakeholders as well as consideration of progress in the development of Mid-Coast Council's two CMPs.

These recommendations have been added as Management Actions in the Manning River ECMP (MA\_2.05 and MA\_2.06) to assist with integration between the proposed Entrance Project and the ECMP.

**Modified entrances are still influenced by tides, waves,** currents, sediment movement and freshwater flooding. Entrance modifications may cause significant changes to coastal and estuarine processes and require detailed environmental impact assessment.

**Estuary entrance modification was rated as the top priority threat** to the environment for the Northern region of NSW in an evidence-based Threat and Risk Assessment completed for the Marine Estate Management Authority.<sup>53</sup> Estuarine entrance modification and associated works were listed as the highest threat to species protected under NSW legislation.<sup>54</sup> In other locations where the entrances to estuaries have been trained, scientific evidence has demonstrated significant environmental impacts such as:

- Increased tidal ranges, increased inundation of floodplains, stormwater infrastructure, coastal wetlands, reduction in estuarine habitats, species and exposure of ASS
- Scouring of riverbanks and channels,<sup>55</sup> changes

to siltation and shoaling patterns

- Exacerbated down drift beach erosion
- Loss of breeding grounds for migratory birds and significant alteration of aquatic flora and fauna assemblages around the entrance and within the estuary.

The Manning River estuary has unique characteristics which will be considered in detail as part of any Environmental Risk Assessment associated with the proposed entrance modifications.

**Stakeholders include:** Transport for NSW; Manning River Action Group; DPIE; MCC; Oyster farmers; recreation users; tourism industries; landowners.

**Related issues:** coastal wetlands, floodplain drainage and ASS, biodiversity loss.

Photo: Red neck avocet, Karen Bettink

## 6.10 FLOOD, TIDAL INUNDATION AND COASTAL INUNDATION

The Manning River Floodplain Risk Management Study and Plan 2019 is Council's primary planning instrument covering flood, coastal inundation and tidal inundation in the Manning River ECMP Planning Area.

Coastal Management Programs prepared under the Coastal Management Act are not intended to take precedence over other council plans, but rather to provide information to support the more effective consideration of coastal hazards and estuary health in other statutory and operational plans.

Objects of the Coastal Management Act 2016 relating to flood, coastal inundation and tidal inundation in our Planning Area include:

- a) to facilitate ecologically sustainable development in the coastal zone and promote sustainable land use planning decision-making
- b) to mitigate current and future risks from coastal hazards, taking into account the effects of climate change
- c) to recognise that the local and regional scale effects of coastal processes, and the inherently ambulatory and dynamic nature of the shoreline, may result in the loss of coastal land to the sea (including estuaries and other arms of the sea), and to manage coastal use and development accordingly
- d) to encourage and promote plans and strategies to improve the resilience of coastal assets to the impacts of an uncertain climate future including impacts of extreme storm events.

**Under the State Environmental Planning Policy, Coastal Vulnerability Areas** are defined as land subject to current and future coastal hazards. There are seven types of coastal hazard defined by the CM Act. Within the Planning Area for the Manning River ECMP, the potential hazards could include:

- coastal inundation
- tidal inundation
- erosion and inundation of foreshores caused by tidal waters and the action of waves, including the interaction of those waters with catchment floodwaters.

### 6.10.1 Flood

**There is a long and relatively frequent history of flooding** within the lower Manning River. The four largest floods on record occurred in 1866 (peak flood level: 5.15 m AHD), 1929 (peak flood level: 5.9 m), 1978 (peak level: 5.75 m) and March 2021 (peak level 5.65 m) (Figure 33).

Figure 33: The Manning River floodplain, 20 March 2021

**With such a big catchment, floodwaters from the mountains flow down the Manning channel with great force,** especially in the constrained channel of the Manning above Wingham, then spread out across the estuary where the energy is dispersed but inundation of low-lying land becomes more of a problem.

**MidCoast Council's approach to flood management is set out in the Manning River Floodplain Risk Management Study and Plan** (BMT WBM 2019). The plan covers the low-lying floodplain area downstream of Wingham. The study addresses both mainstream flooding of the Manning River and the impact of climate change in the form of increased rainfall intensities and sea level rise for the following scenarios:

- Predicted increased rainfall intensity: modelled 10% and 30% increased rainfall
- Sea Level Rise (SLR): +0.28 m by 2050; and +0.98 m by 2100.

The Floodplain Risk Management Study (FRMS) has derived an appropriate plan of measures and strategies to manage present and future flood risk in accordance with the NSW Government Floodplain Development Manual. These include flood modification measures, property modification measures, risk modification measures and emergency measures (e.g. evacuation, sandbagging). MidCoast Council works closely with the NSW State Emergency Service to establish flood triggers for emergency situations.

**The FRMS has also identified a Flood Planning Area for the Manning River floodplain.**

Development of land within the Flood Planning Area is restricted and controlled by Council due to the hazard of flooding. In defining the Flood Planning Area in the MidCoast LGA, Council has considered a future flood scenario that has accounted for climate change in the form of increased rainfall and sea level rise in a combined riverine flooding and high tail water scenario to the 1% Annual Exceedance Probability (AEP, 1 in 100-year event) plus a freeboard of 500mm.

The Manning River Floodplain Risk Management Study and Plan is therefore the appropriate management tool for flooding within the geographical extent of this ECMP.

**Related Issues:** erosion and sedimentation; climate change

**Stakeholders:** MidCoast Council; NSW State Emergency Service; Adapt NSW; Department of Planning, Industry and Environment, residents, farms and businesses on the floodplain.



Photo: Evan Vale



### 6.10.2 Coastal Inundation

**Coastal inundation is the flooding of coastal management areas by ocean waters**, occurring “when a combination of marine and atmospheric processes raises ocean water levels above normal elevations and inundates low-lying areas” (Coastal Management Manual 2018).

**Coastal inundation on the NSW coast is most often associated with east-coast lows** (Heimhuber et al 2019). It is typically a short-term event with waters receding to normal conditions. Coastal inundation from storm surge in the Manning River estuary is caused by various processes including low barometric pressure, strong onshore winds, high tides, and trapped coastal waves.

**Coastal inundation in the Manning generally affects the open coast and low-lying areas near the entrance**, such as Harrington and Manning Point which are outside our Planning Area. For the Manning River ECMP Planning Area, threats associated with coastal inundation include rising groundwater, impacts on coastal wetlands and vegetation, inland estuary flooding and damage to riverbanks and infrastructure.

The Manning River Floodplain Management Study (BMT WBM 2019) considers flood events driven by both catchment and oceanic processes, addressing the current probability and future scenarios under climate change as shown above. Storm surge is factored into tail-water levels.

**In general, coastal inundation causes more frequent nuisance flooding** while riverine flooding is less frequent but causes more damage. Impacts include reduced efficiency of stormwater infrastructure and increased groundwater levels.

Modelling in the MRFMS (2019) shows that in storm events, the impact of water across land from high rainfall and riverine flooding will be more significant than the impact of coastal inundation. The flood mitigation, planning and emergency response measures set out in the MRFMS and Plan (2019) should therefore provide an effective management approach to coastal inundation. For more information see Section 10.

### 6.10.3 Tidal Inundation

Tidal Inundation or nuisance flooding is defined as “the inundation of land by tidal action under average meteorological conditions” (Coastal Management Manual 2018). It causes short term nuisance flooding in low-lying coastal areas.

**Tidal inundation is mapped and managed through the Manning River Floodplain Risk Management Study and Plan** (BMT WBM 2019), using the High High-Water Spring tidal signature provided in the Flood Risk Management Guide (DECCW 205) for locations south of Crowdy Head as the ocean water level boundary.

**Tidal inundation impacts on infrastructure** such as roads, housing and stormwater systems are addressed in the Climate Change section of this document and the Climate Change Issue Paper provided as a supporting document.

## 6.11 URBAN STORMWATER AND LITTER

Urbanisation in the towns of Taree, Wingham, Harrington and Old Bar has created large areas of impervious surfaces such as roads, rooves, driveways and carparks. As a result, there is less infiltration of rainfall to ground water, increased stormwater overland flow velocities and greater volumes of runoff (Worley Parsons 2009).

**Sediment transport is particularly problematic during the construction phase** of urban development, when soils are exposed. Over the life of a development 80% of sediment lost occurs during the construction phase.

**Pollutants typically found in stormwater** include litter and microplastics, bacteria, nutrients, petrochemicals, pesticides, heavy metals, sediment and organic matter (NSW Govt. 2009).

A preliminary spatial risk assessment for the Manning River Estuary produced for the Manning River ECMP Scoping Study found that pollutant loads from urban stormwater are relatively low compared to catchment loads from agricultural land (MCC 2020).

Potential impacts include:

- Excess nutrients fuel algal blooms which lead to habitat loss impacting on the abundance and diversity of macroinvertebrates and aquatic fauna
- Visual pollution from gross pollutants impacting scenic amenity, town pride, tourism and recreation.
- Plastics can mimic natural food sources and injure/kill wildlife including birds, fish and dolphins.
- Sediment reduces the amount of light available for seagrass to grow, impacting aquatic fauna.
- Organic matter such as grass clippings reduces oxygen levels in the water as it breaks down, killing plants and animals.

**In Taree, Browns Creek** is an identified hot spot affected by runoff from the town centre and residential area which carries litter, hydrocarbons, sediments and nutrients into the creek.

**In Wingham** large catchments with aging infrastructure have led to increased erosion at outlets causing sedimentation in the local waterways, and as hydrocarbons and litter pollution at the Wingham Wetlands site next to the major shopping centre.

**Management agencies:** MidCoast Council (MCC), Hunter Local Land Service (Hunter LLS), DPIE – Environment, Energy and Science, NSW Government.

**Community:** Friends of Browns Creek; Team Taree, OzFish, Mid Coast 2 Tops Landcare.

**Who's affected?** Private landholders, MCC, DPIE – Crown Lands, community members, fishing and oyster industry.



## 6.12 BIODIVERSITY LOSS

**At the national level, key threats to biodiversity in aquatic ecosystems** and marine receiving waters include diffuse-source water pollution, degraded riparian habitats and climate change, including the impacts of changed frequency, magnitude and intensity of floods and droughts.<sup>56</sup>

**In NSW, land clearing is currently the main threat** to the extent and condition of native vegetation and habitat for terrestrial fauna.<sup>57</sup> Clearing, degradation and fragmentation of vegetation due to land uses such as agriculture and urban development result in loss of diversity and degradation of natural terrestrial and aquatic environments (Commonwealth of Australia, 2017).

**These threats are reflected in the Manning River** estuary and catchment, where major stressors include:

- Habitat loss, degradation and fragmentation
- Water pollution from sediment and nutrients
- Changing climate including extreme weather events such as drought and widespread and intense wildfires
- Invasive plants (Senegal tea, long-leaf willow primrose, small and large-leaved privet, vine weeds) and pest animals (foxes, rabbits/hares, feral deer, feral pigs, goldfish)
- Diseases such as Phytophthora, Chytrid fungus and myrtle rust
- Altered hydrological regimes (e.g. weirs and causeways blocking fish passage)
- Land-uses such as forestry (private and public) and mining
- Manning River helmeted turtle: predation, habitat degradation and illegal collecting.

Loss of biodiversity (species and trophic levels) is classified as a high risk to social, economic and cultural benefits of the NSW Marine Estate.<sup>58</sup> The pressures that have pushed biodiversity and natural ecological systems in the catchment into decline also undermine the delivery of important ecosystems services, which in turn impacts social and economic drivers in the MidCoast Region.

**Stakeholders:** NSW National Parks and Wildlife Service (NPWS), MidCoast Council (MCC), DPIE, Hunter LLS; Purfleet-Taree Local Aboriginal Land Council, Taree Indigenous Development and Employment (TIDE); Gloucester Environment Group, Mid Coast 2 Tops Landcare, Manning River Turtle Conservation Group, OzFish, Manning-Great Lakes Birdwatchers, Koalas in Care, FAWNA.

56: Commonwealth of Australia, 2019 57: Commonwealth of Australia, 2017 58: Marine Estate Management Authority, 2018

## 6.13 SEWERAGE AND SEPTIC SYSTEM PATHOGENS

**MidCoast Council operates eight Sewerage Treatment Plants (STPs)** in the Manning catchment, at Gloucester, Wingham, Dawson wetlands (Brimbin), Harrington, Manning Point, Old Bar, Cooperbrook and Lansdowne.

**Most of the region is unsewered**, relying on on-site sewage management (OSSM) systems including traditional septic systems and pump-to-sewer systems. MidCoast Council (MCC) has the responsibility to ensure that all onsite sewage management systems are approved, installed and managed so that they comply with the requirements under the Local Government Act 1993 and do not pose a risk to the environment or public health.

**Failing systems or mismanagement of OSSMs present a pathogen risk** to groundwater and receiving waters, with consequent health risks for the oyster industry, potable water and recreation.<sup>59</sup>

**Sewerage and STP run-off have been found to affect water quality** in the Manning, particularly during high rainfall events.<sup>60</sup> While the highest faecal input comes from livestock, human pathogens have the highest safety risk.

**Pathogens (faecal coliforms and E. coli) from sewerage and septic systems are an issue for the local oyster industry**, particularly at Pelican Bay, Scotts Creek and the South Channel. In the Manning oyster fishery, rainfall exceeding 25 mm in 24 hours

is a trigger for closure of harvest areas due to the potential decrease in salinity and increase in faecal coliforms that can result from significant rainfall stormwater run-off.<sup>61,62</sup> Depuration requirements add time and cost to the harvest-to-market process. Critical risk on-site sewage management systems for the oyster industry are located within 100 meters of the shoreline and adjacent to a shellfish harvest area.<sup>63</sup>

**Pathogens from human sources pose a risk to raw water quality for potable water** extracted from the Manning catchment at Barrington and Bootawa. MidCoast Council's water services team (formerly MidCoast Water) held drinking water risk workshops in May 2016 and July 2020, both of which identified bacteria, viruses and protozoa as high to extreme risk for raw untreated water.<sup>64</sup> Water Treatment Plant and operational policies (e.g. selective extraction from the river) produce safe drinking water.

**Pathogens present a hazard for passive and secondary recreation**, with popular activities including swimming, boating and kayaking. This is rarely an issue. After the 1-in-100-year flood in March 2021, water quality testing by the Environment Protection Authority gave the all-clear for swimming in the Manning and Dawson Rivers less than two weeks after the flood.

**Stakeholders include:** NSW Food Authority, MCC Water Services, MCC Environmental Health and Natural Systems teams, Environment Protection Authority (EPA), Department of Primary Industries - Fisheries, oyster farmers, MCC Water Services (rate payers, water buyers); passive and secondary recreation users; recreation and commercial fisheries; tourism industry.



Figure 34: Clean water is essential for safe recreation  
Photo: Mandy Friedrich

59: Swanson, 2019 60: Williams, 1987 61: Bullock, 2018 62: Parsons, 2010 63: NSW Fisheries Spatial Data Portal - <https://www.dpi.nsw.gov.au/fishing/spatial-data-portal> 64: Bligh Tanner, 2016

## 6.14 EROSION AND SEDIMENT

**Water quality testing shows high turbidity levels after periods of rainfall** in both the freshwater catchments and the Middle and Upper Manning Estuary. High turbidity is caused by sediments suspended in the water column. Along with agriculture as previously discussed, activities that contribute to erosion and sedimentation include:

**Unsealed roads**, stock crossings and unsealed driveways

**Forestry operations** including dirt roads and timber harvest<sup>65</sup>

**Construction sites** disturb soil and create dust and debris. Construction includes Council road, bridge and drainage works and private infrastructure such as homes and dams.

**There is community concern that boatwash** is causing significant bank erosion in the Lansdowne River and a study identified the Dawson River was at risk, exacerbated by historic clearing of riparian vegetation (McKeown and Associates, 1997). Flood, tide and wind waves are of more concern in the Manning main channels.

**The bushfires of late 2019** burnt 244,173ha, representing 30% of the catchment, with several subcatchments burning over 90%. The potential for soil erosion after a bushfire can be severe due to the destruction of ground cover and the litter layer.

The estuary has an average flushing time of 31.6 days, compared with a State-wide median estuary flushing time of 9 days (Roper et al. 2011). Due to the long residence time of fresh water, the estuary is sensitive to the accumulation of sediments.

High concentrations of suspended sediments in rivers can:

- diminish light needed for photosynthesis, reducing condition and extent of aquatic plants including seagrass at the base of the food chain
- cause eutrophication of rivers and wetlands
- make water unsuitable for irrigation and cattle
- increased the cost of potable water treatment and infrastructure maintenance
- smother the stream bed, macroinvertebrate habitat and seagrass
- inhibit respiration and feeding of stream biota.<sup>66</sup>

**Stakeholders:** MidCoast Council, Hunter LLS, Transport for NSW, Department of Primary Industries - Fisheries, DPI - Forestry, Mid Coast 2 Tops Landcare, Environmental Protection Authority, recreational boating associations, landholders.

**Related issues:** Loss of riparian vegetation, stormwater, agricultural impact.

65: Midcoast Water, 2011 66: NSW Government, 2009



## 6.15 SYSTEMS THINKING: THE INTERACTION BETWEEN ISSUES

Ecological systems such as rivers are made up of connected interactions between living organisms, including humans, and their physical environment. The issues presented here do not occur in isolation. Many of them are “wicked problems” with no single solution and as such no single action will be able to “fix” the identified issue.

“Systems thinking” is an approach to problem solving which recognises this complexity. Problems are considered as parts of an overall system. Solutions seek to address multiple interactions in the system rather than reacting to a single impact which is frequently ineffective and can cause unintended consequences.

While the Manning River ECMP presents issues and actions focussing on single stressors, impacts and interventions, it is recognised that many of the issues are interrelated, and management actions will need to work together holistically to achieve long-term environmental improvement.

For example, bank erosion is a problem in the estuary. It has multiple causes including tidal movements, wind, waves and boatwash. Clearing of riparian vegetation including mangroves has made banks more vulnerable to erosion. Stock activity adds to the vulnerability. Changes in tidal movements caused by sea level rise or entrance modifications will exacerbate bank erosion.

In this scenario, a single intervention, for example rock armouring of a reach of bank, will not address the problem. The Manning River ECMP recognises that in many cases its actions will be most effective when working in concert to address multiple stressors holistically.

Examples of holistic actions that could work together to address an issue include:

- Riparian restoration, bank revetment, stock management, source control of boatwash erosion and education for the river users to practice responsible boating.
- Maintenance of Gross Pollutant Traps, restoration of constructed wetlands, source control of litter and community education (only rain down the drain).

Systems thinking will be used to implement the Manning ECMP.

## 7. MANAGEMENT ACTIONS

The following Management Actions were developed to respond to risks and threats, address the issues and achieve our objectives. They were derived from several consultation inputs:

- One-on-one interviews with members of the Manning River ECMP Reference group
- A series of 13 issue analysis discussion groups with members of the Technical Advisory Group and delivery partners
- A series of 9 workshops with internal and external delivery partners to firm up the details of the management options, assess whether they belonged in the ECMP Action Program, complementary programs or could be amalgamated, and convert them to S.M.A.R.T format (Smart, Measurable, Achievable, Timely).

Additional detail that will assist practitioners to understand the context and intention of the actions is provided in Annexure J: Manning River ECMP Management Actions with Practice Notes.

### Evaluation of management options

A structured and transparent evaluation of management options against the three broad themes of feasibility, viability and acceptability is required by the Coastal Management Manual. MidCoast Council's project team managed acceptability evaluation while a team of consultants led by Salients undertook the feasibility and viability evaluation.

The method and results of the evaluation process are outlined below and shown in Figure 35. The full evaluation report is provided in Annexure K: Report: Evaluation of management options for the Manning River ECMP (Salients 2021).

The feasibility evaluation considered whether the actions could be completed in technical, engineering and/or legal terms. As a first stage of the feasibility assessment every management option was subjected to a multi-criteria assessment. The purpose of an ECMP is to give effect to the objectives of the Coastal Management Act 2016. For this reason, the objects/objectives of the CM Act and, by extension, the Marine Estate Management Act 2014 were used as the criteria against which each of the management options were assessed.

Where options were identified as being suitable for direct progression (typically low cost, low regrets, high confidence of success), the multi criteria assessment was applied as a confirmatory feasibility assessment.

**“People will move here and invest here if they know we are committed to looking after the river.”**

Ian Crisp, oyster grower,  
Manning River ECMP Reference Group



For other, more complex or expensive actions, the feasibility assessment also involved more detailed consideration including, at least, a qualitative evaluation of potential shortcomings and benefits.

The viability evaluation focussed on economic and financial considerations, asking:

- Is the option justifiable in terms of improving overall wellbeing (economic assessment)?
- Is it possible to fund the option?

If the answer to the first question was “Yes”, the option was included in the business plan assuming there will be an opportunistic mechanism to carry it forward, even if there is no viable funding mechanism presently available. The funding environment changes from year to year and the ECMP should be able to take advantage of any funding opportunities that might make an action viable in future, even if a present funding pathway cannot be readily identified.

As a minimum, all short-listed options have had a cost estimate derived, based largely on the experience of study team members, assisted by staff from MCC and Hunter LLS. When this cost estimate is combined with the qualitative multi-criteria analysis feasibility assessment, it constitutes a “Simple Economic Assessment” (in the terminology of the CM Manual).

More detailed financial assessment has been undertaken for several management options, with a specialist report prepared by the Centre for International Economics (CIE). Where this is the case, the options examined have been subjected

to assessments of varying complexity, up to an “Intermediate Level Assessment.” The more complex options assessed by the CIE were subject to Rapid Cost Benefit Analysis (CBA) assessment which follows the same framework as a detailed CBA, except that it allows the use and consideration of qualitative assessments and is more accepting of imperfect data or data gaps.

All options were found to be feasible in the sense that there is no key impediment from a legal, technical or engineering perspective. In some cases, future study to better direct actions at specific sites and/or follow up engineering design may be required as the ECMP is implemented.

All options were found to be viable in that they have been assessed as being good value for money except for one, a study on the viability to buy and retire water licenses. Importantly though, none of the options have been subjected to a full cost benefit analysis where attempts are made to quantify, in dollar terms, the full suite of benefits arising from the management option being assessed. Viability has been assessed, in part, by considering the amounts that would normally be spent on similar activities.

Acceptability evaluation considers whether there is broad acceptability among community and stakeholders, as determined through consultation. Consultation has been consistent and extensive during Council’s ECMP preparation process to ensure management actions are acceptable to community representatives and delivery partners.

Acceptability was formally assessed via:

- A meeting with the ECMP Reference group to review the “long-list” of actions prior to filtering at the management action workshops mentioned above.
- A series of workshops with delivery partners held in February-March to review the Management Actions and set targets.
- One-on-one meetings with lead agencies and delivery partners within and external to Council to ensure all Management Actions included in the final draft were acceptable, including the intention of the action, the wording used, S.M.A.R.T targets and budgets.

These consultations are documented in the Stakeholder report, Annexure B.

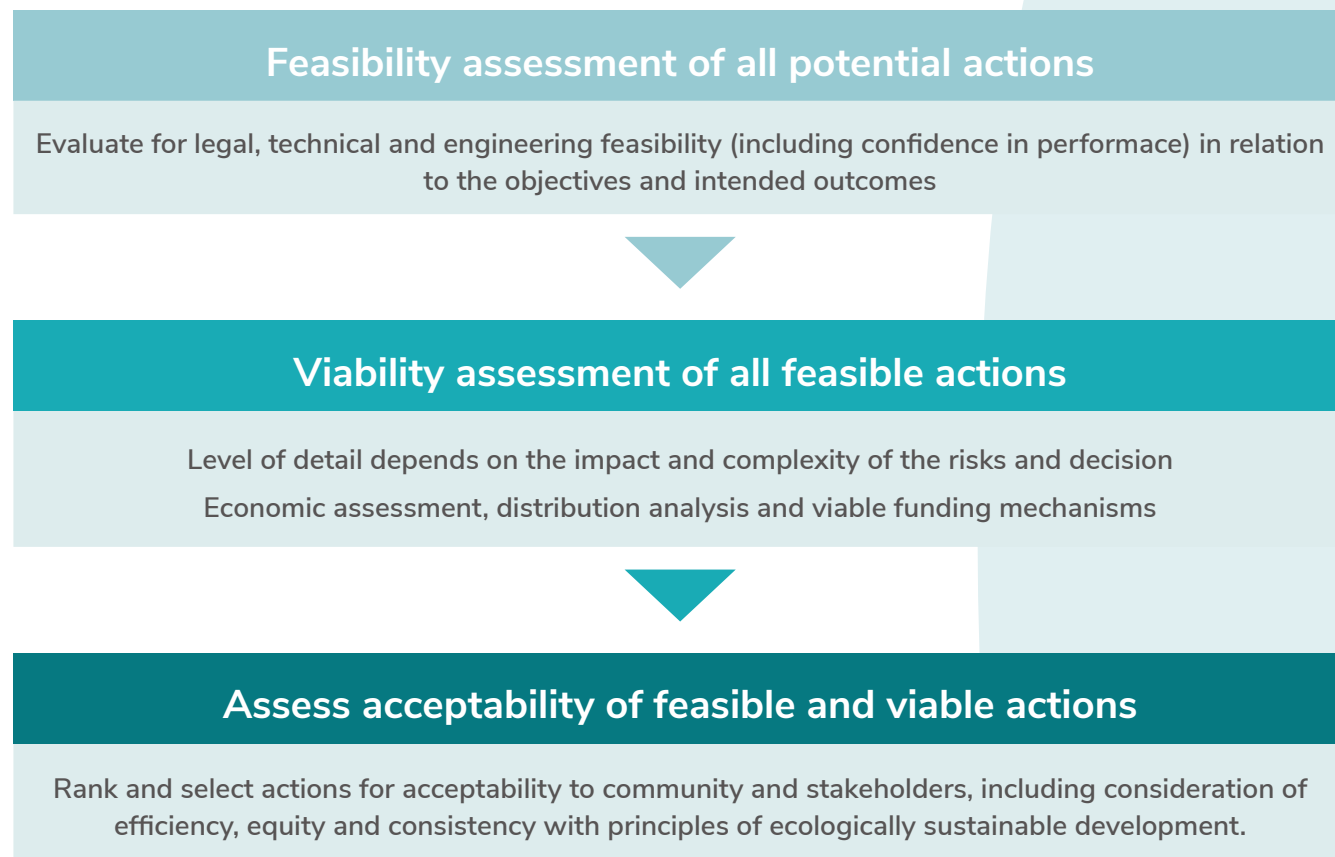
#### Find out more:

Further information can be downloaded from [www.midcoast.nsw.gov.au/ourmanningriver](http://www.midcoast.nsw.gov.au/ourmanningriver)

Annexure B: The Manning River ECMP Stakeholder Consultation Report (MCC 2021)

- Annexure J: Manning River ECMP Management Actions with Practice Notes (MCC 2021)
- Annexure K: Report: Evaluation of management options for the Manning River ECMP (Salients 2021)

Figure 35: The three stages of evaluation



Reference: NSW Coastal Management Manual Stage 3

# THEME 1: STEWARDSHIP

Engage with the community, build capacity and support partnerships to promote understanding, connection and stewardship.



“ It’s the responsibility of everyone to respect and understand our iconic river system. Appreciate it, utilise it, and do their bit to keep it clean.”

Sam Nicholson, Dairy Farmer,  
member ECMP Reference Group

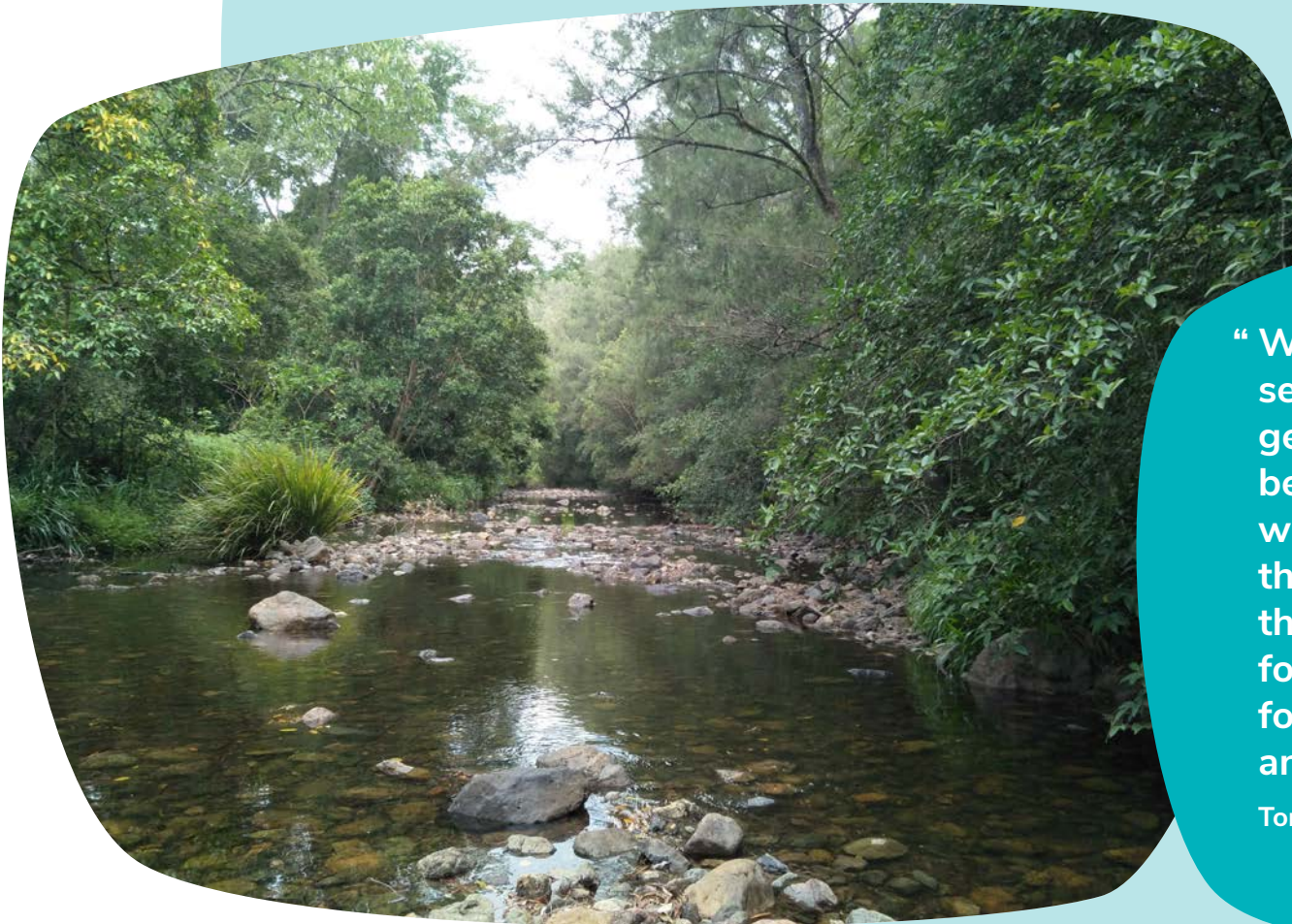
## 7.1 STEWARDSHIP ACTIONS

1.01	Engage river users and the whole community in an engagement program to promote understanding and stewardship of the river a) Identify desired practices, undertake stakeholder analysis and needs assessment, develop an engagement program b) Implement the engagement program to build understanding of ecosystem values and services and commitment to stewardship.
Issues addressed	Floodplain drainage and ASS; Agricultural impacts; Stormwater and litter; Erosion and sediment; Biodiversity loss; Coastal wetlands loss; Riparian vegetation loss; Low and modified flows
Lead agency	MCC (Lead) and Hunter LLS in partnership with MC2T Landcare, DPI-Agriculture, community groups, schools and DPIE.
1.02	Promote whole-farm planning and Best Management Practice for catchment outcomes a) Establish an environmental Best Management Practice framework for agriculture in the Manning catchment including the estuary b) Support landholders to develop whole farm planning approaches to decision making based on best management practices.
Issues addressed	Floodplain drainage and ASS; Agricultural Impacts
Lead agency	MCC (a) and Hunter LLS (b) in partnership with MC2T Landcare, DPI-Agriculture, Industry Groups and DPI - Agriculture.
1.03	Promote and facilitate establishment of 30 private conservation agreements covering 1500 ha in the Manning catchment by 2030, through Land for Wildlife and the Biodiversity Conservation Trust.
Issues addressed	Agricultural impacts; Biodiversity loss; Riparian vegetation loss
Lead agency	Led by Biodiversity Conservation Trust and MidCoast Council (LFW) with support from Hunter Local Land Services and MC2T Landcare.

1.04	<p>Develop a litter and stormwater pollution source control program</p> <p>a) Monitor and report annually on the volume, type and location of litter collected during GPT maintenance and clean-up days</p> <p>b) Utilise this data for targeted education and engagement campaigns</p> <p>c) Develop source control plans for identified hot spot locations</p> <p>d) Support community and industry groups to complete a minimum of one litter clean up event each year in identified hot spots.</p>
Issues addressed	Stormwater and litter
Priority area	Taree, Browns Creek
Lead agency	MidCoast Council
1.05	<p>Develop and distribute guidelines to promote improved erosion and sediment control (ESC) for earthworks and infrastructure on private land.</p>
Issues addressed	Erosion and sediment
Priority area	Dingo Creek, Lansdowne River, Cedar Party Creek, Barrington River, Barnard River, Upper Manning River
Lead agency	MidCoast Council
1.06	<p>Improve erosion and sediment control (ESC)</p> <p>a) Develop a comprehensive erosion and sediment control management system within MCC. Identify improvements required; set benchmarks; undertake audits and share results to build capacity.</p> <p>b) Develop and implement an ESC capacity building program for designers, builders, engineering consultants and developers. Follow up with a proactive, targeted compliance program by 2025.</p>
Issues addressed	Stormwater; Erosion and Sediment
Priority area	Estates under development such as Brimbin, Figtree and Kolodong
Lead agency	MidCoast Council

## THEME 2: WATER QUALITY AND ECOSYSTEM HEALTH

Manage the Manning River catchment and its estuary holistically to maintain and improve water quality and ecosystem services



“ We need to maintain ecosystem services; those services that we get from the river for free and the benefits they provide – drinking water, food, recreational spots, the geomorphic regeneration of the river through accretion of silts for agriculture. The river supports forests, recharges groundwater and sustains fisheries”

Tony Wales, member ECMP Reference Group

## 7.2 WATER QUALITY AND ECOSYSTEM HEALTH ACTIONS

2.01	Implement key priority acid sulfate soil management actions from the draft Manning River Floodplain Prioritisation Study 2021: a) Reinstate 1550 ha of coastal wetlands on public and private land subject to landholder agreement b) Audit, upgrade, replace or decommission Council floodgates within the Lower Manning Floodplain and add them to MCC's Asset Management Program. Promote rectification of floodgates on private land.
Issues addressed	Floodplain drainage and ASS; loss and degradation of coastal wetlands
Priority areas	The highest priority ASS areas for remediation are Moto, Ghinni Ghinni and Big Swamp. These three areas contribute 81% of the overall acid drainage risk Ghinni Ghinni Creek, Dickenson's Creek, Lansdowne River and the northern arm of the Manning River downstream of Dumaresq Island are the highest acid impacted surface water areas in the estuary
Lead agency	MCC (Lead) and Hunter LLS in partnership with MC2T Landcare, DPI-Agriculture and DPIE - Crown Lands.
2.02	Investigate options and work with landholders to restore 100 ha of coastal wetlands on both public and private land by 2031, for example by managing stock and reinstating tidal flushing.
Issues addressed	Agricultural impacts, loss and degradation of coastal wetlands, Biodiversity
Priority areas	CM SEPP-listed wetlands at Mitchells Island (Pelican Bay), Oxley Island, Cabbage Tree Island, Jones Island, Bohnock, Pampoolah, Mamboo Island, lower Lansdowne River, Dawson Wetlands
Lead agency	Hunter LLS (lead) with supporting agencies MCC, DPI-Fisheries, NSW Coastal Protection Scheme, Biodiversity Conservation Trust, MC2T Landcare, NPWS and DPIE - Crown Lands.
2.03	Improve the condition, extent and connectivity of riparian and estuarine bank vegetation on private and public land by protecting and/or restoring 50 km of buffer vegetation by 2031.
Issues addressed	Riparian vegetation loss; Agricultural impacts, Biodiversity
Priority areas	Priority subcatchments with proximity to the estuary: Manning River, Scotts Creek, South Arm, Ghinni Ghinni Creek, Killabakh Creek, Lansdowne River, Dingo Creek, Moorah Creek, Cedar Party Creek. Priority subcatchments in the upper catchment: Barnard River, Gloucester River, Barrington River
Lead agency	Hunter LLS with support from MidCoast Council, NPWS and DPIE - Crown Lands.

2.04	Promote good catchment management practice on public land a) Ensure any new grazing tenures on Crown land include appropriate controls to manage stock impacts on riparian vegetation and CM SEPP-listed coastal wetlands b) Promote compliance with grazing lease tenure conditions.
Issues addressed	Agricultural impacts; Coastal Wetlands loss; Riparian vegetation loss Biodiversity loss
Lead agency	DPIE - Crown Lands, with support from NPWS
2.05	Implement the Manning River Taskforce Recommendation 1: that the proposed Manning River Entrance Project is entered into the Infrastructure NSW Investor Assurance and NSW Treasury business case process. The development of a Strategic Business Case (SBC) is required to further analyse the optimal engineering outcome, the broader impacts of intervention in the area, and the relative costs and benefits of the identified options. If the benefits are found to outweigh the costs of the project, a more rigorous engineering, constructability, and environmental impact assessment should be undertaken in a Final Business Case prior to a decision to invest in a permanent solution.
Issues addressed	Entrance modifications; Coastal wetlands loss; Biodiversity loss; Climate change; Coastal inundation
Lead agency	Transport for NSW
2.06	Implement the Manning River Taskforce Recommendation 2: that any future process should be supported by an extensive stakeholder consultation process that includes the local community and impacted industries and stakeholders as well as consideration of progress in the development of Mid-Coast Council's two CMPs.
Issues addressed	Entrance modifications; Fragmented governance; Stewardship
Lead agency	Transport for NSW
2.07	Implement a systematic approach to maintaining stormwater quality improvement devices a) Refurbish 5 proprietary Stormwater Quality Improvement Devices to achieve their full working capacity by 2022. b) Incorporate Water Sensitive Design devices in the MCC asset management program by 2023 and implement the monitoring, maintenance and renewal program. c) Complete a report on the upgrade of Wingham Wetland, including feasibility, budget and scope of works. Implement resulting actions by 2025.
Issues addressed	Stormwater and litter
Priority areas	Proprietary devices identified in audit; Wingham constructed wetland
Lead agency	MidCoast Council
2.08	Review, revise and supplement current stormwater, policies, procedures and guidance in order to create opportunities to incorporate Water Sensitive Urban Design into Council's new and upgraded capital infrastructure.
Issues addressed	Stormwater and litter
Lead agency	MidCoast Council

2.09	Revise the Greater Taree Capital Urban Stormwater Management Plan (2000) by 2025, adding the township of Gloucester. Implement resulting actions
Issues addressed	Stormwater and litter
Priority areas	Gloucester, Taree including Browns Creek, Wingham
Lead agency	MidCoast Council
2.10	Complete a study to prioritise sensitive estuarine riverbank areas for management. Follow up by stabilising 5 km of estuarine streambanks in priority areas using best practice that promotes native vegetation by 2031.
Issues addressed	Erosion and sediment; Riparian vegetation loss; Recreational boating
Priority areas	Manning estuary, Lansdowne River, Dawson River and Scotts Creek to the tidal limit.
Lead agency	MCC, DPI-Fisheries, Hunter LLS, with support from NPWS
2.11	Identify, assess and prioritise sediment hotspots from unsealed roads. Remediate 5 sites by 2026.
Issues addressed	Erosion and sediment
Priority areas	Dingo Creek, Lansdowne River, Cedar Party Creek
Lead agency	MidCoast Council
2.12	Complete Council's Onsite Sewerage Management System (OSSM) Audit and Compliance Strategy by 2022 and implement with a proactive inspection program in identified high-risk locations.
Issues addressed	Pathogens (Sewerage and Septic)
Priority areas	Areas within proximity of oyster harvest leases with slow tidal exchange and potable water offtakes
Lead agency	MidCoast Council
2.13	Undertake monitoring, evaluation and reporting of ecosystem health to guide adaptive management a) Implement the Manning River ECMP ecosystem health MER Program b) Establish a platform for data sharing between agencies.
Issues addressed	Monitoring and Evaluation
Lead agency	MidCoast Council
2.14	Undertake a scientific research program in partnership with academic institutions to fill knowledge gaps and enable evidence-based adaptive management of the catchment and estuary.
Issues addressed	All
Lead agency	MidCoast Council (Lead) with HLLS and academic institutions

## THEME 3: CLIMATE CHANGE

Understand, mitigate, adapt and build resilience to current and future hazards including the impacts of climate change



**“ We need to take action to mitigate and adapt to the impacts of climate change.”**

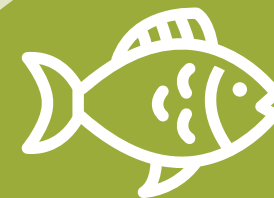
Noel Piercy, Community Representative,  
Member ECMP Reference Group

## 7.3 CLIMATE CHANGE ACTIONS

3.01	Use research data that identifies retreat buffer zones for coastal wetlands and littoral rainforest under sea-level rise scenarios to develop a forward plan to retain suitable buffers in partnership with landholders.
Issues addressed	Coastal wetlands loss; Biodiversity
Lead agency	MidCoast Council in partnership with DPI - Fisheries and Hunter Local Land Services
3.02	Develop forward plans in Council's Asset Management Program for upgrade and replacement of Council assets at risk from sea level rise and extreme storm events (e.g. roads, stormwater systems, and river access facilities).
Issues addressed	Impact on infrastructure
Lead agency	MidCoast Council
3.03	Work collaboratively with landholders and other stakeholders to develop an adaptation plan to mitigate the long-term (50-100 years) risk of climate change impacts on the floodplain, including management of productivity, coastal wetlands, Acid sulfate soil and blackwater events.
Issues addressed	Floodplain drainage and ASS
Priority areas	Manning River floodplain
Lead agency	MidCoast Council in partnership with Hunter LLS, DPI-Fisheries

## THEME 4: BIODIVERSITY

Protect and conserve natural character and biological diversity



“ There are not too many systems coming out of a World Heritage Area with the ice age diversity of the Gondwana flora. It’s an important piece of dirt!”.

Peter Bignell, Grazier,  
Member ECMP Reference Group

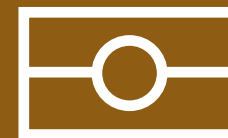
Figure 36. Platypus field research (photo: Platypus Conservation Initiative)

## 7.4 BIODIVERSITY ACTIONS

4.01	Address 3 priority sites and/or re-connect 70 km of fish passage by removing or re-designing barriers identified in the audit by Fisheries.
Issues addressed	Biodiversity loss
Priority areas	Priorities in the estuary: barriers on main stem and tributaries of the Manning with proximity to the estuary Priority freshwater river subcatchments: Bretti Trail Road causeway on the Barnard River; Hicks Lane on the Cooplacurripa River; Duffys Forest Road and Cells River Road on Rowleys River
Lead agency	MidCoast Council in partnership with DPI - Fisheries
4.02	Develop and implement cross-tenure integrated pest and weed control plans to protect priority natural assets within the Manning River and its catchment.
Issues addressed	Biodiversity loss; loss and degradation of riparian vegetation
Lead agency	Hunter Local Land Services (lead) with supporting agencies MCC, NPWS, Forestry Corporation
4.03	Implement recommendations of the Manning Catchment Refugia Study 2021, working in partnership with private landholders to assess, protect, restore and monitor hydrological refugia in 10 priority reaches in priority subcatchments.
Issues addressed	Biodiversity loss
Priority areas	Dingo Creek, Barnard River, Nowendoc
Lead agency	MidCoast Council with support from MC2T Landcare and Manning River Turtle Steering Group.

## THEME 5: ABORIGINAL CUSTODIANSHIP

Acknowledge and support Aboriginal peoples' spiritual, social, customary and economic connection to the Manning River Catchment and its Estuary



“Our country is bound by where the leaves touch the water from the mountains to the sea. We rely on the natural flow of the fresh to the salt for rebirth of all species and to keep the system clean.”

Joedie Lawler,  
CEO Purfleet-Taree Local Aboriginal Land  
Council, Member ECMP Reference Group

Photo Credit Brett Dolson

## 7.5 ABORIGINAL CUSTODIANSHIP ACTIONS

5.01	<p>Involve Aboriginal traditional knowledge and personnel in management of the river, catchment and estuary:</p> <p>a) Support the Conservation and Ecosystem Management TAFE course for Aboriginal Rangers by providing guest speakers.</p> <p>b) Build partnerships with Aboriginal Rangers to implement conservation and land management in the Manning catchment.</p> <p>c) Conduct cultural burns on Council land to reduce fuel loads and maintain ecological processes.</p>
Issues addressed	Riparian vegetation loss and degradation; Coastal Wetlands loss and degradation; Biodiversity loss - pests and weeds
Lead agency	MidCoast Council (lead) with supporting agencies Hunter Local Land Services, PT LALC, TIDE.
5.02	Install interpretive signage and facilitate cultural activities to share the story of the Manning River's significance to Biripi people.
Issues addressed	Stewardship
Lead agency	MidCoast Council with support from PT LALC.
5.03	<p>Involve Aboriginal people in monitoring of the river:</p> <p>a) Engage Aboriginal people including school students and commercial fishers in Waterwatch monitoring.</p> <p>b) Establish a single contact person at Council for the Aboriginal Community to report pollution incidents impacting on estuary health.</p>
Issues addressed	Stormwater and litter; Floodplain drainage and ASS; Agricultural impacts
Lead agency	MidCoast Council with Hunter Local Land Services, PT LALC, TIDE.
5.04	Increase involvement of Aboriginal people in the Manning River ECMP by appointing two Aboriginal representatives to the ECMP Reference Group (See Action 8.01) and inviting Council's Aboriginal Community Development Officer to attend meetings.
Issues addressed	Governance
Lead agency	MidCoast Council

## THEME 6: SOCIAL AND ECONOMIC VALUES

Manage the Manning River Catchment and its Estuary to maintain and improve social, cultural, and economic opportunities and benefits



“The river is the lifeblood of our community – we drink from it, eat fish, use it for recreation. The river serves us, and we serve it.”

Cr Len Roberts, co-chair,  
Manning River ECMP Reference Group



Photo: Jordan Reed

# 7.6 SOCIAL AND ECONOMIC VALUES ACTIONS

6.01	Investigate and implement pathogen source control measures as required for high-risk areas.
Issues addressed	Pathogens
Priority areas	Proximity to oyster harvest leases, potable water offtakes and aquatic recreation areas
Lead agency	MidCoast Council (lead) with NSW Food Authority.

# THEME 7: LAND USE PLANNING

Facilitate ecologically sustainable development and promote sustainable land use planning decision-making



**“ We need good planning for development that allows the river space to be a river. Minimise damage by not putting development in harm’s way.”**

Kirsty Hughes, Community Representative  
and Member ECMP Reference Group



## 7.7 LAND USE PLANNING ACTIONS

7.01	Provide evidence, undertake landholder consultation and submit a planning proposal recommending amendments to the Coastal Management SEPP to support purchase, rezoning and remediation of coastal wetlands to improve ecosystem services and sequester carbon. See section 11 and Annexure M.
Issues addressed	Coastal Wetlands
Lead agency	MidCoast Council
7.02	Prepare mapping of the Tidal Inundation Coastal Vulnerability Area and undertake stakeholder consultation to inform a future planning proposal recommending amendments to the Coastal Management SEPP.
Issues addressed	Climate Change; Tidal inundation
Lead agency	MidCoast Council
7.03	Use the Risk Based Framework to identify water quality objectives and associated management targets for development within the Manning River Catchment. Develop and include stormwater quality targets in MCC's harmonised LEP and DCP.
Issues addressed	Stormwater; Erosion and Sediment
Lead agency	MidCoast Council



## THEME 8: GOVERNANCE

Build stakeholder partnerships for good governance and integrated management



**“Look at the whole picture and manage holistically”**

Peter Neal, Dairy Farmer,  
Member ECMP Reference Group

Photo: The Manning River ECMP Reference Group

## 7.8 GOVERNANCE ACTIONS

8.01	Establish a ECMP Working Group to coordinate operational implementation of the Manning River ECMP, with representation from all government agencies involved in project delivery.
Issues addressed	Fragmented Governance
Lead agency	MidCoast Council
8.02	Implement a holistic, interagency approach to compliance and regulation focussing on identified ECMP risks and issues. a) Promote compliance through community education. b) Develop organisational systems and capacity for proactive compliance. c) Build community capacity to report illegal activities.
Issues addressed	Vegetation loss and degradation; Low and modified flows; Erosion and sediment
Lead agency	MidCoast Council, with support from DPIE - Crown Lands

## 8. COMPLEMENTARY MANAGEMENT PROGRAMS

Some of the management options identified during consultation have been included in alternate programs of Council and other agencies, rather than including them in the Manning River ECMP Action Program.

Including actions in the ECMP introduces a legal obligation to carry through. However, it also provides access to the DPIE Coast and Estuary Grants funding stream, acknowledging this is a competitive process.

Throughout the consultation process, participants took a holistic view of the estuary and its catchment. In total 127 management options were proposed.

During the final series of consultation workshops on management options held in February-March 2021, stakeholders identified 25 management options that either were already being managed by other programs or would be best be delivered through other programs.

Several criteria were used to make these decisions:

- Is the option subject to separate NSW government legislation?
- Is it already managed adequately in an alternate program?
- Is it securely funded under a separate process?

A description of the complementary programs and their Management Actions which will contribute

to the objectives of the Manning River ECMP are outlined below. These actions will be monitored and reviewed through the ECMP's Monitoring, and Evaluation Program, with progress reported through our Reference Group on an annual basis.

### 8.1 COUNCIL PROGRAMS THAT CONTRIBUTE TO ESTUARY AND CATCHMENT MANAGEMENT

#### 8.1.1 Integrated Water Cycle Management and water resilience

**Team:** Water Services

**Theme:** Water Quality and Ecosystem Health

During the record-breaking drought in 2019, low flows and extraction were understandably major concerns for community representatives consulted for the Manning ECMP.

**Council's Integrated Water Cycle Management Strategy** (IWCM Strategy) meets the Guidelines for Best-Practice Management of Water Supply and Sewerage under the Local Government Act 1993.

The IWCM Strategy sets out the direction for the sustainable management of water and sewer services to 2045. It aims to manage water responsibly and recognises that river and groundwater are limited resources required for the healthy functioning of ecosystems.



**Responding to the drought**, Council's Water Services department established a cross-Council and interagency Water Resilience Team, which is guided by the IWCM Strategy. While potable supply is a key concern, the team aims to achieve a zero or positive impact on our water resources, aligned with the objectives of the Water Sharing Plan.

**The Water Resilience team has its own action program** which will help maintain both potable water security and environmental flows by managing water use sustainably:

- Ensure Sewerage Treatment Plant management is effective and capacity matches new residential demand
- Minimise water loss through the continued upgrade of MCC water infrastructure to maximise water efficiency
- Continue MCC programs to support implementation of the Smart Water Advice Audit for large water users, e.g. caravan parks, abattoir, dairy industry, hospital
- Complete review and implementation of MCC's Integrated Water Cycle Management Plan to improve drought security and protect environmental flows
- Consider expanding use of treated effluent for stock purposes and farm use
- Promote uptake of Best Management Practice to conserve water and improve drought resilience on farms
- Develop Best Management Practice for water conservation on Council open space
- Continue MCC programs with residents to promote water efficiency, eg water restrictions, ongoing education, pricing mechanisms
- Liaise with the Manning Water Users Association to regulate extraction during drought.

## 8.1.2 The Biodiversity Framework

**Team: Natural Systems**

**Theme: Biodiversity**

The Manning River and estuary provide important habitat for wildlife, including dispersion corridors. During consultation for the ECMP, biodiversity conservation was a strong theme.

**MidCoast Council's Biodiversity Framework (2021) provides a platform** for integrated management of land, water and living resources to achieve biodiversity management and conservation

outcomes. There is considerable synergy with the ECMP.

In allocating actions between the two programs, the ECMP focusses on riparian vegetation, aquatic species and fauna that depend on the riparian zone for food, shelter and dispersal. Terrestrial vegetation and fauna not tightly tied to the riparian zone and river are managed through the Biodiversity Framework.

Actions identified through the ECMP consultation process that will be delivered via the Biodiversity

framework are as follows:

- Deliver an annual nature discovery program to raise awareness and commitment to conservation
- Develop an interagency, multi-media communication package and education and training materials to promote awareness, appreciation, understanding and skills to conserve wildlife in urban and rural settings
- Identify, prioritise and provide evidence to support amendments to the LEP and DCP for the protection of wildlife habitats and corridors.

### 8.1.3 Community Recovery and Resilience program

The Community Recovery Officer (CRO) is responsible for supporting community recovery after the 2019/2020 bushfires and 2021 floods. The CRO works with the community to identify needs, develop local recovery programs, assist in accessing information and resources and provide leadership and community capacity building.

A key part of recovery from bushfire and floods is to build community capacity to be more resilient and prepared for future disasters. This includes encouraging individuals to complete and maintain individual bushfire, flood and disaster preparedness plans, and working with communities to map community assets and vulnerabilities and develop local recovery plans.

The action developed through consultation for the ECMP that will be delivered through the Recovery and resilience program is:

- Build capacity for landholders to safeguard and recover from drought, flood and fire.

### 8.1.4 Recreation Needs Assessment

**Team: Community Spaces, Recreation and Trades | Theme: Social and Economic Values**

Objective 6 of the Manning River ECMP is to improve social, cultural, and economic opportunities and benefits of the estuary and its catchment.

Council is currently undertaking a recreation needs assessment that will help us achieve this objective. The recreation needs assessment will consider community demographics, participation and demand, open space planning and community consultation. Once complete, the recreation needs assessment will be used to develop an Open Space and Recreation Strategy (OSRS) to improve the quality of public space in the MidCoast LGA for wellbeing & economic growth.

Two actions identified through the ECMP consultation process will be addressed through the recreation needs analysis and OSRS:

- Explore opportunities to promote reorientation of riverfront towns to face the river and take advantage of the views.
- Develop a strategic mix of family-friendly passive recreational facilities including nature-based experiences that improve access while encouraging understanding and conservation of environmental and Biripi cultural values.

### 8.1.5 The Barrington Coast Destination Management Plan

**Team: Community Spaces and Services ECMP | Theme: Social and Economic Values**

Council's Barrington Coast Destination Management Plan sets out to achieve the vision that by 2030, MidCoast is renowned as a place where outstanding natural beauty meets vibrant country living, inspiring healthy and active lifestyles.

The Plan aims to position the MidCoast region as a "clean, green environment for the well-being of its communities and the quality of its produce." This positioning statement is supported by actions to develop a "soil to sea" event to promote the diverse and seasonal produce of the region, and a 'Sharing Our Produce' program to encourage greater awareness, use and promotion of local produce.

One action developed for the Manning River ECMP will be implemented via the Barrington Coast Destination Plan:

- Develop a program to build the link between premium produce, a healthy environment and sustainable farming practices (eg Manning Valley Naturally).

## 8.1.6 Land Use Planning for the Future

**Team: Land Use Planning | Theme: Land Use Planning**

Objective 7 of the Manning River ECMP is to facilitate ecologically sustainable development and promote sustainable land use planning decision-making. Council is developing a land use plan that will help achieve this and other objectives of the ECMP, ensuring future development meets the objects of the Act.

Council's strategic direction for each of the CM Areas, and our land-use strategies to meet the objectives of the Coastal Management Areas under the Act are provided in Appendix 7.

### Urban development

Development in the region is guided by the Hunter Regional Plan 2036. The Hunter Regional Plan priorities for the Mid Coast region most relevant to the Manning River ECMP are to:

- Support the visitor economy by leveraging the natural beauty of the area and enhancing nature-based tourism infrastructure
- Protect productive landscapes that sustain poultry, dairy and beef industries
- Manage development within sensitive water catchments and protect environments that sustain the oyster industry.

The document also includes a specific priority for Taree to “encourage greater utilisation of the Manning River for tourism, recreational and commercial purposes.”

These priorities are closely aligned to community aspirations for the Manning River ECMP Planning Area, as expressed throughout our consultation.

Future housing and urban renewal opportunities identified in the ECMP Planning Area include the Figtrees development on the Manning River, a mixed use redevelopment of a previous industrial site along the Manning River that will provide around 500 units and Brimbin New Town to the North of Taree that will accommodate approximately 20,000 people in 8,000 homes.



The MidCoast Urban Land Monitor 2016-2036 was adopted by Council in December 2020. The ULM found that, overall, the entire MidCoast has adequate supply of residential zoned land to meet historic average growth rates until 2036, though additional land supply will be required in coastal settlements to meet demand.

An estimated 800 new lots will be developed at Brimbin (an approved new town north of Taree) by 2036. Cundletown is fully developed from a residential perspective but has 74 ha recently rezoned for a transport hub to capitalise on its location adjacent to the Pacific Highway and between the Taree Regional Airport.

MidCoast Council is currently reviewing land identified in the Mid North Coast Regional Strategy 2006-36 for future urban development that has not yet been rezoned. This review considers 47 previously identified urban release areas, recommending that ten of these no longer be considered and three new ones be added. Within the Manning this includes two areas at Wingham for residential development; two at Taree for residential and one for a mixed-use outcome; and two at Cundletown for employment uses.

The provision of public infrastructure is an important part of Council's role, ensuring that people can move through our towns safely and encouraging healthy recreational alternatives to the car. Council carefully considers the design and installation of public infrastructure that meets the community's needs in an environmentally sensitive manner.

Redevelopment of foreshore areas such as Chatham in Taree is expected to occur over time and Council plans for associated infrastructure from road upgrades through to footpaths/cycleways, sewer pump stations and so on. An example of this is the "Figtrees on the Manning" development in Taree where \$8.5m is being spent at time of writing on public infrastructure to support a \$455m mixed use redevelopment of a former dairy factory site along the Manning River foreshore. A Review of Environmental Factors (REF) under Part 5 of the EP&A Act 1979 was prepared following the completion of detailed designs for a walkway/cycleway over Browns Creek, another bridge over the disused rail corridor, raised boardwalks, concrete footpaths/cycleways, road extensions, intersection upgrades and the construction of a sewer pump station to cater for the increase in development. The Coastal Management SEPP forms part of assessment of the designs and environmental impacts. The recent revision to the REF template to update and standardise assessment of REFs will ensure consistent application of the SEPP.

### The Rural Strategy

Rural and environmental lands cover around 95% of the MidCoast LGA. The development of a draft Rural Strategy is underway and examines rural, environmental and waterway zones. It will be available for the community to comment in 2021. The four goals of the draft Rural Strategy will support the objects of the Coastal Management Act and objectives of the Manning ECMP.

**Find out more about the draft Rural Strategy on MidCoast Council's website.**

## 9. BUSINESS PLAN

**This Business Plan was prepared to meet the mandatory requirements of the Coastal Management Manual.** It outlines the key components of the funding strategy, including the cost of proposed actions, proposed cost-sharing arrangements and funding mechanisms.

The Business Plan is presented as follows:

**Section 9.1** discusses the overarching funding environment for coastal management actions, the uncertainty of funding streams and the key funding sources that will be utilised

**Section 9.2** summarises the key considerations that have governed scheduling and funding decisions

**Section 9.3** discusses the issue of benefits and beneficiaries from this CMP

**Section 9.4** contains the business plan schedules.

### 9.1 KEY FUNDING SOURCES AND THE FUNDING ENVIRONMENT

#### 9.1.1 Funding Environment

According to the Coastal Management Manual (Part B), “the CMP should contain sufficient information to stand alone as a framework for sustainable management of the coastal zone for the coming 10 years.” The manual also calls for CMPs to be reviewed every ten years. For this reason, a ten-year business plan has been presented. However, there is an important caveat.

MidCoast Council has a dedicated Environmental Levy that raises income for environmental projects. These funds are not sufficient to address the entire range of environmental issues faced by our LGA, which covers an area of 10,053 km<sup>2</sup>. The Manning River ECMP is just one of a suite of strategic plans and operational programs to protect our natural assets. An annual funding allocation for the ECMP has been estimated, allowing the remaining funds in the Environmental Levy to be directed to other needs. These needs and Council’s priorities may change over time, and our financial contribution will be subject to review and adoption through the annual budget process.

Council gets the best from the Environmental Levy by leveraging these funds to attract co-investment, frequently from grant programs such as the NSW Coast and Estuary Grants, NSW Environmental Trust and federal programs. Grant programs are contestable, and the likelihood of success can be affected by:

- Demand for the program
- The rules can change surrounding the matching funding required from year to year
- Variability in the pool of available funding, depending on other demands on public funds
- Changes in policy and legislation that see funds re-directed to new priorities, which in the longer term (5-10 years) may be unforeseen
- Competing interests from across the state.

Future funding from grants, including both state and federal government sources, is therefore uncertain in

the medium and long term.

This variability is also a factor for Council’s project partners such as Hunter Local Land Services, whose funding pool depends on state allocations (for example from the Marine Estate Management Strategy).

This means that while the Manning River ECMP budget shown below has been estimated for ten years, there is considerable uncertainty over time. Council’s ability to implement the ECMP will depend on successfully obtaining matching funds at the ratio of 2:1 DPIE:MCC as allowed under the current Coast and Estuary grants. Similarly, it will depend on our project partners being able to secure sufficient funds to meet the budget estimates provided, and their willingness and ability to continue contributing to the Manning River ECMP at the estimated rates.

If funding allocations change, the program will be scaled back in response to budget constraints.

As has been mentioned in section 7, actions have been included in the ECMP in good faith that the funds shown will be secured. Our project team will take advantage of any funding opportunities that become available in the future, even if a present funding pathway is uncertain. Novel funding mechanisms are also being explored, such as a Blue Impact Bond under development in partnership with the Nature Conservancy and HSBC Bank.

The key funding sources are outlined below. A more detailed discussion of funding options and responsibilities is provided in Appendix 7.

### 9.1.2 MidCoast Council

MidCoast Council presently has an income of approximately \$270M per annum with around 60% coming from general rates. Council commonly uses rates revenue to leverage additional funding from external grant programs.

Rate revenue includes an environmental rate which raises approximately \$4M per year. This funds the Natural Systems team which will administer the Manning River ECMP and is the primary funding mechanism for delivery of actions in the program.

A total annual contribution of approximately \$250,000 per annum has been allocated from the environmental rate for either direct expenditure or as a contribution to leverage grant funding sources.

Council also charges a Stormwater Levy, raising approximately \$850,000 annually to deliver projects that address local flooding and improve stormwater quality across the whole LGA. A portion of Stormwater Levy funds will be applied to actions to improve stormwater management in the Manning River ECMP.

Several Management Actions will be delivered in-house by Council personnel using existing resources. These do not require additional funds and have been marked with an \* in schedule 9.4.1.

### 9.1.3 Hunter LLS and the Marine Estate Management Strategy

Hunter Local Land Services presently administers substantial funds arising from delivery of the Marine Estate Management Strategy to cover works associated with riparian repair, bank erosion protection and to improve the quality of drainage from roads and tracks.

Based on discussions with Hunter LLS staff, it is expected that, on average, \$800,000 per annum can be set aside for these purposes within the Manning Catchment.

Hunter LLS manages additional funding sources including:

- The National Landcare Program, which could contribute around \$100,000 per annum to the Manning CMP
- The Catchment Action NSW Program, from which around \$80,000 per annum could be used for the repair of riparian areas within the Manning Catchment
- In 2021-22, Hunter LLS is also managing federal bushfire recovery funds which can be apportioned to actions relating to weeds, pests, threatened ecological communities and threatened species. Around \$650,000 is allocated to ecological recovery from fire in the Manning catchment.

Hunter LLS generally secures funding on an annual basis. Allocations may vary depending on changes in policy and priorities both within Hunter LLS and their funding agencies. Hunter LLS funds committed to the Manning River ECMP are therefore subject to variation. It is understood that changes in funding may affect the ability to achieve program targets.

### 9.1.4 Coast and Estuary Grants

There are two broad streams of coast and estuary grant funding provided by the Department of Planning, Industry and Environment; the planning stream and the implementation stream. Generally, the grants program funds on a 2:1 (State:Local) ratio but cannot be used for the following:

- Maintenance of funded projects
- Projects eligible for funding under natural disaster relief
- Amenity works (car parking, footpaths, seating, shelters and lighting etc)
- Projects within freshwater environments unless they are shown to significantly improve estuary health
- Variations exceeding +30% of the original amount requested.

### 9.1.5 Other Sources

Other potential funding sources for some actions include:

- Floodplain Management Grant Funding from DPIE presently funded 2:1 (State:Local)
- NSW Environmental Trust: Environmental Education, Environmental Research and Restoration and Rehabilitation grants administered by DPIE (funding ratio is variable, success more likely with some contribution)
- DPI-Fisheries: Habitat Action Grants (1:1 funding available for projects up to \$40,000)
- DPI Flagship Fish Habitat Rehabilitation Grants (supports works including hydrological and environmental investigations and on-ground works, a maximum of \$400,000 with projects running for up to two years)
- MIDO Boating Now Program: For the case of studies into boating, works would require 1:1 funding. To be successful, works would typically need to be of primary benefit to navigation
- Novel funding mechanisms such as a proposed Blue Impact Bond being developed by The Nature Conservancy in partnership with HSBC and MidCoast Council.

## 9.2 CONSIDERATIONS

The timing of actions in the Business Plan is based on the following considerations:

- Prioritisation: A prioritisation score, representative of efficiency or utility for dollars spent was derived based on a multi-criteria analyses, the scale of expected impact and estimated cost. These were used to guide the sequencing of actions within the program. Exceptions to this general rule were made where funding was known to have already been allocated for proposed management actions
- Sequencing: The reliance of one action upon completion of another was considered and actions ordered accordingly
- Available funding: The expected annual budget from different sources was researched and total expenditure from those sources was limited to those estimates. Available funds or “cash flow” will have a strong influence on how quickly the full program of actions can be rolled out

The business plan contains a detailed schedule for the first 5 years. After 5 years, a review of the ECMP will be undertaken to revisit likely funding sources and recalibrate some actions. This is due to:

1. the uncertainty surrounding the funding environment (see Section 9.4)
2. the uncertainty around several actions, which will be guided by the results of studies and plans still under development.

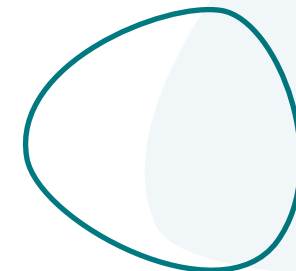
## 9.3 BENEFICIARIES

Understanding the benefits that will arise from the ECMP and who the beneficiaries are has guided the timing and funding streams identified for the action program. Examination of the management actions within the ECMP shows that:

- The focal Coastal Management Areas are the Coastal Wetland and Coastal Environment Area.
- Where actions don't have “Environmental Benefit” as their primary focus, they mainly contribute to building or maintaining collective wellbeing and wealth within the community.

From these two points, most benefits are widespread and not targeted to any small group or individual (Addendum – distribution of benefits). Where benefits accrue to a particular group, this group is a significant part of the Manning community (e.g., Farming community, Aboriginal groups) and the benefits are often multi-faceted and can be seen to contribute more broadly to society and the local economy.

Based on these considerations, all actions can be justifiably funded from public sources (Local, State and Federal Government).



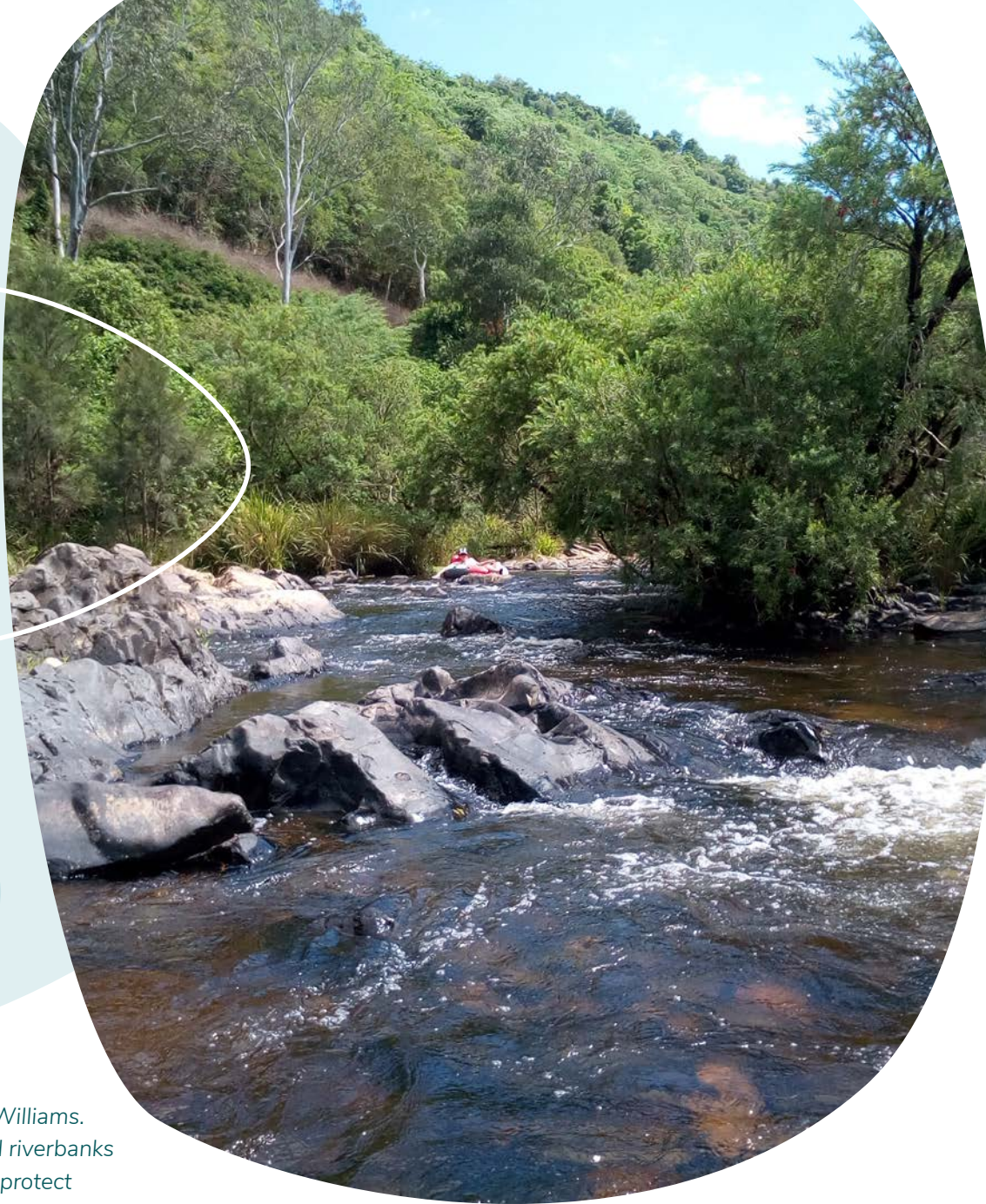


Photo: Sarah Williams.  
Well vegetated riverbanks  
upstream help protect  
water quality in the estuary

## 9.4 BUDGET SCHEDULES

A series of schedules are provided overleaf setting out the annual budgets, cost sharing and implementation program.

The Funding Schedule (Table 9.4.1) provides total costs of each management action over 10 years and the forecast contribution from key agencies: MidCoast Council (MCC), Hunter Local Land Services (HLLS) and the NSW Government's Coast and Estuary Grant Program (DPIE C&E Grants).

The schedule further divides costs into capital, maintenance and operational costs.

- A capital cost is an upfront cost required to implement the action.
- An operational cost is a cost required to successfully establish and operate the project (e.g. restoration and engagement projects).
- A maintenance cost is an ongoing cost, usually required annually, to maintain outcomes after completion of the project (e.g. weed control).

Grant funds will be sought for capital and operational costs.

The Annual Budget (Table 9.4.2) gives an annual breakdown of costs forecast for years 1-5 and indicative costs for years 6-10, to be confirmed in the Year 5 review. Cost-sharing is shown for key agencies. Annual cash flow was used to develop the Implementation Program (Section 9.5 and 9.6).

The Total Budget Schedule (Table 9.4.3) shows the total forecast funding contribution from each organisation annually for years 1-5, and grouped for years 6-10.

## 9.4 BUDGET SCHEDULES

### 9.4.1 Funding Schedule

Action #	Management Option	Capital Cost \$	Annual Costs \$		Total MCC \$ Contribution (10 years)	Total HLLS \$ Contribution (10 years)	DPIE C&E Grants \$ (10 years)	Other Source \$ (10 years)
			Maintenance	Operational				
MA_1.01	Develop and Deliver an Engagement Program	20,000	0	55,000	200,000	70,000	300,000	
MA_1.02	Promote Whole Farm Planning and Best Management Practice**	200,000	0	0	15,000	155,000	30,000	
MA_1.03	Promote and Facilitate Establishment of Private Conservation Agreements	0	0	5,000	50,000	0	0	
MA_1.04	Develop a Litter and Stormwater Pollution Source Control Program	0	0	40,000	133,333	0	266,667	
MA_1.05	Develop and Distribute Education Material and Guidelines for ESC on Private Land	5,000	0	0	5,000	0	0	
MA_1.06	Improve Erosion and Sediment Control for Council and Developers	50,000	0	25,000	100,000	0	200,000	
MA_2.01	Implement Key Priority ASS Management Actions	6,301,250	0	10,000	2,113,750	0	4,227,500	
MA_2.02	Protect and/or Rehabilitate Coastal Wetlands**	0	0	49,000	120,000	130,000	240,000	
MA_2.03	Improve Riparian and Estuarine Bank Vegetation	0	0	435,000	750,000	2,100,000	1,500,000	
MA_2.04	Promote Good Catchment Management Practice on Public Land*	0	0	0	0	0	0	
MA_2.05	Enter the Manning River Entrance Project into the NSW Investor Assurance and Business Case Process	0	0	0	0	0	0	
MA_2.06	Ensure Manning River Entrance Process includes Extensive Stakeholder Consultation	0	0	0	0	0	0	
MA_2.07	Implement a Systematic Approach to Maintaining SQIDs	640,000	100,000	0	1,213,333	0	426,667	
MA_2.08	Review, Revise and Supplement MCC's Current Stormwater Guidance	50,000	0	0	16,667	0	33,333	
MA_2.09	Revise and Implement the Greater Taree Urban Stormwater Management Plan	250,000	0	0	83,333	0	166,667	
MA_2.10	Study and Prioritise Sensitive Estuarine Riverbank Areas for Management and Implement Stabilisation	75,000	0	150,000	25,000	1,250,000	0	
MA_2.11	Prioritise Unsealed Road Sediment Hotspots and Undertake Remediation	440,000	0	0	0	440,000	0	
MA_2.12	Onsite Sewerage Management System Audit and Compliance Strategy. Implement Audit Program	0	0	0	0	0	0	

Action #	Management Option	Capital Cost \$	Annual Costs \$		Total MCC \$ Contribution (10 years)	Total HLLS \$ Contribution (10 years)	DPIE C&E Grants \$ (10 years)	Other Source \$ (10 years)
			Maintenance	Operational				
MA_2.14	Implement a Scientific Research Program	0	0	15,000	50,000	0	100,000	
MA_3.01	Develop Forward Plan to Retain Retreat Zones for Coastal Wetlands in Partnership with Land Owners*	0	0	0	0	0	0	
MA_3.02	Develop Forward Plans for Council Assets at Risk from Sea Level Rise*	0	0	0	0	0	0	
MA_3.03	Long Term Adaptation Plan for Manning Floodplain in Collaboration with Landowners*	0	0	0	0	0	0	
MA_4.01	Address Barriers to Fish Passage	300,000	0	0	100,000	0	200,000	
MA_4.02	Develop and Implement Integrated Pest and Weed Control Plans for Local Priorities	120,000	0	0	40,000	0	80,000	
MA_4.03	Implement Recommendations of Refugia Study	150,000	0	0	150,000	0	0	
MA_5.01	Involve Aboriginal Community in Management of the River, Catchment and Estuary	0	0	15,000	50,000	0	100,000	
MA_5.02	Install Interpretive Signage and Facilitate Cultural Activities	52,500	0	0	17,500	0	35,000	
MA_5.03	Engage Aboriginal People in Water Quality Monitoring*	0	0	0	0	0	0	
MA_5.04	Appoint Two Aboriginal Members to the ECMP Reference Group*	0	0	0	0	0	0	
MA_6.01	Develop & Implement Site-Specific Pathogen Source Control Plans for High-Risk Oyster Growing Areas	60,000	0	0	20,000	0	40,000	
MA_7.01	Submit a Planning Proposal for CM SEPP	50,000	0	0	16,667	0	33,333	
MA_7.02	Preparing Mapping of Coastal Vulnerability Area for Tidal Inundation	100,000	0	0	33,333	0	66,667	
MA_7.03	Identify Water Quality Objectives and Management Targets	100,000	0	0	33,333	0	66,667	
MA_8.01	Establish Multi-Stakeholder Management Committee*	0	0	0	0	0	0	
MA_8.02	Build the Capacity of Compliance Program*	0	0	0	0	0	0	

Totals \$ 5,896,583 \$ 4,145,000 \$ 9,233,167 \$ \$ 19,274,750

\* Actions to be delivered in-house within existing wage budgets

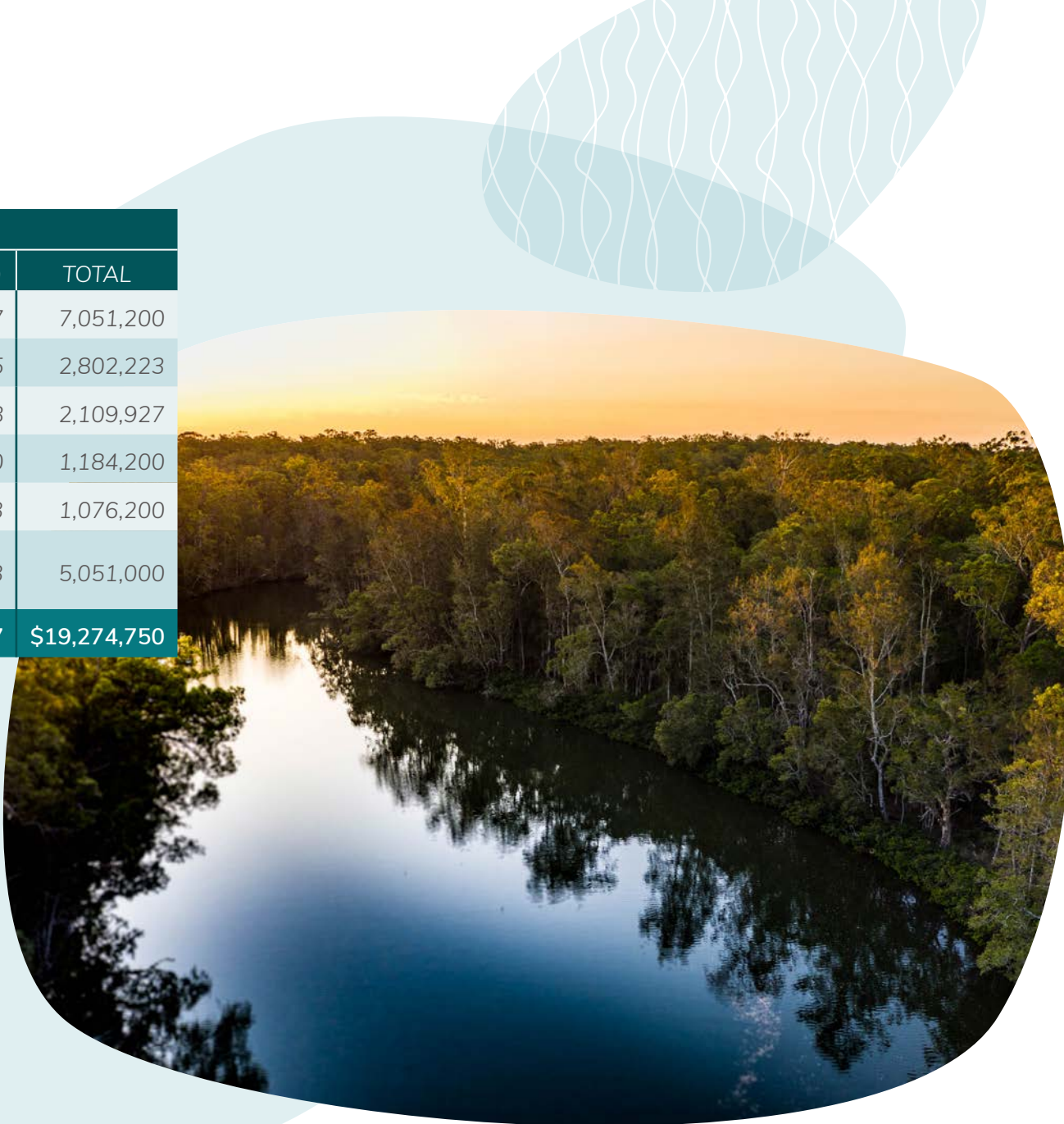
\*\* Action to be confirmed

9.4.2 Annual budget

Action #	Management Option	Total Cost	FUNDING AND DELIVERY PROGRAM																	
			2021/2022			2022/2023			2023/2024			2024/2025			2025/2026			Mid 2026 onwards		
			\$ MCC	\$ HLLS	\$ DPIE (C&E)	\$ MCC	\$ HLLS	\$ DPIE (C&E)	\$ MCC	\$ HLLS	\$ DPIE (C&E)	\$ MCC	\$ HLLS	\$ DPIE (C&E)	\$ MCC	\$ HLLS	\$ DPIE (C&E)	\$ MCC	\$ HLLS	\$ DPIE (C&E)
MA_1.01	Develop and Deliver an Engagement Program	570,000	15,000	25,000	30,000	25,000	5,000	30,000	15,000	5,000	30,000	25,000	5,000	30,000	15,000	5,000	30,000	105,000	25,000	150,000
MA_1.02	Promote Whole Farm Planning and Best Management Practice**	200,000				15,000	5,000	30,000		50,000			50,000			50,000				
MA_1.03	Promote and Facilitate Establishment of Private Conservation Agreements	50,000	5,000			5,000			5,000			5,000			5,000			25,000		
MA_1.04	Develop a Litter and Stormwater Pollution Source Control Program	400,000	13,333		26,667	13,333		26,667	13,333		26,667	13,333		26,667	13,333		26,667	66,667		133,333
MA_1.05	Develop and Distribute Education Material and Guidelines for ESC on Private Land	5,000							5,000											
MA_1.06	Improve Erosion and Sediment Control for Council and Developers	300,000	10,000		20,000	10,000		20,000	10,000		20,000	10,000		20,000	10,000		20,000	50,000		100,000
MA_2.01	Implement Key Priority ASS Management Actions	6,341,250	1,753,667		3,507,333	353,417		706,833	3,333		6,667	3,333		6,667						
MA_2.02	Protect and/or Rehabilitate Coastal Wetlands**	490,000	12,000	13,000	24,000	12,000	13,000	24,000	12,000	13,000	24,000	12,000	13,000	24,000	12,000	13,000	24,000	60,000	65,000	120,000
MA_2.03	Improve Riparian and Estuarine Bank Vegetation	4,350,000	75,000	210,000	150,000	75,000	210,000	150,000	75,000	210,000	150,000	75,000	210,000	150,000	75,000	210,000	150,000	375,000	1,050,000	750,000
MA_2.04	Promote Good Catchment Management Practice on Public Land	0																		
MA_2.05	Manning River Entrance Project Business Case Process	0																		
MA_2.06	Ensure Manning River Entrance Process includes Extensive stakeholder Consultation	0																		
MA_2.07	Implement a Systematic Approach to Maintaining SQIDs	1,640,000	130,000		60,000	116,667		33,333	266,667		333,333	100,000			100,000			500,000		
MA_2.08	Review, Revise and Supplement MCC's Current Stormwater Guidance	50,000				16,667		33,333												
MA_2.09	Revise and Implement the Greater Taree Urban Stormwater Management Plan	250,000	41,667		83,333	41,667		83,333												
MA_2.10	Sensitive Estuarine Riverbank Areas for Management and Implement Stabilisation	1,275,000	25,000	200,000			150,000			150,000			150,000			150,000			450,000	
MA_2.11	Prioritise Unsealed Road Sediment Hotspots and Undertake Remediation	440,000					176,000			176,000			88,000							
MA_2.12	Onsite Sewerage Management System Audit and Compliance Strategy	0																		
MA_2.13	MER for Ecosystem Health	1,681,000	98,733		197,467	45,733		91,467	45,733		91,467	45,733		91,467	45,733		91,467	278,667		557,333
MA_2.14	Implement a Scientific Research Program	150,000	5,000		10,000	5,000		10,000	5,000		10,000	5,000		10,000	5,000		10,000	25,000		50,000
MA_3.01	Develop Forward Plan to Retain Retreat Zones for Coastal Wetlands	0																		
MA_3.02	Develop Forward Plans for Council Assets at Risk from Sea Level Rise	0																		
MA_3.03	Long Term Adaptation Plan for Manning Floodplain in Collaboration with Landowners	0																		
MA_4.01	Address Barriers to Fish Passage	300,000				9,091		18,182	90,909		181,818									
MA_4.02	Develop and Implement Integrated Pest and Weed Control Plans for Local Priorities	120,000	40,000		80,000															
MA_4.03	Implement Recommendations of Refugia Study	150,000	75,000			75,000														
MA_5.01	Involve Aboriginal Community in Management of the River, Catchment and Estuary	150,000	5,000		10,000	5,000		10,000	5,000		10,000	5,000		10,000	5,000		10,000	25,000		50,000
MA_5.02	Install Interpretive Signage and Facilitate Cultural Activities	52,500				17,500		35,000												
MA_5.03	Engage Aboriginal People in Water Quality Monitoring	0																		
MA_5.04	Appoint Two Aboriginal Members to the ECMP Reference Group	0																		
MA_6.01	Investigate & Implement Site-Specific Pathogen Source Control measures	60,000							6,667		13,333							13,333		26,667
MA_7.01	Submit a Planning Proposal for CM SEPP	50,000							16,667		33,333									
MA_7.02	Preparing Mapping of Coastal Vulnerability Area for Tidal Inundation	100,000				33,333		66,667												
MA_7.03	Identify Water Quality Objectives and Management Targets	100,000	33,333		66,667															
MA_8.01	Establish Multi-Stakeholder Management Committee	0																		
MA_8.02	Holistic approach to Compliance Programs	0																		
	** Action to be confirmed	Totals	\$2,337,733	\$448,000	\$4,265,467	\$874,408	\$559,000	\$1,368,815	\$575,309	\$604,000	\$930,618	\$299,400	\$516,000	\$368,800	\$286,067	\$428,000	\$362,133	\$1,523,667	\$1,590,000	\$1,937,333

### 9.4.3 Total Budget Schedule

Financial Year	Source of Funding			
	\$ MCC	\$ HLLS	\$ DPIE (C&E)	TOTAL
2021/22	2,337,733	448,000	4,265,467	7,051,200
2022/23	874,408	559,000	1,368,815	2,802,223
2023/24	575,309	604,000	930,618	2,109,927
2024/25	299,400	516,000	368,800	1,184,200
2025/26	286,067	428,000	362,133	1,076,200
Mid 2026 onwards	1,523,667	1,590,000	1,937,333	5,051,000
<b>Totals</b>	<b>\$5,896,583</b>	<b>\$4,145,000</b>	<b>\$9,233,167</b>	<b>\$19,274,750</b>



## 9.5 IMPLEMENTATION PROGRAM – ACTIONS LED BY COUNCIL

Action #	Management Action	Lead agency	Supporting agencies	Impact Score*	SHORT TERM YEAR 1	MEDIUM TERM YEARS 2-5					LONG TERM YEARS 6-10
						FY22	FY23	FY24	FY25	FY 26	FY27-31
1.01	Stewardship program	MCC	HLLS, MC2T Landcare, DPI, Community Groups, Schools	93							
1.02a	Develop a Best Environmental Management Practice framework for agriculture	MCC	HLLS, MC2T Landcare, DPI, Industry Groups	110							
1.03	Promote and Facilitate Establishment of Private Conservation Agreements – Land For Wildlife program	MCC	BCT, HLLS, MC2T Landcare	76							
1.04	Develop and implement a Litter and Stormwater Pollution Source Control Program	MCC	Community groups	65							
1.05	Develop and Distribute Education Material and Guidelines for ESC	MCC		46							
1.06	Improve Erosion and Sediment Control	MCC		73							
2.01	Implement Key Priority ASS Management Actions	MCC	DPI-Fisheries, DPIE - Crown Lands	106							
2.07	Implement a Systematic Approach to Maintaining SQIDs	MCC		53							
2.08	Review, Revise and Supplement MCC's Current Stormwater Guidance	MCC		44							
2.09	Revise the Greater Taree Urban Stormwater Management Plan	MCC		60							
2.11	Study Unsealed Road Sediment Hotspots and Remediate Unsealed Road Sediment Hotspots	MCC		31							
2.12	Complete and Implement Onsite Sewerage Management System Audit and Compliance Strategy	MCC		84							
2.13	MER for Ecosystem Health	MCC		91							
2.14	Scientific research program	MCC	Academic institutions, HLLS								

Action #	Management Action	Lead agency	Supporting agencies	Impact Score*	SHORT TERM YEAR 1	MEDIUM TERM YEARS 2-5					LONG TERM YEARS 6-10
					FY22	FY23	FY24	FY25	FY 26	FY27-31	
3.01	Identify Retreat Buffer Zones for Coastal Wetlands and Littoral Rainforest	MCC	DPI-Fisheries, Hunter LLS	102							
3.02	Develop forward plan for Council Assets at Risk from Sea Level Rise and extreme weather events	MCC		45							
3.04	Long Term Adaptation Plan for Manning Floodplain	MCC	HLLS, DPI	122							
4.01	Address Barriers to Fish Passage	MCC	DPI-Fisheries	45							
4.03	Implement Recommendations of Refugia Study	MCC	Turtle Steering Group	16							
5.01	Involve Aboriginal Community in Management of the River, Catchment and Estuary	MCC	HLLS, TIDE, PT LALC	87							
5.02	Install Interpretive Signage and Facilitate Cultural Activities	MCC	PT LALC	32							
5.03	Engage Aboriginal People in Water Quality Monitoring	MCC	TIDE, PT LALC	43							
5.04	Involve Aboriginal People in Implementation of the Manning ECMP	MCC	HLLS, TIDE, PT LALC	87							
6.01	Investigate & Implement Site-Specific Pathogen Source Control measures	MCC	NSW Food Authority	49							
7.01	Submit a Planning Proposal for CM SEPP	MCC		90							
7.02	Preparing Mapping of Coastal Vulnerability Area for Tidal Inundation	MCC		78							
7.03	Identify Water Quality Objectives and Management Targets	MCC		70							
8.01	Establish Multi-Stakeholder Management Committee	MCC		169							
8.02	Holistic approach to Compliance Programs	MCC	DPIE - Crown Lands	71							

The Impact Score is provided in place of prioritisation. The higher the score, the more geographically widespread is the impact of the action. It was derived from the Multi-criteria Analysis conducted during the evaluation of management options. Find out more in Section 7, Appendix 4 and Annexure K.

## 9.6 IMPLEMENTATION PROGRAM – ACTIONS LED BY OTHER AGENCIES

Action #	Management Action	Lead agency	Supporting agencies	Impact Score*	SHORT TERM YEAR 1	MEDIUM TERM YEARS 2-5					LONG TERM YEARS 6-10
					FY22	FY23	FY24	FY25	FY 26	FY27-31	
1.02b	Promote Whole Farm Planning and Best Management Practice	HLLS	MCC, MC2T Landcare, DPI, Industry Groups	110							
1.03	Promote and Facilitate Establishment of Private Conservation Agreements	BCT	MCC, HLLS, MC2T Landcare	76							
2.02	Protect and/or Rehabilitate Coastal Wetlands	HLLS	MCC, DPI-Fisheries, BCT, MC2T Landcare, NPWS, DPIE - Crown Lands	104							
2.03	Improve Riparian and Estuarine Bank Vegetation	HLLS	MCC, MC2T Landcare, DPIE - Crown Lands.	101							
2.04	Promote good catchment management practice on public land	DPIE - Crown Lands	MCC, HLLS, NPWS	32							
2.05	Enter the Manning River Entrance Project into the NSW Investor Assurance and Business Case Process	TfNSW		1							
2.06	Ensure Manning River Entrance Process includes Extensive Stakeholder Consultation	TfNSW		32							
2.10	Study and Prioritise Sensitive Estuarine Riverbank Areas for Management and Stabilise 7.5 km	HLLS	MCC, DPI-Fisheries, NPWS	64							
4.02	Develop Integrated Pest and Weed Control Plans	HLLS	MCC, NPWS, Forestry Corp	76							

## 10. COASTAL ZONE EMERGENCY SUB-PLAN

Under the mandatory requirements of the Coastal Management Act, a coastal management program must have an emergency sub-plan if the LGA contains land within the coastal vulnerability area and beach erosion, coastal inundation or cliff instability is occurring on that land.

The MidCoast Council Local Emergency Management Plan (EMPLAN) contains SES Flood Emergency Sub Plans for the Former Greater Taree, Great Lakes and Gloucester LGA areas. These Plans have been prepared in accordance with the provisions of the State Emergency Service Act 1989 (NSW) and are authorised by the MidCoast Council Local Emergency Management Committee in accordance with the provisions of the State Emergency and Rescue Management Act 1989 (NSW).

The Greater Taree and Great Lakes Local Flood Plans also cover arrangements for the management of coastal erosion in the council area. In addition to these Flood Plans there is a NSW State Storm Plan as well as a NSW State Tsunami Plan which describe the risk to the community, outline roles and responsibilities for the NSW SES and supporting agencies and set out how the SES as the relevant combat agency will manage these events.

These Plans along with the EMPLAN provide appropriate multi agency emergency response and planning measures to manage such weather events.



# 11. MONITORING, EVALUATION REPORTING AND IMPROVEMENT

Monitoring, evaluation reporting and improvement (MERI) is vital to assess implementation of the Action Program and progress against our targets and objectives. The purpose and steps in the Monitoring and Evaluation program are shown in Figure 37 below.

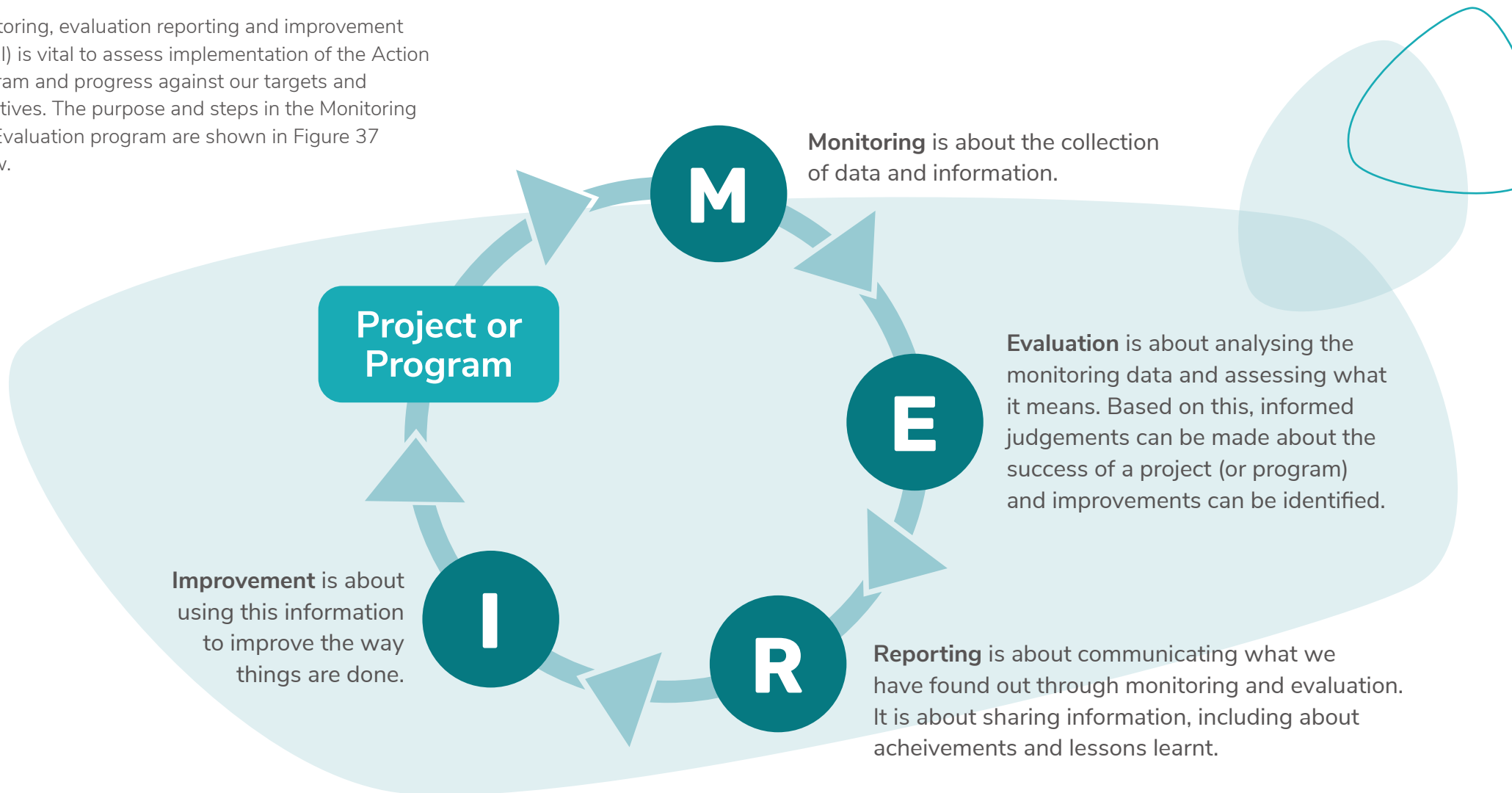


Figure 37: Steps in the MERI Program

## 11.1 MERI FOR THE MANNING RIVER, ESTUARY AND CATCHMENT

MidCoast Council will implement a broadscale environmental monitoring, evaluation, reporting and improvement (MERI) program to support the management objectives of the ECMP.

The MERI Program will provide a high-level assessment of environmental quality to ensure the values in Section 2 are maintained across the Manning River estuary and catchment. Implementing the MERI Program will assist Council and our stakeholders to establish a baseline of data characterising water quality including ecological health. Continued long-term monitoring will enable us to detect changes (positive or negative) in water quality over time. Analysing the data will aid decision-making and adaptive management, helping us to improve the program and achieve our objectives. The MERI Program constitutes the science program defined in the CMP Program Logic Model (see Section 3.4).

### 11.1.1 Principles

The MERI Plan adopts the following Principles:

- Uses SMART Objectives – Specific, Measurable, Achievable, Realistic, Time-bound
- Relies on an agreed program logic – robust methodology to ensure outcomes can be effectively measured
- Uses Best Practice - current best practice and scientific knowledge and multiple (environmental indicator) lines of evidence
- Adopts a risk-based approach – assists MidCoast Council to prioritise monitoring of ecological responses and stressors that pose the highest risk to ecological health
- Emphasises collaboration – builds on existing programs to improve efficiency and reduce duplication in effort
- Transparent reporting – offers open access to information
- Adaptive Management – adopts a systematic approach to improving natural resource management by learning from management outcomes and making changes to improve the ecological response and reduce stressors
- Values cultural knowledge – recognises the importance of cultural knowledge holders in increasing understanding of the condition and health of the Manning River estuary and catchment and the influence environmental change may have on physical and non-physical elements of cultural heritage
- Values local knowledge – recognises the value of local knowledge in understanding and interpreting scientific results about the health and condition of the Manning River Estuary and Catchment
- Values citizen science – recognises the role of citizen science programs in filling knowledge gaps and increasing understanding of the condition and health of the Manning River estuary and catchment.

### 11.1.2 Approach

Council's approach to development of the MERI program for the Manning River estuary and catchment included the following steps:

- Examining current understanding - to inform decisions at subsequent steps, MidCoast Council developed conceptual models of how the Manning River estuary and catchment waterway systems work, the issues they face and how to manage them
- Defining community values and management objectives - community values and more specific management goals (including level of protection) were defined for the Manning River estuary and catchment at stakeholder involvement workshops (refer to Section 2)
- Defining relevant indicators - indicators were selected for relevant pressures identified for the system, the associated stressors and the anticipated ecosystem receptors
- Determining water quality guideline values - MidCoast Council determined the water quality guideline values for each of the relevant indicators required to provide the desired level of protection to meet the management goals of the Manning River estuary and catchment
- Implement management strategy - MidCoast Council developed this MERI program to document its approach to achieving the water quality objectives and the environmental monitoring programs for implementation.

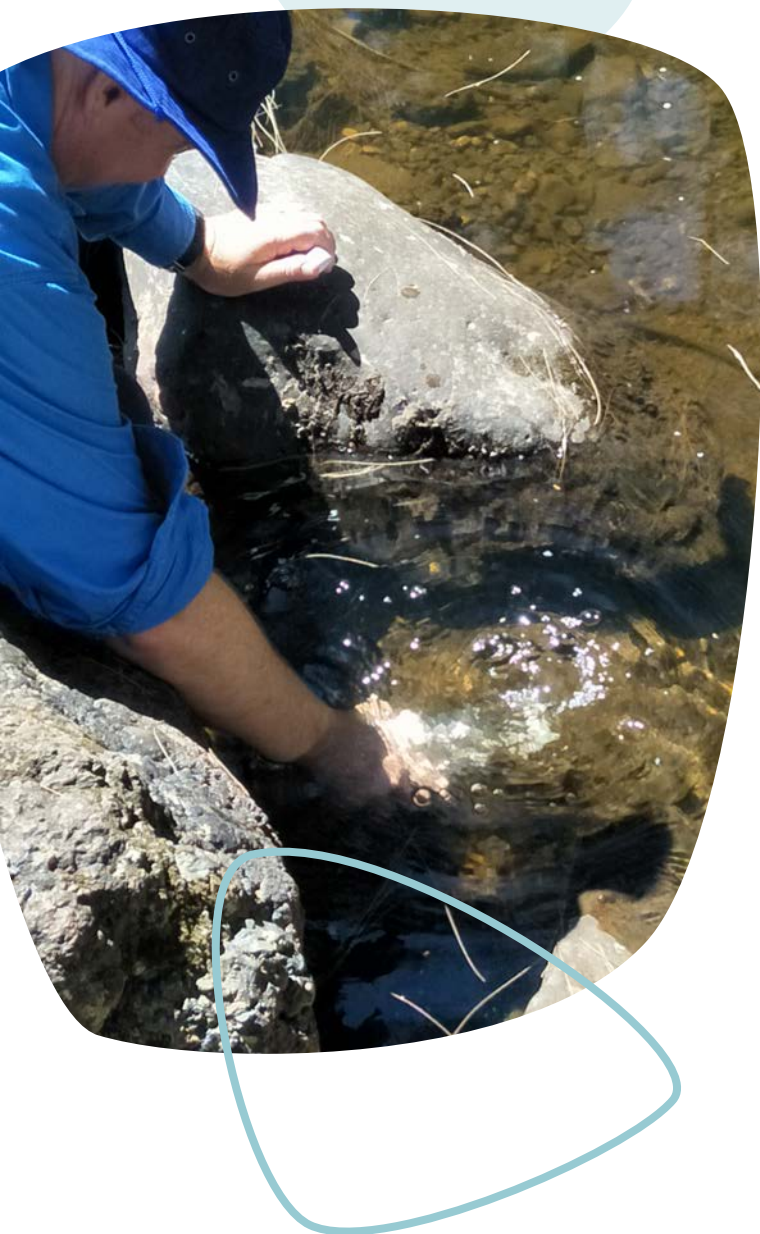
This approach was based on the principles and guidelines of the National Water Quality Management Strategy (NWQMS 2018), with regard to the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG 2018). The focus of the approach is on maintaining existing water quality, identifying where management and/or remediation actions may be required and measuring the effectiveness of these actions.

The water quality management framework adopted in the MERI Program is shown in Figure 38.

MERI programs to be implemented for the Manning River estuary and catchment are summarised in Table 5.

The full MERI Program for water quality and ecosystem health is provided at Annexure L: Manning River ECMP Monitoring, Evaluation, Reporting and Improvement Program – Water Quality (MCC 2021).





### 11.1.3 Evaluation and Continual Improvement

The MERI Program will be continuously reviewed to:

- Assess if water quality objectives are met - Use measurements from monitoring of each relevant indicator to assess whether water quality meets the water quality objectives
- Consider additional indicators or refine water quality objectives - Assess the need to revise or add to the lines of evidence or indicators and the water quality guideline values
- Consider alternative management strategies - Evaluate the effectiveness of current management strategies to address the identified water quality issues and recommend possible improvements. Improved or alternative management strategies are formulated, assessed and prioritised
- Assess if water quality objectives are achievable - Use information gained to assess whether the water quality objectives are achievable.

The project team will use adaptive management to improve on-ground management decisions in order to meet the water quality objectives of the Manning River ECMP. Adaptive management allows Council and stakeholders to adjust our approach in response to current climatic conditions, new information and local knowledge.

### 11.1.4 Reporting

MidCoast Council is committed to open access to information. The results of implementing the MERI Plan for the Manning River estuary and catchment will be reported to the ECMP Reference Group and community through established engagement methods (e.g. Water Quality Report Card, Creek to Coast newsletters).

#### Find out more:

Further information can be downloaded from [www.midcoast.nsw.gov.au/ourmanningriver](http://www.midcoast.nsw.gov.au/ourmanningriver)

- Annexure L: Manning River ECMP Monitoring, Evaluation, Reporting and Improvement Program – Water Quality (MCC 2021)

*Photo: Water quality monitoring will guide adaptive management*

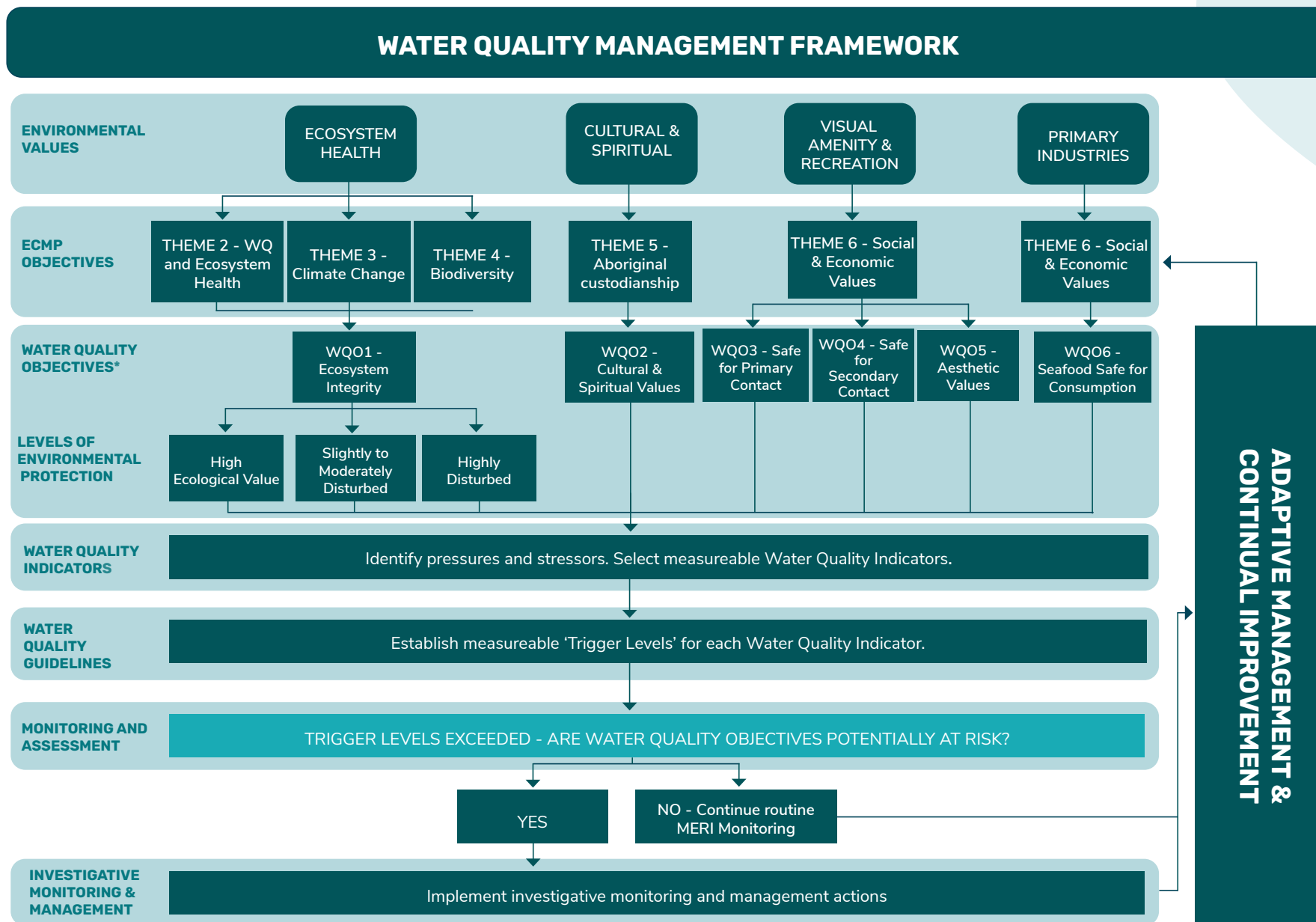


Figure 38: Water Quality Management Framework for the Manning River Estuary and Catchment

Table 5: Summary of the MERI Programs to be implemented for the Manning River Estuary and Catchment

Environmental Value	ECMP Objective	Environmental Issue	Environmental Monitoring Program	The 'Why' – Questions driving the monitoring program	Indicators	Triggers/Thresholds*	Monitoring Frequency
<b>Ecosystem Health</b>	Theme 2: Water Quality and Ecosystem Health  Theme 4: Biodiversity	Erosion and sedimentation Urban stormwater quality Litter, plastics and marine debris Floodplain drainage and ASS Biodiversity loss Agricultural impacts	Estuary Ecological Health Report Card Monitoring	<ul style="list-style-type: none"> <li>What is the ecological health of the Manning River Estuary?</li> <li>How does the condition of the Manning River Estuary compare to past conditions?</li> <li>Is the environmental value 'ecosystem health' being maintained?</li> <li>Does the condition of the estuarine reaches of the Manning River change following the implementation of the ECMP?</li> </ul>	Turbidity  Chlorophyll-a  Seagrass depth range	<p>A requirement for further investigation will be triggered if:</p> <ul style="list-style-type: none"> <li>there is a decline in the overall grade at any site,</li> <li>there is a decline in the score (for turbidity or chlorophyll-a) within a grade, and/or</li> <li>poor grades are recorded for the stressors at a site.</li> </ul> <p>Investigation will be stepwise and include analysis of climatic conditions, the stressor data, potential pressures (through catchment investigations) followed by more detailed sampling and spatial analysis to determine the location and nature of the impact that could be contributing to the change in grade and score.</p>	Annually
<b>Ecosystem Health</b>	Theme 2: Water Quality and Ecosystem Health  Theme 4: Biodiversity	Erosion and sedimentation Agricultural impacts Biodiversity loss Loss and degradation of riparian vegetation	Freshwater Ecological Health Report Card Monitoring	<ul style="list-style-type: none"> <li>What is the ecological condition of the freshwater reaches of the Manning River?</li> <li>How does the ecological condition of the freshwater reaches of the Manning River compare to past condition?</li> <li>Is the environmental value 'ecosystem health' being maintained in the freshwater reaches of the Manning River Catchment?</li> <li>Does the condition of the freshwater reaches of the Manning River change following the implementation of the ECMP?</li> </ul>	Turbidity  Chlorophyll-a  Macroinvertebrates  Riparian condition  Reach condition	<p>A requirement for further investigation will be triggered if:</p> <ul style="list-style-type: none"> <li>there is a decline in the overall grade at any site,</li> <li>there is a decline in the score (for macroinvertebrates, chlorophyll-a, riparian condition and/or geomorphic condition) within a grade, and/or</li> <li>poor grades are recorded for the stressors at a site.</li> </ul> <p>Investigation will be stepwise and include analysis of climatic conditions, the stressor data, potential pressures (through catchment investigations) followed by more detailed sampling and spatial analysis to determine the location and nature of the impact that could be contributing to the poor score on the stressor data or change in grade and score.</p>	Twice in 10 years: base-line and program completion

Environmental Value	ECMP Objective	Environmental Issue	Environmental Monitoring Program	The 'Why' – Questions driving the monitoring program	Indicators	Triggers/Thresholds*	Monitoring Frequency
<b>Ecosystem Health</b>	Theme 2: Water Quality and Ecosystem Health  Theme 4: Biodiversity	Erosion and sedimentation Agricultural impacts Low and modified flow	Freshwater Water Quality Monitoring	<ul style="list-style-type: none"> <li>What are the baseline water quality levels at key locations within freshwater reaches of the Manning River Catchment?</li> <li>How does the water quality at key locations in the freshwater reaches of the Manning River Catchment compare to past measurements?</li> <li>How is water quality in the freshwater reaches of the Manning River Catchment affected by climate (rainfall, drought, climate change)?</li> </ul>	Turbidity Chlorophyll-a Salinity Nutrients	Water quality trigger levels are the default guideline values (ANZG 2018) for slightly to moderately disturbed systems.	Quarterly
<b>Ecosystem Health</b>	Theme 2: Water Quality and Ecosystem Health	Floodplain drainage and ASS	Acid Sulfate Runoff Monitoring	<ul style="list-style-type: none"> <li>What is the quality of the water draining off the Big Swamp floodplain into the Lower Manning Estuary?</li> <li>Is the rehabilitation of the Big Swamp floodplain influencing the water quality draining into the Lower Manning Estuary?</li> </ul>	pH Dissolved oxygen Electrical conductivity Temperature	Water quality trigger levels are the default guidelines values (ANZG 2018) for slightly to moderately disturbed systems.	Annually
<b>Ecosystem Health</b>	Theme 3: Climate change	Climate Change	Climate Change Baseline Monitoring	<ul style="list-style-type: none"> <li>How is climate change affecting waterway conditions - salinity, temperature and tidal influence in the Manning River Estuary?</li> <li>Does salt intrusion become more prevalent over time at different locations along the River as a result of climate change?</li> </ul>	Water level Salinity Temperature (measured at depth and at the surface).	Not applicable - data for this program is being collected to understand climate change impacts in this locality.	Annually
<b>Ecosystem Health</b> <b>Visual Amenity &amp; Recreation</b>	Theme 2: Water Quality and Ecosystem Health	Urban Stormwater Quality Litter, plastics and marine debris	Stormwater Gross Pollutant Trap Monitoring	<ul style="list-style-type: none"> <li>What is the condition of the gross pollutant traps in the Manning River Estuary and Catchment?</li> <li>Are the gross pollutant traps in the Manning River Estuary and Catchment being maintained to MidCoast Council standards?</li> <li>When is the optimum time to clean out the gross pollutant traps?</li> </ul>	Measured pollution as a percentage of sump volume	Measured gross pollutant traps pollution volume is 80% sump volume.	Bi-monthly

Environmental Value	ECMP Objective	Environmental Issue	Environmental Monitoring Program	The 'Why' – Questions driving the monitoring program	Indicators	Triggers/ Thresholds*	Monitoring Frequency
<b>Ecosystem Health</b> <b>Visual Amenity &amp; Recreation</b>	Theme 5: Social and Economic Values	Erosion and sedimentation Litter, plastics and marine debris Agricultural impacts	Citizen Science Monitoring – Waterwatch	What is the condition of water quality at Waterwatch sites in the Manning River estuary and catchment and do these change over time?	Macroinvertebrates Turbidity Oil/Debris/Wrack	Water quality trigger levels are the default guidelines values (ANZG 2018) for slightly to moderately disturbed systems.	Ad Hoc by community volunteers
<b>Visual Amenity &amp; Recreation</b>	Theme 5: Social and Economic Values	Pathogens	Water Quality Monitoring – Recreational Use (Human Health)	<ul style="list-style-type: none"> <li>Is the water quality in the Manning River estuary and catchment safe for primary contact recreation (e.g. swimming)?</li> <li>Is the water quality in the Manning River estuary and catchment safe for secondary contact recreation (e.g. fishing and boating)?</li> </ul>	Faecal Coliform	Water quality trigger levels are the default guidelines values (NHMRC 2008) for recreational use.	Varies depending on purpose (weekly, bi-monthly, event based)
<b>Ecosystem Health</b>	Theme 2: Water Quality and Ecosystem Health  Theme 3: Climate change  Theme 4: Biodiversity	Erosion and sedimentation  Urban stormwater quality  Litter, plastics and marine debris  Agricultural impacts  Flood, coastal & tidal inundation  Biodiversity loss  Floodplain drainage and ASS	Event Based Monitoring	<b>Ecosystem Health</b> <ul style="list-style-type: none"> <li>How does the ecological health of the Manning River estuary respond to flood conditions, fire or drought?</li> <li>How long does it take for the estuary to return to baseline conditions?</li> </ul> <b>Estuary hydrodynamics</b> <ul style="list-style-type: none"> <li>How far does the tide extend into the Manning River estuary under normal conditions and following moderate to major floods?</li> <li>How quickly does the flood wave propagate downstream following moderate to major floods?</li> <li>How does data get collected during floods correlate with flood modelling results?</li> <li>Does opening Farquhar affect water levels of the estuary?</li> </ul>	Indicators differ depending on the type of event (e.g. flood, bushfire, drought) and the waterway responses MidCoast Council seeks to monitor. (e.g. pH for acid events)	Not applicable - data for this program is being collected to understand the impact of major flooding, fire or drought events on estuary health and hydrodynamics.	Coincides with extreme weather events

## 11.2 MERI FOR THE ECMP ACTION PROGRAM

The purpose of this component of the Monitoring, Evaluation, Reporting and Improvement program is to clearly set out the project measures, targets, monitoring and reporting protocols for the ECMP's activities and outcomes. The plan ensures that the process for monitoring progress and achievements is defined. This will support accountability of achievements and an adaptive management approach. This component of the MERI program will be reported on, reviewed and updated (where necessary) annually, with a five-year review to re-set targets for the final tranche of the ECMP.

Monitoring and reporting our progress against the actions will involve two levels:

1. Monitoring and reporting on results to the Manning River ECMP Reference Group on an annual basis
2. Monitoring and reporting on results through Council's IP&R Framework.

For Reference Group reporting, a set of standard project measures and data collection methods will be used across all activities to monitor outputs as shown in Table 6 below.

We will track the progress of each action against its targets using the template in Table 12, Appendix 8. This will be collated throughout the year and reported to the Reference Group on an annual basis. The results will inform an annual review to consider project success, barriers and improvements.

For the IP&R reporting, we will have a single item in Council's Delivery Program and Operating Plan for implementation of the Manning River ECMP, led by the Natural Systems Team. The tracking used above will be converted to an annual percentage completion score against our targets and reported quarterly.

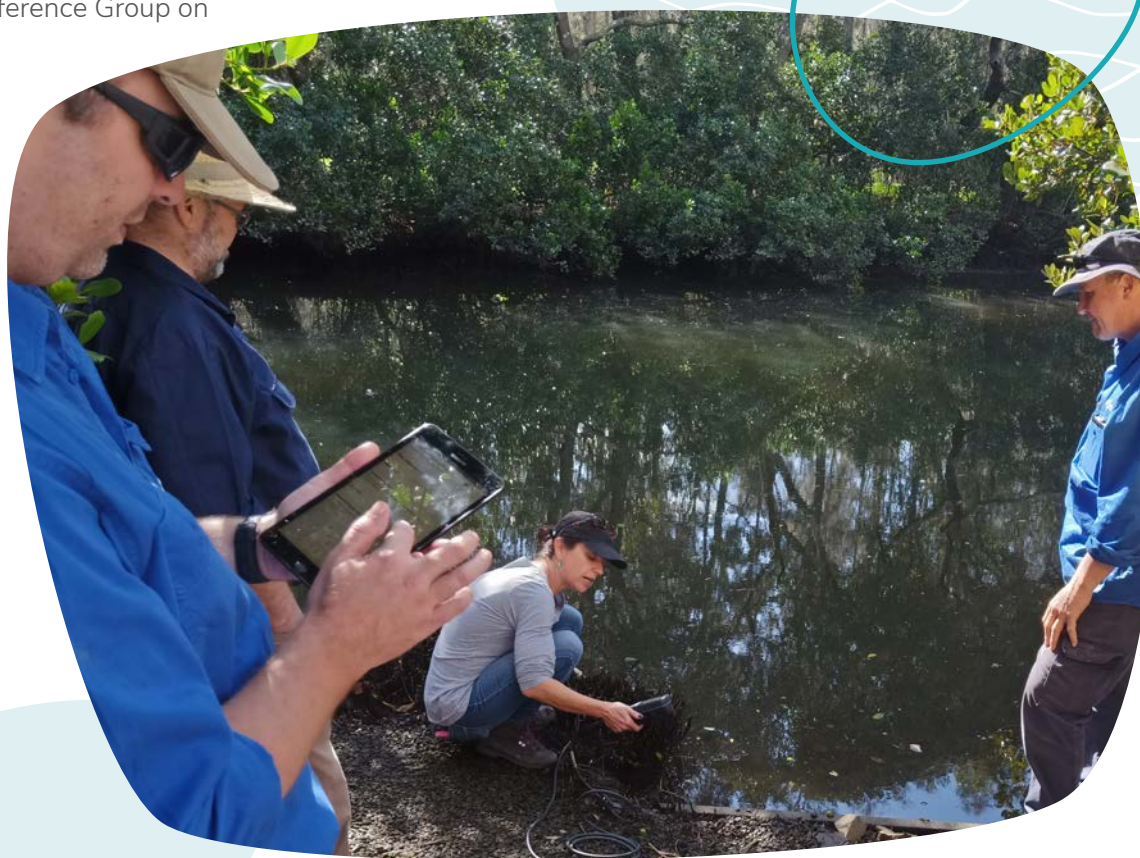


Table 6: Standard measures and data collection

Project measures	How will data be collected?	When will data be collected?	Who is responsible?
Number of education resources produced	<ul style="list-style-type: none"> <li>• Maintain register of all materials produced</li> </ul>	Add item to register on completion	MCC ECMP lead
Number of engagement events	<ul style="list-style-type: none"> <li>• Record date, location, theme, presenters for all engagement events</li> </ul>	After each event	MCC ECMP lead
Number of individuals engaged	<ul style="list-style-type: none"> <li>• Complete a participation registration sheet for all events</li> </ul>	At each event	MCC ECMP lead
Changes in knowledge, skills, commitment and practice	<ul style="list-style-type: none"> <li>• Distribute a survey for participants to complete at the end of each engagement event</li> <li>• Analyse survey results and prepare an evaluation report</li> </ul>	Annually, end financial year	MCC ECMP lead
Water Quality and Ecosystem Health MER Program	<ul style="list-style-type: none"> <li>• See WQ and Ecosystem Health MER Program</li> </ul>	See WQ and Ecosystem Health MER Program	MCC ECMP lead
Ha/linear m/km/sites remediated	<ul style="list-style-type: none"> <li>• All project areas mapped in a GIS layer</li> </ul>	After each project is completed	MCC ECMP lead
Plans/studies/reports complete	<ul style="list-style-type: none"> <li>• Maintain register of all plans/studies/reports produced</li> </ul>	Add item to register on completion	MCC ECMP lead
Number of organisations involved	<ul style="list-style-type: none"> <li>• Maintain register of all organisations involved</li> </ul>	As appropriate	MCC ECMP lead

Table 7: Performance indicators for the 10-year outcomes

10-year outcome	Performance indicator
Improved land management practices reduce pressures on ecosystem health and resilience	<ul style="list-style-type: none"> <li>• Total area of land and water covered by conservation actions including remediation works, conservation agreements, restored fish passage</li> </ul>
The community adopts sustainable behaviours and best practice for land and water management	<ul style="list-style-type: none"> <li>• Number of individuals engaged</li> <li>• Percentage of post-event survey participants who report a positive change in knowledge, skills and commitment to behaviours</li> </ul>
CMP is implemented with strong partnerships between responsible agencies	<ul style="list-style-type: none"> <li>• Number of organisations involved</li> <li>• Number of ECMP Reference Group meetings</li> </ul>

## 11.3 THE MANNING RIVER ECMP RESEARCH PROGRAM

MidCoast Council and our partners at Hunter Local Land Services have a long history of co-funding and supporting scientific research in partnership with academic institutions. Such research may be conducted by honours, masters or PhD candidates or scientists co-funded through research grants. Research results support evidence-based decision-making to ensure our projects are effective.

During development of the ECMP, numerous knowledge gaps were identified, which will inform the development of research projects during the life of the ECMP. These can be found in the Manning River ECMP Issue Analysis Report 2021.

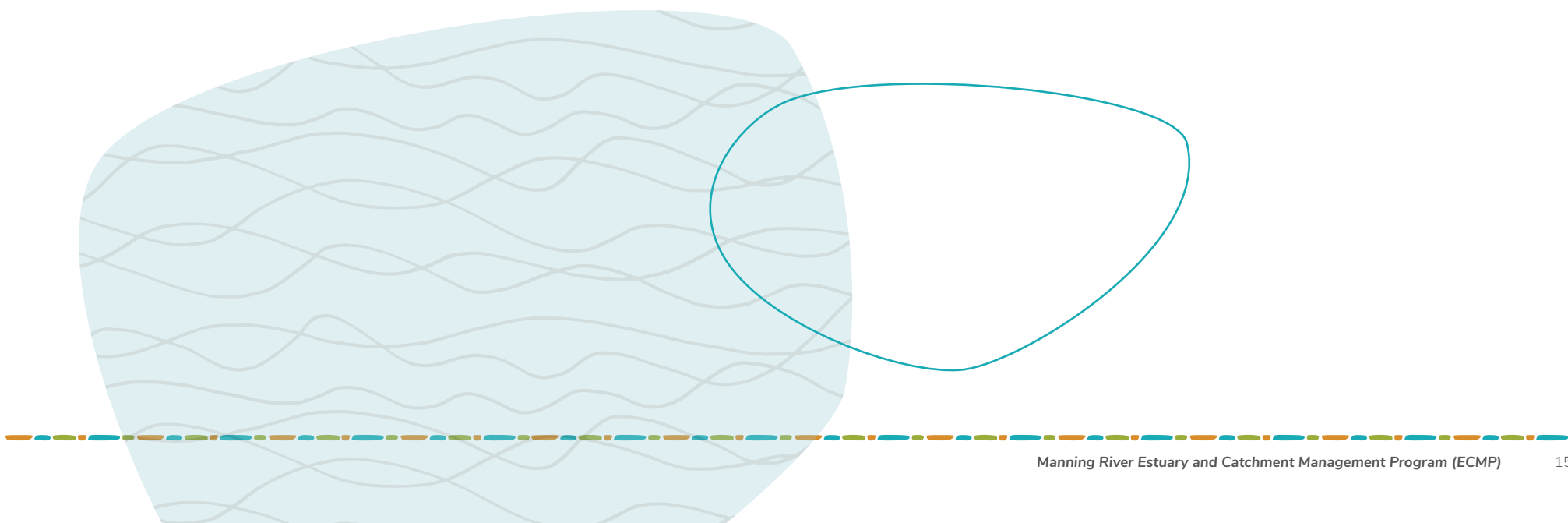
Table 8 overleaf outlines a recommended research program to be completed over the ten-year course of the Manning River Estuary and Catchment Management Program.

Table 8: Recommended Research Program

- Undertake a bathymetric survey combined with hydrodynamic and water quality monitoring at key locations within the lower catchment/estuary and develop a baseline condition hydrodynamic and water quality model for all future research and planning.
- Fine-scale prioritisation of coastal wetlands for conservation based on size, perimeter to area ratio, condition, pressures, extent within the catchment and more broadly in NSW, as well as listing status
- Finalise development of a prioritisation scheme for riparian vegetation in the catchment and estuary
- Quantification of the impact that proposed entrance training works will have on tidal inundation and the distribution of salinity throughout the estuary and its interaction with sea level rise
- Impacts of instream sediment accumulation on flow and ecosystem health over time
- Impact of climate change on catchment hydrology, diffuse pollutant transport, biodiversity, salinity distribution patterns, overtopping of levees
- Undertake e-DNA research to characterise aquatic fauna abundance, diversity and presence of exotic species.
- Develop prioritisation, indicators, stressors and thresholds for aquatic fauna
- Model sediment inputs from significant sources across the catchment to better prioritise management actions
- Distribution of seagrass and analysis of activities, stressors and impacts

Table 8: Recommended Research Program Continued

• Economic valuations: value of habitat for commercial and recreational fisheries, aquaculture and shorebirds; value of river and estuary for tourism and recreation
• Oral history study on the history, ecology and use of the Manning River fishery
• Aboriginal knowledge to guide conservation
• Broad-leaved Paperbark dieback and mitigation strategy
• Hydrology of the tidal pool
• Hydrodynamics and impacts of extraction on freshwater system and inflows to the estuary
• Minimum flow requirements to maintain freshwater refuge pools
• The ecology and hydrology of Groundwater Dependent Ecosystems, including wetlands in Crowdy Bay National Park. Risk to wetlands and GDEs from current and/or increased groundwater demand



## 12. PROPOSED AMENDMENTS TO THE CM SEPP

Council flagged our intent to submit a planning proposal for amendment of the Coastal Wetlands mapping of the CM SEPP in the Manning River ECMP Scoping Study (Annexure A). We engaged Locale Consulting to prepare evidence for the planning proposal for the Manning River ECMP and Old Bar-Manning Point CMP Planning Areas. Their report is provided in Annexure M: Recommendations and evidence to support a future Planning Proposal to amend the CM SEPP (Locale Consulting 2021). It covers both coastal wetlands and littoral rainforest, noting there is no littoral rainforest in the Manning River ECMP Planning Area.

It is Council's intent to wait until fine-scale mapping and analysis has been completed for coastal wetlands across the entire LGA before submitting the planning proposal. The current exercise is therefore a first step in this process. A comprehensive community engagement and consultation program with affected landholders will be undertaken prior to submission of a planning proposal.

As part of MidCoast Council's commitment to the Coastal Management Program, detailed mapping of two of the coastal management areas was undertaken in 2019 - coastal wetlands and littoral rainforests. This finer-scale mapping shows additional areas outside currently mapped areas in the State Environmental Planning Policy (Coastal Management) 2018.

The report prepared by Locale Consulting presents the results of a detailed analysis of the mapping and justification for the mapped areas in the State Environmental Planning Policy (Coastal Management) 2018 to be updated, via the Planning Proposal process.

The mapping analysis gave detailed consideration to the following:

- Existing State Environmental Planning Policy (Coastal Management) 2018 mapping
- Definition of coastal wetlands and littoral rainforest
- Confidence in mapping methodology
- Condition of coastal wetlands and littoral rainforest

The technical mapping analysis identified an additional 317.97 hectares comprising 112 wetlands in the Manning River catchment, noting these generally include parts of lots. Of the areas identified as coastal wetlands 123 lots (284.98 hectares) of private property are included.

The environmental protection of these areas will have positive value to the broader community (being consistent with both the MidCoast Local Strategic Planning Statement and Community Strategic Plan) and implements a priority action in the Coastal Management Program.

Further, much of the land to which the mapping applies has already been identified as having high conservation biodiversity value and as such represents “endangered ecological communities” under the Biodiversity Conservation Act 2016. Biodiversity values of coastal wetlands are further protected under MidCoast Council’s respective Local Environmental Plans, Fisheries Management Act 1994, Water Management Act 2000 and the Commonwealth Environment Protection and Biodiversity Conservation Act 1999.

Ensuring that the locations of the coastal wetlands are correctly mapped under the policy that provides

high level planning controls (i.e. State Environmental Planning Policy (Coastal Management) 2018) will help to protect them in their natural state, including their biological diversity and ecosystem integrity. In turn, this will promote the rehabilitation and restoration of degraded parts of these important coastal management areas. This is consistent with the management objectives of the Coastal Management Act 2016, the Marine Estate Management Act and the NSW Government’s NSW Wetland Policy’s principles for management and conservation.

#### **Find out more:**

The full report can be downloaded from Council’s website.

- Annexure M: Recommendations and evidence to support a future Planning Proposal to amend the CM SEPP – Coastal Wetlands (Locale Consulting 2021)



## 13. CONCLUSION

The Manning River, its tributaries and the estuary give life to our community connecting the mountains to the sea.

The estuary is important for oyster-growing, fishing, tourism and recreation. Up-river the Manning and its tributaries provide water for drinking, stock and irrigation. Our community values the beautiful scenery, the cool places to swim and relax, and the wildlife that can be glimpsed hiding in the deep pools. All these uses depend on a healthy ecosystem and clean water.

Some of the issues we need to manage are lack of stewardship, climate change, loss of coastal wetlands and riparian vegetation, floodplain drainage, Acid Sulfate Soils, and agricultural impacts.

By working with our community and partner organisations to implement the Manning River ECMP, MidCoast Council will lead a 10-year action program to address these issues.

Together we will manage the catchment holistically and respond to a changing climate - safeguarding environmental, social, cultural and economic values.



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## 15. APPENDICES

### APPENDIX 1: THE PROJECT TEAM

#### MidCoast Council

Project Lead	Louise Duff, Catchment Coordinator
Contributors	Prue Tucker, Water Quality & Estuary Management Coordinator
Belinda Kennewell	Environmental Officer
Erin Masters	Environmental Officer
Karen Bettink	Catchment Officer
Alisha Madsen	Catchment Officer

#### Consultants

Salients Pty Ltd	Dr. David Wainwright
Locale Consulting	Katrina Burbidge
	Cinnamon Dunsford
	Alison Martin
	Fiona Dawson

#### Sub-consultants

Centre for International Economics	Nigel Rajaratnam
University of Newcastle	Troy Gaston
Alluvium Consulting	Mark Wainwright

# APPENDIX 2: THE PUBLIC PARTICIPATION SPECTRUM



	INFORM	CONSULT	INVOLVE	COLLABORATE	EMPOWER
PUBLIC PARTICIPATION GOAL	To provide the public with balanced and objective information to assist them in understanding the problem, alternatives, opportunities and solutions	To obtain public feedback on analysis and decisions	To work directly with the public throughout the process to ensure their concerns and aspirations are consistently understood and considered	To partner with the public in each aspect of the decision including development of alternatives and the identification of the preferred solution	To place the final decision making in the hands of the public
E PUBLIC	We will keep you informed	We will keep you informed, listen to and acknowledge concerns and aspirations. Provide feedback on how public input influenced decisions	We will work with you to ensure your concerns and aspirations are reflected in the decisions and provide feedback on how public input influenced decisions	We will look to you for advice and innovation in formulating solutions and incorporate your advice and recommendations into decisions to the maximum extent possible into	We will implement what you decide

The Public Participation Spectrum

(Reference: International Association of Public Participation Australasia 2018)

## APPENDIX 3: MEMBERSHIP OF STAKEHOLDER GROUPS CONSULTED

### Members of the Manning River ECMP Reference Group

Name	Sector represented	Agency, community interest groups represented
Cr. Katheryn Smith	Co-Chair	MidCoast Council
Cr. Len Roberts	Co-Chair	MidCoast Council
Peter Bignell	Beef	
Sam Nicholson	Dairy	Mid-Coast Dairy Advancement Group; MidCoast Young Dairy Network
Peter Neal	Dairy	North Oxley Island Drainage Union
Peter Longworth	Beef	Manning Delta Landholders Group/Taree West Fishing Club
Dr. John Harris	Fisheries	Recreational fishing representative
Chris Scott	Landcare	Manning Landcare
Ian Crisp	Oysters	Manning River Oyster Farmer's Association
Tony Wales	Community	Manning Coastcare
Kirsty Hughes	Community	
Noel Piercy	Community	
Geoff LeMessurier	Public Authority	Hunter Local Land Services – MEMS Program
Andre Uljee	Public Authority	Transport for NSW – Maritime
Neil Kelleher	Public Authority	Department of Planning, Industry and Environment (DPIE)
Josh Chivers	Public Authority	DPIE – NPWS
Joedie Lawler	Purfleet-Taree Local Aboriginal Land Council	Biripi Traditional Owners
Rye Golland	Public Authority	Hunter Local Land Services

## Members of the Technical Advisory Group

Name	Agency
Brian Hughes	Hunter Local Land Services (HUNTER LLS)
Catherine Knight	DPIE - Crown Lands
Neil Kelleher	DPIE – Coast and Estuary Program
Josh Chivers	DPIE – NPWS
Gerard Tuckerman	MCC
Lisa Andersons	MCC
Judy Arusanilai	MCC
Peter Scanes	DPIE
Rebecca Swanson	DPIE
Scott Carter	DPI - Fisheries
Will Glamore	UNSW – Water Research Lab

## Delivery partners consulted – MidCoast Council

Name	Position Title	Team
Dan Aldridge	Manager Community Spaces, Recreation and Trades	Community Spaces, Recreation and Trades
Mat Bell	Senior Ecologist	Natural Systems
Karen Bettink	Catchment Officer – Ecosystem Management	Natural Systems
David Bowland	Environmental Scientist Sustainability	Water Services
Robyn Brennan	Economic Development Coordinator	Growth, Economic Development & Tourism
Sharon Bultitude	Destination Management Coordinator	Community Spaces & Services
Nicholas Colman	Environmental Projects Officer	Natural Systems
Tanya Cross	Sustainability and Natural Assets Coordinator	Natural Systems
Thomas Doyle	Senior Coastal and Flooding Engineer	Natural Systems
Peter Hatton	GIS Technician	Information and Communication Systems
Malcolm Hunter	Senior Environmental Health Officer – Projects and Policy	Building & Environmental Health Services
Ryan Fenning	Coordinator Environmental Health and Food Safety	Building & Environmental Health Services
Peter Goonan	Environmental Officer – Projects	Natural Systems
Becky Hunter	Compliance Officer	Regulatory Services
Belinda Kennewell	Environmental Officer	Natural Systems
Harry Lloyd	Graduate Planner	Strategic Planning

## Delivery partners consulted – MidCoast Council continued

Name	Position Title	Team
Aaron Kelly	Strategic Planner	Strategic Planning
Alexandra Macvean	Senior Land Use Planner	Strategic Planning
Alisha Madsen	Catchment Officer	Natural Systems
Anthony Marchment	Environmental Officer – Natural Assets	Natural Systems
Erin Masters	Environmental Officer – Education and Engagement	Natural Systems
Bob McDonnell	Environmental Officer	Natural Systems
Gary Mead	Manager Building and Environmental Health Services	Building and Environmental Health Services
Drew Morris	Catchment Officer	Natural Systems
Scott Nicholson	Manager Transport Assets	Engineering
Richard Pamplin	Principal Land Use Planner	Planning & Natural Systems
Brock Simpson	Recreation Officer	Parks & Recreation Services
Andrew Staniland	Coastal Management Coordinator	Natural Systems
Prue Tucker	Water Quality & Estuary Management Program Coordinator	Natural Systems
Deb Tuckerman	Manager Growth, Economic Development and Tourism	Growth, Economic Development & Tourism
Gerard Tuckerman	Manager Natural Systems and Acting Manager Land Use Planning	Natural Systems and Strategic Planning
Adam Turville	Asset Planning Coordinator	Water Services
Evan Vale	Team Leader Coastal, Flooding and Drainage	Transport Assets

## Other agencies and academic institutions consulted

Agency	Name
Department of Primary Industries - Fisheries	Kylie Russell
DPIE - Water and Science Group	Claire Evans
DPIE – Threatened Species program	Andrew Steed
Griffith University	Tim Pietsch
Hunter Local Land Services	Kirby Byrne, Rye Gollan, Reagan Walker, Jesse Gollan, Albert Mullen, Toby Whaleboat
MidCoast-2-Tops Landcare	Jessica Leck, Lyn Booth
NSW Food Authority	Anthony Zammit
Taree Indigenous development and Employment	Chris Sheed
Transport for NSW - MIDO	Kevin Morton
University of Technology Sydney	Shauna Murray and Matt Tesorario
University of NSW Water Research Laboratory	Brad Henderson

## APPENDIX 4: DESCRIPTION OF HOW THE MANNING RIVER ECMP ADDRESSES THE OBJECTS OF THE CM AND MEM ACTS

The Coastal Management Manual requires the Manning River ECMP to describe how the objects of the CM Act have been considered and promoted. Table 10 overleaf sets out our actions for each objective, the risks (from section 5.2) and issues (from section 6) they address and describes how they consider and promote the objects of the CM Act.

Our consultant Dr David Wainwright also undertook a multi-criteria analysis of the Management Actions, in consultation with the two project leads from Council's Natural Systems team. Each management option was scored against each object of the CM Act, the objectives for each Coastal Management Area from the CM Act, and the objects of the Marine Estate Management Act 2014.

This is presented in full in Annexure K Appendix D, with results for the final management actions provided in Table 11 below. The analysis demonstrated that the Manning River ECMP align well against objectives in several of the Coastal Management Areas specified in the CM Act.

Management Actions were scored against the object/objectives using the scoring scale presented in Figure 1 below. The scale of geographic impact was scored using Figure 2. The higher Impact Score in the far-right column, the greater the spatial impact of the action.



Scoring Scale for Alignment of Options against Objects/Objectives of CM Act	
Score	Alignment Descriptor
-2	Poor (Counterproductive) Alignment
-1	Negative Alignment
0	Neutral / Not Relevant
1	Postive Alignment
2	Excellent Alignment

Figure 1

Scoring of Geographical Impact Scale for Management Options	
Score	Scale Descriptor
1	Localised Impact
2	River Reach / Embayment Impact
3	Estuarine, Floodplain or Catchment Zone
4	Entire Estuary and/or Catchment

Figure 2

Table 9: Contribution of the ECMP to objects of the CM Act

Action #	Action	Local Objective theme	CM Object addressed	Risks addressed Section 5.2.2	Issue addressed See section 6	Description: how the CM object is addressed
MA_1.01	Develop and Deliver a Stewardship Program	Stewardship	Support public participation in coastal management and planning and greater public awareness, education and understanding of coastal processes and management actions	1.0	Lack of stewardship	This action will use a range of education and communication methods to build awareness and understanding of catchment and coastal processes and promote sustainable behaviours and informed input to decision making.
MA_1.02	Promote Best Management Practice Framework and Whole Farm Planning			2.0, 3.0, 5.0, 6.1, 6.2, 6.3, 6.4, 11.0	Agricultural impacts	This action will build understanding and skills, and enable floodplain farmers to improve their coastal land management practices, and upstream farmers to reduce diffuse source run-off to improve ecosystem health in the waterways.
MA_1.03	Promote and Facilitate Establishment of Private Conservation Agreements			1.0, 3.0, 5.0, 11.0	Biodiversity loss	This action will help landowners identify the conservation values of their property and protect it through a conservation agreement, thus improving coastal management and mitigating impacts from the catchment.
MA_1.04	Develop a Litter and Stormwater Pollution Source Control Program			1.0, 10.1, 10.2, 13.1	Urban stormwater, litter, plastics and marine debris	This action will promote awareness and understanding of the source and impacts of litter and other stormwater pollutants on the marine estate and promote responsible behaviours for source control.
MA_1.05	Develop and Distribute Education Material and Guidelines for ESC			1.0, 6.2, 13.1	Erosion and sediment	This action will promote awareness, understanding and mitigation of erosion and sediment impacts on the marine estate, improving coastal management.
MA_1.06	Improve Erosion and Sediment Control			1.0, 6.2, 10.1, 10.2, 13.1	Erosion and sediment/ Urban stormwater, litter, plastics and marine debris	This action involves capacity building with Council teams and developers to improve management of erosion and sediment controls in the SEPP-listed coastal use area.
MA_2.01	Implement Key Priority ASS Management Actions	Water Quality and Ecosystem Health	Protect and enhance natural coastal processes and coastal environmental values including natural character, scenic value, biological diversity and ecosystem integrity and resilience 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	3.0, 4.0, 6.1, 6.2, 6.3, 6.4, 11.0	Floodplain Drainage/ Loss and degradation of coastal wetlands	The impact of acid pollution events from floodplain drainage and exposure of ASS is described in the issue analysis. This action will remediate ASS and SEPP-listed coastal wetlands to reduce ASS exposure and acid leachate, improve natural coastal processes resilience, ecosystem integrity, biodiversity and recreation values of subject lands. A parcel of residual land owned by Transport for NSW is identified for acquisition through the Coastal Protection Scheme. The practice notes in Annexure J contain a preliminary report on the opportunity to restore the coastal values of this parcel.
MA_2.02	Protect and/or Rehabilitate Coastal Wetlands		Protect and enhance natural coastal processes and coastal environmental values including natural character, scenic value, biological diversity and ecosystem integrity and resilience	3.0, 4.0, 6.1, 6.2, 6.3, 6.4, 11.0	Floodplain Drainage/ Loss and degradation of coastal wetlands	This action will enhance natural coastal processes and restore ecosystem services of SEPP-listed coastal wetlands on the floodplain to improve natural character, biodiversity including commercial fish species and migratory shorebirds, scenic value and resilience.
MA_2.03	Improve Riparian and Estuarine Bank Vegetation			5.0, 6.3, 6.4, 11.0	Loss and degradation of riparian vegetation	This action applies to riparian vegetation in both the estuary and upstream catchment. It will help reduce diffuse source run-off, cool and shade the waterways, provide habitat for aquatic and riparian species including commercial fish species, improve scenic amenity and resilience.
MA_2.04	Promote Good Catchment Management Practice on public land			3.0, 4.0, 5.0, 6.1, 6.2, 6.3, 6.4, 11.0, 12.0, 13.1, 13.2	Loss and degradation of Coastal Wetlands	This action will reduce stock impacts on SEPP-listed coastal wetlands and coastal environment areas, improving ecosystem integrity and resilience.
MA_2.05	Enter the Manning River Entrance Project into the Business Case Process			2.0, 3.0, 4.0, 8.0, 9.0, 11.0	Entrance modifications	This action will ensure that a rigorous process is applied to the proposed entrance modifications. It includes environmental impact assessment and consideration of the Coastal Management Act and CMPs.

Action #	Action	Local Objective theme	CM Object addressed	Risks addressed Section 5.2.2	Issue addressed See section 6	Description: how the CM object is addressed
MA_2.06	Ensure Manning River Entrance Process includes Extensive Stakeholder Consultation	Water Quality and Ecosystem Health	Support public participation in coastal management and planning and greater public awareness, education and understanding of coastal processes and management actions	2.0, 3.0, 4.0, 8.0, 9.0, 11.0	Entrance modifications	An extensive consultation process will support public participation in coastal management. To be effective, participants must be informed of risks and issues associated with the proposed development.
MA_2.07	Implement a Systematic Approach to Maintaining SQIDs		Protect and enhance natural coastal processes and coastal environmental values including natural character, scenic value, biological diversity and ecosystem integrity and resilience	2.0, 3.0, 10.1, 10.2	Urban stormwater, litter, plastics and marine debris	This action will ensure SQIDs are operating effectively to reduce stormwater pollution impacts on water quality and ecosystem health of the estuary, improving ecosystem integrity, resilience and recreation values in the coastal use and coastal environment areas.
MA_2.08	Review, Revise and Supplement MCC's Current Stormwater Guidance			2.0, 3.0, 10.1, 10.2	Urban stormwater, litter, plastics and marine debris	This action will ensure developments have appropriate stormwater controls to reduce impacts on the estuary, thus improving coastal management for ecosystem integrity and resilience.
MA_2.09	Revise and Implement the Greater Taree Urban Stormwater Management Plan			2.0, 3.0, 10.1, 10.2	Urban stormwater, litter, plastics and marine debris	This action will improve stormwater management in the three major towns in the catchment to protect the waterway from stormwater pollutants and improve ecosystem health in the marine estate.
MA_2.10	Study and Prioritise Sensitive Estuarine Riverbank Areas for Management and Implement Stabilisation			3.0, 5.0, 6.3, 11.0	Loss and degradation of riparian vegetation	This action will stabilise bank erosion to reduce sedimentation in the estuary, reducing impacts on ecosystem health and resilience and improving scenic amenity in the coastal environment and coastal use areas.
MA_2.11	Prioritise Unsealed Road Sediment Hotspots and Undertake Remediation			13.1	Erosion and sediment	This action will control sedimentation from unsealed roads, improving water quality and ecosystem health.
MA_2.12	Onsite Sewerage Management System Audit and Compliance Strategy. Implement Audit Program			12.0	Sewage effluent and septic runoff	This action will reduce pathogen contamination of the estuary and catchment, improving water quality for oyster production, potable water and recreational use in the coastal environment area.
MA_2.13	MER for Ecosystem Health			2.0, 3.0, 4.0, 5.0, 6.3, 11.0	Loss and degradation of coastal wetlands/Loss and degradation of riparian vegetation/ Biodiversity loss	This action will monitor water quality and ecosystem health to guide adaptive management of the estuary. This action will also promote integrated and coordinated coastal planning, management and reporting.
MA_2.14	Implement a science research program			All	All	This action will ensure coastal and catchment management is based on scientific evidence, building understanding of emerging issues.

Action #	Action	Local Objective theme	CM Object addressed	Risks addressed Section 5.2.2	Issue addressed See section 6	Description: how the CM object is addressed
MA_3.01	Develop Forward Plan to Retain Retreat Zones for Coastal Wetlands in Partnership with Land Owners	Climate Change	Encourage and promote plans and strategies to improve the resilience of coastal assets to the impacts of an uncertain climate future including impacts of extreme storm events	2.0, 3.0, 5.0, 6.3, 9.0, 11.0	Loss and degradation of coastal wetlands	This action will develop a strategy to protect SEPP-listed coastal wetlands on the floodplain from climate impacts including sea level rise
MA_3.02	Develop forward plans for Council Assets at Risk from Sea Level Rise		Mitigate current and future risks from coastal hazards, considering the effects of climate change	2.0, 8.0, 9.0	Climate change	A climate risk assessment has been completed for Council assets including roads and stormwater assets. This action will develop a plan to maintain and upgrade assets to protect them from coastal hazards such as coastal inundation and extreme weather events.
MA_3.03	Long Term Adaptation Plan for Manning Floodplain in Collaboration with Landowners		Encourage and promote plans and strategies to improve the resilience of coastal assets to the impacts of an uncertain climate future including impacts of extreme storm events	2.0, 3.0, 4.0, 6.3, 8.0, 9.0, 11.0	Floodplain drainage/ Loss and degradation of coastal wetlands	This action will develop a long-term strategy to manage the agricultural production and ecosystem values of the Manning floodplain, considering transitions required to adapt to climate change impacts including coastal inundation in the 50-100 year timeframe.
MA_4.01	Address Barriers to Fish Passage	Biodiversity	Protect and enhance natural coastal processes and coastal environmental values including natural character, scenic value, biological diversity and ecosystem integrity and resilience	7.0, 11.0	Biodiversity loss	This action will restore fish passage, enhancing biodiversity. Fish play an important role in ecosystem health and have social and economic value for fishing.
MA_4.02	Develop and Implement Pest and Weed Control Plans			11.0	Biodiversity loss	This action will protect coastal and catchment environmental values from the impact of invasive weeds and predator species such as fox. This will enhance natural character and scenic amenity, maintain ecosystem integrity and improve resilience in the face of climate impacts.
MA_4.03	Implement Recommendations of Refugia Study			7.0, 11.0	Biodiversity loss	This is an upstream program; it will maintain refuge pools for fish including estuarine species that spend part of their lifecycle upstream.
MA_5.01	Involve Aboriginal Community in Management of the River, Catchment and Estuary	Aboriginal Custodian-ship	Acknowledge Aboriginal peoples' spiritual, social, customary and economic use of the coastal zone	1.0, 3.0, 5.0, 6.3, 11.0	Loss and degradation of coastal wetlands/ Loss and degradation of riparian vegetation	This action will actively support Aboriginal peoples' spiritual, social, customary and economic use of the coastal zone
MA_5.02	Install Interpretive Signage and Facilitate Cultural Activities			1.0	Stewardship	This action will actively support Aboriginal peoples' spiritual, social, customary and economic use of the coastal zone
MA_5.03	Engage Aboriginal People in Water Quality Monitoring			1.0, 10.1, 10.2	Stewardship/Urban stormwater, litter, plastics and marine debris	This action will actively support Aboriginal peoples' spiritual, social, customary and economic use of the coastal zone
MA_5.04	Appoint Two Aboriginal Members to the ECMP Reference Group			1.0	Stewardship	This action will actively support Aboriginal peoples' spiritual, social, customary and economic use of the coastal zone

Action #	Action	Local Objective theme	CM Object addressed	Risks addressed Section 5.2.2	Issue addressed See section 6	Description: how the CM object is addressed
MA_6.01	Investigate & Implement Site-Specific Pathogen Source Control measures	Social and Economic Values	Recognise the coastal zone as a vital economic zone and to support sustainable coastal economies	6.4	Agricultural Impacts	This action will protect oyster fisheries and potable water offtake areas from the impact of human pathogens, contributing to economic security in the region.
MA_7.01	Submit a Planning Proposal for CM SEPP	Land Use Planning	Facilitate ecologically sustainable development in the coastal zone and promote sustainable land use planning decision-making	1.0, 2.0, 3.0, 9.0, 8.0	Stewardship, Climate Change/ Loss and degradation of coastal wetlands/ Flood, Inundation	This action will improve protection for coastal wetlands.
MA_7.02	Preparing Mapping of Coastal Vulnerability Area for Tidal Inundation		Recognise that the local and regional scale effects of coastal processes, and the inherently ambulatory and dynamic nature of the shoreline, may result in the loss of coastal land to the sea (including estuaries and other arms of the sea), and to manage coastal use and development accordingly	2.0, 3.0, 9.0	Climate Change	This action will map coastal vulnerability areas to underpin development controls in coastal use areas.
MA_7.03	Identify Water Quality Objectives and Management Targets		Facilitate ecologically sustainable development in the coastal zone and promote sustainable land use planning decision-making	4.0, 6.1, 6.2, 6.4, 10.1, 10.2	Urban stormwater, litter, plastics and marine debris	This action will determine the water quality requirements of receiving waters, and how this relates to the way development is managed MA_8.01
MA_8.01	Establish Multi-Stakeholder Management Committee	Governance	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 Promote integrated and coordinated coastal planning, management and reporting		All Issues	This action will bring together government agencies, community and industry representatives to improve integration of coastal and catchment management activities. The ECMP monitoring and reporting program will provide for integrated coastal management monitoring and reporting.
MA_8.02	Holistic approach to compliance Programs		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		Agricultural Impacts, Loss of Riparian Vegetation, Sewerage and Septic	This action will improve coordination between compliance agencies for improved management of threats in the coastal zone.

# MANAGEMENT ACTION ASSESSMENT - MANNING RIVER ESTUARY

Criteria (Objects/Objectives from CM Act and MEM Act)

		CM Act Objects												MEM Act Objects						Wetlands			Environment			Use			Vulnerability																					
No.	Management Option	Coastal Processes/Values	Social and Cultural Values	Aboriginal Values/Uses	Coastal Economies	Ecologically Sustainable Development	Coastal Hazards / Climate Change	Ambulatory Recognition	Integrated Planning/Management	Resilience of Coastal Assets	Co-ordinated Management Activities	Public Participation/Understanding	Identify Land for Protection	Biologically diverse and healthy	Economic Opportunities	Cultural, Social, Recreational	Ecosystem Integrity	Scientific Research and Education	Promote Coordination	Management of Marine Parks	Natural Biodiversity/Integrity	Rehabilitation/Restoration	Resilience/Migration	Social/Cultural Values	Promote State Policies/Programs	Environmental Values/Processes	Resilience of Coastal Waters	Water Quality	Social/Cultural Values	Beaches / Dunes / Natural Features	Public Access/Amenity	Natural Scenic Quality	Cultural / Built Environment Heritage	Urban Design	Public Open Space	Use of Surf Zone	Urbanised and Natural Coastline	Public Safety	Mitigate Coastal Hazards	Maintain Beaches	Public Amenity	Sensible Land Use	Reduce Hazard Exposure	Do no harm	Essential Infrastructure	Resilient Development	Impact Scale	Scaled Impact Score		
1.01	Stewardship program	1.7	2	1	1.3	0.7	0.3	0	0.7	0	0.3	2	0	1	0.3	2	0.7	1.3	1.3	0	0.3	0.3	0.3	1.7	1	0.3	0.3	0.3	1.7	0	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	93	
1.02	Best Management Practice Framework for Whole Farm Planning	1.7	1	0.7	1.7	1.7	0.7	0.3	0.7	0.3	0.3	2	0	1.3	1.7	0.7	1.3	1.3	0.7	0	1	1.3	1.3	1	0	1.3	1.3	1.7	1	0	0	0.3	0	0	0	0	0	0	0.3	0	0	0.7	0.3	0	0	0.3	3.67	110		
1.03	Promote and Facilitate Establishment of Private Conservation Agreements	1	0.3	0.7	0.7	1.3	0.3	0	0	0	0.3	1.7	0.7	1.3	0.3	0.3	1.3	0.7	0.3	0	1.7	1.3	1.3	0.3	1.3	1.3	1.3	1	0.7	0.3	0	0.3	0	0	0	0	0	0	0	0.3	0	0	0	0	0	0	0	3.33	76	
1.04	Develop a Litter and Stormwater Pollution Source Control Program	1	1.3	0.7	0.7	1	0	0	0.3	0	0.3	2	0	0.7	0.3	1	1	1.7	0.7	0	0.3	0.3	0.3	1	1.3	1	0.7	1.7	1.3	0.3	0.3	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	65	
1.05	Develop and Distribute Education Material and Guidelines for ESC	0.7	0	0	0.3	1	0	0	0	0	0	2	0	1	0.3	0.3	0.7	0.7	0	0	0.7	0.3	0.3	0	0	1.3	1	1.3	0	0	0	0.3	0	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	3.67	46	
1.06	Improve Erosion and Sediment Control	1	0.7	0.3	0.7	1.7	0.3	0	0.7	0	0.7	0.7	0	1.3	0.3	0.7	0.7	0.7	0	0	1	1	0.7	0.3	0.7	1.7	1.3	1.7	0.7	0	0	0.3	0	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	3.67	73	
2.01	Implement Key Priority ASS Management Actions	2	1	1	1.7	1.3	0.7	0.7	0.7	0.7	0	0.3	1.3	2	1	0.3	2	1	0	0	2	2	1.7	1.3	2	2	2	2	1	0.7	0	0.7	0	0	0	0	0	0	0.3	0	0	0	0	0	0	0	0	3	106	
2.02	Protect and/or Rehabilitate Coastal Wetlands	2	1	0.7	1.7	1	0.7	0.7	0.7	0.7	0	0.3	2	2	0.7	0.3	2	1	0	0	2	2	1.7	1.3	1.7	2	2	2	1	0.7	0	0.7	0	0	0	0	0	0	0.3	0	0	0	0	0	0	0	0	3	104	
2.03	Improve Riparian and Estuarine Bank Vegetation	1.3	1	0.7	1.3	1	0.7	0.7	0	0.7	0	0.3	1.3	2	0.7	0.7	2	0.3	0.3	0	1.7	1.7	0.7	1	1.3	2	2	2	1	0.7	0	0.7	0	0	0.3	0	0	0.3	0	0	0	0	0	0	0	0	0	3.33	101	
2.04	Promote good catchment management practice on public land	1.3	0.7	0	0.7	1	0	0.7	0	0.7	0	0.7	0.7	1.3	0	0.7	1.3	1	0.7	0	1.7	1.7	1	0.7	1.7	1.3	1.3	1.3	1	0.7	0	0.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.33	32		
2.05	Enter the Manning River Entrance Project into the NSW Investor Assurance and Business Case Process	-1	0.7	-1	0.3	1	0	0	0	0	0	0	0	-1	0.7	0.7	-1	0.3	0	0	-1	0	0	0	-1	-0	-0	0.3	0.7	0	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.33	0.8		
2.06	Ensure Manning River Entrance Process includes Extensive Stakeholder Consultation	0.7	1.3	1.3	0.3	1	0	0	0	0	0	2	0	0.3	0.7	1.3	0.3	0.7	0	0	0	0	0	1	0.3	0	0	0	1.7	0	0.3	0	0.3	0	0.3	0	0	0	0	0	0	0	0	0	0	0	0	2.33	32	
2.07	Implement a Systematic Approach to Maintaining SQIDs	1	0.3	0	0.7	0.7	0	0	1.3	0	0.7	0	0	1	0.3	0.7	1.3	0.3	0.7	0	1.7	0.7	1	1	0.3	1.7	1	1.7	1.3	0.3	0.7	0.3	0	1	0.3	0	0	0	0	0	0	0	0	0	0	0.3	0.3	2.33	53	
2.08	Review, Revise and Supplement MCC's Current Stormwater Guidance	0.7	0.3	0	0.7	1.3	0.3	0	1.3	0.3	0.7	0	0	1	0	0.7	1	0	0.7	0	1	0	0.7	0.3	0	1	1	1.3	0.7	0.3	0.3	0.3	0.3	0.3	1.3	0.3	0	0	0	0	0	0	0	0	0	0	0.3	0.3	2.33	44
2.09	Revise the Greater Taree Urban Stormwater Management Plan	1	0.7	0	1	0.7	0.3	0	1.3	0.3	1	0	0.3	1	0.3	0.7	1.3	0	0.7	0	1	0	1	0.7	0	1.7	1	1.7	1	0.3	0.7	0.3	0	1.7	0.3	0	0	0	0	0	0	0	0	0	0	0	0.3	0.3	2.67	60
2.10	Study and Prioritise Sensitive Estuarine Riverbank Areas for Management and Stabilise 7.5 km	1.3	0.3	0.3	0.3	0.7	0.3	0.3	1	1	0.3	0	1	1.3	0.3	0.3	2	0.3	0.3	0	0.7	0.7	1	0.3	0.7	2	2	1.7	1.3	0.3	0.3	0.3	0	0	0	0	0	0.3	0.3	0	0	0.3	0	0	0	0	0	2.67	64	
2.11	Study Unsealed Road Sediment Hotspots and Remediate Hotspots	1.3	0.3	0	0	0.7	0	0	0.7	0	0.3	0	0.7	1.7	0	0.3	1.7	0	0	0	0.3	0.3	0.3	0	0.7	1.7	0.7	1	0.3	0	0	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.33	31	
2.12	Complete and Implement Onsite Sewerage Management System Audit and Compliance Strategy	1.7	0.7	0.7	0.7	1.3	0	0	0.7	0	0.7	0	0	1.7	1	1.3	1.7	0.3	0.3	0	0.7	0	0	0.7	0.7	1.7	1	1.7	1	0	0.7	0	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	84	
2.13	MER for Ecosystem Health	1.3	0.3	0.3	0.3	1	0	0.7	1.3	0.7	0	1	0.7	1.3	0.3	0.3	1.3	1.3	0.3	0	1	1	1	0.3	1	1.3	1	1.3	0.7	0.7	0	0.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	91	

Table 10: Multi-criteria analysis of Management Actions against CM Objects, MEM Objects and SEPP Objectives

# MANAGEMENT ACTION ASSESSMENT - MANNING RIVER ESTUARY CONTINUED

Criteria (Objects/Objectives from CM Act and MEM Act)

		CM Act Objects												MEM Act Objects						Wetlands			Environment				Use				Vulnerability																			
No.	Management Option	Coastal Processes/Values	Social and Cultural Values	Aboriginal Values/Uses	Coastal Economies	Ecologically Sustainable Development	Coastal Hazards / Climate Change	Ambulatory Recognition	Integrated Planning/Management	Resilience of Coastal Assets	Co-ordinated Management Activities	Public Participation/Understanding	Identify Land for Protection	Biologically diverse and healthy	Economic Opportunities	Cultural, Social, Recreational	Ecosystem Integrity	Scientific Research and Education	Promote Coordination	Management of Marine Parks	Natural Biodiversity/Integrity	Rehabilitation/Restoration	Resilience/Migration	Social/Cultural Values	Promote State Policies/Programs	Environmental Values/Processes	Resilience of Coastal Waters	Water Quality	Social/Cultural Values	Beaches / Dunes / Natural Features	Public Access/Amenity	Natural Scenic Quality	Cultural / Built Environment Heritage	Urban Design	Public Open Space	Use of Surf Zone	Urbanised and Natural Coastline	Public Safety	Mitigate Coastal Hazards	Maintain Beaches	Public Amenity	Sensible Land Use	Reduce Hazard Exposure	Do no harm	Essential Infrastructure	Resilient Development	Impact Scale	Scaled Impact Score		
3.01	Identify Retreat Buffer Zones for Coastal Wetlands and Littoral Rainforest	1.7	0	0.3	0.7	0.7	0.7	0.7	1.3	1.3	0.7	0	1.7	2	0.7	0.3	2	0.7	1	0	2	1	2	1	1.3	2	2	1	0.7	0.7	0.3	0.7	0	0	0	0	0	0	1	0	0	0.7	0.7	0	0	0.7	3	102		
3.02	Identify Council Assets at Risk from Sea Level Rise	0	1.3	0.3	1.3	0.7	2	0	1	2	0.7	0	0.3	0	1.3	1	0	0	0	0	0	0	0	0.7	0.7	0	1	0.7	1	0	0	0.3	0	0.7	0	0	0	0.7	1	0	0.3	1	0.7	0	1.3	0.7	2	45		
3.03	Examine Future Effectiveness of Coastal Inundation Emergency Strategies	0	1	0	1	0	1.7	0	0.7	0.7	0.3	0	0	0	1.3	1	0	0	0.3	0	0	0	0	0.7	0	0	0.3	0	0.7	0	0.3	0	0	0.7	0	0	0	0.7	1.3	0	0	0.7	0.7	0	0.3	0.7	3	45		
3.04	Long Term Adaptation Plan for Manning Floodplain	2	1	0	2	1	2	0.7	1.3	2	0.7	1.3	2	2	1.3	1	1.3	0.7	1	0	2	0.3	2	1.7	0.3	1.7	1.7	1.7	1.7	0.7	0.3	0.7	0	0	0	0	0	0	1	0	0	1	0	0	0.7	3	122			
4.01	Address Barriers to Fish Passage	1.7	1	0.7	1	0.7	0	0	0	0.3	0.3	0	0	2	0	1	2	0	0	0	0.7	0.3	0.3	0.7	0.7	2	0.3	0	1.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.67	45	
4.02	Develop Integrated Pest and Weed Control Plans	1.7	0.7	0.3	0	0.3	0	0	0.7	0	0.3	0	0.7	2	0	0.3	2	0.3	0.3	0	1.3	1.3	1.3	0.3	0.7	2	0.7	0	0.3	0.7	0.3	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	76	
4.03	Implement Recommendations of Refugia Study	1	1	0	0	0.7	0.3	0	0	0	0	0.7	0	2	0	0.3	1.7	1	0.3	0	0.3	0.3	0.3	0	0	1.3	0	0	0.3	0	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.33	16	
5.01	Involve Aboriginal Community in Management of the River, Catchment and Estuary	1.3	1.7	2	0	0.7	0	0	0	0.7	0	1.3	0.7	1.3	0.7	1.7	1.3	0.3	0.7	0	0.7	1	0.7	1	1	0.7	0.7	0.7	1.7	0.7	0	0.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.67	87	
5.02	Install Interpretive Signage and Facilitate Cultural Activities	0.7	1.7	1.7	0	0	0	0	0	0	0	1.7	0	0	0	2	0	0.7	0	0	0	0	0	1	0.3	0	0	0	2	0	1.3	0	0.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.33	32	
5.03	Engage Aboriginal People in Water Quality Monitoring	1.3	1.3	2	0	0.3	0	0	0	0	0.7	1.7	0	0.7	0	1.3	0.7	1	0	0	0	0	0	1	0.3	0.7	0.7	1	1.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.67	43
5.04	Involve Aboriginal People in Implementation of the Manning CMP	1.3	1.3	2	0	0.7	0.7	0	0	0.7	0	2	0.7	0.7	0	1.3	0.7	0.3	1	0	0.7	1	0.7	1	1	1	0.7	0.7	1.7	0.7	0	0.7	0.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.67	87	
6.01	Investigate & Implement Site-Specific Pathogen Source Control measures	2	0.7	0.3	1.3	0.3	0	0	0.3	0	0	0.3	0.7	1.7	2	0.3	1.7	0.3	0.3	0	0	1.3	0	0	0.7	2	0.7	2	1.3	0	0.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.33	49	
7.01	Submit a Planning Proposal for CM SEPP	1.7	0	0.3	0.7	1.3	1.3	0	0.7	1.3	0.7	0	1.3	1.7	0.3	0.3	1.7	0.3	0	0	1	0.7	1.3	0.3	2	2	1.3	1	0.7	0.7	0	0.3	0	0	0	0	0	0	0	0.7	0	0	0.7	0.7	0	0	0	3.33	90	
7.02	Preparing Mapping of Coastal Vulnerability Area for Tidal Inundation	1	1	0.3	1	1.7	1.3	0.7	0.3	1	0.7	0	2	0.7	0.3	0.7	0.7	0.7	0	0	0.3	0	0.7	1.3	2	0.7	0.7	0	0.3	0.7	0	0	0	0	0	0	0	1.3	1.3	0.7	0.7	1.3	1.3	0.7	0.7	0.7	2.67	78		
7.03	Identify Water Quality Objectives and Management Targets	1	0.7	0	0.3	1.3	0	0	1.3	0.7	0	0	0.3	1.3	0	0.7	1.3	0.3	0	0	0.7	0.3	0.7	1	0.7	1.3	1	1.7	0.7	0	0	0.3	0	1	0	0	0	0	0	0.3	0	0	0	0	0	0	0	3.67	70	
8.01	Establish Multi-Stakeholder Management Committee	1	1.3	1.3	1	1.3	1.3	0.7	2	0.7	1.7	1.3	0.7	1	0.7	1.3	1	1	2	0.7	1	1	1	1	1	1	1	1	1	1	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	4	169	
8.02	Holistic approach to Compliance Programs	0.7	1	0.7	0.3	1	0	0	1	0	0.7	1	0	1	0	0.7	1.3	0.7	0.7	0	1	0	0.3	0.3	0.3	1.3	0.3	1.7	1	0	0.3	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	71	

Continued: Table 10: Multi-criteria analysis of Management Actions against CM Objects, MEM Objects and SEPP Objectives

## APPENDIX 5: MANNING RIVER ECMP THREAT AND RISK ASSESSMENT

Threat	Description	Causes/Stressors	Values impacted	Inherent Consequence Rating (1-5)	Inherent Likelihood Rating (1-5)	Risk Value	INHERENT RISK RATING	Existing key controls	Control effectiveness	Residual Consequence Rating (1-5)	Residual Likelihood Rating (1-5)	Risk Value 1	RESIDUAL RISK RATING	Total residual score	RANK-ING	Risk tolerance
Lack of engagement and stewardship	Lack of community participation in stewardship, governance, compliance; Lack of community awareness understanding and skills	High level of concern raised CMP reference group. Underpins all other threats.	Environment	4	5	20	Extreme	Range of education and engagement activities such as discovery tours, antilitter campaigns, field days and extension work with farmers, Landcare capacity building activities. Engagement efforts are adhoc. Requires consistent effort over time.	Some-what effective	4	4	16	High	46	1	LOW
			Social	3	5	15	High			3	5	15	High			
			Economic	3	5	15	High			3	5	15	High			
Failure to account for long term impacts of climate change (50-100 years)	Potential maladaptation and restriction of future flexibility in addressing risks.	Warming climate due to greenhouse gases	Environment	5	3	15	High	Overarching and important long-term	NA	5	3	15	High	45	2	LOW
			Social	5	3	15	High			5	3	15	High			
			Economic	5	3	15	High			5	3	15	High			
Clearing and degradation of coastal wetlands	Draining and clearing of coastal wetlands inhibits ecosystem services incl. flood mitigation, nutrient and sediment filtration, habitat, ASS exposure	Agriculture and drainage on the floodplain, urban and peri-urban land-use	Environment	5	5	25	Extreme	Remediation of Big Swamp and Cattai Wetlands	Some-what effective	4	5	20	Extreme	44	3	LOW
			Social	4	3	12	High			4	3	12	High			
			Economic	4	3	12	High			4	3	12	High			
Floodplain drainage (ASS)	Loss of habitat within catchment resulted in loss of species diversity of plants, animals, invertebrates and degradation of natural environment - audit and address land degradation including wind and water erosion, scalding, loss of nutrients, soil acidity, decline in soil structure, loss of biodiversity	Loss of habitat within catchment resulted in loss of species diversity of plants, animals, invertebrates and degradation of natural environment - audit and address land degradation including wind and water erosion, scalding, loss of nutrients, soil acidity, decline in soil structure, loss of biodiversity	Environment	5	4	20	Extreme	Implementation of Lower Manning River Drainage Remediation Action. Land acquisition program to remediate high priority localities; Drain Maintenance Guidelines in DCP; No co-ordinated community capacity building program in place; Assistance to landholders to undertake floodgate modifications where it reduces ASS runoff	Effective	5	4	20	Extreme	44	3	LOW

Threat	Description	Causes/Stressors	Values impacted	Inherent Consequence Rating (1-5)	Inherent Likelihood Rating (1-5)	Risk Value	INHERENT RISK RATING	Existing key controls	Control effectiveness	Residual Consequence Rating (1-5)	Residual Likelihood Rating (1-5)	Risk Value 1	RESIDUAL RISK RATING	Total residual score	RANKING	Risk tolerance
			Social	4	3	12	High			4	3	12	High			
			Economic	4	4	16	High			4	3	12	High			
Clearing and degradation of riparian vegetation and adjacent habitat	Widespread clearing and degradation of riparian buffer vegetation causes bank erosion and loss of habitat	Agricultural, peri-urban and urban land-use	Environment	5	5	25	Extreme	Incentive programs with landholders to restore riparian vegetation. Natural regeneration via stock exclusion	Somewhat effective	4	5	20	Extreme	44	3	LOW
			Social	4	3	12	High			4	3	12	High			
			Economic	4	3	12	High			4	3	12	High			
Clearing and degradation of riparian vegetation and adjacent habitat	Widespread clearing and degradation of riparian buffer vegetation causes bank erosion and loss of habitat	Agricultural, peri-urban and urban land-use	Environment	5	5	25	Extreme	Incentive programs with landholders to restore riparian vegetation. Natural regeneration via stock exclusion	Somewhat effective	4	5	20	Extreme	44	3	LOW
			Social	4	3	12	High			4	3	12	High			
			Economic	4	3	12	High			4	3	12	High			
Agricultural diffuse source run-off: Nutrients	Elevated nutrients in the Manning River and estuary, causing excess macrophyte and algal growth, declines in water quality and seagrass extent and condition Decline in health of aquatic biodiversity quality and extent, including macro invertebrates	Excess fertiliser use Farm effluent used on pasture; Dairy and other effluent direct inputs to waterways; Stock in waterways.	Environment	4	5	20	Extreme	Limited number of dairy effluent plans in lower Manning Pelican Bay study and remediation works LLS Extension Program	Somewhat effective	4	5	20	Extreme	44	3	LOW
			Social	3	4	12	High		Somewhat effective	3	4	12	High			
			Economic	3	4	12	High		Somewhat effective	3	4	12	High			
Agricultural diffuse source run-off: Sediments	Due to the long residence time of fresh water, the estuary is sensitive to the accumulation of sediments. Diffuse runoff from agriculture contributes sediment, leading to elevated turbidity in estuary, sedimentation, reduction in seagrass productivity, available habitats. Sediment also mobilises nutrient pollution.	Stock in waterways Clearing of riparian and adjacent vegetation Forestry Run off from non-perennial pastures	Environment	4	5	20	Extreme	Ad Hoc incentive projects and remediation works		4	5	20	Extreme	44	3	LOW

Threat	Description	Causes/Stressors	Values impacted	Inherent Consequence Rating (1-5)	Inherent Likelihood Rating (1-5)	Risk Value	INHERENT RISK RATING	Existing key controls	Control effectiveness	Residual Consequence Rating (1-5)	Residual Likelihood Rating (1-5)	Risk Value 1	RESIDUAL RISK RATING	Total residual score	RANKING	Risk tolerance
			Social	3	4	12	High		Ineffective	3	4	12	High			
			Economic	3	4	12	High			3	4	12	High			
Stock in riparian and marine vegetation	Widespread stock access to the river throughout fresh and saltwater catchments	Sediment, nutrient and pathogen run-off; reduces condition and extent of riparian veg.	Environment	4	4	16	High	Some ad-hoc exclusion of stock and placement of rock fillets by landholders in conjunction with public authorities in catchment and lower estuary	Somewhat effective	4	4	16	High	40	4	LOW
			Social	3	4	12	High			3	4	12	High			
			Economic	3	4	12	High			3	4	12	High			
Modified hydrology/ hydraulics and flow regime, Modified freshwater flows	Effect on hydrology of climate change (altered flows) and extractions; Current WSP conditions have high ecological risks as a result of the paucity of ecological information used to determine an appropriate CTP threshold; Low flow periods obstruct species' passage (e.g. fish, turtles), increase exposure to predation (e.g. platypus). Saltwater intrusion into in upper estuary around Wingham results in plant deaths (e.g. water ribbons)	Water licenses for extraction, climate change. Medium sensitivity of the estuary to changes in freshwater inflows;	Environment	4	4	16	High	10-year Water Sharing Plans for water sources within the Catchment. Cease to pump regulations imposes access restrictions when flows fall below a set level. No new extraction licences - must purchase entitlement from existing access licences.	Somewhat effective	4	3	12	High	40	4	LOW
			Social	4	4	16	High			4	4	16	High			
			Economic	3	4	12	High			3	4	12	High			
Entrance modifications, including dredging, opening and permanent entrance training	Permanently opening the entrance of the estuary at entrances has/will have a range of ecological impacts to coastal wetlands and ASS and result in changes in the salt wedge	Entrance opening modifies salinity / freshwater exchange in the estuary; Listed in top three threats in statewide the NSW Marine Estate Management Strategy 2018 – 2020	Environment	4	4	16	High	Ecological and geomorphological impacts from dredging addressed through REF process; Community advocacy to further train Harrington and install additional breakwall and open Farquhar. A Parliamentary Taskforce is investigating the engineering and economic feasibility of a second break water at the Harrington entrance.	Somewhat effective	4	3	12	High	40	4	LOW
			Social	4	4	16	High			4	4	16	High			
			Economic	3	4	12	High			3	4	12	High			

Threat	Description	Causes/Stressors	Values impacted	Inherent Consequence Rating (1-5)	Inherent Likelihood Rating (1-5)	Risk Value	INHERENT RISK RATING	Existing key controls	Control effectiveness	Residual Consequence Rating (1-5)	Residual Likelihood Rating (1-5)	Risk Value 1	RESIDUAL RISK RATING	Total residual score	RANKING	Risk tolerance
Flood and inundation	Major floods occurring 1 in 50 yrs., coastal inundation with storm surge and king high tides	Extreme rainfall events exacerbated by loss of vegetation. Legacy issues with development in inundation zones.	Environment	4	3	12	High	Development control in flood zones; stormwater system; flood warnings and recovery efforts.	Some-what effective	3	3	9	Medium	33	5	LOW
			Social	5	3	15	High			4	3	12	High			
			Economic	5	3	15	High			4	3	12	High			
Agricultural diffuse source run-off: Pathogens (e.g. E coli)	Current practices associated with the management of effluent e.g. dairy	Run-off from manures, irrigating pasture with effluent, stock in waterways	Environment	2	3	6	Medium	Some dairy effluent plans on selected properties on the lower Manning. MCC Water Services monitoring dairy effluent plans for selected properties in Lower Manning (LLS)		2	3	6	Medium	33	5	MODERATE
	Potential to reduce social values (e.g. swimming) due to contamination of estuary		Social	5	4	20	Extreme		Some-what effective	5	3	15	High			
			Economic	4	3	12	High			4	3	12	High			
Stormwater discharge including erosion and sediment, litter and plastics	Discharge of sediment, nutrient, chemicals and litter from stormwater system. Due to the long residence time of fresh water, the estuary is sensitive to the accumulation of sediments. There are about 800 unsealed road crossings in MidCoast LGA, most in the Manning which is the largest catchment. Run-off of sediment from unsealed roads causes localised high turbidity in high flow periods. Urban pollutant loads are low comparatively to catchment loads.	Failure to address source control; lack of appropriate in-line infrastructure e.g. GPTs; failure to maintain systems; non-compliance with DCP. Report card monitoring indicates decline in extent and condition of seagrass in estuary. For litter, marine debris and plastics potential sources, include urban areas, tourism sites, fishing.	Environment	2	4	8	Medium	Neutral or beneficial effect is applied to new subdivisions in accordance with the Manning Region LEP. Sediment and erosion management training provided to Council staff; MEMS-funded project for source pollution from roads Some gross pollutant traps in Taree Clean up days and education programs	Some-what effective	3	3	9	Medium	33	5	MODERATE
			Social	3	4	12	High			3	4	12	High			
			Economic	3	4	12	High			3	4	12	High			

Threat	Description	Causes/Stressors	Values impacted	Inherent Consequence Rating (1-5)	Inherent Likelihood Rating (1-5)	Risk Value	INHERENT RISK RATING	Existing key controls	Control effectiveness	Residual Consequence Rating (1-5)	Residual Likelihood Rating (1-5)	Risk Value 1	RESIDUAL RISK RATING	Total residual score	RANK-ING	Risk tolerance
Climate Change 20-year timeframe	Sea Level Rise causes Migration of coastal wetlands & conflicts with land use. Also, impacts on low lying rainforest		Environmental	4	3	12	High			4	3	12	High	30	6	MODERATE
	SLR and extreme weather events cause damage and failure of essential infrastructure		Social	3	3	9	Medium			3	3	9	Medium			
			Economic	3	3	9	Medium			3	3	9	Medium			
Pests and diseases	Introduced plants, animals and diseases are present throughout the catchment and estuary, incl. deer, pigs, European fox, Indian mynah, gambusia, goldfish	Invasive plants especially woody weeds and vines	Environment	4	4	16	High	MCC biosecurity (weeds) program for high priority weeds Control program for deer at Cattai wetlands Site based control of foxes (Minimbah, Manning inlets)		3	4	12	High	27	7	MODERATE
			Social	3	3	9	Medium		Somewhat effective	3	3	9	Medium			
			Economic	3	2	6	Medium			3	2	6	Medium			
Sewage effluent and septic runoff	Pathogens e.g. E coli within catchment and estuary	Septic tanks leaking/hot functioning, runoff	Environment	3	3	9	Medium	MCC sewage treatment plants treat water to a tertiary level under licences from the EPA. Over the past 20 years, MCC Water Services, has expanded off-site sewerage services to smaller villages in environmentally sensitive areas. MCC has prepared an On-site Sewage Management Strategy. MCC carried out inspections of all pump-to-sewer on-site sewage management systems in Pelican Bay 2019.	Somewhat effective	2	3	6	Medium	27	6	MODERATE
			Social	4	3	12	High			3	3	9	Medium			
			Economic	4	3	12	High			4	3	12	High			

Threat	Description	Causes/Stressors	Values impacted	Inherent Consequence Rating (1-5)	Inherent Likelihood Rating (1-5)	Risk Value	INHERENT RISK RATING	Existing key controls	Control effectiveness	Residual Consequence Rating (1-5)	Residual Likelihood Rating (1-5)	Risk Value 1	RESIDUAL RISK RATING	Total residual score	RANK-ING	Risk tolerance
Recreational boating impacts - bank erosion	Localised boatwash bank erosion from powerboats in tributaries to the estuary. Loss of riparian vegetation Report card estuary monitoring data shows high turbidity associated with high flow events from catchment.	Anecdotal concern from landowners in Lansdowne but no quantified data. Potential causes include improved boat ramp facilities, increasing domestic tourism and rise in popularity of wake boats.	Environment	2	4	8	Medium	Maritime Safety Plan 2017-2021. The only no-wake zone is at the confluence of the Dawson and Manning Rivers. Program of revetment and fillets to stabilise banks funded via MEMS and MCC.	Ineffective	2	4	8	Medium	27	6	MODERATE
			Social	2	2	4	Low			2	2	4	Low			
	Positive impact for tourism and rec industries, negative impact for landowners with bank erosion		Economic	2	4	8	Medium			2	4	8	Medium			
Recreational fishing - shore and boat-based line and trap fishing, hand gathering	Recreational fishing has potential to impact fish stocks.	Illegal or excessive take; Inadequate regulation; inappropriate access environmental degradation	Environment	4	2	8	Medium	Manning River estuary designated as a Recreational Fishing Haven, only recreational fishing is permitted downstream from Ghinni Ghinni and Berady Creek		4	2	8	Medium	20	7	HIGH
			Social	3	2	6	Medium			3	2	6	Medium			
			Economic	3	2	6	Medium			3	2	6	Medium			
Commercial fishing - estuary prawn haul, estuary general	Commercial fishing depletes fish stock and damages ecosystem health.	Commercial fishing operations under license	Environment	3	4	12	High	DPI regulations: risk to stocks managed with controls/regulations in place.	Effective	3	3	9	Medium	19	8	HIGH
			Social	3	4	12	High			3	2	6	Medium			
			Economic	3	4	12	High			2	2	4	Low			
Population growth	Increased pressure - system functions and the possible localised and downstream impacts of reduced flow and declining water quality	Population growth forecast from .id profile used by MCC is from 40,540 to 47,453 within our CMP planning area from 2021-2036 e.g. 17%	Environment	3	4	12	High	Range of measures in Rural strategy, LEP and DCP to mitigate impacts of population growth	Somewhat effective	3	2	6	Medium	18	9	HIGH
			Social	2	3	6	Medium			2	3	6	Medium			
			Economic	2	3	6	Medium			2	3	6	Medium			

Threat	Description	Causes/Stressors	Values impacted	Inherent Consequence Rating (1-5)	Inherent Likelihood Rating (1-5)	Risk Value	INHERENT RISK RATING	Existing key controls	Control effectiveness	Residual Consequence Rating (1-5)	Residual Likelihood Rating (1-5)	Risk Value 1	RESIDUAL RISK RATING	Total residual score	RANK-ING	Risk tolerance
Foreshore development	Projections for future growth within coastal localities	Projections for future growth within coastal localities	Environment	3	2	6	Medium	Neutral or beneficial effect applied to new developments	Somewhat effective	2	3	6	Medium	14	10	HIGH
			Social	2	2	4	Low	DCPs in former GTCC		2	2	4	Low			
			Economic	2	2	4	Low			2	2	4	Low			
Oyster aquaculture (in estuaries)	Oyster leases, infrastructure, operations	Infrastructure past, present and future in shallow areas of estuary and on land base Land-based impacts from occupancy of waterfront land for farming operations & storage of cultivation infrastructure and associated equipment Disturbance of sediments through deep water oyster harvesting Fuel or oil spills Wash from oyster punts travelling	Environment	3	2	6	Medium	Environmental Management System for Manning River Oyster Farmers (2013) Growers encouraged to work with Authorities to develop Emergency Response Plans to help prepare for fires, explosions, fuel & oil spills, release of hazardous chemicals, effluent spill/release Pelican Bay desktop study/ plan and implementation		2	2	4	Low	12	11	HIGH
			Social	2	2	4	Low			2	2	4	Low			
			Economic	2	2	4	Low			2	2	4	Low			
Oil, gas, minerals, sand, aggregate, coal mining	Coal mining, sand mining	Coal mining and proposed mining in middle and upper catchment, risk assessed through local studies	Environment	3	2	6	Medium	EPA regulations, EIS		3	2	6	Medium	12	12	HIGH
			Social	2	2	4	Low			2	2	4	Low			
			Economic	2	1	2	Low			2	1	2	Low			
Excessive or illegal extraction			Environment	3	2	6	Medium			3	2	6	Medium	10	12	HIGH
			Social	1	2	2	Low			1	2	2	Low			
			Economic	1	2	2	Low			1	2	2	Low			
Agricultural diffuse source run-off: Pesticides & chemicals	Diffuse runoff of pesticides and herbicides	Current farm and forestry practices.	Environment	3	1	3	Low	Legislative controls. Nil detected in Water Services samples and same result in a research study undertaken in upper catchment.		3	1	3	Low	8	13	HIGH
			Social	3	1	3	Low			3	1	3	Low			
			Economic	2	1	2	Low			2	1	2	Low			

## APPENDIX 6: MCC LAND-USE STRATEGIES ALIGNED TO THE CM SEPP OBJECTIVES

This appendix sets out Council's current and future land use planning controls for the CM SEPP Management Areas.

### Coastal wetland and littoral rainforest area

Land identified by the State *Environmental Planning Policy (Coastal Management) 2018* (CM SEPP) for the purposes of this Act, being land which displays the hydrological and floristic characteristics of coastal wetlands or littoral rainforests and land adjoining those features.

The CM SEPP requires development consent for clearing native vegetation on land mapped as coastal wetlands or littoral rainforests, even if the clearing is not associated with any other development. The development controls for land mapped as coastal wetlands and littoral rainforests apply to all land use zones in LEPs.

Clearing of native vegetation on land mapped as a coastal wetland or littoral rainforest is 'designated development' and triggers a requirement for an assessment under the *Biodiversity Conservation Act 2016*.

### Strategic direction

Council will update the SEPP map layers, LEP zones and new areas as they are mapped in alignment with coastal management objectives e.g. migration pathways for climate adaptation. If land is purchased through the NSW Government's coastal protection scheme for rehabilitation, restoration and ongoing protection, requirements for re-zoning will be identified through the ECMP reviews.

Objectives	Current land use plan	Future land use plan
(a) to protect coastal wetlands and littoral rainforests in their natural state, including their biological diversity and ecosystem integrity.	Under SEPP 14 and SEPP 26 Coastal wetlands and littoral rainforest were included in the Environmental Conservation (E2) Zone in the LEP. The MidCoast Local Strategic Planning Statement includes the following Planning Priorities: P6: Protect and improve our environment P7: Improve our resilience P8: Manage our land and water assets.	Coastal wetlands and littoral rainforest mapped in the CM SEPP will be transitioned to E2 Environmental Conservation in two stages. Stage 1: Coastal wetlands identified in the expanded mapping of the CM SEPP will be recommended for E2 zoning in the forthcoming Rural Strategy. Stage 2: Proposed SEPP amendment through Manning River ECMP Action 7.01.
(b) to promote the rehabilitation and restoration of degraded coastal wetlands and littoral rainforests.	Note: E2 zone objectives are consistent with this CM SEPP objective.	Rehabilitation and restoration are managed through the Manning River ECMP Actions 2.01, 2.02.

Objectives	Current land use plan	Future land use plan
(c) to improve the resilience of coastal wetlands and littoral rainforests to the impacts of climate change, including opportunities for migration.	Note: there are no recognised opportunities for migration however the CM SEPP identifies a 100m buffer to coastal wetlands and littoral rainforest areas.	Recommendations identified in research projects, the SEPP amendment proposed through Manning River ECMP Action 7.01 and revisions of Council's Climate Change Policy and Action Plan will inform future land use planning.
(d) to support the social and cultural values of coastal wetlands and littoral rainforests.	Land-use zones (e.g. rural zones, environmental zones) enable cultural and social uses to occur where appropriate.	Land-use zones will continue to enable cultural and social uses to occur where appropriate in the future MidCoast planning controls.
(e) to promote the objectives of State policies and programs for wetlands or littoral rainforest management.	Under SEPP 14 and SEPP 26 coastal wetlands and littoral rainforest were zoned Environmental Conservation in the LEP.	Coastal wetlands and littoral rainforest mapped in the CM SEPP will be transitioned to E2 Environmental Conservation in two stages.  Stage 1. New SEPP expanded mapping. Will be recommended for E2 zoning in the forthcoming Rural Strategy to.  Stage 2: Proposed SEPP amendment through Manning River ECMP Action 7.01.

## Coastal Environment Area

Land identified by the CM SEPP, being land containing coastal features such as the coastal waters of the State, estuaries, coastal lakes, coastal lagoons and land adjoining those features, including headlands and rock platforms.

### Strategic direction

Council's strategic approach to land-use planning in the Coastal Environmental Area is to manage development in accordance with the objectives and controls of the CM SEPP.

Objectives	Current land use plan	Future land use plan
(a) to protect and enhance the coastal environmental values and natural processes of coastal waters, estuaries, coastal lakes and coastal lagoons, and enhance natural character, scenic value, biological diversity and ecosystem integrity.	<p>Current LEP applies environmental or waterway zones as appropriate to waters up to the tidal extent.</p> <p>The MidCoast Local Strategic Planning Statement includes the following Planning Priorities:</p> <p>P6: Protect and improve our environment</p> <p>P7: Improve our resilience</p> <p>P8: Manage our land and water assets.</p>	<p>Three LEPs (Gloucester, Taree, Great Lakes) are being consolidated into the new MidCoast LEP, which will be developed in accordance with the objectives for the Coastal Management SEPP Management Areas.</p>
(b) to reduce threats to and improve the resilience of coastal waters, estuaries, coastal lakes and coastal lagoons, including in response to climate change.	<p>Foreshore setback line in Cundletown in the Great Taree DCP 2010 recognises potential foreshore erosion.</p>	<p>Foreshore setbacks will be reviewed in the consolidation of DCPs for the MidCoast LGA.</p> <p>Action 7.02 in the Manning River ECMP is to map the Coastal Vulnerability Area. This will inform future planning controls.</p>
(c) to maintain and improve water quality and estuary health.	<p>WSUD is a consideration when assessing development applications.</p>	<p>WSUD guidelines will be incorporated into the future consolidated MidCoast DCP.</p> <p>Identification and protection of priority drinking water catchments and groundwater aquifer resources in the MidCoast Region will be incorporated into the MidCoast DCP and LEP, which will benefit the quality of freshwater inputs into the estuary.</p>

## Coastal Environment Area continued

Objectives	Current land use plan	Future land use plan
(d) to support the social and cultural values of coastal waters, estuaries, coastal lakes and coastal lagoons.	Where appropriate, land-use zones (e.g. rural zones, environmental zones) enable cultural and social uses to occur.	In the future MidCoast planning controls, where appropriate, land-use zones (e.g. rural zones, environmental zones) will continue to enable cultural and social uses to occur.
(e) to maintain the presence of beaches, dunes and the natural features of foreshores, considering the beach system operating at the relevant place.	Development controls identified in the CM SEPP are applied through our planning process.	Development controls identified in the CM SEPP are applied through our planning process.
(f) to maintain and, where practicable, improve public access, amenity and use of beaches, foreshores, headlands and rock platforms.	Development controls identified in the CM SEPP are applied through our planning process.	Development controls identified in the CM SEPP are applied through our planning process.

## Coastal Use Area

Land identified by the CM SEPP being land adjacent to coastal waters, estuaries, coastal lakes and lagoons where development is or may be carried out (at present or in the future).

### Strategic direction

The focus of development in the coastal use area is predominantly consolidation within the existing urban footprint.

Limited urban development is expected to occur and where it is proposed, it will be undertaken in compliance with the objectives of the CM SEPP.

Objectives	Current land use plan	Future land use plan
<p>To protect and enhance the scenic, social and cultural values of the coast by ensuring that:</p> <ul style="list-style-type: none"> <li>a) the type, bulk, scale and size of development is appropriate</li> <li>b) adverse impacts of development on cultural and built environment heritage are avoided or mitigated</li> <li>c) urban design, including water sensitive urban design, is supported and incorporated into development activities</li> <li>d) adequate public open space is provided, including for recreational activities and associated infrastructure</li> <li>e) the use of the surf zone is considered,</li> </ul>	<p>Rezoning applications consider each of these values through a planning proposal process to determine the appropriate zone and planning controls.</p> <p>Development applications consider these requirements through application of the Greater Taree LEP 2010 which applies zones and controls such as appropriate land use, maximum building height, minimum lot size and heritage; and the Greater Taree DCP 2010 with development requirements such as building design, WSUD, open space, building setbacks, Aboriginal cultural assessment and requirements in Coastal Management Areas.</p>	<p>The MidCoast area currently has three LEPs: Gloucester LEP 2010, Greater Taree LEP 2010 and Great Lakes LEP 2014, with different planning controls applying in each LEP. We are currently consolidating the three LEPs to ensure the new MidCoast LEP provides a consistent approach to planning across the MidCoast. The new MidCoast LEP will be developed in accordance with the objectives for the Coastal Management SEPP Coastal Use Areas.</p>
<p>To accommodate both urbanised and natural stretches of coastline.</p>	<p>There is a defined urban footprint for towns and villages that accommodates future growth. Surrounding environmental and rural areas are valued and managed appropriately.</p>	<p>Consolidation of the MidCoast LEP and DCP will apply a consistent approach to encourage urban consolidation within the defined urban footprint.</p>

## Coastal Vulnerability Area

Land subject to current and future coastal hazards as defined by the CM Act 2016.

### Strategic direction

Mapping the coastal vulnerability Area is an action of the Manning River ECMP and its counterparts the Old bar- Manning Point CMP and Open Coast CMP. Once completed a planning proposal will be submitted to incorporate this mapping into the CM SEPP and MidCoast Council planning controls will be amended in accordance with the Act.

Objectives	Current land use plan	Future land use plan
(a) to ensure public safety and prevent risks to human life.	There is no CVA at present and coastal hazard areas identified under the DCP are outside the Manning CMP Planning Area.  A coastal setback line at Cundletown controls development to mitigate to erosion risks. development to mitigate to erosion risks.	CVA mapping is an action for the ECMP and once completed will be used to inform future planning controls.
(b) to mitigate current and future risk from coastal hazards by considering the effects of coastal processes and climate change.	There is no CVA at present and coastal hazard areas identified under the DCP are outside the Manning CMP Planning Area.  A coastal setback line at Cundletown controls.	CVA mapping is an action for the CMP and once completed and will be used to inform future planning controls.
(c) to maintain the presence of beaches, dunes and the natural features of foreshores, considering the beach system operating at the relevant place.	These features are outside the Manning CMP Planning Area.	These features are outside the Manning CMP Planning Area.
(d) to maintain public access, amenity and use of beaches and foreshores.	There is no CVA at present and coastal hazard areas identified under the DCP are outside the Manning CMP Planning Area.	CVA mapping is an action for the CMP and once completed and will be used to inform future planning controls.

Objectives	Current land use plan	Future land use plan
(e) to encourage land use that reduces exposure to risks from coastal hazards, including through siting, design, construction and operational decisions,	As before	As before
(f) to adopt coastal management strategies that reduce exposure to coastal hazards: (i) in the first instance and wherever possible, by restoring or enhancing natural defences including coastal dunes, vegetation and wetlands, and (ii) if that is not sufficient, by taking other action to reduce exposure to those coastal hazards,	Coastal management strategies are implemented through CZMPs rather than land-use planning.	Coastal management strategies are implemented through the ECMP action program rather than land-use planning.
(g) if taking that other action to reduce exposure to coastal hazards ...	As before	As before

## APPENDIX 7: FUNDING RESPONSIBILITIES & OPTIONS

### Introduction

There are several agencies responsible for coastal management in New South Wales and a range of different streams for grant funding. These are described in the following sections, with each section dealing with a specific agency, their key responsibilities, and the funding opportunities they provide.

Historically, the situation surrounding responsibilities and funding opportunities have been extremely fluid. Accordingly, the summary provided herein should be considered as a snapshot, current during April 2021, and subject to ongoing change.

The agencies with responsibility for the Coast and having some mechanism to provide funds are dealt with in separate sections, as follows:

- MidCoast Council.
- Hunter Local Land Services, which implements projects to support the Marine Estate Management Strategy.
- Department of Planning, Industry and Environment (Environment, Energy and Science).
- Department of Primary Industries - Fisheries.
- Maritime Infrastructure Delivery Office (within Transport for NSW).
- Marine Estate Management Authority.
- Other Funding Sources.

### MidCoast Council

MidCoast Council (MCC) takes responsibility for, among other things, roads and bridges, parks, sporting grounds, waterway facilities, water and sewer provision, community services, libraries and environmental planning as services within the Local Government Area. The organisational structure of MCC is illustrated in Figure 39.

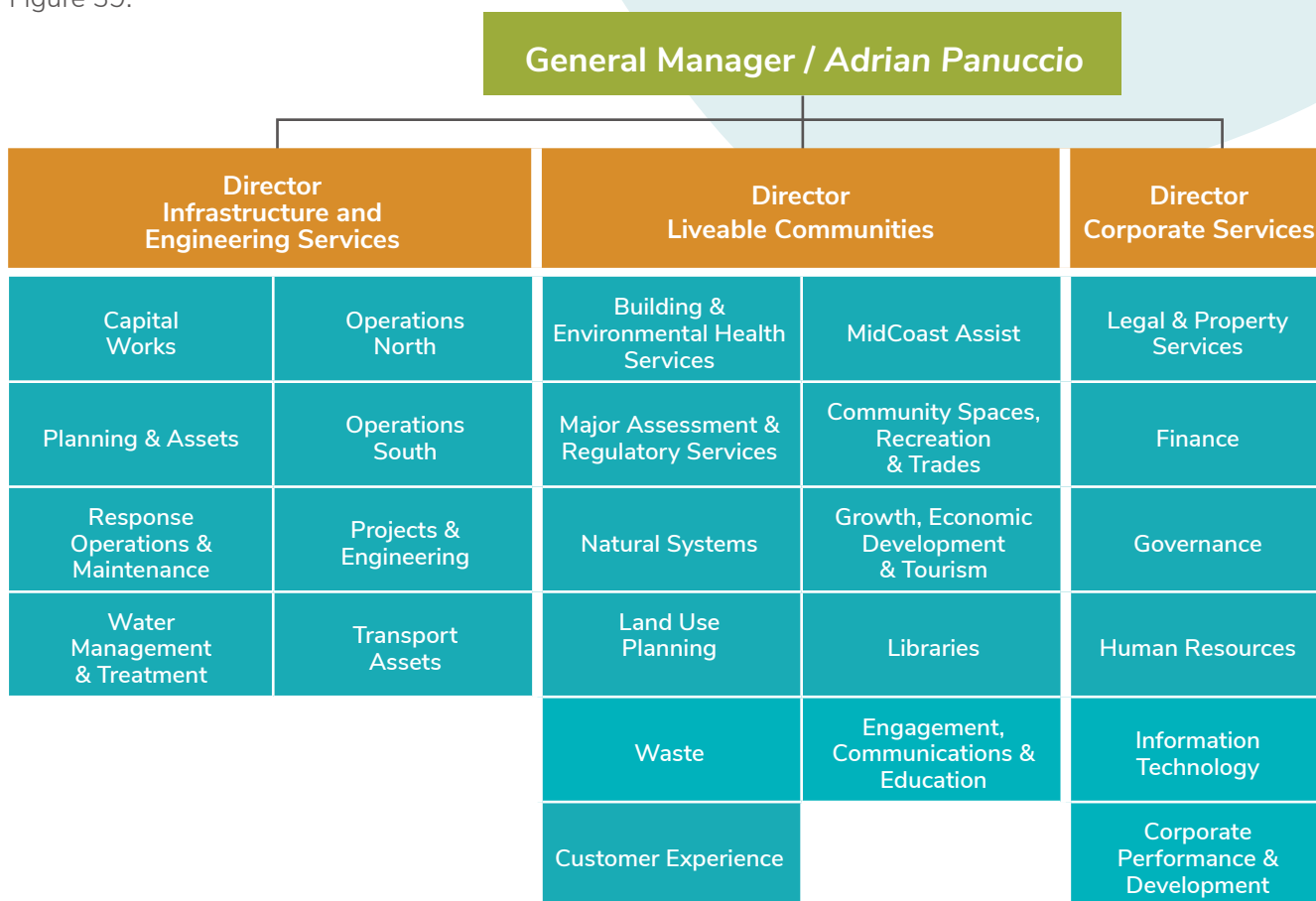


Figure 39: MidCoast Council Organisational Structure

The Manning River ECMP will be administered internally by the Natural Systems Team of Council and direct implementation of different actions will primarily be through teams in the Liveable Communities Directorate and the Infrastructure and Engineering Directorate.

MidCoast Council (MCC) presently has an income of approximately \$270M per annum with around 60% coming from general rates. MCC commonly uses rates revenue to leverage additional funding from external grant programs.

MCC's rate revenue includes an environmental rate which raises approximately \$4M per year. This funds the Natural Systems team which will administer the Manning River ECMP and is the primary funding mechanism for delivery of actions in the program.

A total annual contribution of approximately \$250,000 per annum has been allocated from the environmental rate for either direct expenditure or as a contribution to leverage grant funding sources.

MCC also charges a Stormwater Levy, raising approximately \$850,000 annually to deliver projects that address local flooding and improve stormwater quality across the whole LGA. A

portion of Stormwater Levy funds will be applied to actions to improve stormwater management in the Manning River ECMP.

## Hunter Local Land Services

Under Goal 3 of the South East Strategic Plan ("Healthy, diverse, and connected natural environments"), Hunter LLS identifies priorities including:

- Improving water quality in Rivers and Estuaries.
- Improving native vegetation connectivity.
- Supporting land managers to rehabilitated degraded habitat including weeds and pests and supporting recovery of threatened species and ecological communities.
- Assisting landholders to manage water resources and sustain productive agriculture and natural assets.

Hunter LLS has recently been receiving funding to assist with implementation of the Marine Estate Management Strategy as follows:

- To improve the quality of drainage from roads and tracks. This funding is commonly provided to councils to undertake maintenance work.
- To undertake riparian works including fencing, weeding, planting and maintenance.
- To undertake bank erosion remediation works, where LLS will engage and manage contractors to complete the work.

Funding which comes through MEMA is not constrained in terms of usage on private and public land. In other words, MEMA funding via LLS can be used to undertake repair/rehabilitation works on

riparian reserves that are under the care and control of Council.

Based on discussions with Hunter LLS staff, it is expected that, on average, around \$800,000 per annum would be available for works in the Manning Catchment from MEMA sources.

- Hunter LLS manages several other funding sources. The National Landcare Program (NLP) provides the major environmental federal funding source for the Natural Resource Management Team within Hunter LLS. Around 1.8M has been allocated over the June 2019 – June 2023 period, with 1.2M of that forming the operational budget (~300,000 per year). Considering the area covered by Hunter LLS, around 100K could be allocated per annum on projects within the Manning Catchment.
- Over the next 14 months (till mid 2022), Hunter LLS is also managing federal funds relating to bushfire recovery, including \$650,000 on actions relating to weeds, pests, threatened ecological communities, threatened species and fire. This funding is earmarked for the Manning Catchment.
- Hunter LLS also administers the Catchment Action NSW Program, funded by the NSW Government with a focus of using those funds for the repair of riparian areas within the Manning Catchment. \$80,000 is presently available annually from this funding source.

# Department of Planning, Industry and Environment

## DPIE: Environment, Energy and Science

Several sections of state government traditionally focussed on coastal management were moved from the Office of Environment and Heritage into the Environment Energy and Science (EES) group of the Department of Planning, Industry and Environment in 2019. The functions of relevance to the Manning CMP are presently contained as listed below:

### 1. Within the Biodiversity, Conservation and Science Secretariat:

- Water, Wetlands and Coasts Science Directorate: Includes scientists which undertake targeted research and monitoring relating to estuaries and may provide an avenue for completion of some additional studies needed to better inform management.
- Hunter Central Coast Directorate: Containing regional staff, largely located in Newcastle and on the Central Coast, with a detailed focus on coasts and estuaries along the NSW coast from the Hawkesbury River, extending northwards to the Manning Catchment.
- Marine, Coastal, Estuaries and Floods Directorate: Including specialists in coastal and estuarine policy and management who have an overarching role in the delivery of coastal and estuary focused programs and policy, including the delivery of high-level guidance such as the development of the Coastal Management Manual and supporting documentation.

### 2. Within the Executive Directorate, Office of the Coordinator General of EES:

- The Grants Directorate: which manages the Coast and Estuary Management, Floodplain Management and NSW Environmental Trust contestable grants programs.

Staff within all these directorates contribute to the provision of both technical and financial assistance to local councils in managing the coast. In the context of the Manning CMP, whereby

## Coast and Estuary Grant Funding Streams

The coast and estuary grants<sup>67</sup> cover several streams, of which the “Implementation” stream is the main one of interest to progress on-ground actions of a CMP. For many other parts of a CMP, which relate to ‘planning’ studies, grant applications can be made under the planning funding stream.

At present, the guidelines for the coast and estuary grants indicate that funding will be provided on a 2:1 basis (State Government: Applicant).

A strict read of the funding guidelines indicates that administration costs, non-monetary (e.g., in-kind) or voluntary contributions from other sources cannot be used as matching funding. The contribution of the applicant and any partners needs to be a monetary contribution. One exception is the project management allowance outlined below.

The guideline indicates that the following won't be funded:

- Maintenance of funded projects.
- Projects eligible for funding under natural disaster relief.
- Amenity works (car parking, footpaths, seating, shelters and lighting etc).
- Projects within freshwater environments unless they are shown to significantly improve estuary health.
- Variations exceeding +30% of the original amount requested.

<sup>67</sup> <https://www.environment.nsw.gov.au/topics/water/coasts/coastal-and-estuary-grants>, accessed 27 April 2021

## Coast and Estuary Planning Stream

These grants effectively cover the actions which lead to the implementation 'on-the-ground' works that would be funded under the various implementation funding streams discussed below.

These include the preparation of CMPs and studies that are needed to develop a CMP. Investigations and designs for works recommended in a CMP are also covered, along with cost benefit / distributional analyses to support such works.

A strict read of the most recent guidelines for grants indicates that the planning stream is only valid for activities which are needed to develop a CMP, transition from a CZMP to a CMP, or to undertake investigations, designs and cost-benefit analyses for infrastructure works recommended in a certified CMP. In other words, general planning and investigation required for mapping, additional processes investigation or other supporting studies to fill data gaps or help formulate actions do not seem to be covered by either the Planning Stream or the Implementation Stream (see next section).

Applications for funding under the Planning Stream are presently open until 30 June 2021.

## Implementation Streams

For the coastal vulnerability area, activities that can be demonstrated to reduce the threat from coastal hazards can be funded. These include beach nourishment; dune restoration works and seawalls.

For the coastal wetlands and littoral rainforests area, actions indicated as being suitable for

funding include the management of weeds and invasive animals, trails and accessways, works to reduce exposure to coastal erosion, replanting and stabilising vegetation and habitat restoration/conservation.

For the coastal environment area, actions indicated as being suitable for funding include community education, access management, environmentally beneficial dredging, monitoring (linked with actions to improve ecosystem health), the protection of Aboriginal heritage, management of stormwater quality (where demonstrated to be beneficial to the receiving environment), revegetation and weed management, sediment and erosion control actions. Activities in the upper catchment, where beneficial to estuarine health may also be funded.

For the coastal use area, actions indicated as being suitable for funding include community education, the management of public access, actions to protect Aboriginal heritage, stormwater management, revegetation and weed management and monitoring.

For the most part, funding for activities identified in a certified CMP will be provided at a 2:1 ratio (state: local contribution). For projects costing over \$1M, this ratio will only apply to that component which is determined to be of public benefit. That component assessed as benefiting private interests will not be funded. For projects valued over \$500,000, investigation and design must be completed before application.

In recent years, it has been common for DPIE to

accept grant applications for implementation of coastal management actions during a limited time window each year. For example, the most recent funding round opened on 11 August 2020 and closed on 29 September for the implementation streams.

## Floodplain Management Grants

DPIE runs a parallel grants program relating to floodplain risk management in NSW. There are opportunities to pursue grants under this program to address the hazards associated with tidal inundation (and its interaction with catchment flooding).

Grants are usually provided within strands representing different stages of the floodplain risk management process in NSW (NSW Government, 2005):

1. Flood study.
2. Floodplain risk-management study.
3. Feasibility study.
4. Implementation.

Funding has historically been at a level of 2:1, although higher funding ratios have also been awarded for implementation of works, particularly in rural areas. Applications for these grants are generally accepted during a limited window annually, with the most recent window between February 4 and the end of March 18.

## NSW Environmental Trust

The NSW Environment Trust provides opportunities for the funding of community and government organisations to conserve, protect and rehabilitate the NSW environment, or to promote environmental education and sustainability. The Trust promotes several programs of funding. The different streams open and close at varied times, and grants are available, for example, to support:

- Environmental Education (most recent round closed 16 November 2020), with a pool of \$1M available and up to \$250,000 per project being funded.
- Environmental Research (open to collaborations and research institutions), with a pool of \$1M most recently available and up to \$200,000 per project being funded.
- Restoration and Rehabilitation (open to state and local government and community groups), with a total of \$4M in funding provided and up to \$170,000 per project being available, although the amounts available are dependent upon experience. The last round of funding for Restoration and Rehabilitation closed on 14 December 2021.

For the Restoration and Rehabilitation program, funding for supporting threatened species and addressing climate change (including adaptation) are immediate funding priorities. It appears that actions to promote the adaptation of saltmarsh, for example, to sea level rise should be viewed favourably.

## Department of Primary Industries

### DPI-Fisheries - Responsibilities

DPI-Fisheries is responsible for the management of recreational and commercial fishing, marine protected areas, aquaculture industries and the management of threatened aquatic species.

DPI-Fisheries is responsible for administration of the Fisheries Management Act 1994, including the conservation of estuarine vegetation such as seagrasses, mangroves and saltmarsh.

### Habitat Action Grants

Habitat Action Grants are funded by NSW recreational fishing fees and are available to local councils and organisations looking to rehabilitate fish habitats throughout NSW. Grants are classified as small (up to \$2,000) and large (up to \$40,000).

Typical projects include:

- Removal or modification of barriers to fish passage.
- Rehabilitation of riparian land (including fencing to exclude stock).
- Waterway re-snagging.
- Weeding and replacement with native species.
- Bank stabilisation

Typically, 25-30 individual projects have been funded each year over the past decade, with a total of around \$550,000 to \$750,000 funding provided per year.

Funds provided through the program must be at least matched by in-kind contributions, such as voluntary labour and/or the supply of materials.

### Flagship Fish Habitat Rehabilitation Grants

The Flagship Grants are available for projects that significantly enhance fish habitat, water quality and fish passage within coastal catchments of NSW. The intention of this pool of grant funding is to tackle much larger scale projects. The grants support a range of actions including on-ground works, of a similar nature but larger scale than those of the Habitat Action Grants, and hydrological and environmental investigations, community consultation and economic assessments.

A maximum project funding of \$360,000 is set, with \$360,000 available across the program each year.

Successful projects in recent years have included funding for MCC to address actions in the Lower Manning River Drainage Remediation Action Plan, works to address acidic discharge from wetlands, works to address riverbank erosion, and the removal of barriers to fish passage.

### Maritime Infrastructure Delivery Office (within Transport for NSW)

Transport for NSW (TfNSW) is responsible for maritime policy, including safety, access and infrastructure. Their role includes on-water compliance activities.

## MIDO

The Maritime Infrastructure Delivery Office (MIDO) combines the previous maritime division of TfNSW and the maritime related functions that were previously contained within DPIE - Crown Lands. MIDO was recently formed and aims to streamline the delivery of maritime infrastructure and dredging.

Delivery of the NSW Maritime Infrastructure Plan for 2019-2024<sup>68</sup> is largely the responsibility of MIDO, and several programs support delivery of that plan which focusses on assets and facilities including:

- Entrance breakwaters.
- Harbours.
- Dredged navigation channels.
- Boat ramps, wharves and jetties.
- Boat maintenance and repair facilities.
- Moorings.
- Fuel and sewage pump out.
- Navigation aids and lighthouses.

The Maritime Infrastructure Plan lists 14 key investment locations. The list doesn't include the Manning River. However, MIDO is overseeing current investigations into possible works to open the entrance to the Manning River at Harrington.

## Boating Now Program

The Maritime Infrastructure Plan notes that support will be provided to development of council owned infrastructure under the Boating Now Program. The

Program is funded from boating license, registration, and other fees, and has delivered some 200 boating projects across the state since 2014. The most recent round of funding, (Round 3) announced in October 2019, included a \$28M investment for the period from July 2020 to June 2022 and 69 projects were funded. We have been advised that funding has been announced for a subsequent Round 4 of funding, which will open in 2021.

While the Manning is not identified as a "key investment locations" within the Maritime Infrastructure Plan, that plan does indicate that funding support would be available to councils to develop strategic plans for other locations. Those plans should identify the priority and longer-term infrastructure needs of local waterways to encourage a better planning and management approach to local boating facilities. Such a strategy could potentially have an area added to the list of key investment locations or make a location more attractive for funding.

TfNSW has advised that studies are more likely to be funded if they have a clear aim of improving local boat access and navigation. In other words, studies which aim to address multiple objectives, including environmental outcomes, may be judged as having less merit under this funding stream, when compared to those purely associated with environmental outcomes. Success would depend largely on whether a round of grants funding is oversubscribed or not.

It seems that projects which are not on the list of key investment locations would require a greater funding contribution from local councils.

However, according to guidelines for the most recent Round 3 grant guidelines, recipients of the grants may be eligible for up to 100% of the cost for repair or replacement costs of existing, publicly owned facilities (up to a total of \$500,000 per asset).

## Boating Access Dredging Program

The NSW Boating Access Dredging Program has replaced the prior Rescuing our Waterways program. The program aims to allocate funding to councils for local dredging projects, particularly in regional waterways. Councils are expected to contribute at least 25% of the total project costs and to be responsible for developing and managing their projects.

At the time of writing, applications to a funding round are open but due to close imminently (30th April 2021). A pool of \$2M is available state-wide with a grant value limit of \$500,000.

Projects eligible for funding include actual dredging and pre-dredging activities, and supporting studies relating to sedimentation and hydrodynamics. Overall, projects should aim to deliver navigational benefits and to improve access to infrastructure such as wharves and boat ramps.

<sup>68</sup> [https://maritimemanagement.transport.nsw.gov.au/documents/Maritime\\_Infrastructure\\_Plan.pdf](https://maritimemanagement.transport.nsw.gov.au/documents/Maritime_Infrastructure_Plan.pdf), accessed 22/11/2020

## Marine Estate Management Authority

The Marine Estate Management Authority (MEMA) is responsible for development and delivery of the Marine Estate Management Strategy (MEMS), which was developed under the Marine Estate Management Act 2014. Membership of MEMA includes the four main agencies managing the marine estate from within the NSW Government:

- DPI: Including Fisheries (See Section 0).
- DPIE: EES (See Section 4).
- DPIE Planning and Assessment, which is responsible for the state's land use planning system, state significant developments and infrastructure.
- Transport for NSW (See Section 0).

Other agencies with interests include, for example, Local Land Services (LLS), DPIE Water, DPIE-Crown Lands and local councils.

The MEMS Implementation Plan<sup>69</sup> tends to include specific councils as “partners” in the delivery of management actions.

LLS is a lead agency on riparian vegetation improvements and wetland restoration. Furthermore, bank protection works and the improvement of roads and tracks within the catchment are also identified.

In recent years, funding for the MEMS has been determined on a yearly basis. However, it is

expected that the funding will continue for the full term of the MEMS (i.e., to 2028) and it is reasonable to assume funding will continue at similar rates as experienced in the past couple of years.

## Other

### Federal Funding Sources

Federal funding sources tend to vary from year to year and cannot be relied upon for programming actions. These may present possibilities for opportunistic funding and should be kept in mind.

### Non-Government Funding Sources

There are a range of other options for non-government and private funding of projects. One current example is the Reef Builder partnership between the Australian Government and the Nature Conservancy, a global non-profit NGO, working at conserving land and water. The partnership will develop a \$20 million investment to rebuild shellfish reefs around the Australian coastline. Shellfish reefs, which have been decimated in Australia since 1788, provide multiple benefits including filtering and cleansing sea water and providing habitat.

Similar to federal funding sources, the opportunities for funding through these sources may be variable over time.



<sup>69</sup> [https://www.marine.nsw.gov.au/\\_data/assets/pdf\\_file/0020/1139042/Marine-Estate-Management-Strategy-Implementation-Plan.PDF](https://www.marine.nsw.gov.au/_data/assets/pdf_file/0020/1139042/Marine-Estate-Management-Strategy-Implementation-Plan.PDF), accessed 22/11/2020.

Photo: Kalani Minns

## APPENDIX 8 : MONITORING TEMPLATE FOR THE ECMP

Monitoring and reporting for progress against Manning River ECMP action targets will be done using the template shown in Table 12 below. Results will be reported to the Manning River ECMP Reference Group on an annual basis, and percentage completion will be reported against the ECMP action in Council's Delivery Program and Operating Plan.

Table 11: Project tracking template

Action #	Action	Project measure	FY22 Target	FY22 Actual	Fy23 Target	FY23 Actual	FY24 Target	FY24 Actual	FY25 Target	FY25 Actual	FY26 Target	FY26 Actual	Y 1-5 TOTAL TARGET	Yr 1-5 TOTAL ACTUAL
<b>THEME 1 STEWARDSHIP</b>														
MA_1.01	Develop and Deliver an Engagement Program	Number of education resources produced	6		6		6		6		6		30	
		Number of engagement events	2		4		4		4		4		18	
		Number of individuals engaged			80		80		80		80		320	
MA_1.02	Best Management Practice for Whole Farm Planning	Number of education resources produced	2										2	
		Number of individuals engaged												
MA_1.03	Promote and Facilitate Establishment of Private Conservation Agreements	Number of conservation agreements established	3		3		3		3		3		15	
		Area protected under conservation agreements	150		150		150		150		150		750	
MA_1.04	Develop a Litter and Stormwater Pollution Source Control Program	Number of source control plans developed	1		1								2	
		Number of engagement events	2		2		2		2		2		10	
MA_1.05	Develop and Distribute Education Material and Guidelines for ESC	Number of education products/ resources produced					1						1	
MA_1.06	Improve Erosion and Sediment Control	Number of individuals engaged			20				20				40	

Action #	Action	Project measure	FY22 Target	FY22 Actual	Fy23 Target	FY23 Actual	FY24 Target	FY24 Actual	FY25 Target	FY25 Actual	FY26 Target	FY26 Actual	Y 1-5 TOTAL TARGET	Yr 1-5 TOTAL ACTUAL
<b>THEME 2 WATER QUALITY AND ECOSYSTEM HEALTH</b>														
MA_2.02, 2.03, 2.10,	On-ground remediation	Number individuals engaged	15		15		15		15		15		75	
MA_2.01	Implement Key Priority ASS Management Actions	Number of Ha of priority ASS remediated			775		775						1550	
MA_2.02	Protect and/or Rehabilitate Coastal Wetlands	Number of ha coastal wetlands remediated	15		15		15		15		15		75	
MA_2.03	Improve Riparian and Estuarine Bank Vegetation	Number of km riparian buffer vegetation restored	10		10		10		10		10		50	
MA_2.04	Promote Good Catchment Management Practice on public land	Number of Management Plans produced			1									
		Number of ha with improved practices			10		10		10		10		40	
MA_2.05	Enter the Manning River Entrance Project into the NSW Investor Assurance and Business Case Process	Strategic Business case complete Final business case	1		1								2	
MA_2.06	Ensure Manning River Entrance Process includes Extensive Stakeholder Consultation	Number of engagement events												
		Number of individuals engaged												
MA_2.07	Implement a Systematic Approach to Maintaining SQIDs	Number of SQIDs refurbished	2		3								5	
		Upgrade of Wingham Wetlands complete							1				1	
MA_2.08	Review, Revise and Supplement MCC's Current Stormwater Guidance	Revision complete					1						1	
MA_2.09	Revise and Implement the Greater Taree Urban Stormwater Management Plan	Number of stormwater management plans revised/completed			1		1		1				3	
MA_2.10	Prioritise Sensitive Estuarine Riverbank Areas and Implement Stabilisation	Number of studies completed	1										1	

Action #	Action	Project measure	FY22 Target	FY22 Actual	Fy23 Target	FY23 Actual	FY24 Target	FY24 Actual	FY25 Target	FY25 Actual	FY26 Target	FY26 Actual	Y 1-5 TOTAL TARGET	Yr 1-5 TOTAL ACTUAL
		Number of m of bank land stabilised by installing erosion control measures	750		750		750		750		750		3750	
MA_2.11	Prioritise Unsealed Road Sediment Hotspots and Undertake Remediation	Number of sites remediated	2		2		2		2				8	
MA_2.12	Onsite Sewerage Management System Audit and Compliance Strategy. Implement Audit Program	Development of audit and compliance strategy complete	1										1	
MA_2.13	MER for Ecosystem Health	Annual MER report complete	1		1		1		1		1		5	
		Platform for data sharing established					1						1	
		Number of organisations involved in data sharing agreements					4						4	
<b>THEME 3 CLIMATE CHANGE</b>														
MA_3.01	Develop Forward Plan to Retain Retreat Zones for Coastal Wetlands in Partnership with Land Owners	Forward plan complete					1				1			
MA_3.02	Forward plan for Council Assets at Risk from Sea Level Rise	Plan complete									1		1	
MA_3.03	Examine Future Effectiveness of Coastal Inundation Emergency Strategies	Action complete			1								1	
MA_3.04	Long Term Adaptation Plan for Manning Floodplain in Collaboration with Landowners	Number of engagement events			1		1		1		1		4	
		Number individuals engaged			20		20		20		20		80	
<b>THEME 4 BIODIVERSITY</b>														
MA_4.01	Address Barriers to Fish Passage	Number of barriers remediated					1				1		2	
		KM of fish passage restored					70				70		140	
MA_4.02	Develop and Implement Integrated Pest and Weed Control Plans for Local Priorities	Local weed action plan complete			1								1	
		Local pest animal control plan complete			1								1	
		Ha weeds treated within a 200m buffer of the river												
MA_4.03	Implement Recommendations of Refugia Study	Number of sites restored	3		3		3		3		3		15	

Action #	Action	Project measure	FY22 Target	FY22 Actual	Fy23 Target	FY23 Actual	FY24 Target	FY24 Actual	FY25 Target	FY25 Actual	FY26 Target	FY26 Actual	Y 1-5 TOTAL TARGET	Yr 1-5 TOTAL ACTUAL
<b>THEME 5 ABORIGINAL CUSTODIANSHIP</b>														
MA_5.01	Involve Aboriginal Community in Management of the River, Catchment and Estuary	Number of Aboriginal people engaged	15		15		15		15		15		75	
MA_5.02	Install Interpretive Signage and Facilitate Cultural Activities	Interpretive signage project complete			1								1	
MA_5.03	Engage Aboriginal People in Water Quality Monitoring	Number of Aboriginal people engaged	10		10		10		10		10		50	
MA_5.04	Appoint Two Aboriginal Members to the ECMP Reference Group	Number of Aboriginal people engaged	2		2		2		2		2		2	
<b>THEME 6 SOCIAL AND ECONOMIC VALUES</b>														
MA_6.01	Investigate & Implement Site-Specific Pathogen Source Control measures	Number of source control investigation complete					1						1	
		Number of sites remediated							5				5	
<b>THEME 7 LAND USE PLANNING</b>														
MA_7.01	Submit a Planning Proposal for CM SEPP	Planning Proposal submitted												
MA_7.02	Preparing Mapping of Coastal Vulnerability Area for Tidal Inundation	CVA mapping complete												
MA_7.03	Identify Water Quality Objectives and Management Targets	Study report complete	1										1	
<b>THEME 8 GOVERNANCE</b>														
MA_8.01	Establish Multi-Stakeholder Management Committee	Number of engagement events	1										1	
MA_8.03	Build the Capacity of Compliance Programs													

# Addendum – Distribution of Benefits, Manning River Estuary and Catchment Management Program

## Addendum

This addendum has been provided to meet the mandatory requirement 9iv (MR 9iv) as set out in NSW Coastal Management Manual (2018) – Part A, which states that “the business plan included in the CMP must identify the distribution of costs and benefits of all proposed coastal management actions.”

Section 9.3 (page 131) of the Manning River Estuary and Catchment management program (ECMP) provides an assessment of beneficiaries for the full suite of management actions as shown below.

### Manning River ECMP Section 9.3 Beneficiaries

Understanding the benefits that will arise from the ECMP and who the beneficiaries are has guided the timing and funding streams identified for the action program. Examination of the management actions within the ECMP shows that:

- \* The focal Coastal Management Areas are the *Coastal Wetland* and *Coastal Environment Areas*.
- \* Where actions don't have “Environmental Benefit” as their primary focus, they mainly contribute to building or maintaining collective wellbeing and wealth within the community.

From these two points, most benefits are widespread and not targeted to any small group or individual. Where benefits accrue to a particular group, this group is a significant part of the Manning community (e.g., Farming community, Aboriginal groups) and the benefits are often multi-faceted and can be seen to contribute more broadly to society and the local economy.

Based on these considerations, all actions can be justifiably funded from public sources (Local, State and Federal Government).

In a review of the document prior to submission for certification, the project team received advice from our liaison officer Neil Kelleher, Senior Natural Resource Officer (Coastal), Water Floodplains and Coast in the Department of Planning, Infrastructure and Environment. Neil recommended the addition of a table showing the distribution of benefits to each action.

Table 1 below has therefore been provided in this addendum to meet MR9iv. It presents the distribution of benefits for each of the Management Actions in the Manning River ECMP.

The benefits have been selected to align with the objects of the Coastal Management (CM) Act. For more information on how the Management Actions meet the objects of the CM Act, see Appendix 4, Tables 9 and 10 in the Manning River ECMP.

**Table 1: Distribution of benefits for Management Actions in the Manning River ECMP**

Management Action (MA)	Management Option	Benefits
MA_1.01	Develop and Deliver an Engagement Program	<ul style="list-style-type: none"> <li>• Social change to improve management of the estuary and its catchment</li> <li>• Benefits to water quality, ecosystem health, biodiversity and resilience.</li> <li>• Benefits to social and cultural values including scenic amenity, use and safety.</li> <li>• Benefits to economic value for tourism, primary production and potable water supply.</li> </ul>
MA_1.02	Promote Whole Farm Planning and Best Management Practice**	<ul style="list-style-type: none"> <li>• Social change to improve management of the estuary and its catchment</li> <li>• Benefits to water quality, ecosystem health, biodiversity and resilience.</li> <li>• Benefits to social and cultural values including scenic amenity, use and safety.</li> <li>• Benefits to economic value for tourism, primary production and potable water supply.</li> </ul>
MA_1.03	Promote and Facilitate Establishment of Private Conservation Agreements	<ul style="list-style-type: none"> <li>• Social change to improve management of the estuary and its catchment</li> <li>• Benefits to ecosystem health, biodiversity and resilience.</li> </ul>
MA_1.04	Develop a Litter and Stormwater Pollution Source Control Program	<ul style="list-style-type: none"> <li>• Social change to improve management of the estuary and its catchment</li> <li>• Benefits to water quality, ecosystem health, biodiversity and resilience.</li> <li>• Benefits to social and cultural values including scenic amenity, use and safety.</li> <li>• Benefits to economic value for tourism.</li> </ul>
MA_1.05	Develop and Distribute Education Material and Guidelines for ESC on Private Land	<ul style="list-style-type: none"> <li>• Social change to improve management of the estuary and its catchment</li> <li>• Benefits to water quality, ecosystem health, biodiversity and resilience.</li> <li>• Benefits to social and cultural values including scenic amenity, use and safety.</li> <li>• Benefits to economic value for tourism, primary production, potable water supply.</li> </ul>
MA_1.06	Improve Erosion and Sediment Control for Council and Developers	<ul style="list-style-type: none"> <li>• Social change to improve management of the estuary and its catchment</li> <li>• Benefits to water quality, ecosystem health, biodiversity and resilience.</li> <li>• Benefits to social and cultural values including scenic amenity, use and safety.</li> <li>• Benefits to economic value for tourism, primary production, potable water supply.</li> </ul>
MA_2.01	Implement Key Priority ASS Management Actions	<ul style="list-style-type: none"> <li>• Benefits to water quality, ecosystem health, biodiversity and resilience.</li> <li>• Benefits to social and cultural values including scenic amenity, use and safety</li> <li>• Benefits to economic value for tourism and primary production.</li> </ul>

MA_2.02	Protect and/or Rehabilitate Coastal Wetlands	<ul style="list-style-type: none"> <li>• Benefits to water quality, ecosystem health, biodiversity and resilience.</li> <li>• Benefits to social and cultural values including scenic amenity, use and safety</li> <li>• Benefits to economic value for tourism, primary production, potable water supply.</li> </ul>
MA_2.03	Improve Riparian and Estuarine Bank Vegetation	<ul style="list-style-type: none"> <li>• Benefits to water quality, ecosystem health, biodiversity and resilience.</li> <li>• Benefits to social and cultural values including scenic amenity, use and safety</li> <li>• Benefits to economic value for tourism, primary production, potable water supply.</li> </ul>
MA_2.04	Promote Good Catchment Management Practice on Public Land	<ul style="list-style-type: none"> <li>• Social change to improve management of the estuary and its catchment</li> <li>• Benefits to water quality, ecosystem health, biodiversity and resilience.</li> <li>• Benefits to social and cultural values including scenic amenity, use and safety</li> <li>• Benefits to economic value for tourism, primary production, potable water supply.</li> </ul>
MA_2.05	Enter the Manning River Entrance Project into the NSW Investor Assurance and Business Case Process	<ul style="list-style-type: none"> <li>• Benefits to coastal management: coordinated governance, ESD, integrated coastal planning</li> </ul>
MA_2.06	Ensure Manning River Entrance Process includes Extensive Stakeholder Consultation	<ul style="list-style-type: none"> <li>• Benefits to coastal management: public participation in coastal management</li> </ul>
MA_2.07	Implement a Systematic Approach to Maintaining SQIDs	<ul style="list-style-type: none"> <li>• Social change to improve management of the estuary and its catchment</li> <li>• Benefits to water quality, ecosystem health, biodiversity and resilience</li> <li>• Benefits to social and cultural values including scenic amenity, use and safety</li> <li>• Benefits to economic value for tourism.</li> </ul>
MA_2.08	Review, Revise and Supplement MCC's Current Stormwater Guidance	<ul style="list-style-type: none"> <li>• Benefits to water quality, ecosystem health, biodiversity and resilience</li> <li>• Benefits to social and cultural values including scenic amenity, use and safety</li> <li>• Benefits to economic value for tourism.</li> </ul>
MA_2.09	Revise and Implement the Greater Taree Urban Stormwater Management Plan	<ul style="list-style-type: none"> <li>• Benefits to water quality, ecosystem health, biodiversity and resilience</li> <li>• Benefits to social and cultural values including scenic amenity, use and safety</li> <li>• Benefits to economic value for tourism.</li> </ul>
MA_2.10	Study and Prioritise Sensitive Estuarine Riverbank Areas for Management and Implement Stabilisation	<ul style="list-style-type: none"> <li>• Benefits to water quality, ecosystem health, biodiversity and resilience</li> <li>• Benefits to social and cultural values including scenic amenity, use and safety</li> <li>• Benefits to economic value for tourism, primary production, potable water supply.</li> </ul>
MA_2.11	Prioritise Unsealed Road Sediment Hotspots and Undertake Remediation	<ul style="list-style-type: none"> <li>• Benefits to water quality, ecosystem health, biodiversity and resilience</li> <li>• Benefits to social and cultural values including scenic amenity, use and safety</li> <li>• Benefits to economic value for tourism, primary production, potable water supply.</li> </ul>
MA_2.12	Onsite Sewerage Management System Audit and Compliance Strategy. Implement Audit Program	<ul style="list-style-type: none"> <li>• Benefits to water quality, ecosystem health, biodiversity and resilience</li> <li>• Benefits to social and cultural values including use and safety</li> <li>• Benefits to economic value for tourism, primary production, potable water supply.</li> </ul>

MA_2.13	MER for Ecosystem Health	<ul style="list-style-type: none"> <li>• Benefits to water quality, ecosystem health, biodiversity and resilience</li> </ul>
MA_2.14	Implement a Scientific Research Program	<ul style="list-style-type: none"> <li>• Benefits to water quality, ecosystem health, biodiversity and resilience</li> </ul>
MA_3.01	Develop Forward Plan to Retain Retreat Zones for Coastal Wetlands in Partnership with Land Owners	<ul style="list-style-type: none"> <li>• Social change to improve management of the estuary and its catchment</li> <li>• Benefits to water quality, ecosystem health, biodiversity and resilience.</li> <li>• Benefits to economic value for tourism, primary production.</li> </ul>
MA_3.02	Develop Forward Plans for Council Assets at Risk from Sea Level Rise	<ul style="list-style-type: none"> <li>• Benefits to social and cultural values including amenity, use and safety</li> <li>• Benefits to economic value for tourism, primary production, potable water supply</li> </ul>
MA_3.03	Long Term Adaptation Plan for Manning Floodplain in Collaboration with Landowners	<ul style="list-style-type: none"> <li>• Social change to improve management of the estuary and its catchment</li> <li>• Benefits to water quality, ecosystem health, biodiversity and resilience.</li> <li>• Benefits to economic value for primary production.</li> </ul>
MA_4.01	Address Barriers to Fish Passage	<ul style="list-style-type: none"> <li>• Benefits to ecosystem health, biodiversity, resilience</li> </ul>
MA_4.02	Develop and Implement Integrated Pest and Weed Control Plans for Local Priorities	<ul style="list-style-type: none"> <li>• Benefits to ecosystem health, biodiversity, resilience</li> <li>• Benefits to economic value for tourism, primary production</li> </ul>
MA_4.03	Implement Recommendations of Refugia Study	<ul style="list-style-type: none"> <li>• Benefits to water quality, ecosystem health, biodiversity, resilience</li> </ul>
MA_5.01	Involve Aboriginal Community in Management of the River, Catchment and Estuary	<ul style="list-style-type: none"> <li>• Benefits to social inclusion, equity, Aboriginal custodianship, spiritual and cultural use, reconciliation</li> </ul>
MA_5.02	Install Interpretive Signage and Facilitate Cultural Activities	<ul style="list-style-type: none"> <li>• Benefits to social inclusion, equity, Aboriginal custodianship, spiritual and cultural use, reconciliation</li> </ul>
MA_5.03	Engage Aboriginal People in Water Quality Monitoring	<ul style="list-style-type: none"> <li>• Benefits to social inclusion, equity, Aboriginal custodianship, spiritual and cultural use, reconciliation</li> </ul>
MA_5.04	Appoint Two Aboriginal Members to the ECMP Reference Group	<ul style="list-style-type: none"> <li>• Benefits to social inclusion, equity, Aboriginal custodianship, spiritual and cultural use, reconciliation</li> </ul>
MA_6.01	Investigate & Implement Site-Specific Pathogen Source Control measures	<ul style="list-style-type: none"> <li>• Benefits to economic value for tourism, primary production, potable water supply</li> </ul>
MA_7.01	Submit a Planning Proposal for CM SEPP	<ul style="list-style-type: none"> <li>• Benefits to water quality, ecosystem health, biodiversity and resilience.</li> <li>• Benefits to coastal management: coordinated governance, ESD, integrated coastal planning</li> </ul>

MA_7.02	Preparing Mapping of Coastal Vulnerability Area for Tidal Inundation	<ul style="list-style-type: none"> <li>• Benefits to coastal management: coordinated governance, land use planning, ESD, integrated coastal planning</li> <li>• Benefits to social and economic values – use and safety</li> </ul>
MA_7.03	Identify Water Quality Objectives and Management Targets	<ul style="list-style-type: none"> <li>• Benefits to water quality, ecosystem health, biodiversity, resilience</li> </ul>
MA_8.01	Establish Multi-Stakeholder Management Committee	<ul style="list-style-type: none"> <li>• Benefits to coastal management: coordinated governance</li> <li>• Benefits to coastal management: public participation in coastal management</li> </ul>
MA_8.02	Holistic, interagency approach to Compliance Programs	<ul style="list-style-type: none"> <li>• Benefits to coastal management: coordinated governance</li> <li>• Social change to improve management of the estuary and its catchment</li> </ul>



**MIDCOAST**  
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