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Nambucca River Estuary Management Plan FINAL REPORT

R.B15164.005.03.doc
April 2008

Nambucca River Estuary Management Plan
FINAL REPORT

Prepared For:	Nambucca Shire Council
Prepared By:	WBM Pty Ltd (Member of the BMT group of companies)

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Title :	Nambucca River Estuary Management Plan FINAL REPORT
Author :	Damion Cavanagh
Synopsis :	This report presents prioritised management strategies and actions for the Nambucca River estuary to be implemented over the next five or more years.

REVISION/CHECKING HISTORY

REVISION NUMBER	DATE OF ISSUE	CHECKED BY		ISSUED BY	
0	2 March 2007	ABM		DCC	
1	15 October 2007	ABM		DCC	
2	22 October 2007	ABM		DCC	
3	4 April 2008	ABM		DCC	

DISTRIBUTION

DESTINATION	REVISION			
	0	1	2	3
Nambucca Shire Council	20	1 & Pdf	Pdf	Pdf
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1 INTRODUCTION

This document presents the Estuary Management Plan (EMP) for the Nambucca River. WBM Pty Ltd has prepared the EMP with input from GECO Environmental. The plan has been prepared under the direction of the Nambucca Shire Estuary and Coastline Management Committee, Nambucca Shire Council and Department of Environment and Climate Change (DECC, formerly DNR) in accordance with a study brief released by Nambucca Shire Council in February 2004.

The establishment of an environmental levy (paid to Council as part of quarterly rates) has in part raised funds required to complete the study. The amount raised by Council was matched by the DECC under the NSW Estuary Management Program. This project was also supported by funding from the Australian Government under its Regional Partnerships programme through the Department of Transport and Regional Services.

The EMP builds upon the work completed as part of the Estuary Management Study (WBM, 2006) and Estuarine Geomorphology, Physical Condition and Mapping report by (GECO 2005) and to avoid unnecessarily duplication of material, reference should be made to these documents to ascertain further information about the study and current condition, issues, etc relating to the estuary.

The following sections of the Estuary Management Study have been reproduced in the EMP for completeness. Section 2 of this report provides the implementation tables, which form the centrepiece of the EMP.

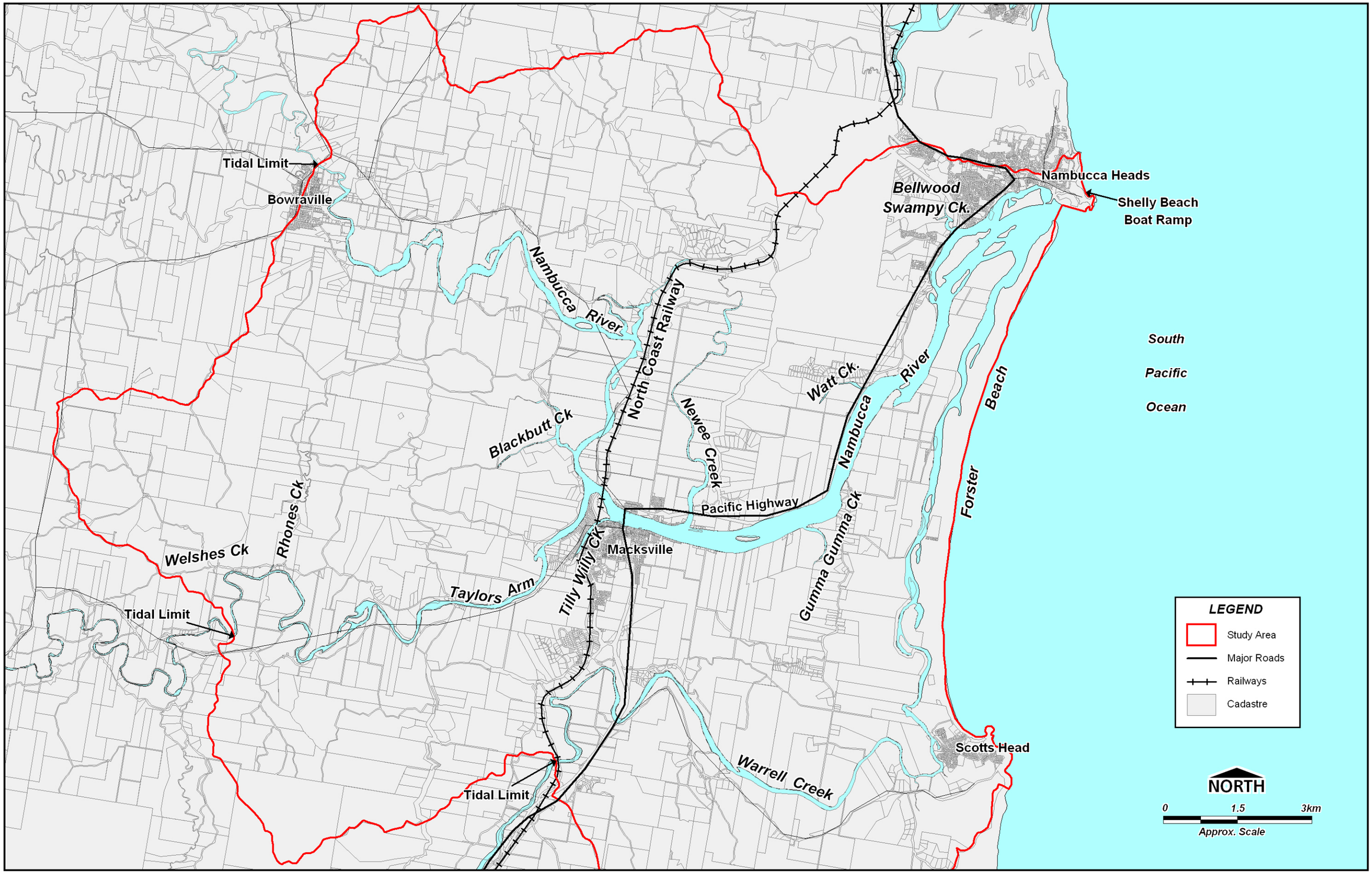
1.1 Study Area

The Nambucca River is located within Nambucca Shire, which is situated on the mid-north coast of NSW approximately 45 kilometres south of Coffs Harbour. The Shire has an approximate area of 1,491 km^2, while the Nambucca River has a total catchment area of 1,460 km^2. The river catchment is almost wholly contained within the Shire's boundary. The prominent waterways of the estuarine river system include the Nambucca River, Taylors Arm and Warrell Creek, which collectively have a waterway area of approximately 7.74 $km^{2.}$

The study area is focussed on the estuary and its catchment. This Management Plan addresses issues specific to the tidal waterways, foreshores and adjacent lands of the Nambucca River. This tidal subcatchment has an area of 253.5 km^2 (approximately 20% of the total catchment). The tidal waterways of the estuary extend:

- From the entrance at Nambucca Heads along the Nambucca River to 250m upstream from Lanes Bridge at Bowraville;
- Along Taylors Arm for approximately 1.6km upstream from Boat Harbour Bridge on Taylors Arm Road at Utungun; and
- Along Warrell Creek 600m downstream from Pacific Highway Bridge just south of Warrell Creek hamlet.

Other minor tributaries to the estuary include Blackbutt Creek, Newee Creek, Gumma Gumma Creek, Watt Creek, Bellwood/Swampy Creek, Tilly Willy Creek, Rhones Creek and Welshes Creek (amongst others). The study area includes the entrance and Shelly Beach boat ramp. Figure 1-1 shows the Nambucca River Estuary and other salient details of the study area.



Study Area Figure 1-1

1.2 Overarching Management Objectives

In respect of the general goals of the Estuary Management Policy (NSW Government, 1992), overarching management objectives have been developed for the Nambucca River estuary (see Table 1-1). The objectives are based on community uses and values associated with the estuary (identified in consultation with the community and stakeholders) and from the technical reviews completed as part of this study. The objectives form the "goal posts" for estuary management and will serve as future measures against which to assess the success of the process.

Table 1-1 Overarching Management Objectives

Land Tenure and Usage (LTU) - Protect and enhance the existing uses and values of the estuary in both the short- and long-term by adoption of best practice land use planning and development controls.
Entrance Condition and Behaviour (EC) - Maintain navigation within the lower estuary for shallow draft vessels, consistent with current use, to maintain user amenity, safety and aesthetics, within the natural constraints of ocean and fluvial processes.
Boating and Waterway Usage (BWU) - Encourage waterway use that causes a minimum of environmental and social impact, and where possible, enhances user amenity through improved safety controls and reduced conflict. Improve the safety of swimmers of all ages within the estuary.
Water Quality (WQ) - Maintain and improve water quality within the estuary to support ecosystem function, commercial fishing/oyster production and tourism, and other forms of human recreation including swimming.
Habitat Management (HM) - Protect and enhance habitats to improve the health and biodiversity of the Nambucca River estuary.
Bank Erosion and Sedimentation (BE) - Improve overall riverbank condition on all major streams and waterways of the Nambucca Valley to limit future bank erosion and sedimentation.
Climate Change and Sea Level Rise (CCSLR) - Consider the potential implications of sea level rise on the estuary and its surrounds as a result of global scale climate change.
Cultural Heritage (CH) - Protect areas and items of Aboriginal and European cultural heritage within the estuary.
Community Liaison (CL) - Maintain open lines of communication with the community and local Aboriginal groups in relation to the ongoing management of the estuary.
Fisheries and Oyster Aquaculture (FOA) - Maintain and improve the viability of existing (and potential future) types of ecologically and commercially sustainable estuary-based aquaculture industries and enterprises.
Tourism Management (TM) - Maintain and improve the recreational and amenity values of the Nambucca River estuary, without resulting in deleterious impacts on the natural environment.

1.3 Prioritised Management Strategies

Through a process of community consultation, a list of prioritised management strategies (25 in total) has been developed for the estuary (see Table 1-2). These strategies address the issues identified through community and stakeholder consultation, as well as those issues identified as part of the technical assessments. The priority and ranking provided to the management strategy provides an indication of the order in which they should be dealt with (with higher rankings, i.e. 1, 2, etc, being dealt with where possible sooner than lower ranked strategies).

Table 1-2 Prioritised Management Strategies

Management Strategy	Priority	Rank
1. Improve overall riverbank condition (including riparian habitats) on all major streams and waterways within the Nambucca Valley.	High	1
2. Minimise the environmental impact of new development by integrating best practice water management approaches (encompassing design, construction and operation) into Council's planning, approval and regulatory systems.	High	2
3. Reinstate tidal flow through the Stuarts Island Causeway, whilst minimising risk to swimmers utilising the Bellwood Swimming Hole.	High	3
4. Raise community awareness as to the environmental impacts of boating within the estuary and boating techniques that could be employed to minimise them.	High	4
5. Support sustainable aquaculture industries within the Nambucca River estuary by application of the highest levels of catchment and waterway management to ensure that the estuary's water quality is sufficient to maintain this industry, in clearly identified areas.	High	5
6. Protect habitats of high ecological and estuarine conservation value (eg saltmarsh, wetlands, littoral rainforests, riparian zones and floodplain wetlands), through appropriate landuse planning and development controls.	High	6
7. Incorporate riparian protection zones within Council's planning framework to safeguard them against potential future development and land-use change.	High	7
8. Enhance condition of habitats of high ecological/ conservation value.	High	8
9. Raise community awareness of coastal/estuary processes to increase the level of understanding of shoaling mechanisms and associated implications as well as the consequences of intervention measures.	High	9
10. To maintain and enhance the condition of Nambucca Valleys waterways to allow for responsible recreational boating and water sports activities.	High	10
11. Rationalise and improve access points, boat ramps and associated facilities to protect existing estuarine values and to provide quality public foreshore access to the estuary.	Medium	11
12. Integrate and improve upon existing water quality monitoring activities occurring within the estuary to provide a better indicator of overall estuarine health, whilst addressing all existing licence and operational requirements.	Medium	12
13. Improve swimmer safety in the lower estuary by a variety of means including improved signage / safety equipment, provision of new swimming areas and/or improving the safety aspects of existing swimming areas.	Medium	13
14. Address localised shoaling and erosion problems and improve navigable access where practical and most needed in the lower estuary giving consideration to the likely effectiveness, costs and benefits of works as well as the potential impacts.	Medium	14
15. Ensure proposals that affect the estuary and surrounds afford an appropriate level of protection to items and areas of Aboriginal and European cultural heritage.	Medium	15
16. Promote the values of the estuary in ways that promote its sustainable use and also support the valuable tourism industry of the Nambucca Shire.	Medium	16
17. Initiate fishing catch surveys on the Nambucca River estuary, which identify key fishing locations, fishing effort, catch quantities and species caught.	Medium	17
18. Obtain better understanding of fisheries habitat values and trends in fish communities over time in different parts of estuary.	Medium	18
19. Incorporate river health goals and best practice design into future bank protection works (e.g. construction of future foreshore retaining walls) through an integrated and streamlined approvals process.	Medium	19
20. Ensure climate change and sea level rise implications are incorporated into the current LEP and forward planning.	Low	20
21. Protect habitats of moderate or local ecological value (eg areas of native regrowth).	Low	21
22. Enhance condition of habitats of moderate or local ecological value.	Low	22
23. Ensure adequate representation of all key local stakeholder groups is maintained on the Estuary and Coastline Management Committee (ECMC) and that stakeholder input is encouraged in the implementation of the Plan	Low	23
24. Ensure all foreshore structures are appropriately licenced, designed and maintained to protect foreshore amenity and access.	Low	24
25. Improve recognition of Crown Land areas in the lower estuary, particular those around existing facilities that may promote greater connectivity and tourist related usage of the area.	Low	25

Note Strategy BWU-5 "Develop a formal Boating Management Plan for regions of the Nambucca River Estuary that are being excessively impacted upon by boating activities" has been removed at NSW Maritime's request.

1.4 Funding

The Nambucca River estuary provides a source of economic income to the Shire in terms of fisheries (commercial finfish and oysters) and tourism. The estuaries are also a large social resource used for a variety of recreational pursuits. There are also numerous environmentally significant habitats and corridors within the estuary and broader catchment area which help to protect biodiversity on a local and regional scale.

There is a real need for the continued investment in active management of the estuary and its catchment in order to maintain its current condition. Over the long-term issues should be addressed and degraded sections of the catchment and estuaries rehabilitated, such that the estuary's overall condition may be improved.

The Nambucca River estuary is a relatively large estuary, however there is only a fairly small resident population (and hence rate base) within the Shire. This limits funds that may be able to be raised by Council to address environmental issues.

It is recommended as part of the implementation of this Estuary Management Plan, that all avenues for matching funds or one-off funding, be investigated to improve Council's ability to fund actions. Without decent long-term investment in the implementation of the Estuary Management Plan, there is unlikely to be any sustained or noticeable improvement in estuarine and catchment condition within the study area.

The recommendations included in this Estuary Management Plan should serve as a vehicle for sourcing funding. The fund administrators typically accept applications for projects only at specific times of the year. There will usually be a number of eligibility criteria that will need to be addressed as part of the application. There may also be specific requirements on how the project is implemented and over what time frame the monies should be spent. Council as the lead body for the implementation of the Plan should aim to keep abreast of all funding opportunities and aim to obtain funding wherever possible and appropriate. Some of the major potential funding sources include:

- Council's Environmental and Stormwater Levy;
- The Northern Rivers Catchment Management Authority (under their Catchment Action Plan);
- Envirofund (mainly for individuals and non-government groups);
- Defeating the Weed Menace Program;
- Indigenous Heritage Program;
- Education for Sustainable Development Grants Program;
- Maintaining Australia's Biodiversity Hotspots Program;
- Threatened Species Community Program;
- Community Water Grants;
- National Landcare Program;
- Maritime Infrastructure Program; and
- NSW Recreational Fishing Trusts.

1.5 Implementation

Management strategies have been ranked in order of priority from 1 to 25. Within this ranking, strategies have also been assigned a level of priority i.e. high, medium or low priority for implementation. Furthermore, within each strategy there may be more than one action, some of these have timeframes associated with them as well.

Overall, the priorities/timeframes provided within this document are indicative and are to be used to guide the order in which things are done. This responds to:

- Key issues identified within the estuary;
- Community preferences and concerns for the estuary; and
- Professional judgement.

Obviously, it would be great to have the resources to tackle a great number of issues at once, however, this will not be possible. The prioritisation highlights the need for matching the rate of implementation to available funds and labour resources.

The amount of resources likely to be allocated by Council and others (via funding applications) to the implementation of this Estuary Management Plan is at present unknown, hence it is difficult for this document to identify accurate timeframes for implementation of many of the actions identified.

Overall, as a general aim sufficient funding should be sought to begin tackling most of the high priority objectives in the short term, i.e. 1 to 2 years. Other medium and longer-term actions will follow after this. Where opportunities exist to implement medium or low priority actions for minimal outlay (both capital and labour) these opportunities should be taken.

1.5.1 Monitoring Implementation

Council as the lead agency for the implementation of the Plan should prepare a yearly recap of the implementation of the Estuary Management Plan. The recap should provide a brief overview of progress (3 to 4 pages of text) and identify:

- What actions have been commenced and their current status;
- Success or otherwise of implementing actions, etc;
- Hurdles to furthering action in relation to management strategies; and
- Expenditure, including funding that has been secured.

The recap should be presented at a Coastal and Estuary Management Committee meeting and attended by all relevant Councillors and State Agencies. Information should be posted to all non-attending members, the remainder of the Councillors, other relevant stakeholder groups and placed on Council's website.

2 MANAGEMENT STRATEGY 1 (HIGH)

Improve overall riverbank condition (including riparian habitats) on all major streams and waterways within the Nambucca Valley

Addresses Management Objectives

- BE- Bank Erosion and Sedimentation
- WQ – Water Quality

References

- For Estuarine Erosion, please refer to GECO Environmental (2005) 'Estuarine Geomorphology, Physical Condition and Mapping' report.
- For Freshwater Erosion, please refer to the Lyall Macoun (1999) '*Nambucca Valley River and Catchment Management Study*' series of reports.

Description

Work completed by Geco Environmental (2005) identified that most of the major reaches of the Nambucca River estuary are suffering from riverbank instability. In the upper reaches of the estuary, fluvial processes (i.e. floods) are believed to be the dominant processes driving channel change, while in the lower estuary wave action (from wind and boats) may also be a significant contributor. Bank stability can be affected by other human actions, such as clearing or damage of riverbank (i.e. riparian) vegetation, and uncontrolled cattle grazing and gravel extraction. These actions either limit the ability of the bank to remain stable against the impacts of wave action and floods flows, or lead to responses in the estuary bed which can cause further bank erosion and sedimentation.

The aim of this strategy is to focus protection efforts on those reaches in good condition through the removal of preventable threatening processes such as boat wash causing erosion, cattle grazing on banks, etc. This strategy also promotes rehabilitation activities in slightly degraded areas with a high likelihood of being returned to a good condition, as well as strategic reaches requiring reinforcement e.g. popular recreational boating and water sport areas.

The choice of appropriate protective or rehabilitative actions will depend on the specifics of the riverbank in question. In general, a variety of actions may be appropriate depending on the specific circumstances of the area in question, such as tree planting, riverbank fencing and/or rock revetment.

Actions	Responsibility	Specific Tasks and Resources	Timeframe	Cost	Potential Fund Sources
1.1 Seek devolved grant funding for a five year period to target protection and rehabilitation of riverbank sections throughout the estuary in accordance with recommendations of GECO Environmental (2005) (p33) namely: • Address estuarine erosion as detailed in Figure 2-1; • Address upstream erosion as detailed in Figure 2-2; • Protect and rehabilitate sites with high quality riparian vegetation (see Figure 2-3); and • Target serious invasive weeds e.g. Madeira vine in riparian areas (see Figure 2-4). In addition to these areas, there is also a need to provide bank protection works at locations susceptible to bank erosion within the estuary, which are also subject to higher levels of recreational boating and water sports, see Figure 2-5. From the above, the proposed actions should be documented in an estuarine **Bank Management Plan** with a minimum 5-year timeframe for investment. The Plan should identify priorities for action, types of works required, resources required, etc. and form a key resource document in this respect.	For Crown (public) lands, the responsibility lies with the Reserve or Trust holder For Private lands, the responsibility lies with the landholder. The Nambucca River Boating User Group will provide assistance for bank protection works in high use recreational boating and watersport areas. NSW Maritime may also be able to provide assistance in this regard.	For details on best practice riverbank restoration techniques for treatment of bank instabilities see GECO Environmental (2005) (pages 20 to 23). Other resources include the: • '*Riverbank restoration for the Nambucca River Estuary*' for vegetation • '*River Restoration Activitites in the Nambucca Valley*' for physical bank treatments • 'A River Rehabilitation Manual for Australian Streams, Volume 1 and 2 (2000) http://www.lwa.gov.au/products_list.asp • River Restoration Manual, Dept of Water WA Government http://portal.water.wa.gov.au/portal/page/portal/WaterQuality/Publications/RiverRestoration/ To implement works, it is recommended that local working groups such as Landcare and Rivercare be encouraged. Figure 2-5 identifies generally areas which are susceptible to bank erosion and which are subject to higher levels of recreational boating. Bank protection works should be designed to cater to expected use types and levels. Works should also integrate with other strategies, e.g. protection/improvement of the riparian zone, removal of weeds, etc. See also **Strategy 19.1** for which proposes the preparation of engineering guidelines for bank design and works	The protection and rehabilitation of those areas currently in: • Good condition should occur in the short terms, i.e. 1 to 2 years. • Moderate condition should occur in the mid-term, i.e. 3 to 5 years. • Poor condition should occur in the longer term, i.e. >5 years.	The costs for protection and rehabilitation vary dramatically for the type of work being completed. A good range of costs for actions such as fencing, weeding, site preparation, rehabilitation, etc is provided in: http://portal.water.wa.gov.au/portal/page/portal/WaterQuality/Publications/RiverRestoration/Content/DRAFT%204.pdf Local Landcare officers may be able to provide site-specific advice on this matter.	• Envirofund • NRCMA • DECC (Landcare) • Council's Environmental Levy
1.2 Raise public awareness in relation to riverbank management options (including riparian vegetation) and funding opportunities.	Council in consultation with and DECC and NRCMA and the Community Support Officer program.	There are many examples in the Shire (and in nearby Shires) of best practice riverbank management (including riparian land) management. A variety management approaches and outcomes should be demonstrated via a series of field days in conjunction with the respective landowners.	Field days should be held in the short term.	Minimal	• NRCMA • Council's Environmental Levy

Actions	Responsibility	Specific Tasks and Resources	Timeframe	Cost	Potential Fund Sources
1.3 Address knowledge gap in relation to sedimentation and shoaling within the estuary and its relationship with bank stability and erosion.	Council in conjunction with the following State Agencies: • NSW Maritime • Department of Lands • DECC • DPI Fisheries	The Estuary Management Study brief identified the need to complete assessments in relation to sedimentation and shoaling. However, this could not be addressed due to a lack of a current hydrosurvey. The following actions are required to address this knowledge gap: • Undertake hydrosurvey to establish extent of shoals and bars in estuary waterways. • Compare current hydrosurvey to previous hydrosurveys to establish changes to bank and bank profiles. • Identify the likely source(s) of sediment to the estuary and determine its role in river processes and ecology. • In conjunction with the Nambucca River Boating User Group, map areas that are problematic to navigation and examine potential management options, see also **Strategy 14.1**.	When hydrosurvey becomes available	DECC to fund hydrosurvey.	Funding for follow up studies to be determined by consultation with identified stakeholders.

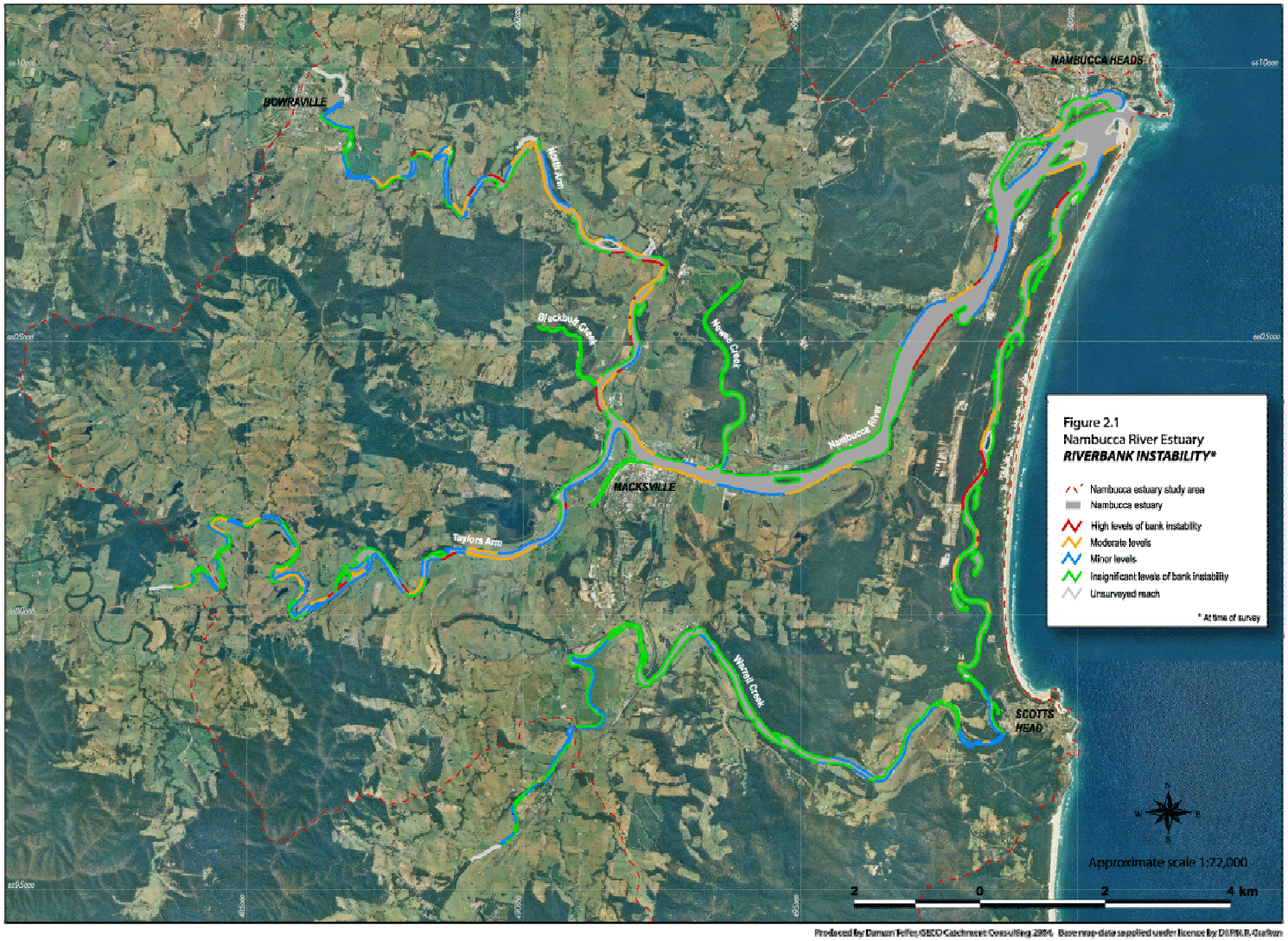


Figure 2-1Riverbank instability in the estuary (GECO Environmental, 2005)

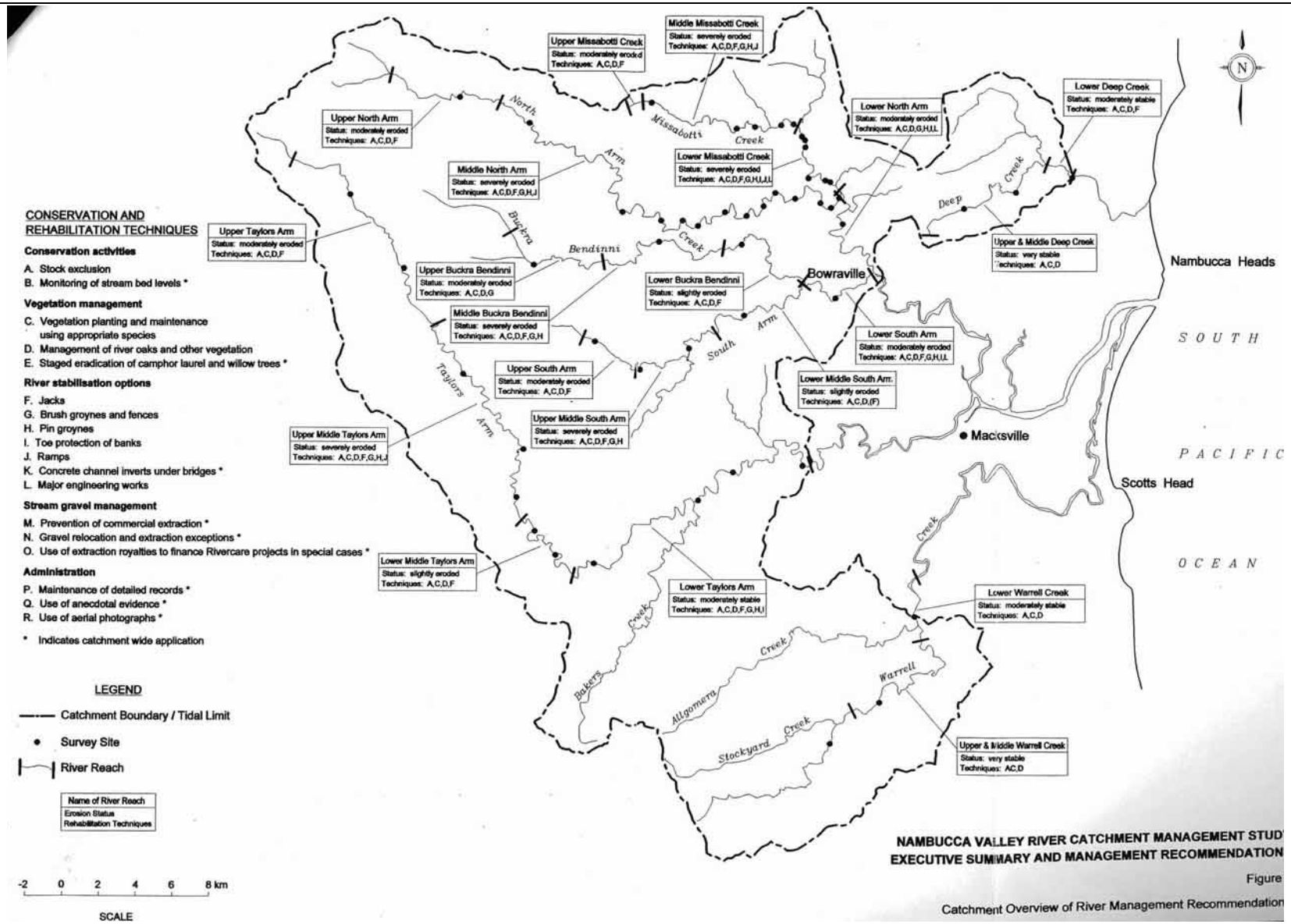


Figure 2-2Catchment Overview of River Management Recommendations (Lyall & Macoun, 1999)

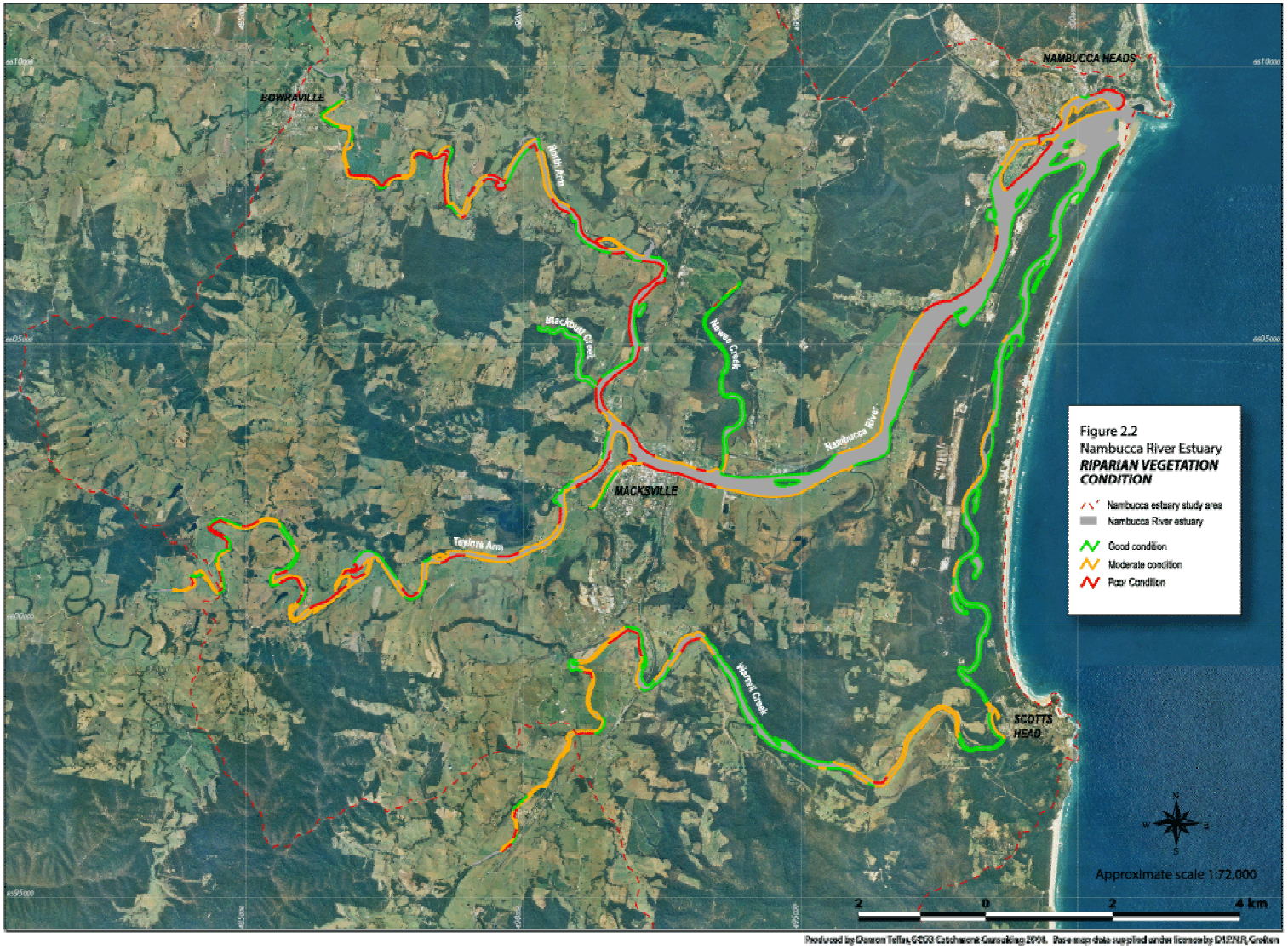
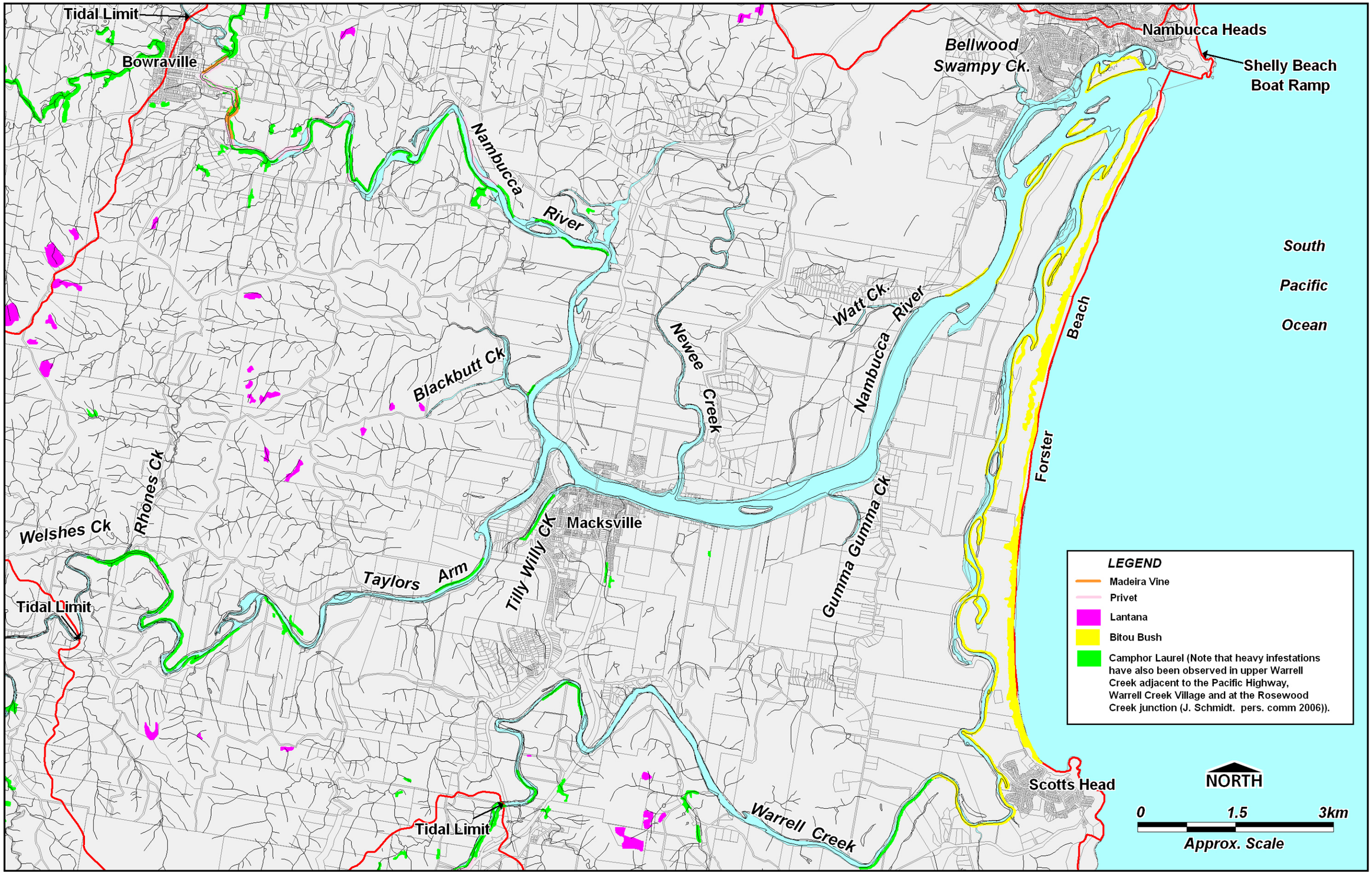


Figure 2-3Riparian vegetation condition in the estuary (GECO Environmental, 2005)



Weed Distribution in The Nambucca River Estuary Catchment (Based on Kendall, 2003 and Telfer, 2004) Figure 2-4

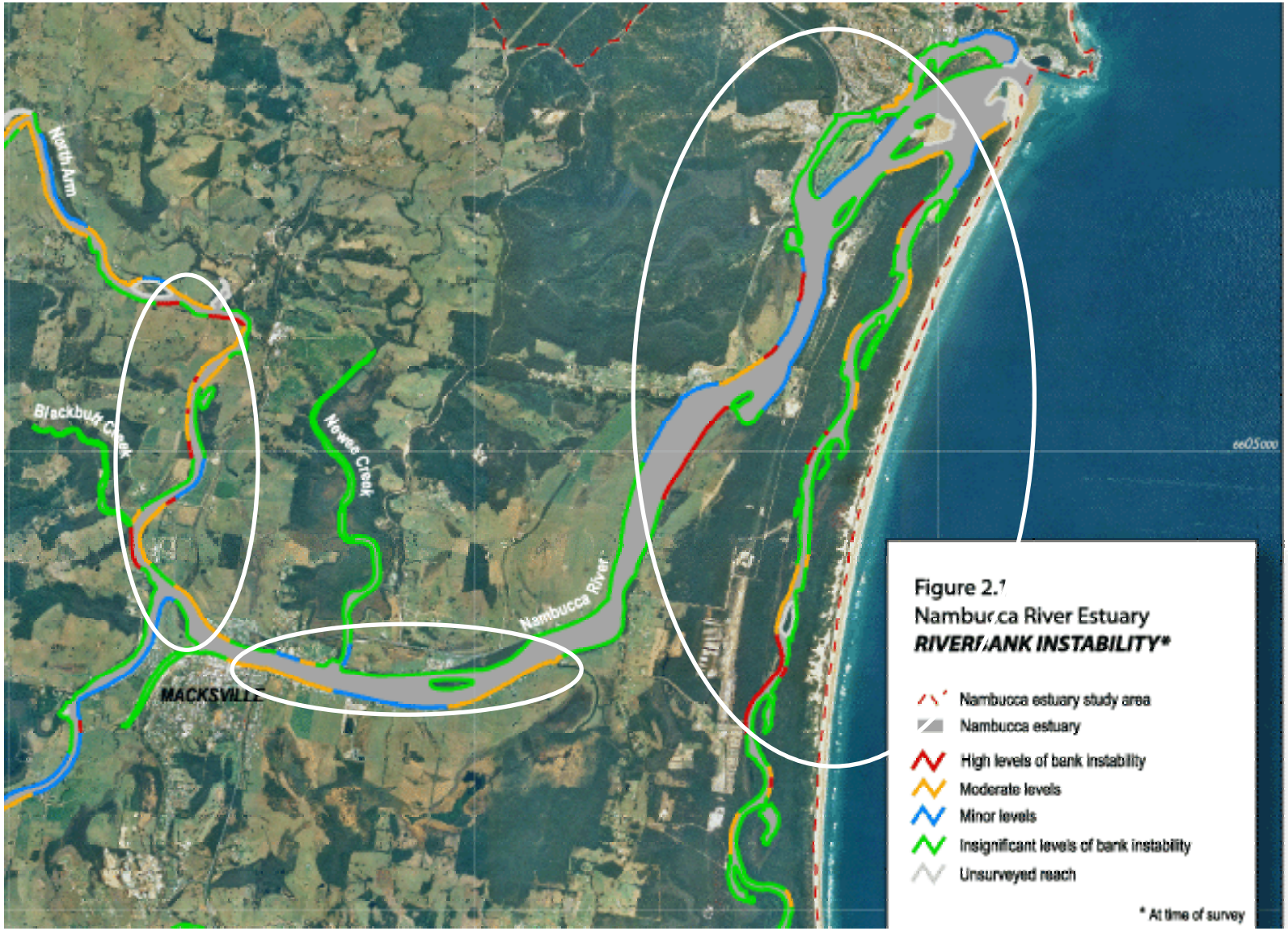


Figure 2-5Locations for targeted bank rehabilitation works

3 MANAGEMENT STRATEGY 2 (HIGH)

Minimise the environmental impact of new development by integrating best practice water management approaches (encompassing design, construction and operation) into Council's planning, approval and regulatory systems

Addresses Management Objectives

- LTU – Land Tenure and Usage
- WQ – Water Quality

References

- Sections 6 and 15 of the Estuary Management Study.

Description

Environmental harm has been noted to occur recently within the estuary as a result of new urban development. These impacts are unacceptable and should be addressed through appropriate management, including:

- Design measures for the construction and operational phases of developments that require the developer and future land owners to implement controls that prevent or reduce potential environmental impacts, e.g. appropriate erosion and sediment control during construction, use of water sensitive urban design (WSUD) as part of the design of the development to reduce operational impacts, etc.
- Monitoring and enforcement of requirements during the construction stage; and
- Maintenance during the operational phase.

Solutions being adopted by other rural Councils at the design stage include amendments/revisions to existing Development Control Plans (DCP) and improved linkage with Local Environment Plans (LEP). The DCPs should outline the requirements for various types of development occurring on land with particular zonings (as specified within the LEP and triggered by the development application). At the construction and later stages, regular involvement and inspection by Council officers is an appropriate way to ensure compliance and to provide long-term positive outcomes.

Actions	Responsibility	Specific Tasks and Resources	Timeframe	Cost	Potential Fund Source
2.1 Identify and incorporate best practice soil and water management (incl. water sensitive urban design) principles within Council's DCP3, DCP4, DCP5 and DCP17. These DCPs will need to provide specific objectives and performance targets for water quality and quantity for a range of development types and locations. The DCPs will also need to specify that developments will require the preparation of **soil and water management plans** as part of the approval process. These plans shall provide sufficient detail of the proposed best practice soil and water management practices intended to be implemented on-site. Suitable references include the "Blue Book" Landcom Manual "Soils and Construction" Volume 1, 4th Edition March 2004.	Council	Assistance for Nambucca Shire Council in the development of appropriate erosion and sediment control standards may be found at: http://www.environment.nsw.gov.au/stormwater/#erosionandsediment Assistance for developers in relation to erosion and sediment control (i.e. soil management) for new development may be found at: http://www.landcom.com.au/bluebook.aspx Additional information in relation to Water Sensitive Urban Design may be found on the WSUD website: http://www.wsud.org/wsud.htm It is acknowledged that Council is in early stages of preparing an Integrated Water Cycle Plan. Opportunities to reduce potable water demands and reduce stormwater inputs to river systems should be investigated as part of the plan. Additional advice may be found in the Managing Urban Stormwater: Harvesting and Reuse manual: http://www.environment.nsw.gov.au/stormwater/#erosionandsediment	The revisions to the LEP, DCP of Council should occur in the short term, as part of Council's LEP and DCP review.	Additional staff resources are required within the Planning section of Council to assist with this process	Council has implemented a stormwater levy 2006/7 for engineering and environmental management providing ~$150,000/yr funding that can be matched by other sources where required & appropriate. Council can apply for grants to improve stormwater management from the NRCMA
2.2 Conduct workshops for local developers, contractors, builders and Council's Works Dept. in relation to soil and water management.	Council	Resources as above. Conduct workshops for local developers, contractors and builders and also Council staff to educate regarding soil and water management for subdivisions and construction sites (for the design, construction and operational phases). Environmental obligations in respect of SEPP 62 as outlined in **Strategy 5.1** (i.e. protection of water quality in Priority Oyster Aquaculture Areas should be highlighted), as well as obligations under the Protection Of Environment Operations Act, 1997.	Short term	Out of pocket costs are minimal, however, additional staff resources from the planning and engineering sections of Council would be required.	• Council's Stormwater or Environmental Levy • NRCMA

4 MANAGEMENT STRATEGY 3 (HIGH)

Reinstate tidal flow through the Stuarts Island Causeway, whilst minimising risk to swimmers utilising the Bellwood Swimming Hole

Addresses Management Objectives

- CH – Cultural Heritage
- WQ – Water Quality
- BE – Bank Erosion and Sedimentation
- FOA – Fisheries and Oyster Aquaculture

References

- See Section 9 and Appendix E of the Estuary Management Study report.

Description

There are concerns regarding the suitability of the Stuarts Island Causeway in its current form. This management strategy aims to re-establish a tidal connection through the causeway that satisfies requirements outlined in the Study Brief namely:

- Review work already undertaken by Council regarding changes to the Stuart Island causeway;
- Investigate ways to improve the tidal flushing through the causeway with the intention of improving water quality and fish passage, without increasing risk to swimmers (in the Bellwood swimming area);
- Examine impacts of greater flushing (through the causeway) on SEPP 14 wetlands in Bellwood Creek;
- Examine option for increasing the height of the causeway so that access to the Golf Course is not impact during king tides; and
- Review environmental factors of a changed hydrology as it relates to adjoining foreshore lands.

In addition to this community consultation identified that the enhanced upstream sedimentation brought about by the causeway was having an impact on a sacred Aboriginal site located immediately upstream of the causeway.

Actions	Responsibility	Specific Tasks and Resources	Timeframe	Cost	Potential Fund Source
3.1 Implement culverts under/through Stuarts Island Causeway	Council manages the causeway	Hydrodynamic modelling has been completed as part of the Estuary Management Study to assess the potential impacts of culverts in reinstating tidal flows. Impacts include: • Small increases in water velocities within the swimming area. • Significant increases in tidal velocities within the structure and near its entrance and exit. • Minor short-term scour and resettlement of sands and seagrasses near the entrance and exit.	The detailed design and construction of the tidal flow structure should occur in the short term (i.e. next 1 to 2 years).	The cost for the tidal flow structure will be a function of its design (i.e. size and function). However, the cost of the tidal flow structure including labour and equipment is estimated to be less than $100,000.	Potential funding sources include: • DECC (dollar for dollar) • NRCMA • DPI Fisheries • State & Federal Funding

Notes:

- The implementation of culverts under the causeway does increase the risk to swimmers in the Bellwood Swimming area. The changes to velocities in this area have been assessed and were deemed acceptable by Council. The design of the culverts has aimed to reduce risk to swimmers by provision of an air space at the top of the culverts (under all tidal conditions), which would allow a swimmer to breathe if they were to pass through the culverts. The size of the culverts should limit debris catch, but an ongoing maintenance program should be implemented as part of Council's standards works procedures to check and remove any trapped debris.
- If funding permits, options to increase the height of the causeway to allow for unimpeded access to the Golf Course, even during Spring Tides can be considered. However, implications for flood restriction would need to be considered in this eventuality.
- The option of providing a full span bridge over to Stuarts Island was not considered to meet all of the requirements of the study brief, due to its likely impacts on swimming in the Bellwood Reserve. The consideration of a bridge would necessitate a further more detailed environmental investigation to specifically assess the impacts of the change. In particular, the responses of the river to the removal of the causeway over a period of a number of years may be significant. The increased tidal flows (and potentially flood flows) through the channel may result in significant bed and foreshore responses which may necessitate a series of further works to control or mitigate them. The option of a bridge would also be of significantly greater cost than provision of culverts.

5 MANAGEMENT STRATEGY 4 (HIGH)

Raise community awareness about the sensitivities and values of Nambucca River Estuary and the potential for boating and water sports to impact on these values

Addresses Management Objectives

- HM – Habitat Management
- BE – Bank Erosion and Sedimentation
- FOA – Fisheries and Oyster Aquaculture

References

- Sections 8, 10 and 11 of the Estuary Management Study
- Estuarine Geomorphology, Physical Condition and Mapping Report

Description

Some boat users may not be aware (or care) that inappropriate boat use could potentially have a significant impact on the sensitive receiving environments and the existing values of the Nambucca River estuary. The social acceptability and community ownership of this type of waterway usage could be improved by increasing the knowledge base of all boat users in relation to acceptable and safe forms of boating. In implementing this Strategy, particular attention needs to be paid to educating the boating public, in particular tourists and visitors to the area.

Particularly sensitive receiving environments are noted to exist in Warrell Creek (high scenic, recreation and vegetation values and contains areas of bank instability) and the upstream reaches of the other Arms (reduced riparian coverage and contains extensive areas of bank instability) from the impacts of boat wash.

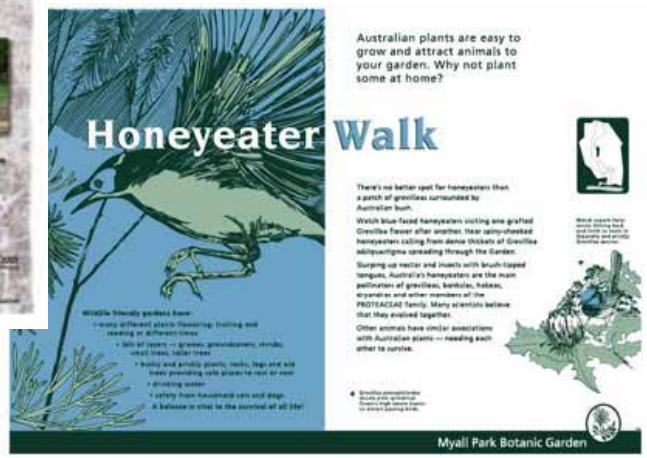
River users also need to be made aware of the Water Traffic Regulations for NSW under which it is an offence to create wash that causes nuisance, annoyance or danger to any person. Boat wash can have a direct impact on certain exposed leases and boaters should be made aware of there requirements to minimise wash in those locations which may impact upon oyster growers.

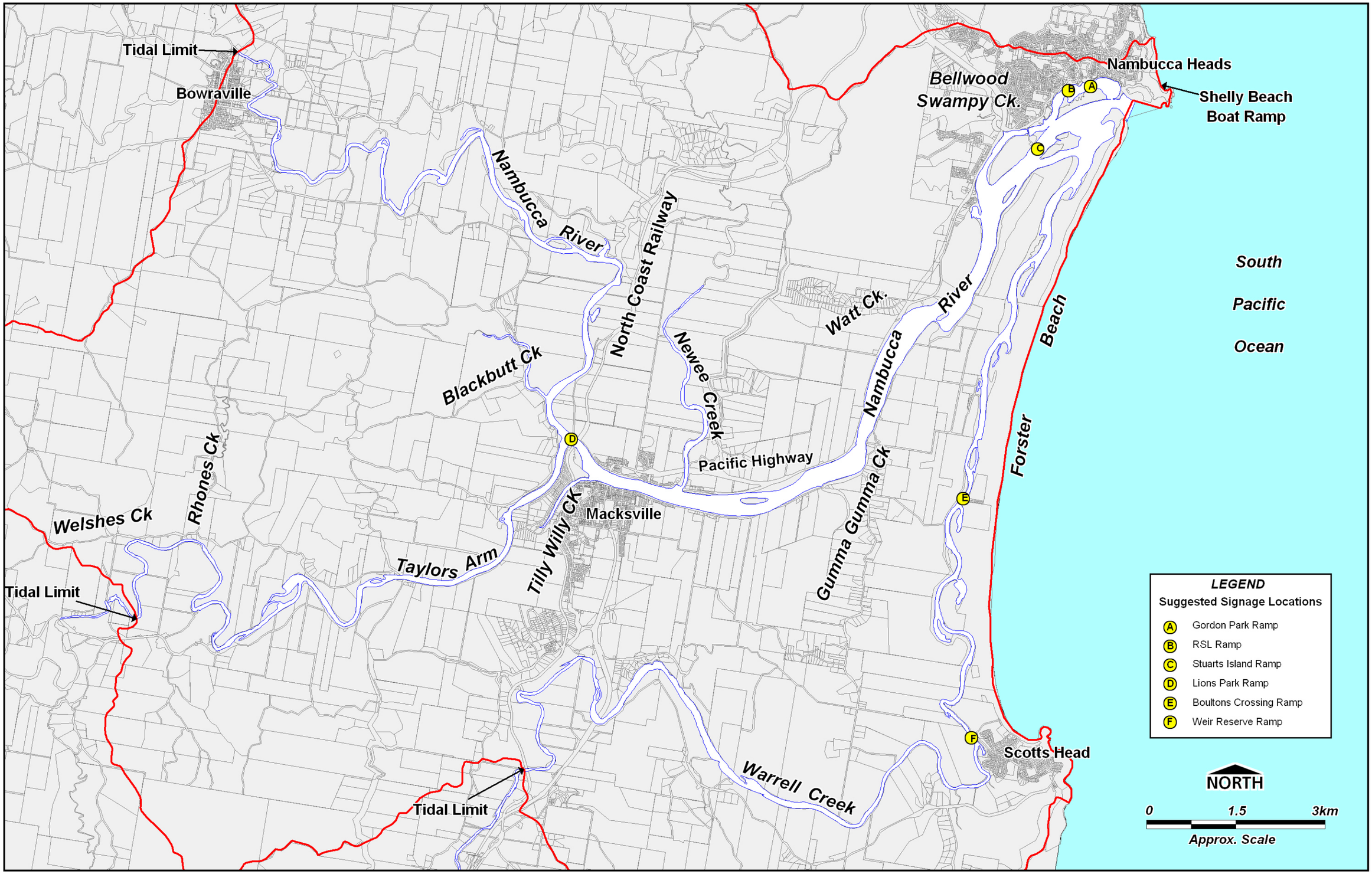
Actions	Responsibility	Specific Tasks and Resources	Timeframe	Cost	Potential Fund Source
4.1 This management strategy requires the use of techniques that will reach the users of the estuary, including locals and tourists, and inform them of their obligations under the Water Traffic Regulations of NSW and the potential environmental impacts of boating within the estuary and boating techniques that can be employed to minimise such impacts. Tools that could be employed include: • Public displays at key community centres; • Brochures and educational material for school and interest groups (may include field visits and on water education).	Council to liaise with DECC and NSW Maritime to secure their involvement River User Group may get involved in distribution of educational material	There may be a range of guidance available to inform what constitutes minimal impact boating and also which provide suggestions for how these actions may best be implemented. Some potentially useful information sources have been provided below: Water Traffic Regulations NSW http://www.austlii.edu.au/au/legis/nsw/consol_reg/wtr301/ Minimal Impact Boating in Tasmania: http://www.dpiw.tas.gov.au/inter.nsf/Publications/JPHS-5S45L9?open NSW Maritime: http://www.waterways.nsw.gov.au/environment.html Over time it is hoped that boat users of the estuary will inform other users regarding appropriate types and locations for boating.	This action should be implemented immediately	The cost of public displays would be minimal. The cost of preparing and distributing brochures and other educational material would be around $2 to 3K on an annual recurring basis. Use of volunteer time to distribute brochures during holiday periods would reduce costs and improve distribution of material.	• Council's Environmental Levy • DECC Estuary Management Program
4.2 Use of signage to alert users to the impacts of boat usage on other users and the environment. Signage should be deployed in a minimalist fashion, but aim to achieve maximum impact. Potential locations for deployment of signage include boat ramps (and potentially exposed visible banks). Figure 5-1 shows suggested locations for signage. Prior to placing signs on banks at locations other than Council operated ramps a review of land ownership and authorisation to place signs should be performed.	Council to liaise with DECC and NSW Maritime to secure their involvement Department of Lands if signs to be placed on Crown Lands not administered by Council.	Obvious and clear signage should be provided to alert boaters to the potential impacts of their boating usage (mainly targeting boat wash) and the correct boating methods they should employ. The signage should clearly identify the type and extent of sensitive environments present within the estuary and how they can be preserved. The signage should identify (using maps) the oyster growing areas (see Figure 6-1), sensitive vegetation areas (namely seagrasses and saltmarsh as per Figure 10-1 and 10-3 of the Estuary Management Study) and also unstable banks (see Figure 2-1). If appropriate key elements of the signs should be displayed in other languages. Consideration should be given to introducing signage to coincide with peak usage periods in recognition of the fact that off-peak usage is relatively low. This may help increase the 'visibility' of the signage to all.	This strategy should be initiated in the short term (i.e. over the next 1 to 2 years).	The cost of signage would be about $2 to $3K per sign on land and significantly more if placed in the water.	Potential funding sources include: • DECC Estuary Management Program • Recreational Fishing Trust

Notes:

The signage should identify via mapping the locations of high value resources which need to be protected and why. The signs should also provide information to waterway users that will allow them to understand what the impacts are of different types of waterway use and how these impact on the resources requiring protection.

Some examples of interpretive signage are provided below:





Suggested Waterway Signage Locations for the Nambucca River Estuary Figure 5-1

6 MANAGEMENT STRATEGY 5 (HIGH)

Support sustainable aquaculture industries within the Nambucca River estuary by application of the highest levels of catchment and waterway management to ensure that the estuary's water quality is sufficient to maintain this industry, in clearly identified areas

Addresses Management Objectives

- WQ – Water Quality
- HM – Habitat Management
- FOA – Fisheries and Oyster Aquaculture

References

- NSW Oyster Industry Sustainable Aquaculture Strategy
- State Environmental Planning Policy (SEPP) 62
- Section 11 and 15 of the Estuary Management Study
- Country Towns Water Supply and Sewerage Program (DWE)

Description

A recent amendment to SEPP 62 integrates elements of the OISAS into this planning policy. This has numerous implications for Council. One of the key requirements stems from a section 117 direction from the Minister for Planning (commencing 19 July 2007) requiring Council to show Priority Oyster Aquaculture Areas on the LEP and to have regard for them in any future revisions to the LEP. As such, there will be a need for appropriate land use decisions to be made to protect this fragile industry, if the oyster industry is to be maintained and/or enhanced. Over time, methodologies will need to be incorporated into Council's planning framework to safeguard the industry when land use management decisions are made, e.g. granting of development approvals, etc.

Actions	Responsibility	Specific Tasks and Resources	Timeframe	Cost	Potential Fund Source
5.1 Integrate requirements of State Environmental Planning Policy (SEPP) No# 62 for Sustainable Aquaculture and the Oyster Industry Sustainable Aquaculture Strategy (OISAS) into Council's planning frameworks, i.e. Local Environment Plan (LEP) and Development Control Plans (DCP).	Council (with DPI Fisheries as a referral agency as required)	A recent amendment to SEPP 62 integrates elements of the OISAS into this planning policy. This has numerous implications for Council. One of the key requirements stems from a section 117 direction from the Minister for Planning (commencing 19 July 2007) requiring Council to show Priority Oyster Aquaculture Areas on the LEP and to have regard for them in any future revisions to the LEP. Priority Oyster Aquaculture Areas are shown in Figure 6-1. Also, Council acting as the consent authority is required to consider whether, because of its nature and location, a development may have an adverse effect on oyster aquaculture or Priority Oyster Aquaculture Areas. If this is likely to be the case, the development application must be referred to the Department of Primary Industries for comment, and Council must consider any comments received within 21 days. There are numerous development activities that can have an adverse effect on oyster aquaculture. Any development, which is likely to adversely affect the environmental conditions required for oyster aquaculture, must be referred to the DPI. Examples of development include (e.g. subdivisions, intensive livestock industries, dredging, road construction, jetty/wharf construction, sewerage works, installation of septic system as part of new development, tourism activities near oyster leases, etc). OISAS and supporting information may be obtained from the NSW DPI website: http://www.dpi.nsw.gov.au/fisheries/aquaculture/publications/general-management-and-policy/nsw-oyster-industry-sustainable-aquaculture-strategy Also contact the Senior Fisheries Conservation Manager of DPI Fisheries on 02 6626 1200 for more information.	Implement as soon as possible. Could potentially be integrated with Council's LEP review.	Internal to Council	-
5.2 Update the conditions of appropriate LEPs and DCPs within Council to ensure that best practice performance targets and guidelines in relation to soil/water management and land use planning are utilised within the Shire, but particularly those catchments with direct influence on the oyster harvest areas.	Council	See also **Strategy 2.1**.	Complete in the short term as part of Council's review of the LEPs and DCPs.	Internal to Council	-

Actions	Responsibility	Specific Tasks and Resources	Timeframe	Cost	Potential Fund Source
5.3 Initiate targeted water quality monitoring and remedial actions as required throughout the estuary to address existing water quality issues.	Council and oyster farmers	Sampling should be conducted for thermotolerant coliforms and physical indicators such at temperature, pH, dissolved oxygen and turbidity. If unacceptable results are identified, sampling should be continued at those locations until source of pollution is identified. The causes of pollution should be addressed as soon as possible. The following should be targeted for monitoring: • Subcatchments that have a direct influence on the lower estuary oyster harvest zone including Newee Creek, Macksville (Tilly Willy Ck, etc), Gumma Gumma Ck, Watt Ck, Lumsden Lane, Teagues Ck, Bellwood Ck and Nambucca (Beer Ck, etc). • Upstream areas (i.e. inflow from upper Nambucca River and Taylors Arm) and other minor tributaries, e.g. Blackbutt Creek. • Onsite wastewater systems adjacent to estuary during peak holiday periods. • Stormwater discharge outlets to the estuary. Monitoring should be conducted monthly on the same tide. Two event samples (i.e. after catchment rainfall which has lead to runoff) should also be collected per year. Council maintains its own equipment and operators. All equipment should be calibrated prior to use. Information should be stored into a spreadsheet maintained by Council, but accessible by third parties. Bacteriological analysis should be conducted by a NATA certified laboratory.	Immediate.	Major costs items are in boat use, staff time, sample analysis and reporting. Thermotolerant coliforms tests are about $30 per sample. An external NATA certified lab should be used to complete this testing. All other parameters can be collected using Council's water quality probe. Data should be stored at a central location within Council.	Councils Environmental or Stormwater Levy
5.4 Identify risk and impact of sewage spills from existing pump stations with a view to upgrading priority stations to avert discharges to the Nambucca River estuary.	Council	It was identified as part of the Estuary Management Study that there were spills from the Macksville STP and East St pumping stations to the river in 2005 and 06, which resulted or contributed to river closures Sewage network system modelling may be required under a range of rainfall scenarios to identify trigger points for discharge and volumes of discharge. This may aid in the sizing of overflow storages or resizing of pipes/pumps. Department of Water and Energy (DWE) may have guidance available.	Immediate.	~ $50K to complete modelling assessments. Cost of physical works if required will be related to size and complexity of scheme.	Funding for physical works may be available through DWE http://www.deus.nsw.gov.au/ or the NRCMA

Actions	Responsibility	Specific Tasks and Resources	Timeframe	Cost	Potential Fund Source
5.5 Investigate options to phase out Macksville STP outlet from direct discharge into estuary to improve the oyster harvest zone classification.	Council	All suitable options such as land based irrigation of agricultural areas, golf courses, ovals, etc should be considered. A process for this would is outlined below: • Option assessment study; • Environmental feasibility assessment (based on a conceptual design); • Detailed design; and • Construction and implementation.	Investigations should occur in the short term with Environmental feasibility assessments, detailed design, construction and implementation to occur over the next several years if a suitable option can be found.	Option assessment study ~ $100K. Environmental feasibility assessments ~$150-200K. Detailed design ~$150 – 250K. Construction could be upwards of $500K depending on the size and complexity of scheme.	• DWE • NRCMA
5.6 Encourage employment of a project officer whose primary role is to formulate and identifying funding for the implementation of strategies and actions to safeguard the health of Nambucca's waterways.	Council and DECC	Discussions should also be furthered with the Bellingen Shire Council, which has recently created and funded a similar position in conjunction with other agencies.	Immediate.	~$70k/yr plus on costs	The NRCMA may also consider part funding this position.
5.7 Support programs focussed on assisting agricultural industries improving their environmental management systems.	Council and DPI Agriculture	Examples may include the "Farmer Targets for Change" operating in the Northern Rivers. The project aims to boost farm profitability and agricultural sustainability by enhancing the skills, understanding and motivation of landholders and landcarers to undertake sustainable agronomic practices and natural resource management at the farm scale. Contact: Ray Johnston, Mid Coast Dairy Advancement Group, 6552 7299	Immediate and ongoing	Unknown	NRCMA
5.8 Confirm and reinforce approaches to management for chemical and oil spill responses within the Nambucca River estuary.	Council in conjunction with the Newcastle Port Corporation	The aim of this strategy is to protect existing assets, such as the oyster harvest zones in the eventuality of a spill of a hazardous substance. A recent spill highlighted the need to confirm and reinforce the chain of command and actions / responsibilities for responding to hazardous spills. The NSW Marine Oil and Chemical Spill Contingency Plan and Oil Spill Response Atlas outlines current Statewide approaches to management of hazardous spills. See: http://www.maritime.nsw.gov.au/shipping/oilspill.html In all cases the Newcastle Port Corporation should be contacted ASAP after any reported spill. Their contact number is 4985 8292.	Immediate	Minimal	-

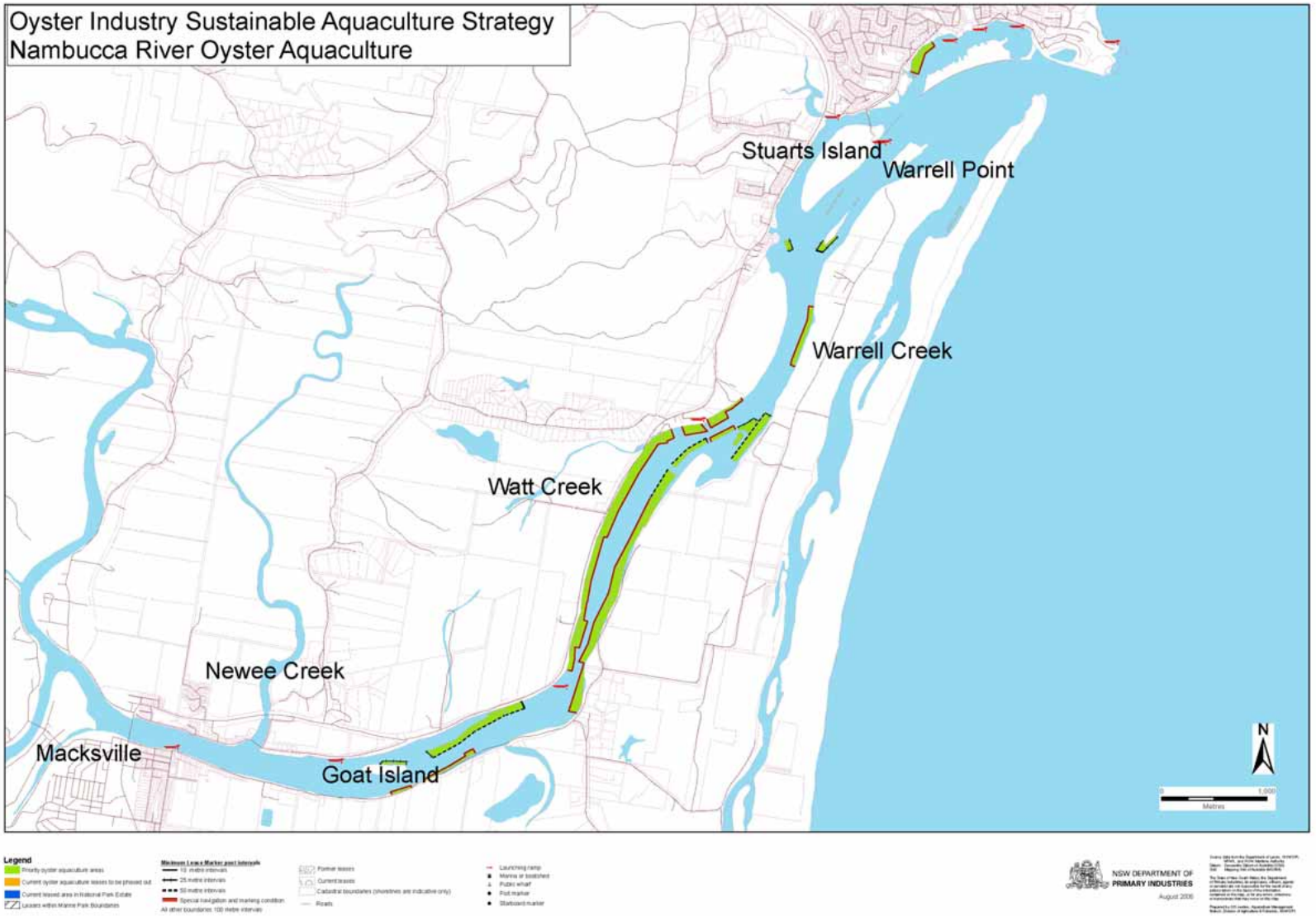


Figure 6-1 Priority Oyster Aquaculture Areas for the Nambucca River Estuary (DPI Fisheries)

7 MANAGEMENT STRATEGY 6 (HIGH)

Protect habitats of high ecological and estuarine conservation value (eg saltmarsh, wetlands, littoral rainforests, riparian zones and floodplain wetlands), through appropriate landuse planning and development controls

Addresses Management Objectives

- LTU – Land Tenure and Usage
- HM – Habitat Management

References

- Sections 10 of the Estuary Management Study.
- Estuarine Geomorphology, Physical Condition and Mapping Report.

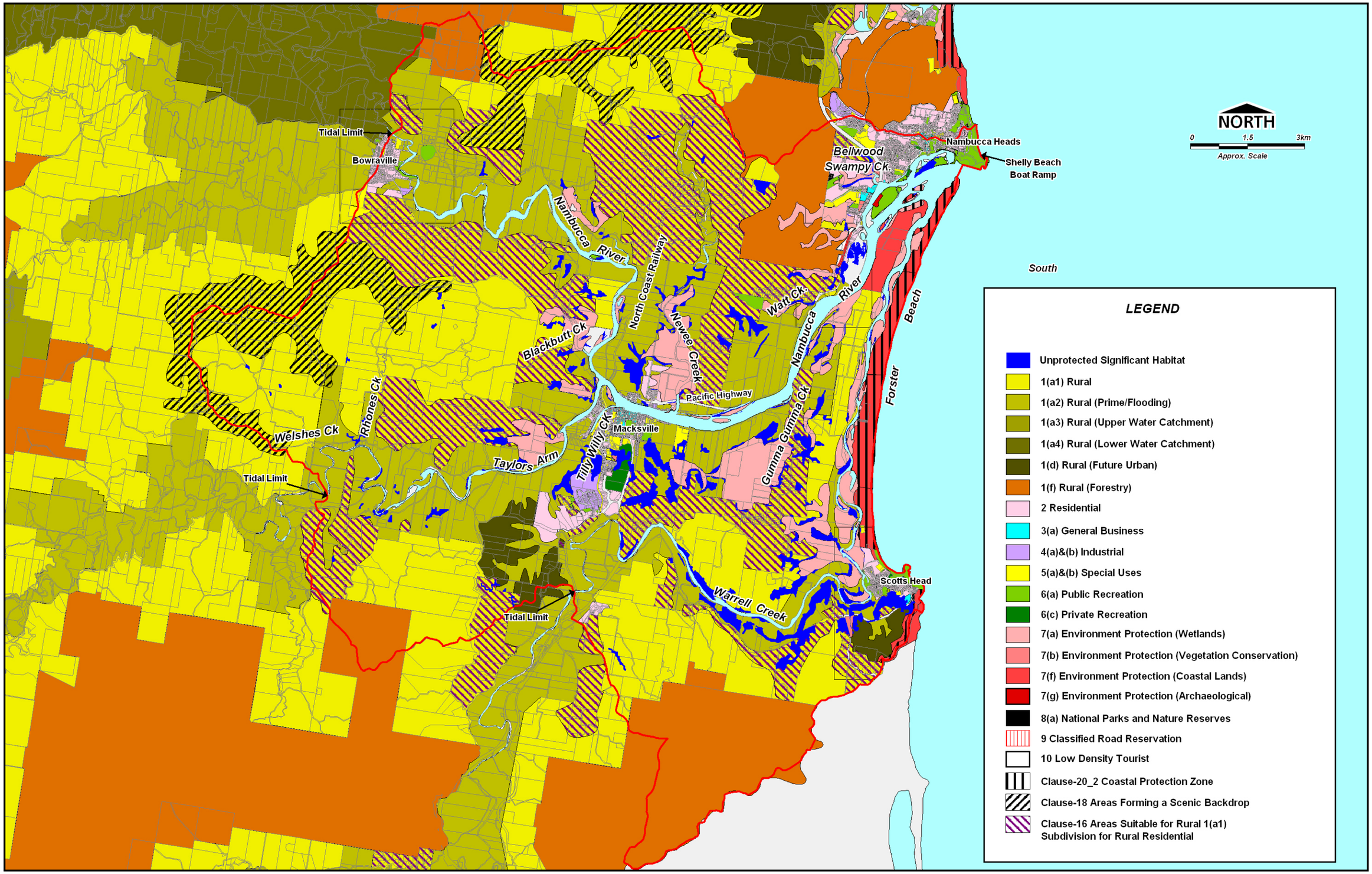
Description

The key habitat management priority for the study area is to protect habitats of high ecological and estuarine value, such as endangered communities listed under the *Threatened Species Conservation Act*, 1995, and to continue to protect habitats regulated by the *Fisheries Management Act,* 1994 to ensure no net loss. It is more cost effective to protect these areas now than to rehabilitate them in the future if habitats are allowed to deteriorate.

It should also be ensured that all existing significant habitats in the study area, and buffers to these, are protected. Buffers are the minimum width of vegetation retention or rehabilitation required adjacent to a habitat of high conservation/ecological value to ensure the values and functions of the habitat are restored and maintained.

The Draft Mid North Coast Regional Strategy recognises the importance of the Region's natural environment and resources to its economy, character, scenery and cultural values. Accordingly, this strategy supports the maintenance and enhancement of the Region's biodiversity. To this end it promotes that urban development be directed away from areas of known or likely conservation importance. Where development may impact on biodiversity it is recommended that it be designed to minimise impacts or provide offsets by protecting and enhancing the long-term viability or priority vegetation and habitat corridors. The Strategy also identifies that the values and functions of riparian corridors, coastal wetlands, lakes, estuaries and fishery habitats need protection.

Actions	Responsibility	Specific Tasks and Resources	Timeframe	Cost	Potential Fund Source
6.1 Amend the Nambucca Shire Council LEP and relevant DCPs to protect high value habitats (i.e. endangered ecological communities listed under the *Threatened Species Conservation Act*, 1995 and habitats regulated by the *Fisheries Management Act* 1994).	Council	Implementation of this strategy will require: • Ensuring that all high value habitats within the study area are covered under suitable planning instruments within Council's LEP. The new NSW LEP Standard Instruments, e.g. zones E2 (Environmental Conservation), W1 (Natural Waterways), etc should be applied as appropriate to these high value habitats. Figure 7-1 shows species listed under the *Threatened Species Conservation Act*, 1995 and *Fisheries Management Act* 1994 that require protection and are not protected under the existing LEP instruments. • Consideration of the potential impact of any form of land use change, in particular impacts of rural and/or urban subdivision on nearby or downstream high value habitats. Land use change can have significant impacts on hydrology, water quality, weeds infestation, etc. If impacts are likely to be realised on high value habitats as part of the future development of the land, then the following outcomes may apply: o The development should not proceed and land be rezoned to protect the high value habitat; or o The development is conditioned to ensure that its impacts are mitigated to an acceptable level and impacts.	Immediate	Minimal	-
6.2 Inform private landowners of the presence of high value habitats on their lands.	Council in consultation with DPI Fisheries, DECC and NRCMA	Advise landowners by letter that their lands contain high value habitats. The letter should: • Identify with use of a map the types and locations of high value habitats; • Outline the benefits and reasons for protecting high value habitats; • Landowner obligations in respect of protecting high value habitats; and • Options and incentives available for protecting these high value habitats.	Immediate	$20 to 30K for mail out project and support	• NRMCA • Council's Environmental Levy
6.3 Encourage protection of high value habitats, particularly riparian vegetation.	NRCMA in consultation with DPI Fisheries, Council and DECC	Encourage adoption of incentives for the long-term protection of high value habitats and riparian vegetation along the estuary. Mechanisms for protecting habitats are available through the (amongst others): • *Native Vegetation Act*, 2003 and Regulations which provides for the creation of Property Vegetation Plans (PVPs); and • *National Parks and Wildlife Act,* 1974 which provides for the creation of Voluntary Conservation Agreements. Figure 2-3 shows the location of good quality riparian vegetation adjacent to the estuary. **Note**: Sections of riparian vegetation are already protected under SEPP 14/26 designations and Council LEP Zone 7. Figure 10-7 of the Estuary Management Study shows the riparian vegetation within the estuary and Figure 10-10 shows areas protected by various zonings/designations.	Immediate	Include as part of **6.2**. Cost for creation of PVPs etc is unknown	Both mechanisms allow for financial payments to landholders to develop PVPs or enter into voluntary conservation agreements. The payments assist with costs of production of agreements as well as implementation of actions such as fencing to protect habitats.



Unprotected Significant Habitat in the Nambucca River Estuary **Figure 7-1**

8 MANAGEMENT STRATEGY 7 (HIGH)

Incorporate riparian protection zones within Council's planning framework to safeguard them from potential future development and land-use change

Addresses Management Objectives

- LTU – Land Tenure and Usage
- HM – Habitat Management
- WQ – Water Quality

References

- Sections 10 of the Estuary Management Study
- Estuarine Geomorphology, Physical Condition and Mapping Report.

Description

Site inspections of the overall condition of riparian lands (including banks and vegetation) within the estuary identified that a significant portion of them exist in a moderate or poor condition (Geco Environmental, 2005). The reasons for this are numerous and in part relate to over clearing of riparian vegetation (e.g. for farm land or urban/rural development) and incompatible landuse (e.g. grazing on unfenced riverbanks which allows cattle access to the waterway), which cause ongoing damage to these lands.

In relation to land use control in these areas, there is a need for improved recognition and protection of riparian lands[1] within Council's planning framework, including the Local Environment Plan and Development Control Plans. A suitable method to ensure this is the mapping of riparian widths based on the management objectives for the watercourse it contains.

[1] *In this context, "riparian lands" mean any land (and its associated vegetation) that adjoins, directly influences, or is influenced by a watercourse, wetland, or waterbody. The spatial extent of this land should be sufficient to provide the following riparian functions: bed and bank stability, water quality, aquatic and terrestrial habitat, riparian connectivity and protective buffer. The width of the riparian land should largely be determined by management objectives (and specific merits of a waterway).*

Actions	Responsibility	Specific Tasks and Resources	Timeframe	Cost	Potential Fund Source
7.1 Mandatory clause inserted in LEP to protect the ecological and geomorphic function of all Nambucca Shire's streams and riparian lands.	Council	Complete as part of LEP review	As part of ongoing LEP review	Minimal	-
7.2 Identify outcomes of Riparian Corridor Management Studies or similar for the region which specifically identify requirements for riparian zone management within the Nambucca Shire. The Riparian Corridor Management Study should identify suggested land zonings, as well as suggested riparian buffer zone widths based on the characteristics of the waterway in question.	Council in conjunction with DECC	If such information is not available, Council to apply for funding to complete a Riparian Corridor Management Study	Immediate	Cost of Riparian Corridor Management Study may be of the order of $50-70K	DECC
7.3 In lieu of the availability of a Shire-specific Riparian Corridor Management Study (see **7.2** above), then it is recommended that a Shire wide stream and riparian lands map be created utilising existing maps of drainage and stream order until such information becomes available. The riparian zone should extend landward from the centreline of the waterway, except where a discernable bank edge is present; in this instance the riparian buffer width shall extend landward from the bank edge. The following riparian buffer zone widths are suggested as an interim measure: • 1st order streams 10m (either side of centreline or bank edge if present, i.e. total buffer width 20m); • 2nd order streams 20m; • 3rd order streams 30m; and • 4th order streams and above 40m. In the instance where good quality riparian vegetation is already present in greater widths than identified above, this vegetation should also be protected if possible. The above widths do not represent recommendations for clearing. Within the hatched riparian buffer zone the aim is to prevent impacting actions (e.g. new development) and to promote more sympathetic use of this land by existing owners/managers.	Council in conjunction with DECC	DECC has stream order mapping for the entire Nambucca Shire, the extent of groundtruthing and accuracy of the data will need to be confirmed. See Ku-Ring-Gai Council's Riparian Policy: http://www.kmc.nsw.gov.au/www/html/277-policies--planning-documents.asp	Short term, i.e. 1 to 2 years.	$15 – 20K for some limited ground-truthing of stream order mapping. Internal cost to Council to update and integrate GIS data and riparian buffer zones onto existing systems.	-
7.4 Council to consider integration of the Standard Instrument for 'Preservation of Trees or Vegetation' within its LEP.	Council	The instrument would give Council the ability to protect certain vegetation, particularly riparian vegetation from clearing.	As part of ongoing LEP review	Minimal	-

Notes:

- For existing rural areas, the nominated buffer zones apply only to new development.
- The application of buffer zones in privately owned lands is not a requirement for private owners of land to stop using this portion of their land. Rather, it seeks special consideration and respect towards the stream and its adjoining lands.
- On publicly owned lands, the application of the riparian protection zone should be mandatory, i.e. included as part of Crown Land Lease arrangements.
- The application of the riparian protection zones should prevent any form of impacting development (e.g. housing) from occurring within the riparian protection zone on both private and public lands.
- Hatched areas can be triggers to ensure flooding and stormwater management is integrated with stream corridor treatment.

When development will impact upon existing streams, it is recommended that:

- For minor greenfield site development, there is a need to clearly define the buffer zones to stream corridors that are to be maintained and/or enhanced.
- For major greenfield sites and urban release areas, there is a need to define the stream corridors by mapping their extent, and establishing appropriate buffer zones to be used in the layout design process

9 MANAGEMENT STRATEGY 8 (HIGH)

Enhance condition of habitats of high ecological and/or conservation value e.g., saltmarsh, wetlands, littoral rainforests, riparian zone and floodplain wetlands

Addresses Management Objectives

- LTU – Land Tenure and Usage
- HM – Habitat Management
- WQ – Water Quality

References

- Section 10 of the Estuary Management Study
- Estuarine Geomorphology, Physical Condition and Mapping Report

Description

Large areas of remnant vegetation exist within the study area, which provide habitats of high ecological, and/or conservation value. Activities that threaten the integrity and viability of these habitats, include:

- *Weed invasion*. The major impact of weeds is their displacement and replacement of native plant species and alteration of habitat values for native fauna. Weed control efforts should target newly introduced species which have the potential for environmental harm;
- *Soil disturbance* (stock impacts / erosion / pathogen introduction);
- *Poor water quality*;
- *Inappropriate fire regimes*. Although some vegetation communities in the Nambucca estuary catchment may be able to recover following fire, they may not benefit from it. Within the Nambucca estuary catchment, fire exclusion rather than use is the recommended management approach for most communities, but detailed site based assessments are required to identify the appropriate method and level of fire management; and
- *Drainage and exposure of acid sulphate soils*. Of most concern are the impacts of flood mitigation and drainage measures on floodplain wetlands.

Actions	Responsibility	Specific Tasks and Resources	Timeframe	Cost	Potential Fund Source
8.1 Rehabilitate habitats of high ecological value where degradation has occurred. Management priorities should be based on the area and condition of remnant vegetation and adjacent landuses. Actions include: • Development of GIS based mapping resources identifying degraded habitats of high value and priorities for action. • Development of appropriate plans to facilitate the process of rehabilitation and identification of suitable funding arrangements. • Development of appropriate record keeping techniques that allow for the identification of previous actions undertaken or planned within the catchment.	Council in conjunction with DECC	Figure 7-1 identifies high ecological value habitats within the study area. If degraded, the condition of these communities and habitats should be enhanced over time. Figure 2-3 shows riparian vegetation condition. Also, activities that threaten the integrity and viability of these existing habitats, e.g. weed invasion, soil disturbance, water quality/quantity (ASS/flooding), fire, stock trampling, should be eliminated or mitigated. Priorities for enhancement should be based on the area and condition of the vegetation remnants and adjacent landuses. To this end, previous data collected by Kendall and Kendall (2003), Council and others should be used to determine the current condition of these habitats within the community. Where data is unavailable, further work (i.e. groundtruthing) may be required to supplement existing information. When planning enhancement work, an initial site assessment should be used to determine the condition of the habitat to be rehabilitated, documenting the extent and composition of vegetation; fauna habitat features; site condition; adjacent land uses and impacting factors (weeds, fire, stock, etc). From this assessment appropriate remedial/rehabilitation strategies can be determined, e.g. planting species, densities, planting techniques and maintenance requirements, such as weed control, fencing for stock, etc.	This strategy should be initiated in the short term (i.e. over the next 1 to 2 years), but it is likely to take several years to complete.	GIS mapping identifying locations of high value habitats is available through DPI Fisheries, DECC, etc. Costs for groundtruthing of habitat condition and development of priorities (labour and reporting) are expected to be around $30K to $50K if this information is unavailable from other sources. Permission from landholders may be required to complete surveys. Rehabilitation plans for individual areas may cost around $5 to 10K each. Costs for habitat rehabilitation will be site specific and could potentially be very high, depending on the total areas targeted and issues to be dealt with. Costs could be significantly offset through adoption of incentives for the long-term protection of high value habitats and riparian vegetation along the estuary.	Widespread rehabilitation may be better achieved through the provision of targeted financial and labour assistance to private landholders wanting to commit to long-term habitat management. Funding sources include: • NRCMA • State Government incentive based schemes. • Envirofund

Actions	Responsibility	Specific Tasks and Resources	Timeframe	Cost	Potential Fund Source
8.2 Development of a program of weed control within the estuary in conjunction with the North Coast Weed Advisory Committee. Figure 2-4 shows the location of known weeds in the estuary.	Council in conjunction with the North Coast Weed Advisory Committee	The program should be prioritised. A priority weed may be Madeira vine (a major environmental weed species), which is just starting to get a hold in the valley. For other major environmental weed species such as camphor laurel, small leaved privet, and bitou bush, targeted removal and control should also be undertaken in areas of otherwise good quality riparian vegetation It should be possible to seek assistance from the North Coast Weed Advisory Committee to develop a program of weed control within the estuary, see: http://www.northcoastweeds.org.au/ The Nambucca Heads Aboriginal Land Corporation's Green Teams could be supported in enacting the weed control programs.	This strategy should be initiated in the short term (i.e. over the next 1 to 2 years), but it is likely involve ongoing resources.	Costs for developing the weed strategy should be determined with the Weeds Advisory Committee. Costs for control will be related to type of weed and level of infestation. In first year, would expect: • $2K -$3K/ha low infestation • ~$10K/ha mod. infestation • ~$50K/ha sev. infestation There will be a need for follow up work in years after initial treatments, but costs should be less.	• NRCMA • State Government incentive based schemes.

10 MANAGEMENT STRATEGY 9 (HIGH)

Raise community awareness of coastal/estuary processes to increase the level of understanding of shoaling mechanisms and associated implications as well as the consequences of intervention measures

Addresses Management Objectives

- EC – Entrance Condition and Behaviour
- BWU – Boating and Waterway Use

References

- Section 7 of the Estuary Management Study

Description

This management strategy seeks to address shoaling/erosion problems and associated navigation issues of the lower estuary. The general community presently perceives shoaling in the lower estuary to be a major issue. The shoaling is the result of a complex interaction of natural coastal and estuarine processes and while it varies with prevailing conditions, the lower estuary has always been subject to shoaling.

The extent of shoaling influences the hydraulic characteristics of the estuary and has follow on effects for other estuary processes and values. Similarly, any measure undertaken to address the shoaling issue has the potential to impact upon other processes. The nature of the processes is such that there are many competing and potentially conflicting issues, making management a complex and potentially expensive matter. A broad understanding of the processes as well as the likely implications and effectiveness of various works may assist in addressing existing community perceptions / expectations and acceptance of the ultimate management strategies adopted.

Recognition needs to be given to the benefits and costs (also impacts) of actions taken to address shoaling. Major permanent works are unlikely to be justified on economic grounds. Smaller, albeit temporary, works such as minor dredging may be considered where problems become critical. While shoaling in general is perceived as being problematic, no specific critical issues have been identified at present (i.e. when navigation by shallow draft vessels is taken into consideration).

Actions	Responsibility	Specific Tasks and Resources	Timeframe	Cost	Potential Fund Source
9.1 Develop appropriate methods and materials to raise community awareness and understanding of the complex shoaling processes in the lower estuary and the consequences / effectiveness of options to deal with it.	Department of Lands in conjunction with Council and DECC If navigation becomes an issues NSW Maritime may need to be consulted.	Appropriate mechanisms to enact this strategy include: • Articles in the local newspaper and on Council's and NSW Maritime's websites (with their permission); • Public forums and/or displays. One topic that may be discussed in a forum format is dredging of North Coast river entrances. Guest experts on river entrance processes, dredging, boating, training walls and tourism could attend. • Brochures, newsletters and educational material for school and interest groups. • Dedicate comprehensive section in Council's website on its estuaries with links to reports and actions.	This action should be enacted immediately.	Costs for running editorials in the local print media will be minor. Information can also be included in Council's newsletter and website at minimal cost. Brochures should be developed for distribution to local boating groups, boat hire outlets, tourist office, schools and public boat ramps. The cost for developing and printing of the brochures could be up to $3K to 5K.	Due to the relatively low cost of this option, funding may not be required.
9.2 Promote the use of appropriate shallow draft vessels in the lower estuary where navigation is constrained.	Council and DECC to liaise with NSW Maritime to secure their involvement	Appropriate mechanisms to enact this strategy include: • Articles in the local newspaper and on Council's and NSW Maritime's websites (with their permission); • Brochures, newsletters and educational material for school and interest groups; and • Signage at boat ramps and key locations in the estuary.	This action should be enacted immediately.	Could be completed in conjunction with **9.1**. Costs for running editorials in the local print media and Council's Community Newsletter would be minor. Brochures should be developed for distribution to local boating groups, boat hire outlets, tourist offices and public boat ramps. The cost for developing and printing of the brochures could be up to $3K to $5K. Information on boating in the estuary could be placed on Council and NSW Maritime's websites at little cost. Permanent signs at boatramps would be around $2 to 5K each depending on size and location.	Due to the relatively low cost of this option, funding may not be required.

11 MANAGEMENT STRATEGY 10 (HIGH)

To maintain and enhance the condition of Nambucca Valleys waterways to allow for responsible recreational boating and water sports activities

Addresses Management Objectives

- BWU – Boating and Waterway Use
- BE – Bank Erosion and Sedimentation
- HM – Habitat Management
- FOA – Fisheries and Oyster Aquaculture

References

- Section 7 and 8 of the Estuary Management Study

Description

Currently the Nambucca River estuary offers relatively unrestricted travel between the major towns, providing a network of recreational access across the valley and quality of river that is amenable to a range of boating activities and water sports. Boat trips between centres, family picnics, fishing and water sports are all part of the mosaic of activities that make Nambucca Valley a special place to live.

However, boat usage can contribute to impacts on the estuary environment, e.g. impacts to bank stability, impacts on sensitive vegetative communities, impact on other users, etc. There is a clear need to protect the health of the estuary, in light of the range of usage that it receives to ensure that these uses and values are able to be maintained and that the condition of the estuary is not degraded. The health of the estuary is likely to underpin the health of the local economy by way of encouraging tourism in the area.

This strategy aims to identify management options and actions focussed on responsible boating use aimed at protecting existing boating and environmental values of the estuary.

Actions	Responsibility	Specific Tasks and Resources	Timeframe	Cost	Potential Fund Source
10.1 Establish formal River User Group to represent these groups' interests and to promote responsible boating and water sports.	Nambucca Valley River Users Groups in consultation with Council, DECC and NSW Maritime	This group provides a vehicle through which funding and projects can be initiated. A member of the River User Group should consider representation on the Estuary Management Committee.	Immediate	Minimal	-
10.2 Revise waterway speeds in certain locations of the estuary based on safety concerns.	It is a function of NSW Maritime to gazette altered waterway signage.	NSW Maritime to consider: • Reducing boat speeds in 'Back Creek' or 'Inner Harbour' from 8 to 4 knots; • Introducing a 'No-skiing or aquaplaning' area in the marked channel on the starboard side of the river immediately adjacent to Stuarts Island; and • Introducing a 4 knot speed limit in the immediate area of Gumma Reserve (i.e. the campground) on Warrell Creek. The revised signage will correlate with the boating maps when they are updated.	NSW Maritime to consider implementation of changes in the short term.	Cost internal to NSW Maritime.	-
10.3 Identify opportunities to initiate and contribute to bank stabilisation and river restoration projects in strategic reaches favourable for boating and water sports.	Nambucca Valley River Users Groups in consultation with Council, DECC and NSW Maritime	Figure 2-5 identifies several locations that may be suitable for bank stabilisation works and/or restoration works as they have bank instability issues and are subject to higher boating usage, particularly during holiday periods. Implement in conjunction with **Strategy 1.1**. Rehabilitation of riparian lands, see **Strategy 8.1 and 8.2**. Temporary cessation of high powered boating use may be required in areas subject to restoration, rehabilitation or protection works, until works are complete and stable.	Commence in the short to medium term	Costs potentially high but will vary according to specifics of project	• NRCMA • Environment Levy • Envirofund • DECC Coast and Estuary Funding
10.4 Undertake boat usage surveys during peak and non peak periods to establish usage patterns detailing location, frequency, craft type, number of people, activities and origin, etc	Nambucca Valley River Users Groups in consultation with Council, DECC and NSW Maritime	The following represents key elements of the survey program: **Weekends** – Surveys should be conducted at all key boating locations (i.e. Warrell Creek, Lower Nambucca River, Macksville and North Arm, etc on select weekends when sufficient resources are available. At least one weekend each season (summer/winter, etc) should be recorded. If surveys can be completed at locations simultaneously this would allow comparisons of the relative density of boating occurring in these locations and the likely incidence of boating issues and other conflicts. **Holidays** – Surveys should be conducted on select days during the summer (i.e. Xmas/New Year) and Easter holidays at all key boating locations. Again if data can be collected simultaneously this would be advantageous. Salient details of usage including location, frequency, craft	Commence in the short to medium term.	Volunteer time	-

Actions	Responsibility	Specific Tasks and Resources	Timeframe	Cost	Potential Fund Source
		type, number of people, activities and origin, etc should be recorded. Information should be compiled and supplied to DECC, Council and NSW Maritime. The survey should occur across a minimum of a one-year period or longer if resources present themselves.			
10.5 Identify boating practices and locations that require a formal code of conduct and / or other management options to be developed.	Nambucca Valley River Users Groups in consultation with Council, DECC and NSW Maritime	Based on the outcomes of the usage survey (**10.4**) identify which boating practices, such as power turning have a high potential for impacting on the environmental values of the estuary. Options for addressing the impacts of these practices need to be developed into a formal code of conduct or similar and applied to boating areas of the estuary.	Consider when option **10.4** is complete	Internal to NSW Maritime as they would be required to prepare and implement the Code	-
10.6 Support investigations to establish relative contribution of boat wash impacts on bank erosion in a range of estuary settings, water depths, bank materials, boat usage rates and craft type	Nambucca Valley River Users Groups in consultation with Council, DECC and NSW Maritime	NSW Maritime have for a number of years been developing a rating tool, which can be used to develop a risk factor to different estuarine reaches based on a range of factors including bank composition and levels/types of boating use. NSW Maritime should be encouraged to apply the tool to the Nambucca River estuary (when available), such that risk factors can be assigned to the various reaches of the estuary. Failing this the Australian Maritime College (AMC) has completed similar studies in rivers in South East Queensland. AMC could be contracted to complete a similar investigation for the key reaches of the Nambucca River estuary.	Commence in the short to medium term.	Use of NSW Maritime tool would be internal to Maritime, as they own the tool. The cost for contracting an external consultant is unknown but is likely to be relatively high.	• Council's Environment Levy • DECC Coast and Estuary Funding • Envirofund
10.7 Support the establishment of permanent cross section monitoring sites to quantify the rates of bank retreat and channel shape in a range of settings and boat usage areas	Nambucca Valley River Users Groups in consultation with Council, DECC and NSW Maritime	Several sites in different reaches of the estuary should be established. Recording should initially aim to gather information over a five year period, with longer term data to be collected if recording sites remain viable. Bank recession/accretion recording activities should build upon leanings already obtained by DECC in Warrell Creek. Option could potentially form part of a PhD or Masters research.	Commence in the short term.	$300 to $500 per site for labour and materials to establish. $500 per year to collect data	• Council's Environment Levy • DECC Coast and Estuary Funding • Envirofund

Actions	Responsibility	Specific Tasks and Resources	Timeframe	Cost	Potential Fund Source
10.8 Conduct a two-yearly campaign to remove litter, including old tyres not actively being used to secure eroding banks, and abandoned oyster leases within the river	Nambucca oyster growers in consultation with DPI Fisheries and the Nambucca Valley River Users Group and commercial fishermen.	DPI Fisheries and local oyster growers should be able to identify the locations of abandoned oyster leases, particularly those outside of Priority Oyster Aquaculture Areas (please see Figure 6-1). A biannual 'clean the river' type campaign coordinated by key user groups such as the oyster growers, boaters, commercial fishermen and the general community. Council may be able to assist with advertising, coordination and rubbish collection/disposal. Tyres and waste should be disposed of appropriately. Consideration should be given to stockpiling of tyres and other materials, e.g. glass, plastic, etc for recycling.	Commence in the short term	Costs are minimal if using volunteer time. Costs to Council may be up to $5K for advertising, and in-kind resources, including rubbish collection and disposal	• Council's Environment Levy • NRCMA • Clean up Australia • DPI Fisheries

12 MANAGEMENT STRATEGY 11 (MEDIUM)

Rationalise and improve access points, boat ramps and associated facilities to protect existing estuarine values and to provide quality public foreshore access to the estuary

Addresses Management Objectives

- BWU – Boating and Waterway Use
- TM – Tourism Management

References

- Section 8 of the Estuary Management Study

Description

The trend of increasing boat ownership in the Shire (and surrounds) and the potentially increasing focus on the Nambucca Region as a tourist destination will probably mean that demand for high quality waterway access (and associated facilities) will continue. A review of existing access and foreshore facilities has identified:

- A number of inadequacies with Council maintained ramps. In general these relate to a lack of certain facilities; and
- A lack of access and facilities in certain locations of the estuary.

Recommendations to alter or increase the types, levels and locations of existing waterway use, have taken into consideration the potential impacts of these changes. The promotion of waterskiing in certain locations of the estuary (i.e. by provision of access and facilities) should be considered in the context of works that may be required to stabilise eroding banks in this location. For example, waterskiing is popular in the Bowraville reach of the Nambucca River, however there are riverbank instabilities in this location (see Figure 2-1), hence some works may be required to make this section of the river more suitable for this use (see Strategy **1.1**).

Many actions in the following table have identified the Maritime Infrastructure Program (MIP) as being a potentially suitable fund source. This funding is typically only given to those projects that are principally infrastructure works and of a lasting nature. The funding is intended to improve amenity for the broader boating community and facilities (e.g. ramp installations/upgrades, public wharves/jetties, feasibility studies for new structures, etc) are required to be located in public areas or available for use by a large section of the boating community.

Actions	Responsibility	Specific Tasks and Resources	Timeframe	Cost	Potential Fund Source
11.1 Repair or improve existing public boat ramps, as detailed below. The priority for implementation of works is provided in Table 12-1:	As detailed below.	As detailed below.	As detailed below.	As detailed below.	NSW Maritime DECC Estuary Program Dept Lands
Shelley Beach, Nambucca Heads • Improve signage highlighting the specific usage for boat trailer parking to prevent usage conflict.	Council in consultation with the Offshore Fishing Group	Council should have all the required tools to implement these actions.	Improvement of car park signage should be initiated in the short term (1 to 2 yrs)	Improvements to signage may cost between $2 and $5K.	-
Wellington Drive, Nambucca Heads • Review feasibility of this ramp. If the ramp is to be retained: ❑ Improve foreshore amenity near this ramp; ❑ Remove ballast rock to provide additional sandy beach; and ❑ Clearly identify appropriate boat ramp usage, i.e. solely for launching/retrieval of small craft, i.e. 3 to 4m.	Council in consultation with River Users Group and NSW Maritime	Council should have all the required tools to implement these actions.	A determination on the ramp should be made in conjunction with **Strategy 16.3**.	Improvements may cost $2 to $5K.	NSW Maritime Infrastructure Program if ramp is to be improved
Gordon Park, Nambucca Heads • Gordon Park ramp may be benefited by a public wharf (see RSL). There remains an issue with shoaling immediately adjacent to Gordon Park, which may limit the ability of boats to tie up to the structure unless dredging is performed.	Council in conjunction with NSW Maritime, DECC, Dept Lands and DPI Fisheries	Consider Council's Structure Plan.	A determination on the wharf should be made in conjunction with **Strategy 16.3**.	-	NSW Maritime Infrastructure Program
RSL, Nambucca Heads • Investigate feasibility of wharf structure (and holding pontoon at ramp) to replace existing aged and potentially undersized infrastructure. Consideration should be given to extending the public wharf along the entire foreshore of the Inner Harbour. Consideration of Council's Structure Plan for Nambucca to be the Tourist Centre of the Shire should be made.	Council in conjunction with NSW Maritime, DECC, Dept Lands and DPI Fisheries	For design guidance: http://www.waterways.nsw.gov.au/docs/engineering-guidelines.pdf	A determination on the wharf should be made in conjunction with **Strategy 16.3**.	Wharf structure (and holding pontoon) would cost $1M+ but may generate significant income through enhanced tourism over a number of years.	NSW Maritime Dept Lands (Waterways Program)

Actions	Responsibility	Specific Tasks and Resources	Timeframe	Cost	Potential Fund Source
Stuarts Island, Nambucca Heads • Need for localised sand removal (see also **Strategy 14.1**). • Improve night-time lighting. Lighting provided at this location is unlikely to be a disturbance to local residents. • Assess feasibility of additional toilet block	Council in conjunction with NSW Maritime, DECC, Dept Lands and DPI Fisheries.	Maintenance Dredging of Tidal Waterways, SEPP 35 would be the appropriate planning instrument by which to conduct dredging	Dredging should be carried out immediately. Lighting should be improved in the mid term (3 to 5 yrs)	Dredging costs around $\$10/m^3$. Lighting improvements may cost between $2K and $5K.	Council to consult with Department of Lands
Apex Park, Bowraville (Wilson Road) • Consider closure of ramp and conversion of land to Public Park. There currently exists a very dangerous vehicle access to park, particularly for those towing boats. • If the ramp is to be retained: ❑ Significantly improve or alter access/exit arrangements. ❑ Provide signage indicating that the river is highly shoaled in this location. ❑ Provide some basic visitor facilities.	Council in consultation with River Users Group	Council should have all the required tools to implement these actions.	A determination on the ramp should be made immediately. Access to the park should be improved immediately Other improvements should be made in the mid term (3 to 5 yrs).	Altered entrance arrangements may cost $20K+ depending on design Other improvements may cost ~$5K	-
Weir Reserve, Scotts Head • Improve water access facilities for a range of users and uses. • Improve visitor facilities e.g. construction of playground equipment, gas BBQs and covered seats for visitors to improve amenity.	Council in consultation with River Users Group	For design guidance: http://www.waterways.nsw.gov.au/docs/engineering-guidelines.pdf	Improvements should be made in the mid term (3 to 5 yrs).	Water access improvements around $10K, other facilities around $10K	NSW Maritime Infrastructure Program
Lions Park, Macksville • Provide boat tie up facilities for launching/retrieving craft. • Investigate feasibility of a jetty/wharf area for fishing, swimming and boat access. • Investigate need for additional parking for boats trailers. • Assess feasibility of construction of a ski beach near the existing ramp.	Council in consultation with River Users Group	Council should have all the required tools to implement these actions.	Improvements should be made in the short to medium 2 to 3 yrs). Investigations of jetty wharf should be completed in the mid term	Boat tie up facilities ~$10K Feasibility study for wharf may cost ~$10K. Cost of parking study internal to Council	NSW Maritime Infrastructure Program Grants for boat tie up facilities, jetty or wharf
Boultons Crossing/Gumma Reserve, Warrell Creek • Construct an access ramp for canoeists/kayakers near the campground.	Council in conjunction with Committee	For design guidance: http://www.waterways.nsw.gov.au/docs/engineering-guidelines.pdf	Improvements should be made in the mid term (3 to 5 yrs).	Cost for access ramp may be $10K+	NSW Maritime Infrastructure Program Grants

Actions	Responsibility	Specific Tasks and Resources	Timeframe	Cost	Potential Fund Source
11.2 Investigate need for future boat ramps/accesses and associated recreational facilities within estuary and freshwater sections, at: • Tewinga or below Wirimbi Cold Stores rendering plant (off Ferry St) on the Nambucca River. It should be noted that this section of the river is highly utilised for waterskiing; • Henstock Reserve (on Warrell Creek); and • Welshes Park (Talarm) (on Taylors Arm).	Council in consultation with NSW Maritime and the River Users Group	Consider Council's Structure Plan and other observations made by NSW Maritime on boating use	See Table 12-2	Cost for investigations would be ~$10K Bank protection works cost in order of $15K per 100 metres to undertake rock work and vegetation establishment	-
11.3 Review Council Plans of Management (including Shelley Beach and the Boultons Crossing campground areas). The following actions should be considered for **Boultons Crossing** campground: • Certification of the suitability and capacity of the existing septic tank by an appropriately qualified plumber/drainer. Consideration should be given to the implementation of a high level alarm on the tank. Formal procedures for emptying of the septic tank are required and should be documented in the Plan for Management; • Closure of the northern access to Warrell Creek to allow for regeneration; • Regrading and protection of the unstable bank in front of the campground to promote improved access to the Creek; • Installation of bins, which cannot be overturned by wild animals, dogs or accessed by birds; and • Consider relocation of access road to campground away from edge of stream (at least a 50m setback). The following actions should be considered for **Shelley Beach**: • Illumination of leads for night-time navigation to beach ramp; and • Connection of suitable phase electricity to the tractor shed to assist in boat rescue operations.	Council in conjunction with Committee overseeing management of reserves. It should be noted that NSW Maritime does not maintain the leads at Shelley Beach and they do not encourage the use of this ramp in darkness or restricted visibility.	Also see recommendations in Geco Environmental (2005), pages 20 to 23 for bank stabilisation	Plans should be reviewed in the next 3 years. Actions should be initiated within 1 year of approval of revised Plans of Management.	Cost for certification of septic tank $200 Cost for installation of level alarms $1000 Closure of northern access minimal Cost for fixing bank may be $5K+ Installation of vermin proof bins $3-$5K Illumination of leads would cost around $5K. Cost for connection of electricity will depend on distance to nearest source	-

Table 12-1 Suggested priorities for upgrading existing public ramp/wharf facilities

Boat Ramp	Requirement	Timing (yrs)
Nambucca Heads		
Shelley Beach	Improve signage in dedicated trailers park to reduce inappropriate parking by non-trailered vehicles	1 to 2
Wellington Drive	Review feasibility of ramp (and continuation of its use)	1 to 2
	(*if ramp to be continued*) Improve foreshore amenity near ramp, remove ballast rock to provide sandy beach	3 to 5
	(*if ramp to be continued*) Provide signage identifying that ramp is suitable for launching of small craft only (i.e. less than 4m).	3 to 5
Gordon Park	Investigate feasibility of a public wharf at this location (and along Inner Harbour)	1 to 2
RSL	Investigate feasibility of a public wharf at this location (and along Inner Harbour) and holding pontoon at ramp	1 to 2
	Commence construction of public wharf facilities (*if to be proceeded with*)	3 to 5
Stuarts Island	Erect nighttime lighting	3 to 5
	Minor dredging required near jetty	Immediate
Macksville/Bowraville		
Apex Park	Review feasibility of ramp (and its continued use) due to traffic issues	Immediate
	(*if ramp to be continued*) Improve safety of road access and exit to Wilson Road	Immediate
	(*if ramp to be continued*) Improve signage relating to high degree of shoaling in the river at this location	3 to 5
	(*if ramp to be continued*) Improve visitor facilities e.g. covered seats, toilets, BBQs, etc, to promote park use.	3 to 5
Lions Park	Provision of bollards for boat tie up facilities	2 to 3
	Investigate feasibility of a beach area for boat parking and ski starts	2 to 3
	Investigate need for additional parking facilities	2 to 3
Scotts Head (Warrell Creek)		
Scotts Head Weir Reserve	Upgrade existing facilities by provision of defined boat trailer parking, redesigned ramp and boat access area (for boaters, fisherman, swimmers and picnickers), playground equipment, gas BBQs and picnic tables for visitors	3 to 5
Boultons Crossing	Construct an access ramp for canoeists/kayakers near the campground	3 to 5
Public Reserves (Boultons Crossing and Shelley Beach)		
Public Reserves	Complete Review of Plans of Management and integrate recommendations where appropriate into the Plans of Management	3 to 5

Table 12-2 Suggested priorities for provision of additional waterway access

Location	Requirement	Timing (yrs)
Lower Nambucca River (Nambucca Heads)	Given the greater tourist focus of Nambucca Heads under the Strategic Plan there may be a need for additional ramp capacity at this location, particularly if Wellington Ramp is decommissioned. The most likely candidate for upgrade would be the Stuart Island ramp. Alternatively a new ramp at Bellwood could be investigated if upgrading of the existing ramp at Stuarts Island is not practical or possible (this option may only be suitable once the Highway is diverted).	3 to 5 or as needs be
Upper reaches of estuary	Complete investigations for additional ramps at locations on Taylors Arm and Nambucca River	3 to 5

Notes:

If the demand for boat moorings increases, NSW Maritime should consider preparing a Mooring Management Plan at that time. Potentially suitable sites have been identified at Bellwood and on the lower reaches of Taylors Arm. Recent mapping of seagrass locations within the estuary (See Section 10 of the Estuary Management Study) will assist in this process.

13 MANAGEMENT STRATEGY 12 (MEDIUM)

Integrate and improve upon existing water quality monitoring activities occurring within the estuary to provide a better indicator of overall estuarine health, whilst addressing all existing licence and operational requirements

Addresses Management Objectives

- WQ – Water Quality
- FOA – Fisheries and Oyster Aquaculture

References

- Section 15 of the Estuary Management Study

Description

Council regularly tests limited sections of the estuary for its water quality (i.e. mainly near sewage treatment plant discharge locations). A review of recent water quality data maintained by Council highlighted several issues in the way in which data are collected.

In addition to Council's sampling, the oyster farmers/NSW Food Authority are both performing a variety of testing in oyster harvest zones. There is currently no integration between the sampling efforts (i.e. storage and use of both data sets) of the oyster farmers and Council. Furthermore, the water quality monitoring, which is being completed, provides limited information upon which an overall estuarine ecosystem health assessment could be based. Consequently, Council's monitoring regime should be altered to enable additional information to be obtained to assist in developing a measure of ecosystem health.

Community consultation has identified potential water quality issues (as evidenced by red-spot disease and fish kills) within other unmonitored parts of the estuary. Maintaining high water quality within the estuary is of high importance in protecting existing aquaculture industries and tourism in the local area.

Actions	Responsibility	Specific Tasks and Resources	Timeframe	Cost	Potential Fund Source
12.1 Review current monitoring scheme (locations, parameters sampled, timing of sampling, etc) with a view to gaining a broader understanding of current water quality condition and trends over time. The regime should include event-based sampling in addition to ambient monitoring of condition.	Council	There are issues with Council's current monitoring approach which need to be addressed including: ➢ Coverage (large sections of the estuary are not monitored) ➢ Parameters/Indicators monitored (largely physical and chemical, no true biological measures of health) ➢ Timing of sampling (irregular and with whole periods missed) ➢ QA/QC (better calibration records, duplicate samples, etc) ➢ Storage and use of data (inaccessible, not being used regularly in management) ➢ Reporting of information to stakeholders (does not occur other than in SoE reports) The current monitoring program needs to be revised/augmented to address the above-identified issues.	Immediate	Engage a consultant to review current water quality sampling procedures and provide advice on how system may be improved. Estimated costs $5K to $10K.	• DECC Estuary Program (not for routine monitoring) • Council's Environmental or Stormwater Levy
12.2 Determine the feasibility of establishing a water quality database for storage and use of water quality data. The database should be usable by Council, Oyster Farmers and other stakeholders.	Council in liaison with the Oyster Farmers NSW Food Authority	Several examples have been developed throughout the State for Councils including Gosford, Eurobodalla, Richmond River County Council. The database should be able to link visual (GIS) information of sampling locations with sampling results and be able to be interrogated to produce desired results.	Determine feasibility immediately The establishment of the database could occur in the mid term, preferable after the monitoring program has been redesigned.	Determination of the feasibility of the program may cost ~$2K. Establishment of a database by external consultants may cost $25K - $30K, depending on complexity and the quantity of historical data to be entered.	• Council's Environmental or Stormwater Levy

Actions	Responsibility	Specific Tasks and Resources	Timeframe	Cost	Potential Fund Source
19.3 Support development of and integrate with the higher-level estuarine ecosystem health-monitoring programs (EHMP).	Council in consultation with DECC and NRCMA.	At both the regional (i.e. NRCMA level) and State level there is a lot of interest in establishing monitoring programs that enable reporting against ecosystem condition targets as established with the Catchment Action Plan for the North Coast and Resource Condition Targets established by the NSW Natural Resource Council. If appropriate the sampling strategy developed for the Nambucca estuary should be consistent with these higher level monitoring programs, however, **it is essential that any program developed for the Nambucca River estuary meets the specific needs of managers/users of the Nambucca River estuary**, i.e. Council, local DECC, DPI (Fisheries), Oyster Growers, etc. The feasibility of a North Coast Region EHMP (similar to the one in place in South East Queensland) is currently being investigated by the NRCMA and DECC. The project may or may not happen. If it does there would be numerous benefits for Nambucca Shire in joining the program. Amongst other benefits it is expected that the program would highlight the relatively high quality of the estuary in relation to other, more impacted, systems in the region.	Within the next 5 years	~$50 or 60K per year, but would largely replace Council's existing monitoring practices (including both capital and staffing outlays.	• Potentially under the NSW Natural Resource Monitoring, Evaluation and Reporting Strategy

14 MANAGEMENT STRATEGY 13 (MEDIUM)

Improve swimmer safety in the lower estuary by a variety of means including improved signage / safety equipment, provision of new swimming areas and/or improving the safety aspects of existing swimming areas

Addresses Management Objectives

- BWU – Boating and Waterway Use
- TM - Tourism Management

References

- Sections 7 and 8 of the Estuary Management Study

Description

There are presently safety issues and usage conflicts with recreational swimming at the V-wall and Shelley Beach. At the V-wall, there have been several deaths and numerous rescues due to the strong currents that flow through the Back Channel (aka Inner Harbour) on certain tidal cycles. While warning signs exists (with appropriate information), they lack visibility (sign size, location and contrast of wording on background). At Shelley Beach, at times a conflict exists between returning/departing boats and swimmers.

Another option to improve swimmer safety is the closure of the hole in the V-wall (while retaining its vital water flushing function). While this option will improve access to the large sand island in the inner harbour, it will also have a variety of impacts on water flow, flushing and sedimentation in the lower estuary and potentially impacts on upstream flooding. It may also have implications on rescue times for the VRA. The implications of any such proposal should be considered in detail. The community should also be consulted in relation to this proposal. If the V-wall option is not to be considered, then there may be options for further developing safe swimming areas within the lower estuary, such as rock pools/netted areas, etc.

Actions	Responsibility	Specific Tasks and Resources	Timeframe	Cost	Potential Fund Source
13.1 Provide/improve signage: • At the V-wall in relation to its very strong currents and need for supervision of children. • At the Shelly Beach ramp to remove swimmers from or at least advise swimmers of the return path of boats to the shore based ramp.	Council to liaise with NSW Maritime to secure their involvement	Details/options for sign design may be found in AS 2416:2002 Design and Application of Water Safety Signs (published by Standards Australia). This Australian Standard applies to all beaches, inland waterways and swimming pools. The Standard is linked to local councils through the Local Government Act in NSW. See www.standards.com.au or call the Customer Service on 1300 654646, for a copy of the Standard.	This action should be enacted immediately.	Cost for this option would be ~ $5K at both sites.	-
13.2 Improve the quantity and accessibility of safety and rescue equipment (e.g. buoys and patrols) near the V-wall and along breakwater.	Council to liaise with Department of Lands to secure their involvement	Review other locations where safety equipment has been provided. These should serve as an example for how safety equipment can be provided. Check also with the Volunteer Rescue Association http://www.rescue.org.au/ Check also with the Australian Professional Ocean Lifeguards Association http://www.apola.asn.au If theft and vandalism are likely to be a problem, devices could be installed and removed on a daily basis at agreed times, e.g. weekends and holidays. The deployment and retrieval of devices could be part of a contract with a local business, etc.	This action should be enacted in the short to medium term.	Cost for safety equipment may be $5K+.	Department of Lands
13.3 Identify suitable options for restricting flow through the V-wall in order to improve swimmer safety at this location. Feasible options must demonstrate a large benefit to the local community and must have an acceptable level of impact on upstream flooding levels, shoaling/erosion patterns in the lower estuary, water quality in the Back Channel (i.e. inner harbour), aesthetics of the V-wall area and boating activities including VRA operations.	Council to liaise with Department of Lands, NSW Maritime, DPI Fisheries and DECC	Once Council has determined a concept design for the option, widespread community consultation should be undertaken to assess the level of community support. Following this, environmental assessments and approvals will be required for the proposed development. Detailed design will only be commenced with community support and all environmental issues addressed. This option may also have some merit in improving the main channel conditions and geomorphic/hydrodynamic assessments should be completed of the impacts of hole closure on channel condition.	This action should be enacted in conjunction with **Strategy 16.3**	Feasibility and concept design study ~150K+ Environmental assessments ~$200K Construction $3 to $5M depending on design.	Department of Lands

Actions	Responsibility	Specific Tasks and Resources	Timeframe	Cost	Potential Fund Source
13.4 Consider the creation of alternative safe swimming locations within the lower estuary.	Council Dept of Lands	This option should be considered as an alternative to bridging the V-wall. The option of enclosing the swimming area to the ingress of sharks should be considered.	Enact after **13.3** if required	Feasibility study $50K Environmental assessments $20 to 50K Construction costs $100 to 300K depending on design	Dept of Lands

15 MANAGEMENT STRATEGY 14 (MEDIUM)

Address localised shoaling and erosion problems and improve navigable access where practical and most needed in the lower estuary giving consideration to the likely effectiveness, costs and benefits of works as well as the potential impacts

Addresses Management Objectives

- EC – Entrance Condition and Behaviour
- BWU – Boating and Waterway Use

References

- Sections 7 and 8 of the Estuary Management Study

Description

Shoaling, changing and dangerous conditions of the entrance and lower estuary channels presently constrain navigation. Recreational boating and fishing has been recognised as a high use (priority) which is affected by the degree of shoaling. Commercial boating and ready access for emergency vessels as well as future development potential are also affected by the shoaling and dangerous conditions. The degree of shoaling may also influence tidal flushing and flooding behaviour.

The highly mobile nature of the sediments in the lower estuary is such that measures to provide and maintain **permanently** deep navigable channels would need to be substantial. They would be likely to involve various training and ongoing dredging works at high costs.

However, consideration could be given to minor works (i.e. various dredging and minor training walls or removal of existing training walls, etc) to **improve localised issues (i.e. shoaling) in the lower estuary**. Such works may have limited benefit and/or be temporary in nature. The likely effectiveness, cost and potential benefits of such works need to be assessed as well as the potential impacts (social and environmental). Examples of this may be dredging around high use boat ramps to facilitate boat launching and retrieval, minor dredging of shoals to allow for navigation of shallow draft vessels in high use areas where shoaling poses a serious navigation and/or safety hazard or to provide adequate passage for the VRA boat. See also Appendix B on pro's and con's of various entrance management options and costs.

In relation to dredging activities, sand in the entrance, although presently building up, remains part of the active coastal zone and should not be permanently removed from this zone (i.e. it cannot be sold), as it may result in erosion of adjacent ocean beaches as dredged areas try to re-fill under natural processes.

Actions	Responsibility	Mechanisms or Resources	Timeframe	Cost	Potential Fund Source
14.1 Address shoaling/erosion problems and associated navigation issues in the lower estuary if critical navigational issues arise, e.g. closure of key ramps, safety or impacts to VRA egress.	Department of Lands, DPI Fisheries and DECC.	See Section 10 of the Independent Inquiry into the North Coast Rivers: http://www.shop.nsw.gov.au/pubdetails.jsp?publication=5686 In this section the document discusses entrance dredging for navigational and other purposes. SEPP 35, which deals with maintenance dredging of tidal waterways, may be the most appropriate mechanism through which maintenance dredging would be carried out.	This action should be implemented if critical navigational issues arise in the lower estuary. At present all parts of the lower estuary are accessible by small draft boats.	Cost for this option would depend on the volume of sand requiring dredging. Current dredging costs are around $\$10/m^3$ of sand. Additional costs may be incurred if sufficient material is proposed for dredging that will trigger an Environmental Impact Study.	There are not expected to be any funding sources available for this task.
14.2 Support the development of a state-wide or regional strategy and/or legislation in relation to entrance dredging. The strategy must address the issues of navigational dredging and cost sharing arrangements that may support such activities. This may be achieved through written letters to local MPs, Ministers, etc.	Council	See Section 10 of the Independent Inquiry into the North Coast Rivers: http://www.shop.nsw.gov.au/pubdetails.jsp?publication=5686	Support development of the strategy on opportune basis.	Minimal	To be resolved at a State level.

16 MANAGEMENT STRATEGY 15 (MEDIUM)

Ensure proposals that affect the estuary and surrounds afford an appropriate level of protection to items and areas of Aboriginal and European cultural heritage

Addresses Management Objectives

- CH – Cultural Heritage
- LTU – Land Tenure and Usage

References

Section 16 of the Estuary Management Study

Description

There are a significant number of Aboriginal and European cultural heritage items and areas within the bounds of the estuary. These sites should be protected according to their level of significance. Many sites will be listed in Nambucca Shire Council's LEP, NSW State Heritage Inventory and Register and other heritage registers. However, our societal base of sites and items of significance is ever increasing as new studies are completed and time goes on. It is important that due care is taken to avoid damage to known cultural sites and sites that may be culturally significant.

Actions	Responsibility	Specific Tasks and Resources	Timeframe	Cost	Potential Fund Source
15.1 Complete a heritage study for the Shire and information derived from the heritage study should be added to the Heritage Schedule of the LEP. Locations of heritage items should be mapped onto a GIS system (according to their sensitivities which should be determined with the local Aboriginal Land Council).	Council in conjunction with DECC and other peak bodies such as the NSW Heritage Office	See Local Government Association NSW http://www.lgsa.org.au/www/html/310-heritage.asp DECC http://www.nationalparks.nsw.gov.au/npws.nsf/Content/Cultural+Heritage NSW Heritage Office http://www.heritage.nsw.gov.au/01_index.htm	Medium term (i.e. 3 to 5 years)	~$100K	The NSW Heritage Office administers a **Heritage Incentives Program** providing assistance for various conservation activities including offering funding opportunities for Local Government.
15.2 Ensure appropriate heritage information is linked to the LEP. The LEP should serve as a trigger to ensure that these items receive due recognition in land use planning and in particular development approval. It may not be appropriate for some Aboriginal Heritage items to be identified in Council's LEP, rather these may be identified on the Aboriginal Heritage Information Management System administered by DECC	Council in conjunction with DECC (Aboriginal Cultural Heritage Advisory Committee), Heritage Office, National Trust of Australia, Australian Heritage Commission	See Local Government Association NSW http://www.lgsa.org.au/www/html/310-heritage.asp DECC http://www.nationalparks.nsw.gov.au/npws.nsf/Content/Cultural+Heritage NSW Heritage Office http://www.heritage.nsw.gov.au/01_index.htm National Trust of Australia http://www.nationaltrust.org.au/ Australian Heritage Commission http://www.ahc.gov.au/	Medium term (i.e. 3 to 5 years)	Minimal once information has been mapped onto a GIS system Costs for inclusion of significant European and Aboriginal Cultural Items into other heritage registers is an internal operating cost to the respective organisations.	-

17 MANAGEMENT STRATEGY 16 (MEDIUM)

Promote the values of the estuary in ways that promote its sustainable use and also support the valuable tourism industry of the Nambucca Shire

Addresses Management Objectives

- TM – Tourism Management

References

- Section 4 and 16 of the Estuary Management Study

Description

Visitor statistics indicate that the North Coast region of NSW is the second most popular destination other than Sydney for domestic travellers. The North Coast region is also a very popular destination for international visitors. Most of the visitors to the region come for tourism and leisure related activities, much of which focuses on the outdoor environment.

However, consultation has identified that there is a community perception that the ailing health of the estuary is causing a decline in tourism to the area. The reasons for any decline are likely to be multiple and unlikely to relate simply to river health. The Nambucca estuary like most estuaries offers a range of recreational opportunities, many of which are not fully utilised. Opportunities exist to promote tourism centred on the values of the estuary and the recreational opportunities it presents. However, any such promotion should aim to encourage only sustainable uses of the estuary and unsustainable uses may further damage this already impacted system.

On a more site-specific scale, Council's Structure Plan has identified the Wellington Drive area in Nambucca Heads as a possible tourism precinct. Opportunities to increase tourism in this region (i.e. improved parklands, foreshore walkways, wharves, etc) should be explored, along with their associated impacts, i.e. traffic, safety, pollution, etc. Sustainable tourism approaches need to be identified in a Masterplan for this region.

Actions	Responsibility	Specific Tasks and Resources	Timeframe	Cost	Potential Fund Source
16.1 Conduct a market survey of tourists to the region to identify their travel habits and reasons for visiting and returning to the Nambucca Region.	Council in consultation with Nambucca Tourism and Chamber of Commerce	The survey should be carried out in the Christmas holiday season at key tourism locations, such as the main streets of the major centres, boat ramps, caravan parks, beaches, holiday grounds, etc. The survey should identify key tourism aspects including: • Length and location of stay. • Average expenditure. • Key activities conducted (particularly estuary related, i.e. waterskiing, fishing, swimming, etc). • What aspects they most value of the region and estuary? • What aspects of the region and estuary do they not like? • How could their visit be improved? • Do they intend to come back? Information obtained should be compiled and prepared into a report and distributed to key stakeholders.	This action should be enacted in the medium term.	Costs for the survey would be expected to be as follows: • Development and distribution of brochure ~$2 to $3K • Survey costs up to $10K but could be minimised by use of volunteer resources • Compilation and Interpretation of information ~$5K	-

Actions	Responsibility	Specific Tasks and Resources	Timeframe	Cost	Potential Fund Source
16.2 Develop educational material for the local community and tourists in relation to the existing uses and values of the **Nambucca River estuary** (not the town). The material should identify the wide variety of recreational uses that the estuary affords. It should also highlight how the estuary functions, its values (i.e. habitat, water quality, fisheries, etc) and its fragility (i.e., e.g. threatened or endangered plants and animals that exist in the region). The educational material should be made available in a colourful, easy to read brochure form for use by schools, Council, interest groups, Tourist office, etc. The brochure should also be included on Council's and Nambucca/NSW Tourism's website.	Council	The educational material could respond to values identified as part of consultation work completed as part of the Estuary Management Study, and also as identified by targeted survey as identified in **16.1** above. There are other examples of this type of material in existence, e.g. there is a range of material that has been published by the Moreton Bay Partnership and others over the past few years. This material may serve as a base for the development of the educational brochure. http://www.healthywaterways.org/about_seq_catchments.html http://www.margaretriver.com/pages.asp?code=140	This action should be enacted in the medium term.	The brochure(s) should be of very high quality, which may necessitate the use of an external graphic artist to produce the brochure(s). The brochure(s) should contain high quality photography and mapping of the estuary to best reach the audience. The graphic artist should produce web friendly versions of the brochure(s) uploadable to a variety of websites. To produce a high quality brochure including printing and a web-based version would cost ~$10K.	Depending on the focus of the material (i.e. inclusion of material on estuary processes) funding may be available from DECC or NRCMA. If focus is on recreational uses such as fishing - DPI Fisheries, under their Recreational Fishing Trust may be a funding source.
16.3 Prepare Masterplan for all foreshore lands fronting Nambucca Heads from Wellington Rock at the river entrance around to Teagues Creek at Bellwood. See also **Strategy 13.1, 13.2 and 13.3**.	Council	A linkage has been identified between the promotion of Wellington Drive in Nambucca heads as a Tourist Precinct and the possibility of closing the hole in the V-wall to provide a safe swimming area and access to the opposing sand island as a recreational resource. There are a number of tourism benefits that may be developed between these strategies, such as creation of an improved foreshore boardwalks, sandy beach access, safe swimming, etc.	This action will be implemented in the short term	~$150K	Funding has been sought for this action.
16.4 Ensure foreshore concept designs are included in any master planning processes identified for the towns and villages of the Shire	Council	The foreshore concept designs will need to take into account a variety of items such as: • Recreational access needs and associated facilities (see **Strategy 11.1 and 11.2**) • Foreshore treatments and riverbank rehabilitation / revegetation goals (see **Strategies 1.1, 8.1 and 12.1**)	When master planning exercises are undertaken	Unknown	-

18 MANAGEMENT STRATEGY 17 (MEDIUM)

Initiate [recreational] fishing catch [creel] surveys on the Nambucca River estuary, which identify key fishing locations, fishing effort, catch quantities, [target species] and species caught

Addresses Management Objectives

- FOA – Fisheries and Oyster Aquaculture
- HM – Habitat Management

References

- Section 11 of the Estuary Management Study

Description

The main aim of this management strategy is to gain an improved understanding of current recreational boat-based and shore-based fishing in the estuary. In general terms, the survey should involve the collection of catch and effort data over multiple temporal and spatial scales (i.e. at a variety of times and locations). This information can be used to develop informed management actions which aim to ensure fishing activities are sustainable.

It should be noted that commercial fishers are required by law to record their catch and effort data. This data is regularly reported to DPI (Fisheries). These data are obtainable through DPI for use in investigations associated with this management strategy.

Actions	Responsibility	Specific Tasks and Resources	Timeframe	Cost	Potential Fund Source
17.1 Undertake recreational fishing catch (creel) surveys on the Nambucca River estuary, which identify key fishing locations, fishing effort, catch quantities, target species and species caught. Outcomes should be used to improve fisheries management within the estuary.	DPI (Fisheries) in conjunction with local groups	The survey would need to be designed by qualified fish/fisheries biologists (from DPI) to ensure survey findings are meaningful and defensible. The creel survey would need to be performed by local community members who are trained and aware of the survey methodology. Training would need to be undertaken by a fisheries biologist. This person(s) would also be responsible for the analysis and reporting of findings. Fish catch data should be compared to existing commercial catch data to assess whole of estuary catches by the recreational and commercial sectors. Liaison with DPI (Fisheries) will be required to obtain the commercial catch and effort data for the estuary over the same period.	This action should be enacted in the medium term, i.e. 3 to 5 years.	Cost for this option would be minor as most of the effort is at the expense of the volunteers. Provision of trained staff would be at DPI's expense.	DPI would need to provide qualified staff to allow this management strategy to be implemented.

19 MANAGEMENT STRATEGY 18 (MEDIUM)

Obtain better understanding of fisheries habitat values and trends in fish communities over time in different parts of estuary

Addresses Management Objectives

- FOA – Fisheries and Oyster Aquaculture
- HM – Habitat Management

References

- Section 11 of the Estuary Management Study

Description

There are community perceptions of declining fish stocks within the estuary. Numerous suggestions were received during the consultation phase to restrict or ban commercial and recreational fishing activities in certain areas of the estuary to help improve fish stocks. At present there is little information available on the relative fisheries values of the various habitats that exist within the estuary or trends in fish communities throughout the estuary over time. This management strategy aims to gain a more thorough scientific understanding of the fisheries values and trends over time within the Nambucca River estuary.

This management strategy will provide information on popular fishing sites for different species, which may be useful in the context of identifying potentially important fisheries habitats and habitat patches in the estuary. However, there is a need to collect more robust, empirical data on fish-habitat interactions in order to identify potential critical areas and habitats in the estuary.

It is already known that certain habitat types are important for different life-stages of various fisheries species, and that the value of a habitat type and patch can vary over time. The factors that influence the value of a habitat type or patch are not well known, but may include such factors as spatial arrangement of habitat types and patches, tidal currents and flows, substrate types, water quality conditions etc. A critical information gap is the absence of information on factors that control fish populations (i.e. whether communities are limited by density-dependent factors such as habitat availability, or density independent factors such as disturbance, predation etc.).

Prior to undertaking any sampling or analyses, there will be a need to undertake a desk-top assessment of key issues and general hypotheses (an example of a hypothesis is that there have been changes in the patterns of mullet movements up Warrell Creek) regarding fisheries habitats and values, which could be used to generate a list of specific, testable hypotheses. Survey designs and methods that could be used to test these hypotheses should then be developed. A scientific panel should then assess and rank the various survey programs (in terms of cost effectiveness, resource availability, 'best bang for the buck'). Research projects could then be implemented to answer some of the critical questions. Potential outcomes of this research would include identification of critical nursery habitat patches or reaches that require protection through Fish Habitat Protection Plans or closures (seasonal/long-term).

Actions	Responsibility	Specific Tasks and Resources	Timeframe	Cost	Potential Fund Source
18.1 Initiate a scientific investigation to improve the current understanding of fisheries habitat values and trends in fish communities over time in different parts of estuary. Outcomes should be used to improve fisheries management within the estuary.	DPI (Fisheries) in conjunction with local University researchers.	If issues are found, this scientifically based and validated information could be used to apply to the DPI (Fisheries) for various types of Fish Habitat Protection Plan, or even Commercial Fishing closures to protect some areas (or parts of areas) with very high fishery values. The assessments would also provide additional information on the ecology and health of the estuary.	This action should be enacted in the medium term, i.e. 3 to 5 years and may take up to three years to finalise.	A joint funding arrangement may be able to be reached with a university or other research organisation to conduct the required investigations.	DPI Fisheries may have grant opportunities.

20 MANAGEMENT STRATEGY 19 (MEDIUM)

Incorporate river health goals and best practice design into future bank protection works (e.g. construction of future foreshore retaining walls) through an integrated and streamlined approvals process

Addresses Management Objectives

- LTU – Land Tenure and Usage
- BE – Bank Erosion and Sedimentation
- HM – Habitat Management

References

- Section 6 and 8 of the Estuary Management Study
- Estuarine Geomorphology, Physical Condition and Mapping Report

Description

There are numerous unlicenced foreshore structures within the estuary (and they continue to be erected within the estuary). Many of these structures were historically constructed by landowners to protect their property against bank erosion. The existing structures have inconsistent designs (i.e. size, shape and function) and detract from the overall aesthetics of the riverbanks. Due to the materials they have been constructed of, the foreshore structures when they finally erode may present an enduring ecological impact (e.g. loss of car tyres to the river bed). There is a lack of suitable guidance available for individuals (and others) in the design of foreshore structures to ensure appropriate engineering standards and river health goals are being taken into account. Furthermore, the approvals process for new or revised foreshore structures should be initiated and coordinated by Council.

Actions	Responsibility	Specific Tasks and Resources	Timeframe	Cost	Potential Fund Source
19.1 Develop a range of engineering guidelines to be made available to those wishing to undertake foreshore works (including the Works departments of Council). The guidelines should present a range of alternative approaches for foreshore works. The choice of appropriate foreshore stabilisation techniques and materials should relate to the value of the asset being protected. Options should be presented for foreshore works which also provide enhanced opportunities for bank revegetation/habitat provision. Guidelines for bank works can be used to assist in the implementation of the Bank Management Plan as outlined in **Strategy 1.1**.	Council in consultation with DECC, DPI Fisheries and Department of Lands	Design solutions should be current best practice. The solutions must have a sufficient level of engineering properties for the given application and be of an acceptable look. Some advice in this regard may be found from the new AS 4997-2005 **'Guidelines for the design of maritime structures'**. The objective of AS 4997 is to provide designers and regulatory authorities of structures located in the marine environment with a set of guidelines and recommendations for the design, preservation and practical applications of such structures. These structures can include fixed moorings for the berthing of vessels, piles and other parts of a substructure, wharf and jetty decks, building substructures over waters, etc See also NSW Maritime: http://www.waterways.nsw.gov.au/docs/engineering-guidelines.pdf	This action should be enacted in the mid term, i.e. 3 to 5 years.	Cost for developing the guidelines will be minimal and most material should be able to be sourced from other Councils.	DECC Estuary Program
19.2 Review the approvals process for foreshore structures to ensure that all proposed structures go through an appropriate approval process that involves the key State Agencies.	Council in consultation with DECC, DPI Fisheries, Department of Lands and Department of Water and Energy	Amend LEP to ensure that any proposed foreshore development triggers the need for an approval from Council. A possible approach may be to identify that any foreshore development with lands zoned E2 or W1 (depending on how Council zones foreshore lands) then triggers the need for an approval. Council will then act as the referral agency for all other agencies (i.e. DIPNR, DoL, NSW Maritime, DPI Fisheries) under IDAS. The role of some of these agencies in approval of such structures should be identified.	Review as part of Council's LEP review process.	Minimal	There are not expected to be any funding sources available for this task.

21 MANAGEMENT STRATEGY 20 (LOW)

Ensure climate change and sea level rise implications are incorporated into the current LEP and forward planning

Addresses Management Objectives

- LTU – Land Tenure and Usage
- CCSLR – Climate Change and Sea Level Rise

References

- Section 14 of the Estuary Management Study

Description

It is predicted that mean sea levels will increase by as much as 0.88m by 2100. This will mean that some current intertidal areas may be permanently inundated. This is likely to have some flow on effects to existing vegetative communities (especially saltmarsh communities if sea level rise is greater than vertical accretion and if they cannot migrate to higher levels), estuarine morphology and on a variety of human based infrastructure situated around the estuary. It will also allow tides to propagate up estuaries to a larger extent and thereby affect existing salinity regimes, which will have impacts on existing vegetation communities. During flood events, ocean surge levels may also be heightened, potentially increasing flood levels and extent. Opportunities exist at the present to address potential impacts through appropriate forward planning. Critical to this is having accurate surface elevation data available.

Actions	Responsibility	Mechanisms or Resources	Timeframe	Cost	Potential Fund Source
20.1 Council to develop a position on Climate Change and Sea Level Rise and adopt this into Council planning procedures.	Council	See Local Government Association: http://www.lgsa.org.au/www/html/253-climate-change.asp See also DECC http://www.dnr.nsw.gov.au/coasts/coastsmgt.shtml	Immediate	-	-
20.2 Obtain sufficiently accurate land height information from which to generate inundation maps under a variety of sea level change scenarios. Inundation will most likely be of greatest impact on spring tidal cycles. Land height information should be collected for all low-lying areas (i.e. within 2m of mean water level as far as the tidal limit of the estuary).	Council in conjunction with DECC.	Recent aerial photography obtained for the Nambucca Shire Council does not have a sufficient level of accuracy for inundation mapping. Typically mapping with a vertical height accuracy of ± 0.1m is considered suitable for inundation mapping. If there are no Government accepted sea level rise predictions for use in forward planning, consider use of recent Intergovernmental Panel on Climate Change publications, see: http://www.ipcc.ch/	Mid-term > 3-5 years	~100K+	DECC Coast Flood and Estuary Program NRCMA
20.3 Consider impacts of higher mean sea levels on flood inundation levels within the estuary and broader coastline as appropriate.	Council in conjunction with DECC.	Identify the need to update the findings of the Lower Nambucca River Flood Study and Lower Nambucca River Floodplain Risk Management Study in light of the impacts of higher sea levels. The preparation of a Shirewide Coastal Zone Management Plan incorporating the estuary may be appropriate.	Long term, 5 yrs+	Update Flood Studies ~$50K Coastal Zone Management Plan ~$70K	DECC Coast Flood and Estuary Program NRCMA
20.4 Include inundation areas (from sea level rise and/or in conjunction with flooding) within Council's LEP and DCPs to avoid potential future land use conflicts and unnecessary asset relocation.	Council	Areas that have been identified as likely to be inundated should be identified in Council's LEP and DCPs to ensure no unacceptable development is planned for or allowed in these areas.	Long term, 5 yrs+	Internal cost to Council	-
20.5 Develop strategies to relocate existing assets that are likely to be inundated as a result of sea level rise. The strategy should identify priority items and locations.	Council in conjunction with relevant asset owners	To avoid unnecessary cost and social and environmental impact, priority assets should be relocated and actions taken to protect other assets which may not be able to be relocated.	Long term, 5 yrs+	N/A	-

22 MANAGEMENT STRATEGY 21 (LOW)

Protect habitats of moderate or local ecological value (eg areas of native regrowth)

Addresses Management Objectives

- HM – Habitat Management

References

- Section 10 of the Estuary Management Study

Description

Approximately 80% of the study area is privately owned and the remainder is constituted of a variety of Crown lands and State Forests. The regrowth communities of the study area provide potentially suitable habitat for a diverse range of flora and fauna species and may contribute to maintaining biodiversity values within the study area by providing wildlife refuge and forming part of the wildlife corridor network across the study area linking upland and lowland vegetation communities. Many of these sites occur on rural residential land and remain unprotected and prone to development pressure. The management priority for these habitats is to protect those that buffer significant ecological habitat or those that contribute to the wildlife network across the study area.

Actions	Responsibility	Specific Tasks and Resources	Timeframe	Cost	Potential Fund Source
21.1 Protect communities that buffer significant ecological habitat or those that contribute to the wildlife network across the study area, for example regrowth communities by inclusion of protection mechanism for these habitats within the Nambucca Shire Council's LEP and DCPs.	Council in conjunction with landowners, Department of Lands, DECC and the Department of Planning	This management strategy aims to protect those habitats of moderate or local ecological value, e.g. regrowth communities, particularly those that buffer endangered ecological communities, key habitats or contribute to the wildlife network across the study area. Buffer zones around these communities should be mapped using GIS tools and triggered as a result of proposed land use changes within the Shire. Protection could be afforded by use Environmental Planning Instruments in the LEP to extend over these areas. Sufficient (GIS based) mapping data exists to identify high value habitats and wildlife corridors throughout the study area. Details of recommended buffer distances to certain endangered ecological communities may be found at: http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/cma_subregion_list.aspx?id=118 Other sources of information may include relevant State agencies such as DPI (Forests), DECC (Parks and Wildlife), State Environmental Planning Policies (SEPPs), etc.	Consider implementation as part of Council's ongoing LEP Review.	N/A	-

Note: Regrowth is defined as any native vegetation that has regrown since 1990 except where a Property Vegetation Plan specifies another date). **Native vegetation** is defined to include trees (including any sapling or shrub, or any scrub), understorey plants, groundcover (being any type of herbaceous vegetation) and plants occurring in a wetland, so long as the species existed in New South Wales before European settlement.

23 MANAGEMENT STRATEGY 22 (LOW)

Enhance condition of habitats of moderate or local ecological value

Addresses Management Objectives

- HM – Habitat Management

References

- Section 10 of the Estuary Management Study

Description

The majority of habitats of potential moderate to low ecological value occur on rural residential land and are prone to existing and future land uses. Significant environmental issues are likely within these lands including poor water quality, clearing and weed invasion, and may require more active management.

Actions	Responsibility	Mechanisms or Resources	Timeframe	Cost	Potential Fund Source
22.1 Rehabilitate those communities that buffer significant ecological habitat or those that contribute to the wildlife network across the study area, for example regrowth communities.	Council in conjunction with landowners and Department of Lands and DECC	Rehabilitate those communities that buffer significant ecological habitat or those that contribute to the wildlife network across the study area, for example regrowth communities. Council may then begin the process of notifying private landowners of the significance of this vegetation and providing them with options and incentives for rehabilitating these lands. Land based surveys of the condition of these communities will be required if this information is not available from other sources. The surveys should identify key information such as the type of vegetative communities present, current condition, issues degrading or potentially degrading it condition and types of rehabilitation activities required to improve its condition. This information may be presented within a 'Rehabilitation Plan' or similar to guide future activities. Council should maintain records identifying previous actions undertaken or planned within the catchments in relation to this Strategy. The Nambucca Heads Aboriginal Land Corporation's Green Teams could be supported in enacting the weed control programs.	Long term 5yrs +	N/A	• NRCMA • State Government incentive based schemes. • Envirofund • Landcare

24 MANAGEMENT STRATEGY 23 (LOW)

Ensure adequate representation of all key local stakeholder groups is maintained on the Estuary and Coastline Management Committee (ECMC) and that stakeholder input is encouraged in the implementation of the Plan

Addresses Management Objectives

- CH – Cultural Heritage
- CL – Community Liaison

References

- Local Government Act 1993 (and any amendments or other relevant State Government Directives)

Description

There will be a need to engage a range of stakeholders in the future management of the estuary (via the ECMC) to ensure that the interests and views of these groups is understood and that actions and processes that facilitate the implementation of the Plan are developed and carried through to fruition.

Actions	Responsibility	Specific Tasks and Resources	Timeframe	Cost	Potential Fund Source
Strategy 23.1 - Continue to encourage appropriate Aboriginal representation on the ECMC under the advisement of the local Aboriginal Communities.	ECMC in consultation with Land Councils	These persons should represent the interests of the local Aboriginal Communities in relation to the management of existing culturally important lands and features, as well highlighting areas of potential conflict or issues with other relevant activities in respect of the estuary. Additional consultation should be engaged in with the Aboriginal Community outside of the normal operation of the ECMC to gain a better understanding of issues (as required). This may entail site inspections, meetings with Elders and others in specific locations, etc.	Immediate and ongoing	Cost minor	Not applicable
Strategy 23.2 – Continue to promote a wide range of stakeholder involvement in the ECMC and that their involvement is encouraged throughout the implementation of the Plan.	ECMC in conjunction with stakeholder groups.	Council should encourage a wide variety of membership on the ECMC. It should aim to cover a variety of user groups including conservation, commerce, farming, oyster, tourism, River Users, fishing groups, etc. As appropriate to the implementation of the Plan, tools and mechanisms that facilitate its implementation should be developed, e.g. Memorandum Of Understanding, service level agreements, etc. ECMC membership must abide by State Government directives for committees (i.e. declared pecuniary interests, etc).	Immediate and ongoing	Cost minor	Not applicable

25 MANAGEMENT STRATEGY 24 (LOW)

Ensure all foreshore structures are appropriately licenced, designed and maintained to protect foreshore amenity and access

Addresses Management Objectives

- LTU – Land Tenure and Usage
- BE – Bank Erosion and Sedimentation
- BWU – Boating and Waterway Usage

References

- Sections 6 and 8 of the Estuary Management Study
- Estuarine Geomorphology, Physical Condition and Mapping Report

Description

There are numerous waterway structures, including ramps, jetties, etc in existence on the estuary, which are not accounted for in existing waterfront licences issued by the Lands Department. This has implications for managing waterway usage.

Actions	Responsibility	Specific Tasks and Resources	Timeframe	Cost	Potential Fund Source
24.1 Assess licencing status (e.g. via a Crown Land Assessment) of waterway structures within the Nambucca River estuary from mapped GIS data for structures prepared as part of the Estuary Management Study	Department of Lands	Unlicenced structures should be licenced with the Department of Lands or removed if appropriate. Uncontrolled accesses on public or private lands, which will not be licenced, should be removed. Activities should where required by coordinated with **Strategies 11.1 and 11.2**.	Long-term >5 years	Internal to DoL	There are not expected to be any funding sources available for this task.

26 MANAGEMENT STRATEGY 25 (LOW)

Improve recognition of Crown Land areas in the lower estuary, particular those around existing facilities that may promote greater connectivity and tourist related usage of the area

Addresses Management Objectives

- LTU – Land Tenure and Usage
- TM – Tourism Management

References

- Section 6 of the Estuary Management Study

Description

There are extensive Crown land areas in the lower estuary, many of these are under-utilised or are restricted in the way that they may promote connectivity and tourist related usage of the area. For instance, the boardwalk around the river from Gordon Park to the RSL is very popular, however, pedestrians are forced to walk beside the road if they want to get to the Bellwood Reserve area, despite the presence of Crown land fronting the Foreshore Caravan Park. This management option aims to improve recognition of Crown Land areas in the lower estuary, particularly those around existing facilities that may promote greater connectivity and tourist related usage.

Actions	Responsibility	Specific Tasks and Resources	Timeframe	Cost	Potential Fund Source
25.1 Investigate the feasibility of the following options: ❑ Connected riverbank walk between Anzac Park and Bellwood Reserve. Consultation with land owners, caravan park operators and oyster growers will be required to identify a suitable design for the this section of the walkway; and ❑ Dedicated walking/cycle track between the Nambucca Plaza and the existing boardwalk section along Nursery Road/Bellevue Drive, Macksville (which is currently poorly used). With the future possible diversion of the Pacific highway, existing traffic levels will be substantially reduced making the option more feasible.	Council in conjunction with the Department of Lands	There will be a need to review land ownership along the proposed pathways and approaches made to these owners. Land may be granted for use or it may need to be purchased. See **Strategies 16.3, 16.4, 1.1 and 11.2.**	Long-term >5 years	Cost of feasibility assessments would be low. Cost for construction of track would be $50K+ but dependent on style and length	NRCMA for construction costs

APPENDIX A: KEY CONTACTS TABLE

Organisation	Name	Position	Phone	Email
Nambucca Shire Council	Bruce Redman	Director Operations	6568 2555	Bruce.Redman@nambucca.nsw.gov.au
Nambucca Shire Council	Greg Meyers	Director Planning	6568 2555	Greg.Meyers@nambucca.nsw.gov.au
Department of Environment and Conservation Change	John Schmidt	Senior Natural Resource Officer	65614975 0417428571	John.Schmidt@dnr.nsw.gov.au
NSW Maritime	Anna Sedlak	Boating Service Officer	0418 420 102	asedlak@maritime.nsw.gov.au
NSW Maritime	Rod McDonagh	Boating Service Officer		rmcdonagh@maritime.nsw.gov.au
Department of Lands	Peter Baumann	Lands Officer	6640 2060	Peter.baumann@lands.nsw.gov.au
Department of Lands	Stephen Channells	Lands Officer		Stephen.Channells@lands.nsw.gov.au
Nambucca Valley Landcare	Tim Ryan	Coordinator	6564 7838	tryan@tsn.cc
DPI Fisheries	Marcus Riches	Conservation Officer	6626 1200	marcus.riches@dpi.nsw.gov.au
NSW Food Authority	Anthony Zammit	Program Officer	9741 4749	anthony.zammit@foodauthority.nsw.gov.au
GECO Environmental	Damon Telfer	Director	0407 878 916	damont@westnet.com.au
WBM	Damion Cavanagh	Associate	07 3831 6744	dccavanagh@wbmpl.com.au

APPENDIX B: MANAGEMENT OPTIONS FOR ENTRANCE CONDITION MANAGEMENT

General Considerations

Most of the present issues relate to sediment infeed and shoaling of the lower estuary with associated navigation considerations. Management options to address these issues need to consider their likely effectiveness, practicality of implementation and the potential effects on other processes and the natural environment. The community consultation process highlighted the importance of entrance shoaling issues and a number of alternative management options have been put forward. These are discussed below in broad terms to aid consideration of appropriate management strategies to meet the objectives. Management options include:

- 'hard' options such as structural works (eg training walls) with other associated works such as initial dredging in an attempt to generate a 'permanent' solution;
- 'soft' options such as dredging which typically requires ongoing maintenance to maintain adopted minimum cross-sections;
- a combination of the two with some structural works aimed at minimising the amount of ongoing maintenance; or
- planning options aimed at accepting the natural processes and implementing strategies to work within the constraints of natural variability.

It should be recognised that structural options are typically expensive and can lead to other problems unless properly designed and implemented with appropriate strategies. They also typically require some ongoing maintenance as well. The costs of such works need to be weighed up against the benefits.

'Soft' options such as regular maintenance dredging can be viewed as working with the natural processes but again need to be properly designed and implemented to minimise adverse effects. They also have the disadvantage of being required on an ongoing basis with associated disturbances and costs.

Planning or management strategies aimed at accepting the natural processes need to be able to accommodate natural variability and the associated implications, for example shoaling and reduced flushing at times. This has the advantage of not 'interfering' with the natural processes, but may with the disadvantage of having to accept the issues.

As outlined above, the major issue in the Nambucca River entrance region relates to the desire to improve waterway access around the lower estuary. Flushing and water quality are not a major concern at this inlet. However, there is a need to ensure that any proposed works do not have any adverse impacts with respect to other issues such as:

- changes to the tidal hydraulic regime and associated environmental concerns;
- potential for erosion of the ocean beaches; and
- potential increased flooding in the lower estuary.

The waterway access and poor navigability of the Nambucca River entrance are a reflection of hydraulic, wave and sediment transport characteristics. Although a northern training wall was constructed, the processes are

such that the entrance has migrated naturally to and from the south and is often broad and shallow. Sediment flow to and from the beach system creates continually changing shallow bar formations which are dangerous for navigation.

At times, such as after flood events or following a sustained period of northerly longshore transport along the beaches, the entrance channel is hard up against the northern training wall and tends to be more confined and deeper.

Options to improve waterway access need to achieve a channel which is stable in location and maintained at a sufficient depth. An important consideration in this regard is the type of vessel that is to be catered for and it's associated draft. For example, non-powered vessels (canoes etc), small outboard runabouts ("tinnies" etc) and jet-powered vessels typically need less than 1m of water depth. Mid-sized runabouts may need between 1m and 2m of water depth while larger pleasure craft, commercial vessels and yachts may need in excess of 2m of water depth for safe navigation.

The time frame and consequences of being constrained with a shallower channel preventing navigation are also important considerations. For example, waiting a short period of time for a higher tide level can often be used to allow navigable access for deeper draft vessels into shallow areas. However, such a constraint would not be appropriate for emergency vessels. Similarly, if a navigation channel is provided and relied upon and subsequently becomes shoaled, the time frame to reinstate the navigable depth may be a major constraint.

As discussed in section 8.5.1 of the Estuary Management Study the vast majority of vessels currently using the river are less than 5m in length and would typically need less than 2m of water depth for safe navigation. Such vessels have access to most of the estuary, albeit with a need to rely on higher tide levels in some places. Larger draft vessels are constrained in some areas and deeper channels would need to be maintained in the lower estuary/entrance region if such vessels are to be catered for and/or encouraged. These aspects are considered below in discussing management options for the entrance region.

Options Considered

A range of specific options have been considered to address the issues outlined above including:

1. Do nothing;
2. Remove training walls (or sections);
3. Full training (southern and internal) walls with associated dredging;
4. Major dredging alone;
5. Minor dredging in key areas;
6. Extend northern breakwater;
7. Block gap in vee wall; and
8. Other training wall reconfigurations.

These options are summarised in Table B-1 in terms of their main components, aims and considerations.

Table B-1 Entrance Modification Options

Option	Aims	Benefits/Costs	Considerations
1. Do Nothing - Entrance retained in existing condition with no specific works.	• Accept present situation with no expenditure.	• No direct costs • No ecological disturbances • Navigation continues to be restricted	• Accept present variable conditions and restricted navigability. • Promote usage of appropriate boats for conditions. • Flushing and water quality remain acceptable.
2. Remove Walls - Partial or complete removal of existing training walls.	• Return estuary to natural conditions.	• High initial disturbance • High initial cost • Natural processes will continue • Navigation continues to be restricted	• Unlikely to make significant improvement to navigation and may cause it to become worse. • Natural entrance was shallow and dangerous leading to construction of walls.
3. Full Training - Dual training walls and dredged channels with associated maintenance / artificial sand bypassing	• Prevent channel migration and provide a safe navigable entrance. • Confine flows to maintain a deeper channel. • Prevent/minimise sand inflow to maintain navigable channel.	• Very high capital and ongoing maintenance costs • High initial ecological disturbance • Will provide navigable access for a wide range of vessels • Increased artificial modification to estuary	• Appropriate design required to minimise sand inflow and to accommodate floods. • May alter natural tidal hydraulic regime with follow on ecological implications. • Ongoing maintenance dredging/sand bypassing required at cost to maintain navigation.
4. Major Dredging - Dredging a major navigation channel through the entrance and lower estuary.	• Provide a deep navigable entrance channel.	• High initial costs and ongoing maintenance costs required • Temporary ecological disturbance • Temporary improvement to navigation	• Ongoing sediment inflow may quickly shoal channels. • Ongoing maintenance dredging will be required on a regular basis to maintain navigation. • Dredged sand will need to be placed back in the active coastal system (eg adjacent beaches).
5. Minor Dredging - Dredging isolated areas of lower estuary where navigation constraints are greatest.	• Provide a navigable channel where most needed in the lower estuary.	• Modest initial costs and ongoing maintenance costs required • Temporary ecological disturbance • Temporary improvement to navigation • Will not change main entrance constraints	• Ongoing sediment inflow may quickly shoal channels. • Ongoing maintenance dredging will be required on a regular basis to maintain navigation. • Dredged sand will need to be placed back in the active coastal system (eg adjacent beaches). • Will provide minimal disturbance but likely to have limited/short term benefits.
6. Extend Northern Breakwater - Extend northern breakwater to the extremity of the northern rocky headland.	• Provide a control to train flows and maintain a deeper channel across the outer bar.	• Modest initial cost • Temporary ecological disturbance • Limited improvement to navigation	• Existing rocky headland provides similar control. • Unconstrained southern side means that flows can still spread out and sediment inflow will continue • Unlikely to result in any substantial improvement.

Option	Aims	Benefits/Costs	Considerations
7. Block Gap in V-Wall - Close existing breach in training wall to block most flow while still allowing sufficient exchange through (say) culverts for tidal flushing.	• Restrict flow through back channel and push more flow down main channel to scour a deeper section. • Maintain enough flow through back channel to maintain water quality. • Reduce current velocities to improve swimmer safety in back channel	• Modest initial cost • Temporary ecological disturbance • May slightly improve channel depth in main channel • Velocities will decrease in back channel improving swimmer safety • Siltation may occur at upstream end of back channel • Direct navigation from back channel to ocean entrance blocked	• Detailed design required to assess sizes of culverts to maintain sufficient flow and minimise adverse water quality, flooding and other related impacts. • Improvement to depth of main channel may only be small. • A commitment will be required to maintain a navigable channel from the back channel to the main channel and the ocean (as the existing route through the gap in the V-wall will be blocked). • Even with a maintained channel as above, the time for access to the ocean from the back channel will be greater. • As well as improving swimmer safety, the concept could provide access to the island.
8. Block South Channel - Construct training wall across south channel opposite Stuart Island joining small islands.	• Block flow through south channel to Warrel Point and force this flow along the central channel adjacent to the existing training wall to scour a deeper channel.	• High initial cost • Temporary ecological disturbance • Limited zone of improvement to navigation	• Sedimentation likely at downstream end where flows can spread out still constraining navigation and requiring maintenance dredging. • Would limit further scour of Warrel Point

APPENDIX C: RESPONSES TO COMMENTS RECEIVED FROM THE PUBLIC EXHIBITION OF DRAFT EMP

The following table outlines responses to the questions posed of the draft estuary Management Plan. Reference is made back to the Plan in many instances which has now been updated or revised. There is much overlap between sections, every effort has been made to divide these into categories for ease of reference.

Proposed Boating Restrictions, General Boating Concerns, Boating Facilities, etc	
Estuary should be functional not just aesthetically pleasing	A balance needs to be achieved between functionality (i.e. types and levels of use it accommodates) and its environmental resources. A swing to far either way may curb or lessen social and economic value (i.e. tourist revenue), or it may degrade the environment in such a way that it's environmental values are reduced, necessitating large expenditure to address the issues, while also lessening its social and economic values.
Boaters have a right to use river	Yes, boaters do have a right to use the river. However, this right should not be taken for granted. There has been an increasing amount of regulation of boating activities in NSW over the past few decades. If boating activities are identified as significant contributors to the degradation of existing estuarine values, it is likely that further regulation will be required, thereby restricting boaters rights to use the river/estuary.
Relatively low boating levels	Complete figures of boat usage are unavailable throughout the year. It is generally accepted that boating levels in most parts of the estuary are low in off-peak times, but can be very high in peak times (i.e. certain weekends, holidays, etc).
Reduces property values (reduced use of river by locals and tourists will prevent interest and purchase of land)	It is questionable as to whether the introduction of broad scale speed restrictions would actually decrease property values in the Valley. There are no current proposals to introduce broad scale speed restrictions within the estuary.
Boat restrictions may reduce tourism	There is some possibility that the introduction of broad scale speed restrictions within the estuary could reduce certain forms of tourism within the estuary. However, it is likely that other forms of tourism would emerge to take their place over time. Irrespective, there are no current proposals to introduce broad scale speed restrictions within the estuary.
Do not believe these proposed changes are in the best interest of many shire residents and waterway users	There are no current proposals to introduce broad scale speed restrictions within the estuary.
The EMP will close the majority of our local waterways to recreational boating, meaning no cruising, no skiing, no wakeboarding, no towing tubes and no jet skiing in these sections of our river.	There are no current proposals to introduce broad scale speed restrictions within the estuary. There are however, certain limited changes to boating behaviours that will be considered by NSW Maritime. Please see **Strategy 10.2**.
Council predominantly responsible for economic and social issues and should not be considering recommendations of the EMP solely on environmental grounds.	It is likely that further consultation and consideration of the potential community impacts of any broad scale boating restrictions would need to be undertaken at that time. However, at present there are no current proposals to introduce broad scale speed restrictions within the estuary.

Boat restrictions may reduce business income	The nexus between estuary related tourism and the income of certain businesses around the estuary is acknowledged. However, there are no current proposals to introduce broad scale speed restrictions within the estuary.
Increase awareness better option than restrictions	This is the approach that has been adopted; please see **Strategies 4.1 and 4.2**.
Densification of use in non-restricted areas leading to safety issues.	This should not be an issue as there are no current proposals to introduce broad scale speed restrictions within the estuary.
Warrell Creek at Boultons Crossing needs a speed restriction in front of the campground area for safety.	NSW Maritime will consider implementing a speed restriction in this area, please see **Strategy 10.2.**
Social (particularly children) and economic factors (business) not considered	It is likely that further consultation and consideration of the potential community impacts of any broad scale boating restrictions would need to be undertaken at that time. However, at present there are no current proposals to introduce broad scale speed restrictions within the estuary.
How would any restrictions be regulated as there is little presence of NSW Maritime within the estuary… also cost of regulation may be high and could be better spent on riverbank restoration / education etc.	There are no current proposals to introduce broad scale speed restrictions within the estuary, hence enforcement will not be as critical. Certain aspects of boating behaviour will be of increased interest to NSW Maritime and the River User Group subsequent to the implementation of this Plan.
Logs floating in the river present a death trap, and nothing is done in this regard.	There is no mechanism for preventing what is really a natural occurrence.
Travelling at lower speeds makes more waves	This is not true. Boat wash generated by boating depends on a number of factors, such as its speed, its shape (length, width, depth), its weight (i.e. displacement) and trim. For certain boats travelling at 4 knots will generate very little wash, whereas 8 knots can generate significant wash. Travelling on the plane can also reduce the level of wash from some boats. Refer to **Section 8** of the Estuary Management Study.
It is bad enough that when we ski at Macksville boat ramp we have to sit near the poorly planned and sited fish cleaning table Wear thongs in the water while tyring to get to our boats due to the sharp rock that been thoughtlessly dumped Hold the boat while it is near the ramp to stop our boats running up onto rocks	**Strategy 11.1** identifies planned upgrades for Lions Park these include: • Provide boat tie up facilities for launching/retrieving craft. • Investigate feasibility of a jetty/wharf area for fishing, swimming and boat access. • Investigate need for additional parking for boats trailers. • Assess feasibility of construction of a ski beach near the existing ramp.
Boaters only use the river for a short amount of time	Complete figures of boat usage are unavailable throughout the year. It is generally accepted that boating levels in most parts of the estuary are low in off-peak times, but can be very high in peak times (i.e. certain weekends, holidays, etc). Observations of residents living on the banks suggests that it is during peak usage times that many of the boat wash impacts can occur.
There is a clear need for better education as to what boating regulations mean (i.e. boating law)	Yes agreed. Please see **Strategies 4.1 and 4.2.**
Loss of entertainment for youngsters.	There are no current proposals to introduce broad scale speed restrictions within the estuary.

Oyster grower's benefit from the proposed changes, tourists were here before oyster farmers, 30 years ago they did not object to waterway use. Also relatively small contribution from oysters to local economy	Oyster farming within the estuary extends back to the 1930's (when production records were commenced). Large-scale production extends back at least 30 years. Oyster production within the estuary, although not as large a contributor to the local economy as tourism is an important industry none-the-less. Nambucca oysters are distributed worldwide, and contribute to the sense of place and value that people associate with the estuary. Many other river based estuary ventures in NSW have closed recently due to disease and water quality concerns. Having a healthy and vibrant industry lends weight to the idea that the Nambucca estuary is healthy.
It appears that only oyster growers and kayak user have been considered in the formulation of the plan	This is not true. Boating has received significant consideration. It should be observed that both oyster growing and kayaking (and all forms of low impact boating) are both highly sustainable forms of estuarine use which are consistent with the goals of estuary management.
Strategy 4.2 talks about sympathetic signage at strategic locations for boat usage, but there is no sign indicated at the northern end of Warrell Creek, one of the major access point to this creek. No signage for Shelley Beach.	A sign at the northern end of Warrell Creek is justified. Please see **Figure 5-1**. A sign at Shelley Beach ramp is not as most of these boats are ocean-going boats.
No wash no tow zoning should be applicable to both side of Stuarts Island.	As indicated in **Strategy 10.2**, NSW Maritime will consider introducing a 'No-skiing or aquaplaning' area in the marked channel on the starboard side of the river immediately adjacent to Stuarts Island. The major reasons for this are safety, i.e. high use confined channel with boats launching and returning. There is probably not as much need for similar zoning on the other side of Stuarts Island due to reduced usage levels and presence of the causeway.
Wellington drive ramps require vehicle access issues to be resolved but should be upgraded to allow for small tinnies, canoes, kayaks, etc to enter the river.	As described in **Strategy 11.1** Council in conjunction with the River User Group and NSW Maritime are to resolve whether the Wellington Drive ramp should be retained. If it is to be retained it will be improved and made suitable for small craft launching and retrieval.
An additional small boat access point in the vicinity of Stuart's Island / Bellwood may help to reduce traffic congestion at the current site in conjunction with golf course patronage	**Table 12-2** identifies the potential medium to long term need to investigate an additional ramp in the lower estuary. The Bellwood area is one that should be further investigated. This option may become more favourable once Pacific Highway traffic is diverted from this area.
I do see some merit in speed restrictions on some parts of the river for safety purposes. During the summer months areas such as Gumma Reserve, the water behind the V wall and water around the Nambucca RSL car park and in front of Bellwood reserve would merit speed and tow restrictions as they attract a high volume of users. I do not support the promotion of swimming at Lions Park at Macksville. This is a primary launch and retrieve ramp for ski boats and skiers as well as other assorted craft. Could other ramps be upgraded for specific use by other skiers.	As indicated in **Strategy 10.2**, NSW Maritime will consider introducing a variety of limited speed restrictions in certain areas of the estuary where safety concerns have been identified. Please also see **Strategy 11.1** that identifies recommended actions in respect of the Lions Park ramp. Suggested actions have been updated to not promote swimming at the ramp, and also to investigate option for ski beach in a nearby location.
Strategy 4.1 should also stipulate jet-skis are frequently observed, especially in holiday time, being ridden at speed and executing tight donuts in close proximity to banks	**Strategy 4.1** is targeted at increasing the knowledge resources of boat users of the estuary, this will include jet-ski (i.e. PWC) users. **Strategy 10.5** will investigate the need for a more formal Code of Conduct for boating activities that have the potential for high impacts.
A boat on the plane creates less wash that a boat doing 4 knots.	This is questionable. It will depend on a number of boat specific factors, such as its speed, its shape (length, width, depth), its weight (i.e. displacement) and trim.
Restrictions will limit or stop recreational fishing	There are no current proposals to introduce broad scale speed restrictions within the Nambucca River estuary.

Perhaps channel markers could be used to direct boat users towards the middle of the river and reduce the effect of a wash on the banks.	The approach being adopted in this regard is to provide further educational resources to boaters in respect of current boating regulations which provide for minimum boating distances to banks. Please see **Strategies 4.1 and 4.2.**
Designate appropriate areas of the river to cater for large wash	There is an informal designation of ski areas within the Nambucca River estuary owing to its natural attributes. No formal zoning of waterway use has been proposed as part of the Estuary Management Plan. **Strategy 10** of the Estuary Management Plan will over time identify if there is need for designated use areas.
Most boat users will tell you that it is hard to remain or have exceptionally high speed on the river because of significant silting and sand banks.	Users should ski according to the conditions available to them. Similarly can be said for driving on public roads, while there are designated speed limits, if the road is wet or covered in debris, a responsible driver would slow down to a safe speed according to the conditions.
An emphasis on education and signage is vital especially for visitors in the tourist season. Contrary to the report we believe that funding would be available, in part from NSW Maritime. We personally have almost zero difficulty with local regular users – the excessive wash from the large vessel moored near the old Macksville Midco plant being the major exception. Tourists, especially skiers represent our biggest problem and we seriously suggest that without some control, accidents will happen. The promotion of no-power turns would help.	Under the Maritime Infrastructure Program NSW Maritime have indicated that they would only consider applications for funding for physical works, e.g. new or upgraded facilities such as ramps, wharves, etc within the estuary. Other avenues should be perused for educational funding. As indicated in **Strategy 10.2**, NSW Maritime will consider introducing a variety of limited speed restrictions in certain areas of the estuary where safety concerns have been identified. The importance of boater education has been increased in priority; please see **Strategies 4.1 and 4.2.**
Boats in Newee Creek only go slow anyway, no need for speed restrictions	There are no current proposals to introduce broad scale speed restrictions within Newee Creek.
Bank erosion (including potential for boating to impact on bank stability)	
Boat users should not be held responsible for maintaining river banks and local government and property owners should take steps to prevent soil/bank erosion as well, e.g. cattle fencing, rehabilitation, rock protection, etc	All parties need to be aware of bank erosion. Boating (via boat wash) in instances can contribute to bank erosion. **Strategy 10.3** looks to identify opportunities for bank stabilisation and river restoration projects in strategic reaches favourable for boating and water sports. **Strategy 6.3** looks to secure protection of riparian vegetation, **Strategy 8.1** seeks for the enhancement of riparian vegetation.
Tidal influences and livestock damage more impacting factors on bank erosion than boating	Potentially this is true in some areas some of the time. As an overall statement this is not correct.
River should be fixed not closed	The approach being adopted within the Nambucca River estuary is that the river will be made suitable for existing boating uses, via a range of remedial and protective measures. A strong education campaign will be implemented to address outstanding boating behaviours.
There is no problem, don't change it, people like it just the way it is	There are problems within the estuary. These need to be acknowledged and addressed. Ignoring the issues may in time lead to restriction on use.
Reducing speed limits in Warrell Creek to 4 knots will not stop the soil erosion problem that is being created by winds and tides.	There are no current proposals to introduce broad scale speed restrictions within Warrell Creek.
There is no doubt that boat wash-wash speeds up the process (of bank erosion) but bank erosion is a natural occurrence that would continue to be a problem even if not one single boat was to use the river	At the time European settlement, estuarine creeks were believed to have been heavily vegetated right down past the water line and the extent of vegetation severely limited opportunities for bank erosion due to any source, e.g. flood waters, tidal flows, etc.

Top of river is choking with gravel and there is no gravel extraction within the EMP for funding purposes. Gravel extraction at the right locations can help stabilise the banks and fund other remedial activities.	Large-scale gravel extraction within the Nambucca River has been ceased due to environmental concerns. It is agreed that in certain instances limited gravel extraction may be warranted. This gravel may need to be replaced into the river system at another location. Appropriate permits should be sought prior to any extraction.
Bank erosion problems were evident over 50 years ago when motorboats were not prevalent. Wind waves are more damaging.	Bank erosion within the Nambucca River initially commenced in the late 1940's and early 50's in response to flooding at that time (Lyall and Macoun 1999) as a result of catchment clearing and hydrologic changes. The lack of protection afforded to many eroding banks (i.e. a protective "toe") makes them susceptible to wash impacts (whether from wind or boats)
Banks should have been rocked 50 or 60 years ago to alleviate issues	The use of rock protection may be appropriate in some instances, however, this solution is considered by many to reduce the aesthetic appeal of the waterway as vegetation cannot easily re-establish on the banks.
Cattle on riverbank are a major problem.	Yes
Would wake dissipating devices provide a better outcome	Wake dissipating devices may be a suitable outcome in certain locations. The costs and practicalities of a number of different treatments will need to be weighed up in determining appropriate treatments to protect banks from wash.
Trees fall into the river, this can't be solely attributed to boating	It isn't, but boating can contribute to bank erosion.
Council to employ full time grants officer to tap into grant monies to fund riverbank restoration activities.	Please see **Strategy 5.6.**
Suggest a small rate rise and approach both state and federal governments for funding and fix over a number of years.	Council has recently implemented both the Environmental and Stormwater Levies which has significantly increased its fund base for implementing strategies outlined within the Estuary Management Plan. Where possible and appropriate Council will seek funding from other sources to increase funds as required.
Council consider payment of a levy by recreation users of the river to pay for restoration of the banks	This could be a good idea, but very difficult to implement and it may deter some users away from the estuary.
Find it hard to believe that the small tinny used on the river is getting the blame for the erosion of the riverbanks.	"Tinnies" aren't normally an issue unless weighed down with a number of persons and operating at higher speeds (but not on the plane). Of more concern are some of the larger boats using the estuary during holiday periods. Please see **Section 8** of the Estuary Management Study.
Mother nature will take care of the banks.	If all aspects of nature were left to tend for themselves it is likely that over a long time frame (on the scale of centuries) without any other factors (such as continued human usage of the estuary in terms of boating, cattle grazing, etc), the riverbanks of the estuary would probably mend themselves as the catchment and banks revegetated. This however, is a totally unrealistic outcome.
In relation to Strategy 1.1 the timeframe for these works appear to be in reverse. Is it not better to protect/repair riverbank sections in poor condition as the highest priority, while still "managing" those in good condition in the interim, will the work not be more expensive and involved if left for a long time.	Typically it has been found that it is cheaper and more effective to protect what is in good condition, as it doesn't cost much. If the good areas are allowed to degrade then it becomes a cost burden. Those areas already in poor condition are unlikely to require a significantly greater investment to fix them at a later stage, than if this work was commence first of all. An example may be the preservation of one's own teeth. Costly to fix, if allowed to degrade, but simple and relatively cheap to keep in good condition.

The Nambucca River needs a boating management plan to identify problem areas and to separate user groups. Only the widest parts of the river should be used for high speed boating activities and should be controlled so that only deep water start of the water ski and wakeboard towing is allowed to protect the river bank from erosion and reduce the hazards to other user groups.	Boating Management Plans are prepared by NSW Maritime. They have indicated that for the foreseeable future they will not be preparing one for the Nambucca River estuary.
The majority of vessels that utilise the Nambucca river estuary are small fishing or ski vessels. These types of vessels create most wash when travelling at speeds between 4 and 10 knots. When these types of vessel are accelerated onto the plane they sit on top of the water and not in the water which creates minimal wash. To make an area 4 knots or 8 knots is asking for trouble regarding wash. As 4 knots is a painfully slow speed most boat drivers will push past the 4 knots to 8 knots which is greatest wash creating speed for the type of vessels that use this river. Vessels having to push into a strong tidal flow at 4 knots will have to use more acceleration to remain at 4 knots than they would if there were not tidal flow. The increased acceleration forces the vessels stern to dig into the water more creating a greater wash effect. If the same vessel was pushing into the same tidal flow but was on the plane in excess of 10 knots then the vessel would create minimal wash, far less than the vessel travelling at 4 knots to 10 knots.	Comments regarding wash are generally agreed with. However, there are no current proposals to introduce broad scale speed restrictions within the Nambucca River estuary.
To make the Nambucca River a 'No Wash Zone' between the Golf Club area and Goat Island will have no effect on the amount of wash in the area. The small types of vessels that use the Nambucca River create minimal wash when travelling in excess of 10 knots on the plane. This means that vessels will continue to travel in this manner as they are not making wash. To restrict this area in speed limit will as for Warrell Creek create larger wash from these types of vessels.	There are no current proposals to introduce broad scale speed restrictions within the Nambucca River estuary.
Designated areas for water activities, so that people may enjoy the lifestyle they already know	There is an informal designation of ski areas within the Nambucca River estuary owing to its natural attributes. No formal zoning of waterway use has been proposed as part of the Estuary Management Plan.
Maps should be made readily available all over the valley for $5 so that all residents, travellers and holidaymakers have the information that is required for them to easily understand and execute.	**Strategy 4.1** aims to provide education material to boaters on appropriate boating behaviours and activities within the estuary. It is likely that the brochure will be made freely available.
The strategy of protecting and rehabilitating the best sections or riverbank first and leaving the worst for later has been around for some years now. Is there evidence that this is actually the best approach?	Typically it has been found that it is cheaper and more effective to protect what is in good condition, as it doesn't cost much. If the good areas are allowed to degrade then it becomes a cost burden. Those areas already in poor condition are unlikely to require a significantly greater investment to fix them at a later stage, than if this work was commence first of all. An example may be the preservation of one's own teeth. Costly to fix, if allowed to degrade, but simple and relatively cheap to keep in good condition.

Other rivers on the NSW coast are also suffering from bank erosion and some Council chambers have adopted a number of ways to help prevent erosion such as bank revegetation, the removal of introduced weeds that are choking the river system, small areas of regeneration that include temporary no tow zones or no boat pull up areas. Possibly the construction of small sandy beaches that are reinforced making it accessible for boats without causing erosion and anchoring floating baffles to stop waves from boat reaching the river banks.	Yes a number of rivers on the NSW Coast are suffering from bank erosion. There are many approaches that can be implemented to address the bank erosion, some of these relate to addressing what might cause the erosion, as well as actually putting measures in place to protect or rehabilitate the banks. Different measures will be appropriate in different regions of the estuary. **Issues and approaches should be considered on a reach-by-reach basis**. Some of the factors which need to be taken into account include: • Principal erosion mechanisms (boat wash, tidal flows, etc) • Bank characteristics, i.e. height of erosion bank (how high is it above the water), slope of erosion bank (is it vertical or sloped back), how steep is the bank below the water surface, is there any vegetation on the bank, is there cattle on the bank, what is the predominant soil type (is it cohesive or non-cohesive) • How will the measure work in with existing uses, or will it require a change to existing use (i.e. temporary closure of skiing, etc) • Cost and ease of implementation (needs to be affordable and safe to implement) • Longevity (all actions need to be designed to last for a long time) • Needs to be consistent with other goals of the Estuary Management Study in terms of using appropriate materials (i.e. not using tyres), needs to allow for bank revegetation (entirely rock river banks does not allow for this, etc)
Entrance Conditions and Dredging	
Entrance requires dredging as a result of mistakes in building the training wall	As outlined in **Section 7** of the Estuary Management Study, which includes a historic overview of entrance conditions based on available hydrographic surveys dating back as far as 1891 (prior to any training works), it was apparent the entrance was even then shoaled and considered to be dangerous to cross. It is considered that the lower estuary is now in equilibrium with the rock walls that have been built and they do not exacerbate the entrance shoaling.
River requires dredging to provide capacity for flows to reduce bank erosion potential	Dredging of the entrance may provide for temporary increases in tidal flow and exchange. This in fact would <u>increase</u> the potential for bank erosion due to the increased tidal flows (heights and velocities) that would be realised in undredged reaches.
Continued dredging to keep the river deep such that flood flows can get away	This option could prove to be very expensive and may have no identifiable end date as natural shoaling will continue, i.e. how long does one maintain this practice until the next flood arrives?
Why can't dredged material be sold for profit (fund southern break wall, etc)	The material on the bed of the estuary (i.e. below the mean high water mark) belongs to the Crown and in the case of the Nambucca River Estuary could potentially be subject to a Native Title claim, as it has never had a mining lease or other freehold title over it. So there could be a number of ownership issues about who has rights to the royalties for these materials. Secondly, any material dredged out of the active coastal zone (which in the case of the Nambucca River) extends a number of kilometres up the Nambucca River and Warrell Creek needs to be put back into the active system, i.e. pumped or placed on nearby beaches etc. If the material is removed from the system, then this will eventually lead to recession of nearby beaches.

Strategy 14.1 talks about "minor dredging" without any mention of environmental impact or evaluation. Dredging may have a significant impact on seagrass beds in the river, may also impact aquaculture sites adversely. Neither of these is mentioned.	State Environmental Planning Policy number 35 (i.e. SEPP 35) deals with the maintenance dredging of tidal waterways by public authorities. **Strategy 14.1** identifies the application/use of SEPP 35 to enable dredging. Any proposal for dredging would require completion of a SEPP 35 application via which environmental impacts, dredge material disposal, etc would be considered and planned for.
Dredging a channel adjacent to Stuarts Island may reduce flood levels	Dredging the entrance and shoals could potentially reduce flood levels upstream. However, this option could prove to be very expensive and may have no identifiable end date as natural shoaling will continue, i.e. how long does one maintain this practice until the next flood arrives?
My family collected 5807 signatures to dredge the river. This should be number 1 priority.	It should be recognised that the dredging of the river entrance could prove to be very expensive and may have no identifiable end date, as natural shoaling will continue. The question arises as to how such an activity may be funded, and whether this application (of potentially public funds) is an appropriate use.
Strategy 11.1 should be more specific re proposal for minor dredging at jetty near Stuarts Island. What is meant by 'minor' to what depth and extent and for what purposes? Small craft only should be launching from this ramp. With shifting sands the problem may no longer exist. The altered flow regime following changes to the causeway may alter the shoaling pattern at the boat ramp	It is acknowledged that the sands in the region of the ramp can change. At present there appears to be some shoaling in the area which restricts usage of the ramp. Minor dredging has been identified (as required) to relocate sands from the immediate vicinity of the ramp to improve access for small craft.
Require safe navigable river, especially at night as there have been a lot of accidents and fatalities on the bar.	**Strategy 14.1** aims to promote actions that allow for the maintenance of safe boating conditions within the estuary. Improvements to the bar crossing are however a different matter due to the very high costs and temporary nature of these works. Please see **Appendix B** of the Estuary Management Plan which provides more advice in this regard.
No review of historical entrance conditions was performed as part of the study nor was any review of the influence of flooding and estuarine process performed as part of the EMS. Flooding was on the original list of concerns as early as 95/96. Omission of these basic issues limits the scope of the study.	**Section 7** of the Estuary Management Study reviews historical entrance conditions based on available information. Flooding issues are typically assessed through the Floodplain Risk Management Process rather than through the Estuary Management Process. Some elements of the Estuary Management Plan may necessitate further flooding assessments i.e., in relation to climate change (see **Strategy 20.1**) and also in relation to any major new potential structures, e.g. blocking the hole in the V-wall (**Strategy 13.2**). The Estuary Management Study and Plan have not tried to identify options to alleviate flooding.
There appears to be a difference of professional opinion about man made islands acting as a sediment sink for marine sand between GHD 1981 flood study and consultant	BMT WBM are not entirely certain of the context and timeframes of GHD's 1981 Flood Study excerpts (as provided), however, we believe they relate mainly to sedimentation processes within canal developments or off-stream waterways (to the main channels) of the estuary. We understand that GHD have identified that sedimentation within these waterways is likely to be due to an imbalance between tidal and fluvial processes (BMT WBM concurs with these views). GHD also refer to the unnamed island to the south-east of Stuarts Island which was reported to be accreting sand. The sedimentation patterns here are again likely to be a complex balance between tidal and fluvial processes. The context of the GHD comments in relation to the above is unclear and further investigation beyond the scope of this study would be required to confirm the trends and implications.

In early EMC minutes, the engineer recommended there should be consideration of the southern wall in the study; this does not appear to have been pursued. Many people believe had original design been completed and not abandoned by Government, we would have a better entrance	**Appendix B** to the Estuary Management Plan provides a better overview of some of the entrance management options that are available for the estuary. The construction of the southern breakwater would require the construction of a sand-bypassing facility (such as is used at the Tweed River entrance to supply the Gold Coast beaches with sand that would otherwise be trapped) to ensure that the breakwaters would be effective into the future. The breakwater and bypassing facility would have very large capital costs, in the order of $20 to $30M (or more) and operating costs of several million per year.
Strategy 9.1 should be afforded a higher rank. Much misinformation has been circulated in the valley about the need to dredge the river to save it from 'completely choking' from sedimentation. We are concerned that many people have been misled into believing the current sediment in the river are a 'new' problem that can be simply fixed by dredging.	There are many competing strategies. It should be noted that **Strategy 9.1** is currently a high priority.
Closure of the hole in the V-wall	
Closing of V-wall would mean this area is subject to constant repair	Closure of the hole in the V-wall would probably necessitate an ongoing maintenance dredging program for the Inner Harbour area as there is a likelihood that with the reduced tidal flows there would be an increased likelihood of sediment buildup. Costs for this dredging would need to be weighed up against the potential benefits provided in terms of access to the sand island, safer swimming, creation of a tourism precinct along Wellington Drive, etc.
Closure of the hole in the V-wall will increase flooding upstream at say Macksville, and reduce flush and flow	There is a risk that closure of the hole in the V-wall may increase flood heights at Macksville. It is however unlikely that the closure of the V-wall would reduce the flush and flow of the overall estuary, as the main channel would be expected to expand (i.e. widen and or deepen) to accommodate the additional tidal flows not passing through the V-wall. This may actually have spin-offs for boating and navigation in the lower estuary and also mitigate any potential flooding impacts. The flooding risk would need to be considered as part of the environmental investigations that will be required as part of any such proposal.
Before any decision can be made on whether or not to close or leave open the V wall, a further study would be necessary to find out what environmental impact closing the wall would have on the area, in particular flooding.	Yes.
Without constant dredging the crossing in Northern training wall up to Stuart Island has never worked. Closing this hole has not been addressed in Study/Plan.	The option of closing the hole has not been addressed in this study, mainly due to the fact that this is a major boating route for boats putting in at the RSL or Gordon Park ramps and accessing the remainder of the estuary. A constrained opening may provide localised benefit in terms of maintaining a deep access channel, however, tidal processes are still likely to deposit marine sands on the inner side of the opening similar to that currently happening at the V-wall. As a result it is likely that dredging will still be required at some later stage to provide navigable access.
Observation has confirmed a time lag of 2 hrs at Bellwood side of causeway 2.5 to 3 hours upstream at the present time. Culverts, closing the V wall not fix problem.	If this comment relates to the 'flush and flow' of the estuary. It should be noted that the entrance is currently fairly constrained by sand build up. Apart from extensive and expensive dredging or a major flood (to clear the entrance) there is not a lot that can be done to improve estuarine 'flush and flow'. The oyster industry of the Nambucca River seems to be able to operate successfully with the current levels of tidal flushing.

The beautiful swimming area would become a stagnant backwater and any worthwhile flushing measures would create more of a hazard to swimmers (with pipe and gratings) than the present hole.	The design for the closing of the V-wall would aim to allow for a reduce level of tidal flow with the aim of maintaining high water quality in the Inner Harbour to promote swimming etc. The design and safety of the pipe and or gratings to enable the tidal exchange would need consideration as part of the assessments associated with the proposal.
Causeway to Stuarts Island	
Culverts are a bandaid solution, bridge is required	Please see **Strategy 3.1**. The option of providing a full span bridge over to Stuarts Island was not considered to meet all of the requirements of the study brief, due to its likely impacts on swimming in the Bellwood Reserve. The consideration of a full span bridge would necessitate a further more detailed environmental investigation to specifically assess the impacts of the change. The option of a full span bridge would also be of significantly greater cost than provision of culverts.
Bridge would improve flow through to Bellwood and to Inner Harbour	This would be a likely outcome. However, the responses of the river to the removal of the causeway over a period of a number of years may be significant. The increased tidal flows (and potentially flood flows) through the channel may result in significant bed and foreshore responses which may necessitate a series of further works to control or mitigate them. If the flow capacity of this channel increases, a corresponding capacity decrease would be experienced in the main channels which may exacerbate boating navigation issues.
Tide free access to golf club has not been addressed. This was on list of concerns as early as 95/96 and is in the brief. I support option for amenities for the foreshore, but all the boardwalks, wharfs, jetties moorings, etc has no environmental benefits and will not fix the problem of flush and flow. It would be wiser to spend money bridging the causeway than providing amenities.	The provision of tide free access to the golf course would require either a bridge or a raising of the current level of the causeway. Council in their design work in relation to the provision of culverts under the causeway have ruled out provision of tide free access due to issues associated with cost. Tidal flushing in the channel between Stuarts Island and Bellwood will be improved by the use of culverts. It is unlikely that a bridge will 'fix the problem of flush and flow' as any increases in flow capacity in this channel is likely to result in a corresponding decrease in the main river channels. This may exacerbate boating navigation issues.
Council investigate "Natural Disaster Mitigation Program" for funding a bridge at the causeway	Such a recommendation would be better made through the Floodplain Risk Management Process rather than through the Estuary Management Process, which does not have a large flooding component.
VRA access issue	The siting of the VRA rescue facilities will need to be reassessed as part of any considerations to close the hole in the V-wall.
Proposed Marina	
Why was the marina not included or detailed in Estuary Management Plan (EMP)	The brief did not require any assessment of a marina. Irrespective, it is not the role of the EMP to either support or discredit such proposals as they are subject to both local and State planning law. However, the following comment can be made. A marina related development would presumably require safe deep-water passage to the ocean to be made available to allow boats to enter and leave the estuary safely. The Estuary Management Study identified that this would likely require the construction of a southern breakwater as well as the construction of a sand-bypassing facility (such as is used at the Tweed River entrance to supply the Gold Coast beaches with sand that would otherwise be trapped). The cost of construction of the breakwater and sand bypassing facilitate (as well as its operation into the future) would have very large capital costs $20 to $30M and operating costs of several million per year.

Take the option put to Council by private enterprise, where they offered to spend $50 million in dredging the river mouth to allow easy access to the open sea and return by large and small boats and the building of a Marina which would help our unemployment and economic structure of our Valley.	The proposal should be consistent with the aims of the Estuary Management Plan (which mainly focuses of the protection and enhancement of the estuarine environment and its values) and the vision of the community for region and estuary.
Oysters, Fisheries and Water Quality	
The wood left behind by old leases is presenting a danger, as this material is not being removed.	Please see **Strategy 10.8**.
Why should I pay part of my rates to an inconsiderate oyster grower for his watertesting for his profit on oysters	The presence of a healthy oyster community within the estuary could be argued to increase tourism to the area, as they are typically a sign of a healthy waterway and the presence of good water quality (please note the oyster industry in the nearby Bellinger River is closed due to water quality concerns). There are also a number of community values in terms of being able to access high quality locally grown produce.
Of all the risks associated with oyster growing we see poor water quality as the most serious. It is therefore extremely disappointing to find this aspect relegated to a medium priority (rank 19) and that it deals with monitoring only. This then appears to be a conflict with the high priority rank 5 of supporting sustainable aquaculture	Maintenance of water quality within the estuary is a high priority. There are several other strategies which aim to improve water quality in addition to **Strategy 12.1**. Examples include: • **Strategy 1** (High), which aims to improve the condition of riverbanks (degrading riverbanks can influence water quality). • **Strategy 2** (High), which aims to lessen impacts of water quality from new development. • **Strategy 5** (High), which provides a variety of water quality, related measures to address and improve water quality within the estuary. • **Strategy 8** (High), which aims to improve the condition of riparian zones, etc.
(The former) strategy 19 should be afforded a higher rank (we suggest 10). Establishing a coordinated and consistent approach to water quality at strategic points through the estuary as early as possible, will provide good baseline data to assess the success or otherwise of the implementation of the strategies outlined in the plan.	This strategy underpins many other strategies, and is one of the few ways means of observing positive (or otherwise) change in the estuary. It can take a number of years to build up a good background of data from which spikes and trends can accurately be identified. In light of this, this strategy was moved higher in the rankings from 19 to 12.
Monitor intensely the development of new subdivision for stripping every piece of vegetation and topsoil, exposing raw earth to be washed into our waterways creating a silt problem.	**Strategy 2.1 and 2.2** aims to improve the performance of developers and Council in managing impacts of development on water quality through improving planning controls and education.
Ban any and all professional fishing and netting of the river west of the rail bridge. This is a breeding area and it does cause considerable devastation, damage to the general river, environment and to a large amount of under size fish, which is concealed and used for crab bait at a later stage	**Strategies 17 and 18** look to improve our scientific understanding of the values of these areas and promote better fisheries management in the long term.
Estuary Management Study to look at netting of fish in the river	Commercial fishing aspects are regulated by DPI Fisheries. **Strategies 17 and 18** have been included in the Plan with the aim of improving our scientific understanding of the values of different areas of the estuary, e.g. seagrass areas and in time promote better fisheries management, which may necessitate a change in fishing practices and or areas.

Numerous tyres exist in the estuary either as homemade wharves, bank stabilising structures or random pollution (escapees from former structures). Their existence and the risks posed to water quality and aquaculture needs to be acknowledged in this strategy.	Please see **Strategy 10.8**.
In Figure 6-1 it is not clear whether the red dash at Wellington rock denotes an oyster lease or hand collect site? The map should also identify known sources of pollution input to the river which impact on the oyster industry i.e. Macksville STP, Newee Ck, acid sulfate runoff from Gumma Gumma Wetland and Watt Ck. Beer Creek drain directs town stormwater runoff into the Nambucca River and especially should be listed. Recently the disastrous West Street development has discharged huge silt loads into the Nambucca river via beer creek during every rain event, having a direct impact on oyster leases in the vicinity of the confluence.	It is a launching ramp. This image is available from the internet, please see http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0010/117973/OISAS-Nambucca.pdf The map has been prepared by DPI Fisheries, and the main pollution sources to the river are currently unknown. Further investigation of the potential pollution input of these tributaries has been allowed for under **Strategy 5.3.** The aim of this strategy also allows for remedial actions to be implemented addressing identified issues. **Strategy 2.1 and 2.2** aims to improve the performance of developers and Council in managing impacts of development on water quality through improving planning controls and education.
Habitat	
Mangroves are menace, choking the riverway and reclaiming riverbanks. They can re-establish as a result of the mud in the banks and low flows. Once there were no mangroves at Macksville.	There were no mangroves at Macksville at one stage as they had all been cleared from the riverbanks. Early explorer logs identify mangroves in the river well up past Macksville. The mangroves are a very cheap and effective way to stabilise banks against erosion and they can provide habitat to a variety of creatures.
Council should introduce a comprehensive Vegetation Management Plan or Tree Preservation Order to ensure impacts to native vegetation are carefully considered and regulated in all new development on private and public land.	It is agreed that there is a need to ensure that impacts to native vegetation are carefully considered and regulated in all new development on private and public land. However, Council has previously decided not to introduce of a Vegetation Management Plan.
Strategy 8 mentions stock impact on area's of high ecological values, but action fail to address problem by the use of stock exclusion fencing and off stream water points. Stock can have far reaching impacts, in particular, loss of understorey and succession plants. Over time this results in decline in species and diversity and therefore ecological integrity. Areas of high ecological or conservation value should be protected from grazing or at the very least have an agreed stock management regime in place that protects the integrity of the ecosystem in perpetuity. Grants available to this end.	Wording of **Strategy 8.1** has been updated to include mention of stock.
Climate change	
Climate change e.g. severe storm events must be addressed in management plan for this area (i.e. Stuart Island, Bellwood park), including any future development of man made islands. Safety of the White Albatross Caravan Park has not been included in the EMS/EMP.	This is outside the scope of the current study. Climate change and impacts is a rapidly emerging area of science and planning. DECC is currently developing a methodology to better assess and define coastal and estuarine hazard under future possible climate scenarios. Once the methodology has been developed and approved by State Government, there is likely to be a greater emphasis on Council's to conduct these studies for their respective areas of management. Nambucca Council should consider conducting a study once the methodologies become available.

Elevation data is now available so that sea level rises of any predicted amount can be gauged and the impacts estimated. The mapping has been done and is available to all Councils. This data has been used in many Shires, including Tweed, Hastings, Taree, Port Stephens and most Sydney Councils, as well as some on the South Coast. We urge Nambucca to buy the available mapping information covering the coastal area of the Shire and to use it in drawing up the LEP.	BMT WBM is not aware of this data. If it is available Council should aim to secure it to assist with implementation of **Strategy 20**.
Monitoring Plan Implementation	
Recommendations regarding monitoring and review of the management plan itself.	Please see **Section 1.5** of the EMP.