Bellingen Shire Council

Bellingen Shire Healthy Rivers Program

Kalang River Health Plan

Department of
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Cover Image
Kalang River estuary

Bellingen Shire Healthy Rivers Program

Kalang River Health Plan

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Foreword

Kalang River Health Plan

Our coastal waterways are under increasing pressure from population growth and change to the traditional low impact industries. Oyster leases dating back to the days of small coastal hamlets are now surrounded by expanding urban and semi rural populations, while agricultural industries such as dairying have become more intensive.

In July 2008 the Kalang River was closed for the recreational and commercial harvesting of shellfish following the detection of human norovirus in oysters.

Funded by the Department of Environment, Climate Change and Water and Bellingen Shire Council, the Kalang River Health Plan has been produced to address issues which affect river health from community and agency perspectives. It recommends actions to address these issues and improve water quality through improved land management practice.

The Kalang River Health Plan is an important component of the long term strategy to improve water quality in the Kalang River and protect industry and the community.

John Williams
Chair
Kalang River Working Group

Acknowledgements

The development of the Kalang River Health Plan was initiated by Bellingen Shire Council and funded by the Department of Environment, Climate Change and Water through the Estuary Management program in partnership with Bellingen Shire Council. Thank you; this Plan could only be developed because of your vision. Many thanks to the Healthy Rivers Reference Group - Mr Ian Turnbull Manager of Vegetation and Environment Bellingen Shire Council; Mr Mohammed Hanif, Natural Resources Project Officer, Department of Environment, Climate Change and Water and Dr Colin Mathews, Coordinator Bellingen Landcare Inc. for their guidance, support and assistance with the development of this Plan, it was much appreciated.

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Thank you to Ms Tania Malone, River Keeper, for your commitment and diligence in bringing together all the information, ideas and views of all parties to make this document a working blueprint for ongoing action.

Thanks also to the many agencies including Bellingen Shire staff that participated in the process and provided significant information needed for this Plan. Finally, but certainly not least, much appreciation to the vast number of Bellingen Shire residents, visitors and industry, particularly the farmers and oyster industry who have supported the Healthy Rivers Program by being involved in the consultations and providing essential information and direction needed for healthy rivers now and in the future.

Mike Colreavy
General Manager
Bellingen Shire Council 2010

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Executive Summary

The Kalang River Health Plan (the Plan) has been prepared on behalf of Bellingen Shire Council (Council) and the Department of Environment, Climate Change and Water (DECCW) under the Estuary Management Program. The Plan has been developed in accordance with the NSW State Government Estuary Management Program to satisfy objectives of the NSW Estuary Management Policy 1992 and the NSW Coastal Policy 1997.

The Plan is a community-driven, action-oriented plan which has, on the recommendation of the community, been written in a style that can be easily understood, with each section able to "stand alone" or be read in its entirety.

The purpose of the Plan is to document the issues which affect river health from community and agency perspectives and priorities, and to assess how these currently impact on water quality and river health. The Plan then recommends actions to address issues and improve management though best practice. The Plan also aims to:

- engage and motivate the community and Council to adopt improved practices and move towards accepted best practice
- identify potential improvements for agency engagement and coordination
- inform Council and the community on water quality issues
- initiate action with all stakeholders
- identify barriers and gaps and improve the coordination of current management activities
- provide a mechanism for monitoring and evaluating change.

A three-part approach to developing the Plan was adopted. This included a community engagement process, a survey of key agencies involved in natural resource management (including government), and a desktop review of relevant literature. In addition, a program reference group comprising Council, DECCW (Natural Resources) and Bellinger Landcare Inc. played an integral role in the planning process. This model of a partnership approach to improve river health was presented as a poster at the 17th NSW Coastal Conference in November 2008.A copy of the abstract and poster are attached in Appendix J.

The community and agencies identified nine key issues as matters that need attention to improve water quality and river health. In order of priority these are:

- agricultural practices
- on-site sewage management systems (OSMS)
- riparian and wetland management
- boating, tourism and recreational impacts
- waste water treatment plants
- forestry, logging and clearing
- stormwater and building construction
- rural roads and bridges
- water quality monitoring.

An overview of each of the priority issues is outlined in the document, together with the current status, a summary of the community and agency response, best practice management, and barriers and key considerations for change. This information forms the basis of the strategic management of each identified issue and is summarised in Appendix C.

Both the agencies surveyed and the community recognised that, in order to ensure effective implementation of the Plan, a number of areas that should be managed and coordinated by Council's River Health Program. These are:

- Education - integrating educational strategies within a holistic framework of actions such as creating supporting environments, building appropriate policies, reorienting services and strengthening action.
- Coordination - Council as the driver of the Plan will need to ensure coordination between the key agency stakeholders and the community. This will be required both internally within Council, with its defined roles and responsibilities of divisions, as well as through the development of partnerships with external agencies in order to achieve actions. In some instances this may need to be formalised through agreed Memorandum of Understanding or Partnership Agreement. A River Health Working Group, which includes key stakeholders and community representatives to oversee and drive the process, supported by a continuing River Keeper position, was recommended as a model to ensure continuing coordination. The inclusion of universities and schools in the Program was also strongly recommended.
- Communication - the development and implementation of a communication strategy is needed to enable participation in and monitoring of the Program by the community,
- Program Sustainability - the most significant key element in the effective implementation of the Plan identified by all stakeholders is to sustain the implementation and actions. This will require a long term commitment by Council and its partners to see the Plan driven and implemented.

Council is committed to improving water quality and therefore implementing the actions within the Plan. This is vital, as the community will be looking for leadership and demonstrated resolve from Council in implementing actions that are within their direct management control and legislative jurisdiction, as well as being responsible for guiding positive change in partnership with the community and other agencies. One of the key concerns will be to ensure that Council and other agencies focus on improving compliance in their respective areas of jurisdiction, as well as communicating compliance responsibilities and non-compliance penalties to support other strategies and motivate change.

DECCW is supporting the Plan and the implementation of actions to improve water quality and river health through partnership programs with Council under the Estuary Management Program. Key agencies have indicated a willingness to work together and the community has shown its readiness to collaborate with government and other stakeholders to bring about the improvement in river health. There is a groundswell of support and momentum for the Program that will assist in this process.

The Plan should be viewed as a living document that adapts to meet both opportunities and needs to improve water quality and river health for the Bellingen Shire. To commence the implementation of the Plan, the priorities and actions set out in the following table will be addressed over the next three years.

Strategic Action for the Next 3 Years

Issue	Strategy	Priority
Agricultural Practices	Review locally relevant sustainable farming, engagement and implementation strategies and programs	1
	Map respondents (and farming areas) who have shown a commitment to Landcare improvement and river health Map farming areas to identify cattle access to river	2
	Develop calendars of farming production/work schedules to identify intervention times and plan appropriate times for strategic workshops and on-ground activities	2
	Facilitate a working group of key stakeholders, e.g. Department of Industry and Investment(Agriculture and Fisheries), Department of Water and Energy, Northern Rivers Catchment Management Authority, Council, Landcare, farming representatives, River Keeper and Oyster industry Identify core duties, functions, legal responsibilities, jurisdictions and resource availability; and clarify status with landholders	2
	Develop an agreed strategy to implement the staged adoption of good management practice across the Shire Integrate strategic actions utilising universities and schools	2
	Identify high profile farmers and community members who can be utilised as “key champions” as part of a “train the trainer” process	2
	In conjunction with agencies and farming representatives, develop a toolbox of key improvement resources, e.g. farm assessment tools, management options, funding information	1
	Identify and gain funding to develop and implement an awareness raising and media strategy to highlight the impacts of agriculture on water quality and river health - highlight POEO Act implications and pollution and promote the benefits of sustainable farming	2
	Organise and facilitate train the trainer work shops for key peer farming representatives to develop awareness and improved farm management and production information and address river health impacts	1
	Strategically write to and contact farmers in reaches to organise workshops and information and assessment days Target key people identified from consultations Target new residents to increase knowledge and skills to address impacts; encourage formation of river care groups/neighbourhood groups to improve resources	1
	Organise and facilitate workshops on good practice management, identify enabling factors and barriers to good practice management in order to utilise an “Education for Sustainability” approach, review and address after each workshop	1
	Work with farmers to develop 5-year management plans to improve outcomes	3
	Identify resource and funding needs, and work in reaches to access funding	3
	Promote landholders who have adopted good practice management strategies Highlight landholder improvement issues	3
	Assess and report on improvements, review and identify next stage of the strategy	2
	Work with the Department of Water and Energy to address more responsible and efficient water use (water licences)	2
	Liaise and work with all relevant stakeholders to develop and implement strategies to address debris removal in relation to flood impacts	2

Issue	Strategy	Priority
OSMS	Facilitate a presentation to Council by key agency representatives who have been involved with successfully developing and implementing a comprehensive OSMS strategy Present the proposed developed proposal to the group	1
	Develop and implement a sustainable Onsite Sewage Management Strategy for Bellingen Shire Consult with key agency representatives who have been involved with successfully developing and implementing a comprehensive OSMS strategy to identify the processes and information needed for development and implementation Liaise with other Councils to identify key expert personnel utilised. OSMS experts and Council staff to review current performance of systems in Bellingen Shire and improve systems performance	1 2
	Market the "fee for service" needed for implementing the OSMS strategy and promote the benefits to the community	1
	Implement the OSMS strategy, utilising a "fee for service" monitoring program of all OSMS in Bellingen Shire	1
Ongoing	Ensure Council staff have access to training and development on best practice strategies Ensure the implementation of ongoing best practice development	2
	Assess the needs of owner/occupiers in relation to best practice management of OSMS	2
Short Term – ongoing	Continue and expand an educational program to improve owner/occupier management using adult education principles	2
	Investigate and address impacts from camping along the river, incorporating compliance where appropriate	2
Riparian and Wetland Management	Implement the strategies of the Council's Estuary Management Plan – Management Objective 21 – Incorporate appropriate riparian protection zones within Council's planning framework to safeguard against potential future development and land use change	2
	Develop a process to undertake a vegetation mapping survey building on previous work (in conjunction with the Estuary Management Plan's erosion study)	1
	Develop and implement a weed control strategy for private land, public land, Crown reserves and roadsides Develop and implement communication strategies, raise awareness and implement participatory educational workshops Target key weeds in specific landscapes Investigate options to assist landholders with weeds management and revegetation	2 3
	Raise awareness of the needs and purpose of improving riparian vegetation through the media, letters to landholders, and promotion through suggested local networks and Landcare/river care groups Promote and support with resources as appropriate neighbourhood, Landcare approaches to riparian management Liaise and work with communities to identify needs, information and assistance required to implement good practice management	2
Short to Medium Term	Utilising key stakeholders, facilitate workshops to assist landholders with improving management and maintenance of riparian land Hold field days to showcase good practice management for riverbank restoration and investigate options to increasing landholder participation. Provide discussion forums on overcoming difficult management issues	2

Issue	Strategy	Priority
	Liaise with funding bodies in relation to landholders concerns regarding funding access and utilisation Work with Council's Grants Officer and other key stakeholders to investigate funding to implement actions Facilitate working groups with agencies and communities to improve access to funding	1
	Liaise with Council representatives regarding improving vegetation management that involves work across private and public land to improve processes and cooperation	1
	Promote improvements and achievements through the media and newsletters Investigate rewards systems	1
	In conjunction with Landcare facilitate the development of a working group of all key agencies that are involved with riverbank restoration. Identify requirements needed from each agency for undertaking riverbank restoration works; Identify good practice processes needed for approvals Develop an information kit outlining the approval process requirements and information regarding approved management options	2
	Work with key stakeholders and land owners and raise awareness on the issues concerning river oaks and the recommendations for managing them and improving bank stability as outlined in the leaflet released by Bellingen Landcare in cooperation with Northern Rivers Catchment Management Authority Discuss issues at workshops	2
Boating, Tourism and Recreational Use	Implement the recommendations of the Estuary Management Plan Incorporate the recommendations of the consultations within the code of conduct	1
	Engage with key representative groups including universities and schools to implement good practice adoption	1
Short Term and Ongoing	Work with and motivate the community to identify and report negative behaviours as well as noting successful positive strategies (including noise) In conjunction with NSW Maritime, actively advise the community about the required information needed for reporting breaches and negative behaviours	2
	Liaise with NSW Maritime to raise their profile and presence on the rivers particularly during peak periods	1
	Liaise with NSW Maritime to improve and update signage around the rivers	1
	With NSW Maritime, Council and Coastline and Estuary Management Committee, review information at the completion of studies, surveys and implementation of interim code of conduct	2
	Liaise with Council and undertake an audit of public toilets in recreational areas that are unsewered to ascertain whether they are functioning properly Rectify any problems Improve knowledge and awareness of Council's effluent dumping points	1 2
Short to Medium Term	Liaise with Council, and key stakeholders in (e.g. Mylestom and Repton) to improve the reserve areas and decrease erosion on river banks from indiscriminate pedestrian use	2
	Work with Department of Industry and Investment-Fisheries, community groups, schools and universities to address over fishing and over crabbing	2
Waste Water Treatment Plants	Council to install back up generators for Waste Water Treatment Plants to stop surcharges during blackouts	1
	Improve management and operations to minimise license breaches Investigate and implement options to reduce sediment and nutrient concentrations leaving treatment facilities, e.g. constructed wetlands Update and implement new emergency spill procedures and complaint procedures Raise awareness within the community to notify Council Water and Sewerage departments of any sewerage overflows or spills	1

Issue	Strategy	Priority
Short to Medium Term	Liaise with DECCW (EPA) and Area Health Services to investigate strategies to develop and implement best practice to plan for medium and long term improvements	1
	Consult with Council Water and Sewerage staff to identify strategies for medium and longer term improvement	
	Work with Council Water and Sewerage Engineers to develop and implement a best practice strategy and implement best practice pilot projects	2
Short to Medium Term	Undertake testing to identify and reduce leakages	1
	Proactively promote Council improvements through the media	2
	Educate the public regarding improved practices	
	Undertake inspections to rectify illegal connections	1
Short Term to - Ongoing	Work with Council Water and Sewage Engineers and Staff, businesses and community, Tourism, (incorporating events and festivals) to identify current practices, and develop and implement strategies to improve impacts on water quality	1
Forestry, Logging and Clearing	Facilitate staff training in relation to river care and catchment management	1
Stormwater and Construction Site Management	Council to strengthen its regulatory requirements by identifying and implementing water sensitive urban design criteria for new developments	1
	Council to insert a provision in its adopted Fees and Charges Schedule that allows for the collection of funds for the peer review of proposed Stormwater Strategies.	
Short to Medium Term	Undertake a stormwater study incorporating new and current developments (that incorporates s. 7.3 and Stormwater Management Plan, Water Sensitive Urban Design principles; includes water quality information, field study to identify and map stormwater data, and the identification of assets, their location and the type of mitigation works)	1
Ongoing	Ensure Council staff have access to and implement best practice strategies	2
Short to Medium Term	Develop and implement a best practice Stormwater Action Plan for Bellingen Shire including education	2
	Develop and implement a policy and an implementation process for managing compliance	1
Short to Medium Term	Develop and implement a holistic building and construction strategy incorporating social and environmental impacts	2
	Investigate with Council the feasibility of providing dog waste disposal bags at key areas in the Shire, and implement as appropriate	1
	Liaise with key entertainment area managers regarding a strategy to reduce cigarette butts on the streets	1
Water Quality Monitoring	Ensure the implementation of the strategies of Management Objectives 1 and 3 of the Estuary Management Plan	2
Short to Medium Term	Collate and provide access to current water sampling results	2
	Provide periodic reports on waterway health	
	Work with the regional working party to develop and implement a Ecosystem Health Monitoring program for the region	2
	Ensure the program integrates current sampling	

INTRODUCTION

Background

Plate 1. Kalang River (photographer unknown)

Bellingen Shire residents have a high level of environmental awareness, for many it was the environmental attributes which attracted them to the Shire. The rivers are a central focus for the community. The Kalang River originates in the Scotchmans, Roses Creek and Oak State Forests and flows through to the coastal town of Urunga located at the entrance of the estuary system where it meets the Bellinger River.

Plate 2. Kalang River (near Picketts Hill Ck)

Plates 3 and 4. Kalang River - Urunga

While the Kalang River (as with the Bellinger) originates in pristine areas, human influences have significantly impacted on the rivers resulting in declining water quality in the estuary system. This was highlighted with the closure of the Kalang River in July 2008 to recreational and commercial harvesting of shellfish following the detection of human norovirus in oysters. The closure has caused community anger and concern over the poor water quality for recreation and industry.

Council has recognised a need for a program that would take a holistic approach to address the factors that affect river health. As part of this program it was acknowledged that there was a need to establish a coordinated plan of action to improve water quality and health in the Kalang River (as with the Bellinger River). This plan would reflect both the community's and agencies' priorities, and be developed and implemented in accordance with their priorities using evidence based strategies.

In response to this identified need, the NSW Department of Environment, Climate Change and Water (DECCW) and Bellingen Shire Council (Council) continued their existing partnership, and through a grant from the Estuary Management Program, have jointly funded the development of the Kalang Healthy Rivers Plan (the Plan). The Plan has been developed in accordance with the NSW State Government Estuary Management Program to satisfy objectives of the NSW Estuary Management Policy 1992 and the NSW Coastal Policy 1997.

Bellingen Shire Council has maintained the position of River Keeper to develop, implement and manage the Plan and Program. This requires identifying, improving and strengthening current practices, instigating new initiatives and ensuring an integrated approach with other relevant plans such as the Bellinger Kalang Estuary Management Plan and the Northern Rivers Catchment Management Authority Catchment Action Plan.

This was supported by all stakeholders as it was deemed unacceptable for no action or intervention to be undertaken to address the issues of water quality in the Kalang.

What is a Healthy Kalang River?

The Healthy Rivers Commission defines a healthy water system as one where it enables a broad range of environmental, social and economic values and practices to be pursued. Essentially, it is a river where a balance may be struck between human use and the ecology of the river—a balance where the integrity of the system is still preserved, a reasonable level of human needs can be met, and where both can be sustained into the future.

To determine a direction for the Kalang, the community through a systematic planning process have defined their values and expectations for the river. This model of a partnership approach to improve river health was presented as a poster at the17th NSW Coastal Conference in November 2008. A copy of the abstract and poster are attached in Appendix J.

Landholders across the Shire were asked how they defined a healthy river and why this river was important to them. Their response was that it was one that:

- sustains a broad variety of aquatic life healthy ecosystem
- is free of pollutants, including chemicals, oil, rubbish and *E. coli*
- has stable banks, little erosion, good vegetation on river banks, is weed and pest-free, with good vegetation (native plants retaining banks and preventing erosion, weed-free riparian zone for at least 25 m on both banks)
- maintains high clarity, non-turbid flows and is algae-free.

Plate 5. Riparian vegetation, Kalang River

The key values were:

- aesthetics, pleasure, pride in where we live, peace and tranquillity, relaxing, attractive to visitors
- added property value – increased fertility for river flats
- crucial habitat for all living organisms
- high value for recreation.

The community recognised that the river quality is now under threat, and that they don't want to see the river deteriorate any further. Negative impacts to the river and tributaries are seen to affect the quality of the surrounding environment. There is a need to address these impacts, so the situation doesn't worsen. Maintaining the current status is not enough.

Norovirus and Precautionary Closure of the Kalang River

The Kalang River oyster estuary was placed under precautionary closure by NSW Food Authority on 23 July 2008 following two outbreaks of gastroenteritis suspected of being linked to oyster consumption, and the subsequent epidemiological advice which established a statistically significant link with Kalang River oyster consumption and gastroenteritis. Oysters collected for viral testing from the Kalang River on 24 July and 4 August 2008 were found to be positive for norovirus.

In response to the closure, the Kalang River Working Group was formed to coordinate inputs from key organisations to address the problem in a timely and effective manner. The Working Group comprises representatives from NSW Department of Premier and Cabinet, NSW Food Authority, Bellingen Shire Council, Department of Industry and Investment NSW, NSW Health, NSW Department of Environment, Climate Change and Water, Northern Rivers Catchment Management Authority and Kalang River Oyster Growers Association. The group subsequently initiated working links with two academic consultants to build on work conducted by the NSW Food Authority, Bellingen Shire Council and other stakeholders in an attempt to track the source of the problem and to test for any continuing presence of the virus.

The agreed approach is to work with all stakeholders to identify and rectify pollution sources in the Kalang River, address public health implications and satisfy the NSW Food Authority re-opening criteria for the Kalang River oyster industry

The identification of norovirus genogroup I as well as genogroup II (normally associated with human infection) in Kalang River oyster samples suggests contamination via human effluent or infected body substances. The priority task has been to quickly identify all potential contamination risks, investigate the current status of those risks and either confirm or eliminate causation.

To this end, Bellingen Shire Council has checked each aspect of its human waste management infrastructure and operational practices in an effort to locate and eliminate any identified contamination source. Other possible sources include on-site sewerage management systems and private reticulation systems. A great deal of work has been undertaken in risk assessments and on-site inspections, as well as system testing and oyster monitoring programs. Unfortunately these investigations were disrupted by a number of major floods during 2009 and to date, despite all efforts, no definite contamination point source has been identified.

A strategy has been devised to improve the quality of water in the Kalang River and Council is currently in the process of implementation. This strategy includes, among other things, the routine inspection of on-site sewage management systems within close proximity to waterways and the upgrading of systems to meet current standards. In addition further monitoring and testing continues to provide more definitive information about possible contamination sources within the Kalang River.

Purpose of the Kalang River Health Plan

The purpose of the Plan is to document the issues which affect river health from community, and agency perspectives and priorities, and to assess how these currently impact on water quality and river health. The Plan will then recommend actions to address issues and improve management though best practice. The Plan also aims to:

- engage and motivate the community and Council to adopt improved practices and move towards accepted best practice
- identify potential improvements for agency engagement and coordination
- keep Council and the community informed on water quality issues
- initiate action with all stakeholders
- identify barriers, gaps and improve coordination of current management activities
- provide a mechanism for monitoring and evaluating change.

Methodology

A three-part approach to developing the Plan was adopted. This included a community engagement process, a survey of key agencies (including government) involved and a desktop review of relevant literature. In addition a program reference group comprising Council, DECCW (Natural Resources) and Bellinger Landcare Inc. played an integral role in the planning process.

The community engagement process ensures that the strategies and actions developed meet identified community needs and are appropriate, effective and sustainable. In addition, as outlined by Phil Smith in the Better Water Quality workshops, community engagement, if undertaken effectively, can produce the following outcomes:

- more effective program outcomes and projects undertaken as participants become the owners of the outcomes
- trust and credibility are built with the community having a better understanding of process boundaries and constraints
- mobilisation of volunteer energy leading to more cost-effective strategies
- community skills and experience strengthen decision making
- better management of environmental, social and political risks as transparency and equality improves confidence and reduces the potential for conflict
- the possibility of strong long term relationships is strengthened.

As a result, the process has generated extensive support for the program, with the intention of subsequent ownership of the Plan by the community.

Using this process the Plan was developed through:

- research and reviews of related literature, plans and information from the Premier's Working Group
- consultations and interviews with the community,
- surveys with key agency stakeholders
- a desktop review of water quality issues and management (Birch Aquatic Ecology Services 2008).

Community Consultation

The first part of the consultation process focused on landholders adjacent to the Kalang River. Letters were sent to each of the landholders inviting them to participate in the development of the Plan.

To facilitate the consultation process, participants were asked the questions:

- What do you see are the main issues affecting and impacting on water quality and river health, and what are the causes?
- What current actions are being or have been undertaken to make improvements - and how effective were these?
- What are the barriers to achieving more effective solutions?
- What future actions do we need to undertake to manage and improve the issues?
- What steps need to be undertaken?
- What contribution are you prepared to undertake to improve water quality and river health?

Community responses are presented geographically in Appendix A.

Agency Stakeholder Survey

Natural resource management has multiple agency stakeholders operating under a number of regulatory and policy frameworks. Key agency stakeholders were surveyed with additional questions relating to core priorities and functions, current operations and opportunities relating to education and other activities, coordination, resources and water quality or river health monitoring. Pertinent information relating to agency stakeholders is outlined in Appendices D and E.

Responses to these surveys provided a legislative, policy and priority framework for water quality issues in the local context. The results of the consultations and surveys were analysed and summarised by agency response and by location across the hire. The responses were then allocated a priority rating of high and medium, based on frequency of response (as outlined in Appendix B). The strategic approach tables within the Plan provide a summary and address the high and medium priorities. This qualitative approach was determined by the reference group as the most appropriate methodology for prioritising responses. To monitor and evaluate effectiveness and ensure accountability, the tables outline the strategies and performance indicators needed to achieve the identified objectives. These are linked to intended timeframes with allocated responsibility, and are categorised as short, medium and longer term.

With the vast range of priority areas, these timeframes are set at:

- Short term – 1–2 years
- Medium term – 3–5 years
- Longer term – 5–10 years.

The achievement of the key results within these intended timeframes will be dependant on resources, both human and financial opportunities, and readiness for change.

Desktop Review

A desktop study, or literature review, was undertaken to identify the extent of issues, the possible implications and current best practice scenarios for management. This included the review of documents such as Council's Growth Management Strategy, Estuary Management Plan and numerous other relevant documents.

Strategic Approach

The Plan synthesises and documents the collective findings of these processes and from this presents a summary of strategic approaches to the management of each identified issue, guided by currently understood best practice management. Best practice management is documented for a number of the key issues as listed in Appendix G. It is based on techniques, methods, processes, incentives and/or rewards that are more effective at delivering a particular outcome. These in turn are based on efficiency and effectiveness and ability to be adapted and applied to the local situation. For the purpose of this Plan, they include guidelines, pollution control measures, management and treatment techniques, engineering systems, supporting functions, e.g. training and equipment maintenance, operational or procedural practices, land use management and change processes.

Links to Other Documents

The Kalang River Health Plan is linked strategically and operationally to a number of key documents.

Bellinger River Health Plan

This plan is the sister document to the Kalang River Health Plan and focuses on the issues that are crucial to the Bellinger catchment. The actions from the Bellinger and Kalang Plans overlap and many are common to both. They have been designed to be implemented in partnership.

Bellinger Kalang Estuary Management Plan (EMP)

The EMP was adopted by Council in 2008 and provides strategic direction for the improved management of the estuarine zone of both the Bellinger and Kalang Rivers. A number of the core items are duplicated in the Kalang and Bellinger River Health Plans. The implementation of both River Health Plans will have positive impacts on the estuarine zone and they are therefore closely linked.

Other Council Plans

The Plan also ties in closely with Bellingen Shire Council's Growth Management Strategy, identifying possible impacts of future land use changes on the river system. These matters are being taken into account in the development of Council's Local Environment Plan and, from an operational perspective, Council's annual Management Plan.

Northern Rivers Catchment Action Plan (CAP)
The Plan will address a number of targets within both the water and community themes of the CAP.

- *Management Target CCB1 – Awareness, Knowledge and Skills*
  By 2016, there is an increase in community awareness, knowledge and skills in relation to Natural Resource Management.
- *Management Target CCB2 – Community Engagement*
  By 2016, there is an adequate engagement of community engagement and collaborative partnerships in Natural Resource Management and adequate trust in Natural Resource Management institutions and processes.
- *Management Target CCB3 – Community Support*
  By 2016, there is an adequate level of community capacity building support, including resources and infrastructure.
- *Management Target W1 – River Structure, Riparian Vegetation and Fish Passage*
  By 2016, rehabilitate and protect the stream health (in terms of structure, riparian vegetation and fish passage) of 60% of stream length in all identified streams in priority sub-catchments (15% to be completed by 2009).
- *Management Target W3 – Water Information and Education*
  By 2016, 100% of Local Government authorities actively participating in water monitoring/environmental education networks (key networks established by 2009).

NSW State Plan
The Plan addresses the following target from the NSW State Plan.
Priority E4: Better outcomes for native vegetation, biodiversity, land, rivers and coastal waterways.
Implementation of this plan will ensure delivery on the NSW Government's state wide targets for Water specifically:

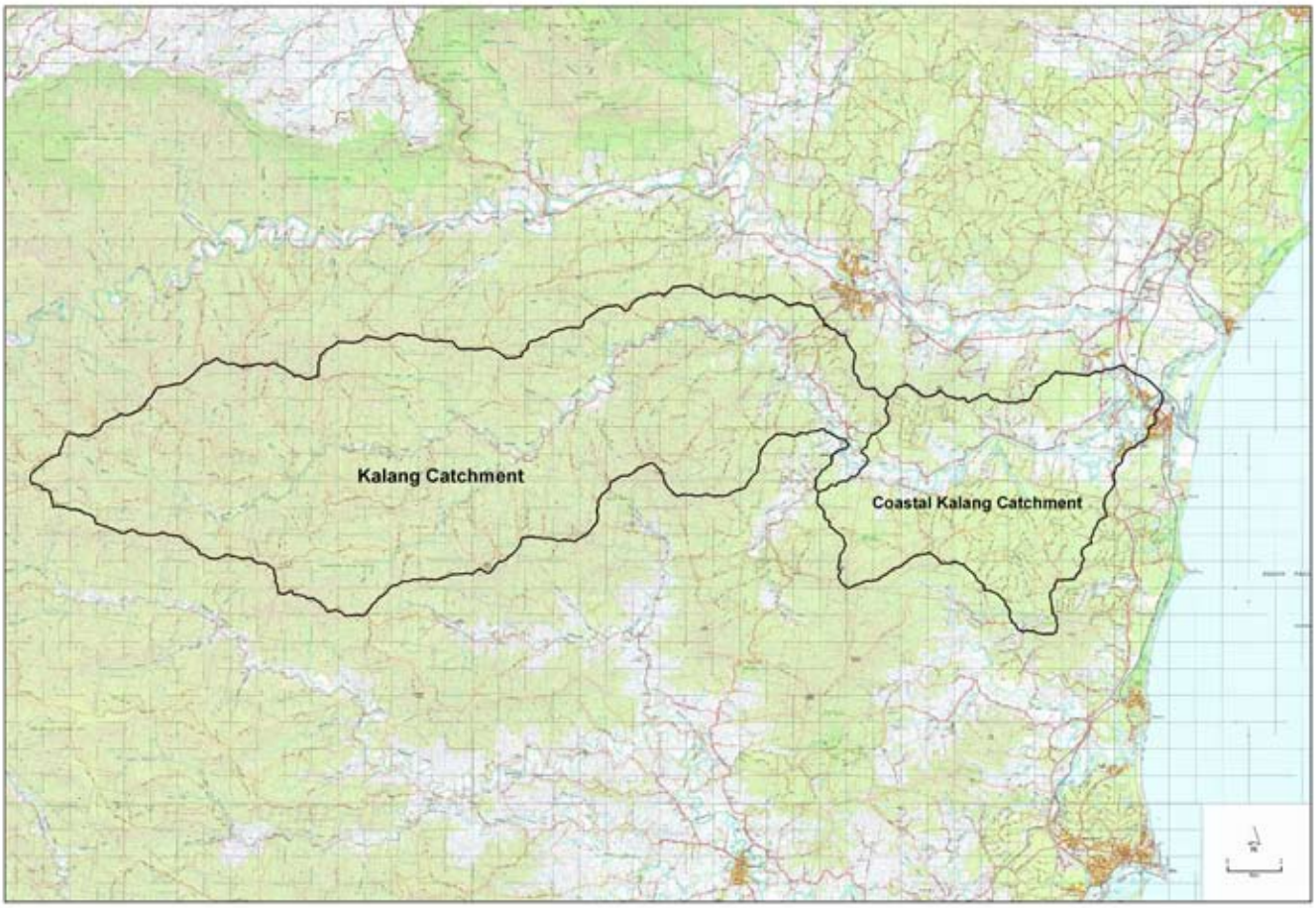
- by 2015 there is an improvement in the condition of riverine ecosystems
- by 2015 there is no decline in the condition of marine waters and ecosystems
- by 2015 there is an improvement in the condition of estuaries and coastal lake ecosystems.

The Plan is aligned with a number of pieces of legislation and policies which are identified both within the body of the Plan and listed in Appendixes H and I.

Study Area

The Bellingen Shire is situated on the mid-north coast of NSW approximately 360 km south of Brisbane and 520 km north of Sydney. The Shire has an approximate area of 1604 km^2 while the Kalang and Bellinger Rivers have a total catchment of 1110 km^2. The Kalang River is estimated to have a catchment area of 330 km^2, while the Bellinger has some 780 km^2.

The climate of the Shire is sub-tropical with warm, wet humid summers and mild, dry winters. Annual average rainfall for the area is 1526 mm with the majority of rainfall occurring in the summer period of December to April with average monthly rainfalls of 138–218 mm. Annual rainfall is up to 1904 mm in the upper portions of the catchment at Dorrigo, and smaller in the lower portions of the catchment (1370 mm) at Urunga. The relatively high rainfall and steep catchment slopes exacerbate impacts on water quality and river health.



Location Map Kalang Catchment Areas

Plates 6 and 7. February 2009 Floods Urunga

The upper catchment of the Kalang/Bellinger system is predominantly well vegetated. More than half the catchment area is contained within State Forest, National Parks and Nature Reserve boundaries (Lawson and Treloar 2003). Logged native forests are the next major land use type, followed by agriculture, with beef cattle, dairy cattle, small fruit and nut operations, small vegetable and cut flowers operations represented. Urban areas within the catchment are dominated by the towns of Urunga and Bellingen, and there are a number of small village settlements including Fernmount, Repton, Raleigh and Mylestom. Rural areas include Kalang, Newry Island and Brierfield. The dominant land uses on the river floodplain are dairy and beef cattle farms, taking advantage of the relatively rich soil.

KEY RIVER HEALTH ISSUES

Agricultural Practices

Overview

A major land use within the Kalang/Bellinger catchments area is agriculture. Agricultural pursuits within the Shire include grazing, dairy farming, turf farms, cropping (e.g. grains, corn, potatoes, and garlic), horticulture (e.g. macadamias, olives, pecans and cut flowers), intensive animal production (e.g. piggeries, chicken farms) and aquaculture.

Plates 8 and 9. Stock access on river banks

The specific issues and impacts associated with agricultural practices include the following:

- stock access - increased risk of faecal contamination, trampling of riverbanks, damage to riparian and in-stream vegetation, crossing impacts
- runoff of fertilizer, pesticides, sediments and faecal matter
- drain management, on-farm waste disposal, and dead stock disposal.

It is recognised that agriculture is an integral part of the Shire.

Plate 10. Stock access surrounding oyster leases

Plate 11. Drainage on farms

Current status

A wide range of best practice actions have been undertaken to varying extents including on-ground works and community awareness activities which benefit water quality. These have occurred in various geographical areas and within industry groups and to various extents both through individual or group action. For example, the Department of Industry and Investment has undertaken the program Dairy Farmer Targets for Change; this is voluntary program with the benefit of giving participants access to funding on completion. Currently 9 out of 11 floodplain dairy farmers have undertaken the program in conjunction with Bellinger Landcare. The dairy farmers involved have identified areas on their individual farms where, using a staged plan of action, improvements in water quality and river health can be achieved.

Additionally, a range of agencies work with farmers in different capacities, offering advice and suggestions in an extension role. They foster on-ground works on both an individual and workshop basis, but these are not coordinated actions.

The *Protection of the Environment Operations Act 1998* deems Council to be a Regulatory Authority, requiring the prevention of pollution to waterways. Water pollution is defined under Schedule 5 of the Regulations. With specific reference to agriculture, this includes:

- Any animal matter of any description, including (but not limited to) carcasses of animals, parts or remains of animals, offal, flesh and bones
- Any plant matter of any description, including (but not limited to) vegetable or fruit wastes, leaves, grass, trees, wood, sawdust, shavings, chips, bark or other forest products or refuse
- Any ashes, soil, earth, mud, stones, sand, clay or similar inorganic matter
- Any washings or spoil from any mineral processing or extractive operation, from any dredging operation or from any other industrial, agricultural or commercial activity
- Any matter that contains faecal coliforms or faecal streptococci.

Plate 12. Cattle in river

Currently there are no planning or policy procedures in place to manage stock access to riverbanks. Council investigates complaints, however there is no strategic auditing or inspection program in place.

Community and Agency Response

Common response from community and agencies	
Agricultural impacts highest priority. Need to address stock and agricultural impacts in a proactive way. There are a range of agreed best practice management strategies. Increased agency coordination and coordination and involvement with landholders to make improvements. Implement education strategies on best practice and good practice fact sheets. Plant riparian vegetation and have exclusion zones	
Community specific response	*Agency specific response*
Lobby for alternate and flexible funding sources and funding timeframes	Regular surveillance and audits of farms should be undertaken to ensure compliance.
Recognition by agencies of the need for maintenance funding	Proactive strategic approach to address impacts; investigate other Council strategies to address agricultural impacts and compliance
Partnership development between landholders and Council to develop and implement strategies for improvement including funding; identify information and skill needs	Farmers and other river users need to work together
Holistic approach, with actions that meet both farmers needs, e.g. for productivity and time and water quality improvements; explore alternative strategies for improvement, monitor to show improvements	
Audit farms to assess current status and cooperatively develop action plans for improvement	
Holistic weed management and removal practises	
Conduct forums on current practice vs. best practice (in specific areas, e.g. fertilizers) and Provide education and problem-solving discussions, workshops and best practice demonstrations at field days; Build on what has worked elsewhere, utilise experience and skills of farmers (local and elsewhere) with best practice (options and cost effectiveness) and build on local networks	
Fence off the river's edge and install other watering solutions. Plant more shade trees in the paddocks	
Remove debris from water's edge and in river where possible	
Involve university groups to increase man power and education within the community. Include school groups in programs to educate from the youth up	
River Health Program needs to extend reach to other landholders and land uses, e.g. turf farms and piggeries to assess and address impacts; needs to find ways to engage land holders who are sceptical of government Target key landholders	
Provide incentives to farmers who do comply with better practices	
Domestic waste disposal practices should be investigated and better practices implemented where necessary	
Monitoring and implementation of controls on water pumping licences	

Best Practice

Best practice in agricultural systems is constantly evolving. Current understanding of best practice in relation to natural resource management recognises that Whole Farm planning is the basis for an integrated approach to maximising production whilst protecting the natural resources both within and beyond the property boundary. In relation to river health the following are key considerations for best practice.

- Stock access/riparian vegetation – controlling stock access by fencing/time management.
- Sustainable grazing along riverbanks can be achieved by careful management. Controlling stock access during the regeneration of riparian plants is particularly important.
- Fencing must be planned carefully to avoid problems with floodwaters.
- The provision of off-stream watering. This removes the need for cattle to regularly visit the riparian zone.
- Healthy riparian buffers trap sediment and nutrients and reduce the erosive potential of floodwaters by increasing channel roughness (resistance to high flows) and stabilising soils.

Barriers and Key Considerations for Change

- Clarification of Council's roles and responsibilities and strategies for ensuring compliance
- A strategic, proactive Council policy and implementation of a regime of compliance, auditing and education is required, linked to monitoring, evaluation and reporting.
- Coordinated approach between agencies and landholders
- Holistic flexible approach for improved agricultural practices
- Funding issues – availability, flexibility, timing, application processes, knowledge of source
- Lack of economic and physical resources, planning and time management to implement on ground actions
- Attitudes and knowledge/recognition of cumulative impacts of agricultural practices on water quality
- New residents unaware of best practices
- Lack of respect for the river and land
- Perceived conflict between needs
- Service costs
- Licensing requirements do not cover viruses
- Poor signage
- Hidden information
- Clean up the oyster farming industry as a whole
- Restrict chemical and fertilizer use within exclusion zone of the river
- Increase the flow of the river by removing silt and debris.

STRATEGIC APPROACH TO AGRICULTURAL PRACTICES IMPACTS: EROSION, SEDIMENTATION AND POLLUTION			
OBJECTIVES	**STRATEGIES**	**PERFORMANCE INDICATORS**	**TIMEFRAME/ RESPONSIBILITY**
Increase the number of farmers who are implementing sustainable farm management practice	Review locally relevant sustainable farming, engagement and implementation of strategies/programs	Evidence-based successful intervention strategies and programs are documented	Short to Medium Term BSC - River Health Program
	Map respondents and farming areas who have shown a commitment to Landcare improvement and river health Map farming areas to identify cattle access to river	Baseline spatial/community information for intervention is established	Short Term BSC - River Health Program
	Develop calendars of farming production/ work schedules to identify intervention times and plan appropriate times for strategic workshops and on-ground activities	Key intervention times are identified	Short Term BSC - River Health Program
	Facilitate a working group of key stakeholders, e.g. Department of Industry and Investment (Agriculture and Fisheries), Department of Water and Energy, Northern Rivers Catchment Management Authority, Council, Landcare, farming representatives, BSC - River Health Program and oyster industry Identify core duties, functions, legal responsibilities, jurisdictions and resource availability; and clarify with landholders	A coordinated response and implementation plan is developed	Short Term All core stakeholders
Decrease the impacts of farming in relation to improving water quality, increasing healthy riparian vegetation and improving river bank stability	Develop an agreed strategy to implement a staged adoption of good management practice across the Shire Integrate strategic action utilising universities and schools	Improved and increased resources to address agricultural impacts	Short Term All stakeholders
	Identify other key farmers and community members who can be utilised as “key champions” as part of a “train the trainer” process	A pool of farmers across the Shire agree to be trained in farm management practice	Short Term Landcare BSC - River Health Program Northern Rivers Catchment Management Authority Farmers
	In conjunction with agencies and farming representatives, develop a toolbox of key improvement resources, e.g. farm assessment tools, management options, funding information	Resource kit addresses the issues from both farmer and agencies perspectives	Short-Term Department of Environment, Climate Change and Water Landcare BSC - River Health Program Northern Rivers Catchment Management Authority Farmers

STRATEGIC APPROACH TO AGRICULTURAL PRACTICES IMPACTS: EROSION, SEDIMENTATION AND POLLUTION			
OBJECTIVES	**STRATEGIES**	**PERFORMANCE INDICATORS**	**TIMEFRAME/ RESPONSIBILITY**
	Identify and gain funding to develop and implement an awareness-raising and media strategy to highlight the impacts of agriculture on water quality and river health - highlight POEO Act implications and pollution and promote the benefits of sustainable farming incorporating a range of best practice issues including improved chemical fertilizer use or alternatives to chemicals	Increased awareness and knowledge of agricultural impacts and improvement strategies	Short to Medium Term Department of Environment, Climate Change and Water Landcare BSC - River Health Program Northern Rivers Catchment Management Authority Department of Industry and Investment Farmers BSC - Environmental Health and Building Surveyors
	Organise and facilitate “train the trainer” workshops for key peer farming representatives to develop awareness ,improved farm management and production information, and address river health impacts	Workshops are undertaken	Short to Medium Term Landcare BSC - River Health Program Northern Rivers Catchment Management Authority Department of Industry and Investment Farmers
	Strategically contact farmers in reaches to organise workshops and information and assessment days Target key people identified from consultations Target new residents to increase knowledge and skills to address impacts; encourage the formation of river care groups/neighbourhood groups to improve resources	Number of farmers agreeing to participate in workshops Number of new residents participating in education sessions Number of new river care/ neighbourhood groups participating in improved practices	Short to Medium Term Landcare Northern Rivers Catchment Management Authority BSC - River Health Program
	Organise and facilitate workshops, on good practice management, identify enabling factors and barriers to good practice management in order to utilise an “Education for Sustainability” approach, review and address as appropriate	Number of workshops undertaken and attendance Farmers’ satisfaction with the work shops Increase in farmers participating in a problem-solving approach Number of farmers committed to future planning and implementation of improvements Number of farmers implementing improvements	Short to Medium Term Northern Rivers Catchment Management Authority BSC - River Health Program Landcare Department of Industry and Investment Farmers

STRATEGIC APPROACH TO AGRICULTURAL PRACTICES IMPACTS: EROSION, SEDIMENTATION AND POLLUTION			
OBJECTIVES	**STRATEGIES**	**PERFORMANCE INDICATORS**	**TIMEFRAME/ RESPONSIBILITY**
	Work with farmers to develop 5-year management plans to improve outcomes	Number of farmers who have developed plans Extent of improved management strategies being implemented	Medium to Longer Term All stakeholders
	Identify resource and funding needs, and work in reaches to access funding	Improved cooperative approach to accessing funding Number of farming groups who have accessed funding	Ongoing Department of Environment, Climate Change and Water Northern Rivers Catchment Management Authority Landcare Department of Industry and Investment BSC - River Health Program
	Promote landholders who have adopted good practice management strategies Highlight landholder improvement issues	Number of media and promotion events Increased number of landholders involved in promotion Areas still in need of attention are identified	Ongoing Department of Environment, Climate Change and Water Northern Rivers Catchment Management Authority Landcare Department of Industry and Investment BSC - River Health Program
	Assess and report on improvements, review any identify next stage of the strategy	Farmer satisfaction with the programs Extent to which the coordinated working groups have implemented the proposed program Working groups develop the next stage of the Plan	Ongoing Department of Environment, Climate Change and Water Northern Rivers Catchment Management Authority Landcare Department of Industry and Investment BSC - River Health Program
	Work with the Department of Water and Energy to address more responsible and efficient water use (in relation to water licences)	Improvements in water use are identified and implemented	Department of Water and Energy Landcare BSC - River Health Program
	Liaise and work with all relevant stakeholders to develop and implement strategies to address debris removal in relation to flood impacts	Knowledge and awareness of processes undertaken to address debris removal	Department of Industry and Investment Bellingen Shire Council Department of Lands All relevant parties

On-site Sewage Management Systems (OSMS)

Overview

Onsite Sewage Management Systems (OSMS) applied in the catchment include septic systems, composting toilets, aerated waste water treatment systems, aerobic sand filters and artificial wetlands. Many of the OSMS are located in close proximity to the Kalang River and its tributaries.

Plates 13 and 14. OSMS located close to the river

The coastal villages of Mylestom and Repton are unsewered, as are the rural sections of Newry Island and all residences along the Kalang River. It is well known that failing OSMS close to shorelines can result in surface water contamination. Kenway and Irvine (2001) suggest that 50–90% of OSMS perform inefficiently or fail. Therefore it is of vital importance to consider the cumulative effect of OSMS on the Kalang/Bellinger system as well as the individual operating circumstances of each.

State-wide, the management of OSMS is covered by an Australian Standard for domestic waste water treatment (AS/NZS 1547:2000) and the Local Government (Approvals) Regulation 1993 as amended by the Local Government (Approvals) Amendment (Sewage Management) Regulation 1998).

Current status

Bellingen Development Control Plan (DCP) 6

OSMS in the Bellingen local government area are regulated under a development control plan, DCP 6. The DCP refers to the above State regulations that empower Council to regulate the installation and operation of OSMS and to levy a fee for all necessary inspections. Among the objectives of the DCP are:

- the protection of ground and surface water, prevention of public health risk
- a code of practice for OSMS installation, monitoring and management and a protocol for the prevention, detection and management of sewage contamination in oyster-growing areas in the Shire
- building and maintaining a database of all OSMS operating in the Shire
- an approval to operate
- developing plans for individual households in cooperation with owners
- ensuring continuing improvement in the regulation and operation of onsite management systems
- achieving sustainable, long term on-site sewage management in unsewered areas.

It should be noted that DCP 6 is a dynamic and evolving document to ensure continual improvement. The document proposes an evaluation of the process be undertaken in 2009.

The number of operating OSMS in the Shire is approximately 2820. In the 2005 submission by Council to the Department of Local Government's Septic Survey, 1700 systems were identified as high risk, 1500 of which were failing at first inspection. The term failing is defined by the Department of Local Government as "when an unacceptable level of contaminants is released from the facility (including the land application area) to either groundwater or surface water pathways to the natural environment. Failures can encompass major and minor issues and include disposal area failures, missing/damaged tank infrastructure, system maintenance (pump-outs) and miscellaneous system discrepancies".

Operating a system of sewage management is a prescribed activity under the Local Government Act 1993 and Regulations. This means that the landowner must obtain from Council an approval to operate a system of sewage management. This approval should be undertaken annually.
Approximately 2580 are currently operating without an "approval to operate". It has been stated (Civicview 2008) that:

- There is no routine monitoring of OSMS, inspections occur for new applications, changes of ownership and complaints
- The current system used is a property based system rather than a database.
- The current system used doesn't provide for electronic retrieval of risk classifications being high, medium and low, or relational information regarding status concerning inspection requirements. The system currently relies on an individual inspector's knowledge and experience both past and present.
- The current system used cannot provide trends and relevant relational information regarding OSMS, complaints or compliance issues.
- Currently information regarding OSMS is not recorded on a dedicated register.
- Council currently does not have the resources needed to meet the legislative requirements for management of OSMS; Council is yet to utilise the fee for service system provided for under the Local Government Act and Regulations which would address resource issues.

Community and Agency Response

Common response from community and agencies	
Some concern has been raised as to the operation of OSMS in the Bellingen Shire There are areas along the river that are being used for camping for extended periods without any sewage system Coordinated approachs needed through the River Health Program Need for Council action – implementation of an ongoing strategy that incorporates monitoring, management, maintenance and education Council needs to ensure that systems in problem areas are identified and upgraded Systems need to be inspected regularly, annually in high risk area Council needs to adopt best practice strategies for future systems	
Community specific response	*Agency specific response*
Systems have not been inspected for 8-10 years; some places have illegal sewage disposal/no system for sewage disposal and malfunctioning systems with particular concern in remote areas; there is a need for Council to communicate and work with the community to make improvements. This needs to include visitors and holiday rentals – additional monitoring, education and compliance during weekends and the holiday season - this could be linked in with tourism	NSW Food Authority (2007) considers them to be a moderately high risk to oyster production in the Kalang River and this is even if there was a reasonable degree of Council control.
Council needs to investigate alternative funding sources to implement a monitoring and management program	River Health Program to assist in addressing the deficiencies in information and how to carry out planning and actions to address these.
Council needs to ensure systems are working and maintained properly; the systems need to be adequate for this area or upgraded or replaced with more suitable systems; this includes systems on reserves (Council and Lands Department)	Department of Environment, Climate Change and Water have indicated they can provide funding for OSMS projects managed through the Healthy Rivers Program.
Council to provide information on cost-effective and appropriate alternative systems, e.g. composting toilets systems	More strategic proactive approach, State of the Environment Report should be driving actions

Best Practice On-site Sewage Management

A review of at least 12 coastal councils with comprehensive OSMS strategies focused upon continual improvement. These strategies have the following elements in common:

- catchment management approach to risk assessment
- holistic, coordinated and cooperative approach between community, agencies interdepartmentally within Council
- frequency of inspections based on risk, with high risk systems require a minimum of annual monitoring
- the education of landholders
- an improved understanding of soil conditions
- recognition of the cumulative effects of OSMS
- use of GIS mapping to classify natural resource, geographical and climate data to rank areas in terms of their contribution to poor water quality
- the use of specific systems that a suitable for specific conditions e.g. the use of alternative systems, such as composting toilets, which have the advantages of conserving water, being able to be installed in remote locations and recycling nutrients.

The education of OSMS owners is an important factor in reducing their effects on the environment. Householders should know (after Great Lakes Council 1999):

- how their system operates and how to maintain it
- their responsibilities and costs involved
- what to do in the event of system failure
- how to minimise waste water and manage its environmental effects.

As information and technology for on-site sewage management is constantly changing, best practice management needs to involve regular ongoing training and development to ensure Council staff have access to and can apply new performance guidelines and best practice strategies. The Centre for Environmental Training (Newcastle) and the On-site Waste Water Treatment: International Best Practice Conference held in Armidale biannually is recommended best practice training and development. Peer forums such as North Coast forums are also recommended.

In order to ensure a holistic approach to OSMS management, additional resources will be needed to ensure Council meets the legislative requirements. To achieve this, a “fee for service” will need to be adopted which covers the ongoing cost to manage the systems throughout the Shire. It is recommended that the “fee for service system’ which is provided for under the *Local Government Act* and Regulations incorporates compliance, education and administration. A proposal outlining the resourcing needs has been developed.

Environment and Health Protection Guidelines: Onsite Sewage Management for Single Households provides ways to meet best practice environmental and health outcomes.
Local Government (Approvals) Regulation 1993 states that sewage management systems must be operated to:

- prevent the spread of disease by micro-organisms
- prevent the contamination of water, and
- to ensure good water conservation practices.

Barriers and Key Considerations for Change

- Community are unclear as to their responsibilities versus Council's responsibility; many community members are unaware that self assessment is no longer applicable.
- Council needs to improve the current inspection system to meet legislative requirements and best practice, time periods between inspections are too long (often 8–10 years), the practice of only carrying out inspections for new systems, on change of ownership and on receipt of complaint is inadequate.
- Need for more stringent conditions near water courses.
- Need for information and guidance on best practice management and maintenance.
- Location of current systems and type of systems may not be appropriate.
- System load, inappropriate use and products put through systems.
- Holiday period overloading needs to be addressed within strategy.
- Need for improved transparency and communication between Council and the community regarding status, management and improvements.
- Council doesn't recognise or address OSMS issues and needs, many systems are close to the river in high risk areas, perception is that systems in remote areas are even less likely to be inspected.
- Monitoring and management needs to include areas used for either camping or living where there are no sewage disposal facilities, as well as systems on Council reserves.
- Suitability of current systems in relation to specific local conditions and sites; need for best practice design guide of OSMS for areas of the Shire as many newer system being approved may not be the most suitable
- Costs to upgrade systems or have regular pump out.
- Need for a cost recovery system to implement OSMS strategy (like water and sewerage) in order to meet community needs, and ensure access to required resources to implement the program.
- There is a need for a more formalised effective register of enquiries and complaints, along with a recording system for OSMS issues to extract data and identify overall issues, trends, risks and needs and strategies; this needs to be linked to appropriate data systems e.g. Northern Rivers Catchment Management Authority land use conflict database. Currently there is no complaints register; information is recorded by various means but is property based which often relies on individual knowledge.
- A strategic proactive Council policy and implementation regime of compliance, auditing and education is required, linked to monitoring, evaluation and reporting.
- There is a need for coordinated planning and operations; utilise and build on other areas experience and best practice.
- To date, sourcing of the OSMS Shire-wide strategy has not been fully investigated or a proposal put to Council.
- Investigate ocean outfall system or modern method of waste disposal.
- Improve stormwater mitigation.
- A holistic waste management system.
- Community fears of viruses spread from mismanagement of OSMS.
- Licensing conditions don't cover viruses.
- User-pays systems.
- Link Newry Island to Council's sewerage system.

STRATEGIC APPROACH TO MANAGEMENT OF OSMS IMPACTS: POLLUTION			
OBJECTIVES	**STRATEGIES**	**PERFORMANCE INDICATORS**	**TIMEFRAME/ RESPONSIBILITY**
Ensure sustainable on-site management of domestic sewage and waste water while protecting and enhancing the quality of public and environmental health	Facilitate a presentation to Council by key agency representatives who have been involved with successfully developing and implementing a comprehensive OSMS strategy Present the proposal to the group	Council commits to the development and implementation of an OSMS strategy for the Shire A process and timeframe is agreed to and commenced	Short Term BSC - Director of Environmental Health and Planning BSC - River Health Program Department of Environment, Climate Change and Water
Develop and implement a sustainable OSMS strategy for Bellingen Shire	Consult with key agency representatives who have been involved with successfully developing and implementing a comprehensive OSMS strategy to identify the processes and information needed for development and implementation Liaise with other Councils to identify key expert personnel utilised. Key OSMS experts and staff to review performance of current systems in the Shire, gather information on other systems and shire requirements and improve systems performance	Processes and information needed for implementing the strategy are identified Implementation strategy commenced Accurate register of systems is established Development of a database identifying the levels of risk of the OSMS in the Shire in accordance with legislative requirements System validated Data needs and systems are established and linked to a risk rating recall process Shire specific issues are identified A range of systems are reviewed regarding suitability Council officers have access to, and support of, a range of expertise Council officers utilise expertise A comprehensive Bellingen Shire specific OSMS based on the legal responsibilities and the guidelines for On-site Sewage Management Systems for Single households is developed Risk assessment and management options for the Shire developed and implemented Design guide of systems is developed and implemented	Short to Long Term BSC - Director of Environmental Health and Planning, with the support of relevant Council officers Department of Environment, Climate Change and Water Department of Water and Energy Department of Health Department of Lands NB A coordinated approach to waste management should be undertaken
	Market the “fee for service” needed for implementing the OSMS strategy and promote the benefits to the community	Communication strategy informing the community of the new process is implemented Community have the knowledge and awareness of the need for Council’s new strategy Community satisfaction with Council’s new strategy	Short Term BSC - Senior Environmental Health Officer BSC - River Health Program

STRATEGIC APPROACH TO MANAGEMENT OF OSMS IMPACTS: POLLUTION			
OBJECTIVES	**STRATEGIES**	**PERFORMANCE INDICATORS**	**TIMEFRAME/ RESPONSIBILITY**
	Implement the OSMS strategy utilising a "fee for service" monitoring program of all OSMS in Bellingen Shire	Council meets its legislative requirements under the *Local Government Act* and Regulations and the *Protection of the Environment Operations Act* OSMS are inspected according to Council's risk rating systems of 1, 3, and 5 years Existing system upgrades are identified and rectified to meet the requirements of the recommended management options and design guidelines. The number of systems meeting performance standards including the number of upgrades of existing systems	Short Term - Ongoing BSC - Director of Environmental Health and Planning BSC - Senior Environmental Health Officer with the support of relevant Council officers Department of Environment, Climate Change and Water Department of Water and Energy Department of Health
	Ensure Council staff have access to training and development on best practice strategies Ensure the implementation of ongoing best practice development	Regular ongoing training and development is undertaken to ensure Council staff have access to and can apply new performance guidelines and best practice strategies for OSMS management, e.g. The Centre for Environmental Training, On-site Waste Water Treatment: Best Practice Conference held in Armidale biannually, and North Coast forums such as Septic Tank Action Group (STAG). Number of Environmental Health and Building staff attending training and development, frequency of attendance and/or number of reports and in-service courses regarding training and development attended by Environmental Health and Building personnel and reported back to the BSC - Director of Environmental Health and Planning and relevant Council staff Staff application of best practice management	Ongoing BSC - River Health Program in conjunction with the BSC - Director of Environmental Health and Planning
	Assess the needs of owner/occupiers in relation to best practice management of OSMS To continue and expand an educational program to improve owner/occupier management using adult education principles	Owner/occupier OSMS needs assessment identifies management knowledge and skills, and areas of need River Health education program addresses management needs Reach of education program Owners and occupiers of premises with OSMS have increased knowledge and skills to manage systems Number of owners/occupiers who are implementing best practice management Community satisfaction with Council's OSMS Strategy particularly in relation to communication and transparency	Short Term – ongoing BSC - Director of Environmental Health and Planning BSC - Senior Environmental Health Officer in conjunction with BSC - River Health Program and other relevant Council Officers
	Investigate and address impacts from camping along the river incorporating compliance where appropriate	The issue of proper liquid/solid waste disposal is addressed	Short Term to ongoing BSC - Senior Environmental Health Officer in conjunction with BSC - River Health Program

Riparian and Wetland Management

Overview

The land closest to rivers, streams and wetlands is called the riparian zone. It is defined as 'that part of the landscape, which exerts a direct influence on waterways, and on the water and aquatic ecosystems contained within them'. The width of the natural riparian zone varies from stream to stream and location within the landscape – generally larger streams and wetlands tend to have wider riparian zones.

Plate 15. Riparian Vegetation – Kalang River near entrance

Wetlands are areas of river systems characterised by shallow, slow moving water. Like streams, they can be permanent or ephemeral and, because of their low position in the landscape, wetlands play an important role in slowing water movements and filtering nutrients and pollutants from inflowing water. They are also an important biodiversity feature of floodplain and watershed landscapes.

Riparian land is usually highly productive and as a result has often been cleared for agriculture. By its very nature, riparian land is fragile and its location next to water subjects it to a range of forces, which can result in erosion if it is not adequately protected. The vegetation that naturally occurs in riparian zones is adapted to this higher energy environment and is vital in filtering nutrients from water entering the stream from elsewhere. Riparian vegetation often provides important habitat and corridors for wildlife movement across otherwise modified landscapes.

Plate 16. Riparian Land – State Forest and cleared agricultural land

Where riparian land has been modified from a natural condition, active management is important to decrease erosion, improve water quality and maintain river courses. These management goals can usually be achieved in many cases simply by restoring appropriate vegetation in riparian zones. However, where riparian zones are severely degraded, structural works may be necessary to stabilise banks to enable that vegetation to become established. Healthy riparian vegetation also provides shade and shelter for stock, regulates stream temperatures, helps provide habitat for fish and can improve property values.

One of the key threats to the health of riparian vegetation is weed impacts. Weeds readily colonise the frequently disturbed sites which occur in riparian zones, outcompeting native vegetation and creating a monoculture which is susceptible to future flood impacts. This can lead in turn to accelerated erosion. Weeds also impact on the biodiversity values of riparian zones.

A second key threat to riparian lands is unrestricted stock access. Stock have direct impacts on riparian vegetation and its natural regeneration, can cause destabilisation of banks, can impact on water quality and promote the proliferation of weeds. However, the main tool for controlling stock access to riparian zones – fencing – can also promote weed incursion. The appropriate management of stock in riparian zones is a challenging issue for landholders and the broader community with a concern for good water quality.

Plate 17. Stock access to river banks

Current Status

There is little current information on the overall condition of riparian land and wetlands in Bellingen Shire. River rehabilitation projects occurring across the catchments (e.g. Kalang, Never Never River, and Orama) have focused on improving the condition of specific reaches, both through structural and vegetation management approaches, but there is a need for comprehensive survey as a basis for strategic planning.

Weed infestation in riparian zones of the Kalang and Bellinger River valleys was assessed in 2000 (Lonie 2000) with the objective of identifying weeds species, and priority areas for rehabilitation. Out of 242 km of riparian zone surveyed (includes both sides of the stream), 38% were in good condition, 11% had moderate weed infestation and 34% were heavily infested with weeds. In addition, 16% of riparian areas were classed as “no native vegetation” which includes pasture. In summary, Lonie notes “generally the vegetation is extremely modified and fragmented as a result of past land use, flooding impacts and weed invasion”.

Plate 18. River bank stabilisation

Structural bank stabilisation in areas of severe degradation or as a preventative measure has taken place in a number of locations throughout the catchments both by government and private landholders. A variety of methods have been used, some more successful than others, but all generally have a greater or lesser environmental impact either on site or immediately downstream. Council is able to identify locations and techniques used as each activity is subject to development approval.

Plate 19. River bank erosion

Plate 20. River bank erosion

The location and status of wetlands in the Shire is poorly documented and has never been comprehensively mapped. There are a number of SEPP 14 wetlands on both private and public land in the lower catchments and a wetland zoning is a feature of the current LEP.

Weed management in Bellingen Shire has traditionally been single species focused as required by the *Noxious Weeds Act 1993*. However, a recent Northern NSW Invasive Plants Strategy prepared in partnership with the NSW North Coast Weeds Advisory Committee and the Northern Rivers Catchment Management Authority has seen a shift in focus towards addressing weeds in landscapes. This strategy will see the management of weeds in the riparian zone (as a defined landscape) treated in an integrated way. This regional strategic approach needs to be focused into local reach strategies and action plans. This has occurred on a number of reaches within the Kalang and Bellinger catchments, providing examples of best practice management of riparian zone, integrating the control of weeds into other activities (e.g. fencing, provision of off stream watering points and revegetation).

Community opinion regarding river oaks (*Casuarina cunninghamiana*) was divided on whether they have a beneficial or negative impact on erosion. The removal of some larger specimens has been suggested. A review of relevant factors is outlined.

River oaks are a common riparian tree species in the freshwater and upper estuarine reaches of the Bellinger and Kalang Rivers. River oaks are commonly known as a ‘pioneer’ species because they are fast growing, light loving, set shallow roots and readily colonise disturbed areas or areas denuded of vegetation. However, community consultation undertaken by Council has shown that some landowners consider them a nuisance, as individual large trees have been known to fall down in floods, while gravel islands provide colonisation sites and are implicated in ‘worsening’ erosion.

A leaflet, released by Bellingen Landcare in cooperation with the Northern Rivers Catchment Management Authority, identifies some of the benefits of river oaks in the riparian zone and poses solutions to some of the problems encountered by land owners in relation to large individual trees. A summary of the leaflet follows:

- River oaks are more numerous now then they would have been pre-settlement, due to the increase in suitable (read: disturbed) habitat available.
- River oaks, when left to colonise undisturbed, can stabilise gravel bars and protect riverbanks from erosion, thus playing a role in the re-establishment of a narrow river channel. In this way they have a positive effect on river health.
- The scouring effects around large individual river oaks can be managed by allowing or encouraging the growth of other plants, such as rushes and other trees around the trees. This will also help to stabilise the bank in the area of the large tree, reducing the likelihood of it falling and taking a section of land with it.
- The effect of river oaks stabilising gravel islands and thereby diverting flow towards unprotected or susceptible banks can be managed by improving overall bank stability in the immediate area.
- The effects of large fallen river oaks deflecting flows towards the riverbanks can be managed by repositioning the log and root ball against the bank.

Community and Agency Response

Common response from community and agencies	
Undertake an erosion study to identify issues and best management options Improve and streamline riverbank restoration approval process between agencies; guidelines on approval needs and information; implement associated education programs on best practice Integrated multi stakeholder approach for implementing river bank stabilisation and revegetation Investigate options to utilise resources, e.g. University Groups and Green Teams; develop neighbourhood working groups Raise awareness and implement education programs on best practice	
Community specific response	*Agency specific response*
Need for holistic approach and plan of action for clearing weeds, replanting and maintenance; strategically commence at top of catchment; Council, River Health Program and Landcare coordinated plan (for private and public land) River Health Program to raise awareness of issues and impacts and encourage landholder action, e.g. individual contact and assistance; utilise existing networks, e.g. land care, rural fire brigade Need for increased knowledge on best practice management; with multi stakeholder approach for implementation with landholders' strategies along with an education program and workshops (NB recommended to also address casuarinas as a specific concern for different situations) Target specific problem weeds instead of everything at once, e.g. vine weeds, camphor laurels Investigate, lobby and access longer term/alternative funding to address river bank restoration; improve riparian buffer zones and weed management; River Health Program to promote the positive work being undertaken	Council to ensure the development of buffer zones through LEP and planning instruments, incorporate remediation in DA process Information sessions for state agencies and Council Need for proactive approach - environmental inspections; education and improved compliance with POEO Act linked to monitoring, evaluation and reporting Need to find and utilise incentives for landholders
Investigate, lobby and access longer term/alternative funding to address river bank restoration; improve riparian buffer zones and weed management	Need to find and utilise incentives for landholders
River Health Program to promote the positive work being undertaken	Need for proactive approach - environmental inspections; education and improved compliance with POEO Act linked to monitoring, evaluation and reporting
Develop weed free zones and riparian vegetation only zones	
Improve drainage by removing silt, sedimentation, debris and choking hazards	
Stop livestock entering the waterways which are causing erosion, pollution, spread of weeds and loss of riparian vegetation	

Best Practice Riparian Management

The overall goal of riparian management is to ensure that land use and management adjacent to waterways have minimal negative impact on water quality, bank stability and biodiversity. Best practice management of riparian areas can provide a number of additional benefits such as landscape connectivity, stock shading and shelter, security of channel location and a variety of other ecosystem and property value services.

Plate 21. Riparian vegetation - Sunny Corner

In general, as part of an overall effort to improve riparian vegetation cover and general bank stability, river oaks play a positive role in the Kalang River system. When large trees become isolated from other vegetation they can become a nuisance, but positive management strategies should revolve around stabilising existing trees with other vegetation to slow flood waters and stabilise soils, rather than removing trees and further degrading riparian structure.

There is also significant overlap between good riparian management and good agricultural practices as they relate to water quality and other impacts on river systems. Private landholders, and especially the farming and grazing community, can play a key role in improved riparian management when given training, support and incentives to undertake works which facilitate production as well as riparian environment outcomes.

From the agricultural perspective, best practice riparian management covers a variety of activities relating to protecting the values of riparian zones outlined above. Appendix F identifies a number of guidelines on best practice riparian management.

The design of structural works for river bank stabilisation, restoration and rehabilitation is a specialised field and works are generally tailored to individual sites using local materials wherever possible. Advice on design, construction and maintenance is available from a number of sources including Northern Rivers Catchment Management Authority, engineering consultancies and local government (e.g. Tweed Shire Council who have developed a toolkit). As a best practice principle, any design should always aim to maximise all riparian values, e.g. biodiversity, habitat creation and protection and connectivity, as well as the primary goal of bank stabilisation.

Barriers and Key Considerations for Change

- Coordinated/partnership approach between agencies, agencies and landholders and between neighbours that provides an register of land approved for clearing, clarifies best practice, streamlines approvals and actions, ensures quality control and compliance; need for interagency monitoring, evaluation and reporting; need for a reach based approach including neighbours across the river, and council reserves and road sides; need for resource sharing.
- Lack of knowledge regarding regulations, when consent required and monitoring unauthorised works (as often these can only be seen from the water).
- Difficulty with keeping up with maintenance.
- Lack of follow through on Landcare plans.
- Bureaucracy and multiple agency involvement.
- Attitude and knowledge of the importance of riparian vegetation; desire for river views leading to clearing vegetation, unauthorised clearing; need for guidance and monitoring for a holistic approach for clearing, replanting and management with best practice guidelines.

- A strategic proactive Council policy and implementation plan for management, compliance, auditing and education is required, linked to monitoring, evaluation and reporting.
- Funding issues, e.g. availability, flexibility, timing, application processes, lack of recurrent funds, knowledge of sources, in relation to length of river bank; need to address needs of local and regional landscapes incorporating maintenance rather than simply evolving priorities.
- Commitment required for weeds management and maintenance, management is a thankless task, lack of knowledge on management particularly with new residents.
- Lack of knowledge of diffuse impacts on water quality.
- Lack of knowledge of best practice, including weed removal and maintenance, and strategic approaches; new weeds; improved management is voluntary, best practice paradigms need to be addressed including site specific considerations e.g. on steep slopes and appropriate vegetation.
- Cease repeating past failures and short term fixes, e.g. throwing in large rocks to stabilise erosion.
- Stop logging.
- Holistic approach to riparian revegetation and weed control, reduce chemical controls.
- Differing opinions on best practice management, e.g. gravel deposits, island formation and presence of casuarinas.
- Managing inherited problems, e.g. running bamboo, lack of management upstream
- Landholders lack of trust with agencies and Landcare.
- Need for improved knowledge and practice of various bank stabilisation measures, incorporating improved approval and implementation processes, and coordination between agencies.
- Lack of economic and physical resources; public liability, lack of knowledge of the work and commitment required; management issues with absentee landlords.
- Lack of legislative controls and regulation, e.g. private native forestry operations, some river bank restoration works; need for resources or reorientation of resources for compliance and education to address breaches and gaps, e.g. earth work contractors operating without consent.
- Fisheries barriers regarding debris required for aquatic life support
- Proper stormwater mitigation.
- Improve government subsidies for tanks and other improvement strategies/equipment.
- Improve neighbourly communication.
- Stop livestock from entering river.
- Put water sampling results onto Council website for public awareness.
- Sample after rain.
- Dredge the rivers and remove sea walls.
- Oyster farming has positive and negative impacts on the river, e.g. the cultivation of oysters shows the quality of water in the systems.
- Opposing vested interests, particularly when livelihoods are threatened.
- Lack of Council funding to address emerging issues and compliance.
- Plan land usage and development better

STRATEGIC APPROACH TO RIPARIAN AND WETLAND MANAGEMENT IMPACTS: EROSION, SEDIMENTATION, FLOOD IMPACTS AND BIODIVERSITY			
OBJECTIVES	**STRATEGIES**	**PERFORMANCE INDICATORS**	**TIMEFRAME/RESPONSIBILITY**
Increase the extent of healthy riparian vegetation Improve the management of riparian zones	Implement the strategies of the Council's Estuary Management Plan – Management Objective 21 – Incorporate appropriate riparian protection zones within Council's planning framework to safeguard against potential future development and land use change	Improved riparian protection	Short Term BSC - Director of Environmental Health and Planning Strategic Planners BSC - River Health Program Coastline and Estuary Management Committee
	Liaise with key groups, e.g. Northern Rivers Catchment Management Authority, Department of Environment, Climate Change and Water , Bellinger Landcare and land care and river care groups to develop a process to undertake a vegetation mapping survey building on previous work undertaken (in conjunction with the Estuary Management Plan's erosion study) Investigate options to assist landholders with weeds management and revegetation	Baseline information regarding current status of riparian vegetation is established Landholders and community groups have access to assistance to implement improvement strategies	Short to Medium Term BSC - River Health Program Department of Environment, Climate Change and Water Northern Rivers Catchment Management Authority Landcare
Decrease the impacts from heavy rainfall and flooding	Facilitate a working group of Council, government agencies and community members to develop a strategic coordinated weeds management and vegetation action plan, incorporating communication, awareness raising, participatory educational strategies and implementation	Cooperative partnership developed An agreed vegetation implementation plan is established Action plan is implemented Improved coordination and communication between agencies and communities	Short to Medium Term BSC - River Health Program Landcare Groups Northern Rivers Catchment Management Authority Other Key agencies
	Investigate options to assist landholders with weeds management and revegetation	Landholders and community groups have access to assistance to implement improvement strategies	Medium Term BSC - River Health Program Landcare Groups Northern Rivers Catchment Management Authority Department of Environment, Climate Change and Water
	Undertake a community and agency skills audit to identify key people who can and are willing to develop community capacity to improve river bank stability and improve riparian vegetation	Register of key personnel to assist with the program is established	Medium to longer term BSC - River Health Program in conjunction with working group

STRATEGIC APPROACH TO RIPARIAN AND WETLAND MANAGEMENT IMPACTS: EROSION, SEDIMENTATION, FLOOD IMPACTS AND BIODIVERSITY			
OBJECTIVES	**STRATEGIES**	**PERFORMANCE INDICATORS**	**TIMEFRAME/RESPONSIBILITY**
	Raise awareness of the needs and purpose of improving riparian vegetation through the media, letters to landholders, and promotion through suggested local networks and Landcare/river care groups Promote and support with resources as appropriate neighbourhood and Landcare approaches to riparian management Liaise and work with communities to identify needs, information and assistance required to implement good practice management including alternatives to chemical use	Increased knowledge and understanding of enhancing riparian vegetation and improving bank stability Increased number of groups involved in the program No. of articles, no. of landholders accessed Needs are identified Program implementation is appropriately targeted	Medium Term BSC - River Health Program in conjunction with working group Department of Environment, Climate Change and Water
	Utilising key stakeholders, facilitate workshops to assist landholders with improving management and maintenance of riparian land Hold field days to showcase good practice management for riverbank restoration and investigate options for increasing landholder participation. Provide discussion forums on overcoming difficult management issues	Number of workshops undertaken Number of participants Workshop satisfaction Commitments to improvements	Medium Term BSC - River Health Program Landcare Northern Rivers Catchment Management Authority
	Work with key stakeholders and land owners and raise awareness on the issues concerning river oaks and the recommendations for managing them and improving bank stability as outlined in the leaflet released by Bellingen Landcare in cooperation with Northern Rivers Northern Rivers Catchment Management Authority. Discuss issues at workshops	Increased community awareness and knowledge of Casuarina management Increased awareness of riverbank management	Medium Term BSC - River Health Program in conjunction with working group

STRATEGIC APPROACH TO RIPARIAN AND WETLAND MANAGEMENT IMPACTS: EROSION, SEDIMENTATION, FLOOD IMPACTS AND BIODIVERSITY			
OBJECTIVES	**STRATEGIES**	**PERFORMANCE INDICATORS**	**TIMEFRAME/RESPONSIBILITY**
	Liaise with funding bodies in relation to landholders concerns regarding funding access and utilisation Work with Council's Grants Officer and other key stakeholders to investigate funding to implement actions Facilitate working groups with agencies and communities to improve access to funding	Agencies recognise funding barriers and agree to improve funding accessibility and appropriateness Database of funding is identified Increased numbers of groups access funding Increased number of groups making improvements Increasing healthy riparian vegetation Improving weeds management	Ongoing BSC - River Health Program Department of Environment, Climate Change and Water
	Liaise with Council representatives regarding improving vegetation management that involves work across private and public land. Reconvene the working group with key Council stakeholders and Landcare/ river care representatives to improve processes and cooperation	A streamlined and cooperative process for integrating work on private and council land is developed and implemented	Short Term BSC - River Health Program
	Promote improvements and achievements through the media, newsletters. Investigate rewards systems	Increased recognition is given to good practice Decreasing impacts as a result of runoff Improved bank stability	Ongoing BSC - River Health Program in conjunction with working group
Improve river bank works and processes	In conjunction with Land care facilitate the development of a working group of all key agencies that are involved with riverbank restoration. Identify requirements needed from each agency for undertaking riverbank restoration works; identify good practice processes needed for approvals Develop an information kit outlining the approval process requirements and providing information regarding approved management options	Coordinated streamlined process for river bank approval process is developed Coordination and cooperation by departments and agencies Increased community knowledge and understanding of the approval process Decreased approval time Increased formally approved restoration works undertaken Improved community satisfaction	Short Term Landcare

Boating, Tourism and Recreational Impacts

Overview

Very little research has been done on the environmental effects of boats and jet skis specific to the Kalang River system. However, there is evidence that can be used to consider the generalised impacts of motorised craft on rivers and estuaries everywhere. Impacts can include the following:

- erosion and sedimentation
- damage to vegetation and habitat
- noise
- pollution, biological and chemical
- increased turbidity.

The effects of a boat are dependent upon a wide range of variables including size of craft, weight of craft, hull shape and length (and modifications), water displaced, the speed of the craft, driver behaviour, adherence to rules, type of activity, depth of the water and the distance from the bank and other sensitive receptors. These effects may be exacerbated depending upon the knowledge and behaviour of the operator in different circumstances.

Plates 22. Boating on the Kalang River

Plates 23 and 24. Boating on the Kalang River

Erosion is a high priority issue in the river system and the potential for erosion caused by boating is dependent on the specific circumstances of the waterway in question. In particular:

- specific intensity and frequency of boating activities
- types of boats involved
- form, stability and soil types of the banks.

However it should be noted that a number of factors contribute to erosion and therefore boating impacts should not be addressed in isolation.

Apart from speed and wash restrictions signposted on rivers, NSW Maritime have no written policy to address the environmental effects of boat use. A decision support tool to assess the impact of boat wake has been developed by NSW Maritime and they have been invited to trial it in the Bellinger and Kalang waterways.

Current status

The Kalang/Bellinger system has a long history of boating. Almost all boating is recreational and recent studies indicate that it is the major human use of the estuarine area (BMT WBM 2007). The number of boat registrations in the Bellingen Shire has expanded exponentially in recent years (BMT WBM 2007).

The use of motorised craft is restricted entirely to the estuarine reaches of the system. Most of the motorised boating occurs downstream of the Pacific Highway crossing on the Kalang. Waterskiing, tubing and wakeboarding occurs at Urunga between Newry Island and the Pacific Highway and upstream of Newry Island along what is locally known as the “mad mile”.

Plate 25. Boating and recreation on the Kalang River

Generally motorised craft use consists of tinnies, ski boats, small trailer boats, wake boats and jet skis. During the summer and holiday season, while not unexpected, there are a substantial number of varying users on the river at one time. This influx can lead to conflicts of river use and other impacts such as noise due to the number of craft in a confined area, often adjacent to residential properties. This is exacerbated at times by a minority playing loud music via their boat stereos.

NSW Maritime is responsible for the management of boating traffic on the river. Current controls can be obtained from NSW Maritime in the form of a boating map and include:

- extensive 8 knot zones in Back Creek, around Tuckers Island, around Newry Island, All parts of the estuary downstream of the Pacific Highway crossing of the Kalang and downstream of Urunga Island
- no wash zones around Newry Island.

A trial code of practice for waterskiing and other craft on the Kalang River was introduced in 1999, developed in consultation with Council and waterway users groups. It was endorsed by Council, and aimed to reduce noise and boat wash impacts around the estuary.

Both hydrocarbon pollution and introduced species are also issues which impact upon river health.

Hydrocarbon Pollution

Emissions from two-stroke outboard motors are unregulated in Australia and, for their size and usage, the levels can contribute significant amounts of air and water-based pollutants. A Voluntary Emissions Labelling Scheme (VELS) has recently become operational in Australia and there is a need to increase boaters’ awareness of the scheme and encourage the replacement of inefficient two-stroke motors.

Jet skis and motorised boats, particularly those powered by older two-stroke engines emit a variety of pollutants in relatively large quantities which have a detrimental effect on the aquatic environment.

Introduced Species

A significant form of pollution associated with motorised craft is the introduction of unwanted non-native organisms that can invade and modify aquatic ecosystems. These effects are seen when boats move from one waterway to another without taking proper precautions to remove unwanted organisms from their hulls.

Marine pests are plants or animals, usually introduced from overseas, that have a significant impact on our marine industries and environment. They can include mussels, crabs, seaweeds, sea stars and other marine species. However, not all marine pests are from outside Australia. Some are native to other regions of our country and have been transported into NSW, for example, through domestic shipping or the aquarium trade.

Community and Agency Response

Prior the River Health Plan consultations, many issues had already been identified and addressed through the Estuary Management Planning process.

In terms of the adequacy of current boating controls, the Estuary Management Study (EMS) (BMT WBM 2007) identified:

- a need for boating restrictions around areas of mapped seagrass that may be subject to propeller damage
- a need for boating restrictions around mapped mangroves that act as a protective barrier for salt marsh communities and areas of salt marsh that are exposed to boat wash
- a need to protect areas that are actively eroding or sensitive to erosive forces from the effects of boat wash
- a need to review existing boat speed and wash designations to reduce potential confusion and minimise damage to banks susceptible to erosion
- a need to consider the potential effects of increased boating densities or more widespread boating, as well as likely effects of additional facilities (such as extra boat ramps)
- a need to protect oyster harvesting areas from sediment disturbance caused by motorised craft.

The Estuary Management Plan (BMT WBM 2008) outlines two management objectives and strategies that relate to boating use on the Kalang/Bellinger estuary. The first objective is to minimise boating impacts on sensitive ecological communities and riverbanks. The strategies to achieve this are:

- improve signage to protect salt marsh areas with no wash zones, protect seagrasses against propeller damage and boat wash and to educate users
- reassess the suitability of jet skis and wake boats for the estuary and to gather information to confirm the suitability of high impact boating in the estuary.

The second objective is to assess boating patterns and related issues throughout the estuary to better understand actual boat use associated impacts. The strategies to achieve this are:

- maintain an inventory over the course of a year to record the maximum possible information regarding boat use
- undertake a boating use survey at major access points on at least two weekends per season over the course of a year.

These studies would adequately fill gaps in the current knowledge.

Of the agencies that responded none identified this area as a priority.

Community response
Noise issues – need to address noise pollution especially from music, and conflicts in residential areas particularly relating to hours of operation
Have zoned areas for activities and identify sensitive areas (including oyster leases) and how to minimise impacts (as outlined in Appendix E)
Develop a code of conduct to address activities and behaviours that impact on river health (as outlined in Appendix E) and promote this to river users; use this for education through River Health Program, NSW Maritime, peers, River Health Program and tourism, undertake observational studies to monitor and evaluate
Improve riparian vegetation, exclusion zones
Integrate education strategies through schools
Utilise universities for research and education
Concern with larger boats, displacement hulls and speeds on these rivers; need to investigate and address impacts
Develop and provide good practice fact sheets on maintenance and operation to minimise pollution
Lobby for higher profile from NSW Maritime
Assess recreational use; improve river bank and recreation areas, e.g. Repton and Mylestom (form a river care group), decrease access by cars, and limit bank damage by pedestrian access (stairs and signage)
Work with Fisheries to extend sustainable fishing strategies
Work with Tourism Bellinger and Coffs Coast Tourism to develop and implement strategies to reduce impacts on river health, promote best practice and ensure sustainability; investigate options for tourism to support and resource river health
Council to address to 4WDing on riverbeds and banks; restrict motorbike riding in sensitive areas
Council to provide more bins and implement a litter campaign
Improve Fisheries patrols of areas and increase fines to stop bad behaviours

Best Practice Management of Boating Issues

The best management options for boating issues are dependent on the issues themselves and the specific context and waterway in question. As critical information for the types and location of boating issues on the Kalang River is limited, specific management options cannot be determined with certainty at this time.

For example, many vessels reach their transitional pattern of wash generation at quite low speeds, between 4 and 8 knots. It also warrants mention, that some very flat-bottomed vessels, or 'punts', reach the plane at quite low speeds and therefore can create low energy wash on the plane. Additionally, some boats that reach the plane at 8 knots may be restricted to the transitional phase at the same speed when travelling with a heavier load. The upshot of this is that speed limits within estuarine and riverine waters may not always be as effective as well-observed and policed 'no wash' zones in reducing erosion.

Best practice management guidelines for boating issues for the Kalang have yet to be developed. However information from the scientific literature and plans for other nearby river systems will contribute to this process.

For the Kalang specifically, the following actions will guide the development of best practice for the river:

- recommendations from the Estuary Management Plan – including erosion survey, behaviour and recreational use survey, identifying and managing impact at sensitive areas, reducing boat wake
- reviewed code of conduct by NSW Maritime and Council
- education and awareness programs on issues – e.g. use of cleaner technologies, maintenance of craft, appropriate river use (noise), hygiene and cleaning practices.

Barriers and Key Considerations for Change

- A lack of planning, resources and amenities to address tourism impacts on the river environment, particularly during public events, the need for an integrated approach between the tourism industry and the River Health Program
- Improve signage
- Public toilets (OSMS) not working, leaking into the creek, Council hasn't inspected them for years
- Need to address littering through a range of strategies; lack of Council resources to monitor littering
- Need to increase knowledge, awareness and participation in Council's waste minimisation strategy (this includes user pay system for excess green waste or alternatives rather than dumping rubbish in public places), raise awareness of Raleigh waste disposal operating hours
- Need to assess, improve design of, maintain and promote proper use of reserve areas, e.g. South Arm Road - visibility of steps, informal river access points and bank damage
- Lack of knowledge of visitors about the impacts of over fishing/crabbing, only visit for a short time and don't see the impacts, need for Fisheries after hours contact number, Fisheries perceived as not operating after hours when offences primarily occur
- The cost (including expenditure by Council) to remediate eroded banks, general lack of community knowledge on the best techniques to address and minimise erosion, bureaucracy and red tape involved in river bank remediation often encourages illegal works due to the number of agencies involved and the time taken for approval, need for a coordinated streamlined process
- Negative attitude and behaviours of some boat users regarding sharing with passive recreational users, lack of knowledge of impacts including and the need to protect sensitive areas; lack of knowledge of location of sensitive areas and effects, the need for a balance of use to ensure longer term sustainable use

- Conflicting values and use including noise, varied use intensity and frequency
- Disregarding rules, lack of NSW Maritime staff, the need for constant presence of NSW Maritime to enforce rules particularly during peak times.; need for a river users' code of conduct to improve behaviours; install speed cameras, increase fines and enforcement; offenders to undertake community river bank restoration programs
- Fear of economic impacts if some river use is excluded, divided opinion on these economic impacts and river health
- Difficulty in accessing visitors to provide information and improve behaviours
- Organise events for water skiing with proper course layout and buoys to prevent erosion
- Prevent the use of boats at all times
- Wildlife are being terrorised by noise of boats – need for wildlife only zones
- Limit hours of boat usage on the river
- Ban stereos on boats
- Inappropriate launching of vessels at non-compliant areas – build more launch sites
- Installation of floating barrages in high wash areas to alleviate erosion
- Conflict between ski boats and fishing boats
- Educate the public on breeding cycles of species and what they can/cannot catch to alleviate such things as overcrabbing
- Council to investigate the illegal hiring out of cabin/accommodation with inadequate toilet facilities
- Include school groups to improve community participation/pride and educate from the youth up
- Build board walks and undertake beautification programs including community groups to promote respect of the area
- Effluent dumping points throughout the shire
- The need for further studies and observations on the rivers including bank erosion in general and recreational use in the Kalang/Bellinger Rivers.

STRATEGIC APPROACH TO BOATING, TOURISM AND RECREATIONAL USE IMPACTS: POLLUTION, EROSION, SEDIMENTATION AND SAFETY			
OBJECTIVES	**STRATEGIES**	**PERFORMANCE INDICATORS**	**TIMEFRAME/ RESPONSIBILITY**
Decrease the negative boating and recreational impacts	Implement the recommendations of the Estuary Management Plan Incorporate the recommendations of the consultations within the code of conduct	Further studies and surveys in relation to boating impacts and river user behaviour are completed Coordinated interim code of conduct is developed, implemented and evaluated by NSW Maritime and Council	Short to Medium Term BSC - River Health Program NSW Maritime Department of Environment, Climate Change and Water
Develop a sustainable boating and recreational strategy	Engage with key representative groups including university and schools, to implement good practice behaviour	A range of river user representatives encourage and promote good behaviours and river management	Short Term BSC - River Health Program NSW Maritime
	Work with and motivate the community to identify and report negative behaviours as well as noting successful positive strategies (including noise) In conjunction with NSW Maritime provide and promote to the community the required information needed for reporting breaches and negative behaviours	User groups identify positive and negative behaviours and report back to Council and NSW Maritime Increased and improved reporting of issues to Maritime NSW Maritime addresses negative issues	Short Term and Ongoing BSC - River Health Program
	Liaise with NSW Maritime to raise the profile and presence on the rivers particularly during peak periods Liaise with NSW Maritime to improve and update signage around the rivers	Increased presence of NSW Maritime Increased awareness by the community of NSW Maritime presence Increasing compliance with rules Broken and old signage replaced	Short Term BSC - River Health Program NSW Maritime
	NSW Maritime, Council and Coastline and Estuary Management Committee review information at the completion of studies, surveys and implementation of interim code of conduct	A new river use plan is developed	Medium to Longer Term NSW Maritime BSC - River Health Program Coastline and Estuary Management Committee
	Investigate options for a user pays system to assist with funding to address erosion and sedimentation	A range of options utilised in other areas are documented Recommendation for implementing options are identified, reviewed and discussed with Reference Group and Council for practicality. Implementation of system is commenced as appropriate	Longer Term BSC - River Health Program

STRATEGIC APPROACH TO BOATING, TOURISM AND RECREATIONAL USE IMPACTS: POLLUTION, EROSION, SEDIMENTATION AND SAFETY			
OBJECTIVES	**STRATEGIES**	**PERFORMANCE INDICATORS**	**TIMEFRAME/ RESPONSIBILITY**
	Work with Coffs Coast Tourism Alliance (Tourism Bellinger, Council's Tourism and river user representatives including schools, and universities) to develop and implement strategies to promote sustainable and responsible use of the river through regular media, public relations and promotions activities targeting potential and actual visitors and community members	Strategies reach targeted groups Increased knowledge and awareness of impacts Improving behaviours Sustainable river use is integrated into the Coffs Coast Tourism Marketing, Development and Resourcing Plans	Medium to Longer Term BSC - River Health Program BSC - Manager Economic Development and Tourism
	Undertake and compile research and market intelligence, which identifies and communicates the importance of sustainable river use for recreation and tourism. Use these findings to support the attraction of funding and development of policy to support the objectives of the program.	Research completed, sustainable river use evidence gathered Evidence based information is utilised for funding Increased funding support	Medium Term BSC - Manager Economic Development and Tourism BSC - River Health Program Department of Environment, Climate Change and Water
	Collaborate with local Chambers of Commerce and individual businesses operating in the marine recreational tourism market to promote and regulate responsible use of the river system	Number. of businesses promoting responsible use of the rivers Number of flyers/pamphlets distributed	Medium to Longer Term BSC - Manager Economic Development and Tourism BSC - River Health Program
	Work with Coffs Coast Tourism Alliance, events organisers and tourism venues to: a) develop and implement strategies to raise awareness of the impacts and promote good practice when utilising the river particularly addressing waste, littering, inappropriate driving b) ensure event managers have considered, and provide facilities to address, impacts from human waste and littering c) address non-approved rentals that have inadequate toilet facilities d) beautify land adjoining the river and promote respect of river health issues (construct boardwalks) Liaise with Council's Ranger regarding a strategy to improve compliance issues in key areas, e.g. litter, driving on river banks	Strategies reaching targeted groups Increased knowledge and awareness of impacts Tourism venues promote good practice Improving behaviours Event managers provide adequate facilities to cater for events Education and compliance strategy targets key issues at events and key recreational areas Community liaison and input	Medium to Longer Term BSC - Manager Economic Development and Tourism BSC - River Health Program Council Ranger

STRATEGIC APPROACH TO BOATING, TOURISM AND RECREATIONAL USE IMPACTS: POLLUTION, EROSION, SEDIMENTATION AND SAFETY			
OBJECTIVES	**STRATEGIES**	**PERFORMANCE INDICATORS**	**TIMEFRAME/ RESPONSIBILITY**
	Liaise with Council and undertake an audit of public toilets in recreational areas that are unsewered to ascertain whether they are functioning properly Rectify any problems	Public can utilise functional toilets Improved waste management, waste not being disposed of in toilets	Short Term BSC - Department of Environmental Health and Planning, BSC - Senior Environmental Health Officer
	Improve knowledge and awareness of Council's effluent dumping points	Council provides signage for effluent dumping points	BSC - Engineering and Operations
	Liaise with Council and key stakeholders, e.g. in Mylestom and Repton, to improve the reserve areas and decrease erosion on river banks from indiscriminate pedestrian use	Improved visibility and repair of steps River care group formed and implement actions to improving riverbanks and recreational areas	Short to Medium Term BSC - River Health Program BSC - Manager of Buildings and Services
	Liaise with key stakeholders and other Councils to develop and implement a strategy to lobby government to have Australia-wide best practice emission standards	Increased government awareness of need for standards Regional/state wide lobby group is formed Emission standards are placed on the government agenda for investigation	Longer Term Coastline and Estuary Management Committee
	To work with Department of Industry and Investment-Fisheries, community groups, schools and universities to address over fishing and overcrabbing	Increased compliance Increased knowledge and awareness of the principles of sustainable fishing	Short to Medium Term NSW Maritime Department of Industry and Investment-Fisheries BSC - River Health Program

Waste Water Treatment Plants

Overview

Two of the three Council sewage treatment plants (STP) discharge treated effluent into the Kalang/Bellinger River system. The Bellingen STP releases treated effluent into the river less than 1 km downstream from Lavenders Bridge, which connects north and south Bellingen. The Urunga STP discharges into Urunga Lagoon, indirectly via an unnamed creek, approximately half way along the lagoon, which itself is located adjacent to the mouth of the Bellinger system.

Both systems treat effluent to a tertiary standard. The basic treatment program for the plants is:

- Primary Treatment. Screening of effluent at inlet works to remove rags, etc.
- Secondary Treatment. Effluent is aerobically processed in an extended aeration tank, excess sludge is anaerobically processed in sludge lagoons.
- Tertiary Treatment. Effluent is disinfected with ultraviolet radiation from a UV unit. At both Bellingen and Urunga plants phosphorus is removed chemically.

Plate 26. Urunga Waste Water Treatment Plant

Plate 27. Aerial View of Urunga Waste Water Treatment Plant

Current Status

Council is responsible for the maintenance and monitoring of the systems under the *Local Government Act 1993* subject to licensing requirements set out by the *Protection of the Environment Operations Act 1997*.

The licensing requirements for both of the plants dictate that fortnightly sampling of effluent discharge is undertaken. In addition Council undertakes sampling for faecal coliform levels in receiving waters on a fortnightly basis. The licences also require annual reporting of recorded information including pollutant levels, breaches of licence conditions, complaints and overflow/bypass incidents. The parameters monitored are daily inflow, Biochemical Oxygen Demand (BOD), Total Suspended Solids (TSS), grease and oil, Ammonia, Total Nitrogen (TN), Total Phosphorus (TP), pH and faecal coliforms. The licensed pollutant levels from the plants are the same with the following exceptions:

- The Urunga STP is licensed for a maximum daily inflow of 10 000 kL whilst the Bellingen plant is licensed for 3 000 kL.
- The Bellingen STP is licensed for a maximum concentration of 700 faecal coliform units (fcu) in effluent, Urunga is licensed for 600 fcu.

Generally the Urunga Waste Water Treatment Plant functions within the maximum allowable limits of its license. Over the past 4 years the most common breaches have related to:

Exceedances of concentration limits for the pollutants specified in the license agreement. The most notable breach was that the pH of the effluent has regularly been outside the allowable range, attributable to algal growth in the tertiary ponds. Otherwise the breaches were generally attributed to incorrect dosing, incidents relating to equipment problems, high rainfall, and faecal contamination from birdlife on the tertiary ponds and algal growth. Very little effect on the receiving waters was noted.

Breaches relating to exceeding the volume and mass limits on discharges were caused by heavy rainfall.

To address the breaches, Council's Water and Sewerage staff have improved internal management and monitoring, carried out the installation of a UV disinfection unit and made provision for bypassing the tertiary ponds.

The Urunga plant would benefit from a mechanism of reducing nutrient and sediment concentrations in the discharged effluent with particular emphasis on reducing TP concentrations. An improved system for chemical dosing is now being employed.

Effluent reuse schemes have been considered for the waste/water, with a major aim of reducing the impacts of effluent discharge on the sensitive environments of Urunga Lagoon. Council commissioned an Environmental Impact Statement for conversion to reuse of the effluent from Urunga but the process met with opposition from the (then) Department of Land and Water Conservation for reasons mostly associated with groundwater protection.

Liquid trade wastes (i.e. wastes generated by industry, small businesses and commercial enterprises) may exert greater stress on sewerage systems and if uncontrolled can pose serious problems to public health, worker safety, the environment and Council's sewerage system. To achieve responsible liquid trade waste disposal, Council developed a Liquid Trade Waste Policy, which was adopted in 2003 and amended in 2005. This policy has yet to be implemented.

Community and Agency Response

Community specific response	*Agency specific response*
Some concern on STP impacts on water quality	Installation of backup generators to prevent surcharges during blackouts (Urunga this year and Bellingen next year)
Council to investigate alternative practice (e.g. constructed wetlands, land based disposal/recycling, ocean outfall)	Council would prefer utilisation of reverse osmosis
Increase in population and development and the need for systems upgrades	
Council to inspect their systems, effluent dumping points, caravan parks	Address issues leading to license breaches
Setup Water Watch and other community-based work groups	Improve management and maintenance
Stop effluent flowing into water courses, sample more frequently to monitor viruses and other levels	Address leakages and illegal connections
Council to improve better practices, procedures, management and systems for residents and businesses	Trade waste management

Best Practice

There is a need to define the principles of best practice for the Shire's STPs. These principles and the relevant actions will be tailored specifically to each of the plants and take into consideration factors such as land use, future development and alternative options.

The reuse of effluent for irrigation, industrial and non-potable household applications is quickly gathering acceptance among policy makers, planners and the general public. The benefits of effluent reuse include reduced stress on waterways, reduced demand on potable water resources and reduced need for chemical fertilizer use.

The current basic requirements for waste water reuse are outlined under the *Australian Guidelines for Water Recycling: Managing Health and Environmental Risk*. These guidelines are used by the Department of Water and Energy to assess new reuse schemes under the *Local Government Act 1993* or the *Water Management Act 2000*. The assessment of reuse schemes has changed and Council must reassess effluent reuse schemes as part of its Integrated Water Cycle Management efforts.

Where the concept of reuse is not considered feasible, reductions in sediment and nutrient concentrations can be achieved by diverting treated effluent through constructed wetlands before entering existing waterways. Constructed wetlands, when well-designed, offer a relatively low cost, low maintenance form of effective water treatment.

Barriers and Key Considerations for Change

- sewerage discharges during blackouts and heavy rain events
- illegal water and sewerage connections
- community knowledge, awareness and understanding of best practice and how to contribute
- treated sewerage impacts on Urunga Lagoon which has inadequate flushing
- resources needed (cost and location) to upgrade, though Council has a 30-year plan of works
- need to address trade waste impacts
- need to investigate and pilot best practice options (environmental and public health) including contemporary reuse options
- integration of educational strategies to inform the public (including businesses) on best practice, including what should not be put down the sewer
- monitor and identify trends from breaches, implement strategies to address the causes, monitor, evaluate and report on interventions
- increase and improve signage
- improve information between all parties concerned to alleviate miscommunication of responsibilities and liabilities
- implement emergency spill procedures with improved response times to complaints
- clear up misconception that Council does not care about water quality or oyster farming in the rivers
- rock walls and Sea Lido cause sediment build ups in the river and stop proper flow
- sedimentation and siltation build-up due to lack of dredging
- spread of viruses and nutrient build up to unsafe levels
- visible oil slicks and pollution due to lack of flow through Urunga Lagoon
- increase in population during peak tourist times puts huge pressures on smaller outdated systems which were not built to accommodate such usage
- development increasing runoff into waste water systems: Developers and builder education in regards to better practices and legislation
- recycle waste water to industry.

STRATEGIC APPROACH TO WASTE WATER TREATMENT PLANTS IMPACT: POLLUTION			
OBJECTIVES	**STRATEGIES**	**PERFORMANCE INDICATORS**	**TIMEFRAME/ RESPONSIBILITY**
Implement ongoing improvements to Waste Water Treatment Plants and practices to reduce impacts on water quality	Council to install back-up generators for Waste Water Treatment Plants to stop surcharges during blackouts	Back-up generators are installed Decreased surcharges	Short Term BSC - Water and Sewerage Engineers
	Improve management and operations to minimise license breaches Update and implement new emergency spill procedures and complaint procedures Raise awareness within the community to notify Water and Sewerage Department of any sewerage overflows or spills Investigate and implement options to reduce sediment and nutrient concentrations leaving facilities, e.g. through constructed wetlands	Decreased license breach frequency Relevant agencies are notified of spills Procedures to address spills are implemented correctly Increase in the number of notifications Improved notification time frames Ongoing improvement strategy is implemented	Ongoing BSC - Water and Sewerage Engineers
	Liaise with Department of Environment, Climate Change and Water (EPA) and Area Health Services to investigate strategies to develop and implement best practice to plan for medium and long term improvements Consult with Water and Sewerage staff to identify strategies for medium and longer term improvement Work with BSC - Water and Sewerage Engineers to develop and implement a best practice strategy and implement best practice pilot projects	Best practice environmental and public health strategies are identified and pilot trialled Council implements best practice plan Reduced impacts on water quality	Longer Term BSC - River Health Program with Department of Environment, Climate Change and Water Department of Health BSC - Water and Sewerage Engineers
	Undertake testing to identify and reduce leakages Proactively promote Council improvements through the media Undertake inspections to rectify illegal connections	Improved management and maintenance Decreased volume of waste water Reduced illegal connections Increased community awareness of Council's operations for improvement	Short term BSC - Water and Sewerage Engineers Short Term BSC - Water and Sewerage Engineers BSC - River Health Program Department of Environment, Climate Change and Water Short Term Environmental Health Health and Building

STRATEGIC APPROACH TO WASTE WATER TREATMENT PLANTS IMPACT: POLLUTION			
OBJECTIVES	**STRATEGIES**	**PERFORMANCE INDICATORS**	**TIMEFRAME/ RESPONSIBILITY**
	Work with BSC - Water and Sewerage Engineers and staff, businesses and community, Tourism, (incorporating events and festivals) to identify current practices, and develop and implement strategies to improve impacts on water quality.	Current practices identified Improvement strategies identified and implemented Decreased license breach frequency Improved management and maintenance Increased community and business knowledge of impacts on water quality Reduced impacts on water quality	Short Term - ongoing BSC - Water and Sewerage staff BSC - River Health Program Tourism Community Businesses
	On completion of the Trade Waste survey, determine the appropriate fees and charges according to the business type discharge factors Review and modify as necessary Council's Trade Waste Policy Investigate and incorporate appropriate strategy to cover liquid trade waste for industrial areas that are not connected to the sewer Develop a Trade Waste Agreement with each business Undertake regular audits to ensure compliance with the agreements and in accordance with Council's Trade Waste Policy	Business fees and charges are completed Trade Waste Policy and Strategy is implemented and evaluated	Medium Term BSC - Water and Sewerage Engineers Medium Term BSC - Senior Environmental Health Officer

Forestry, Logging and Clearing

Overview

Healthy, well managed forests filter rainwater and runoff entering watercourses, ensuring good water quality. Poorly managed forests generate large sediment and pollution loads for rivers downstream. The NSW legislation covering the management of all forestry operations is rapidly evolving. A number of codes of practice and changes to legislation have been introduced recently covering native forestry operations on private lands, native forestry operations in State Forests and plantation timber harvesting.

Forestry operations can have a significant effect on water delivery to rivers. For example, an increase in water supply tends to occur in recently harvested areas, as there are fewer trees intercepting rainfall and transpiring water. The trend is reversed as the trees within a stand grow and require more water. There may also be an increase in the speed of water delivery following harvesting due to an increase in the area of bare soil and a reduction of the baffling effect of vegetation.

Since 2007 private native forestry in NSW has been regulated by the Private Native Forestry Code of Practice (CoP), administered by the Department of Environment, Climate Change and Water. The *Native Vegetation Act 2003* requires landholders to enter into a Property Vegetation Plan for up to 15 years, a legally binding document between the landholder and the Department of Environment, Climate Change and Water. The Property Vegetation Plan outlines which areas can and cannot be harvested, identifies effective harvest strategies and targets for regeneration, identifies important landscape and cultural heritage features, identifies strategies for biodiversity conservation and ensures the protection of waterways by creating strategies to minimise erosion and polluting runoff. The CoP also contains a provision for the auditing of landholders to ensure compliance and continually improve forestry practices. The CoP supersedes the previously existing agreements under the *Native Vegetation Conservation Act 1997* and the *Soil Conservation Act 1938* in October 2008 or at the end of the previous contract. The CoP is a transitional arrangement until new legislation specific to native forestry is gazetted.

Current Status

Plantation forest operations on Crown lands and private land in NSW are managed by the Department of Industry and Investment under the following legislation:

- Plantations and Reafforestation (Code) Regulation 2001
- *Plantations and Reafforestation Act 1999.*

The Code outlines buffer zones to be left intact around watercourses (20 m either side, and 10 m either side for drainage depressions), within which no harvesting or replanting for harvesting is permitted. The Code also stipulates that stabilising vegetation must be planted after harvesting to reduce soil erosion and sets slope limits for harvesting operations on specific soil types.

Plate 28. Buffer zones and sedimentation prevention

Harvesting in Forests NSW plantations also comes under the Forests NSW Code of Practice (NSW Department of Industry and Investment 2005) and an Ecologically Sustainable Forestry Management Plan. The Ecologically Sustainable Forestry Management Plan does not contain any guidelines specifically relevant to river health. The Code of Practice includes many protection measures, such as the maintenance of undisturbed streamside filter strips, use of silt fencing, construction of appropriate road drainage and stream crossings and limits placed on road use during wet weather.

Forests NSW maintains a register of all plantations in NSW. A summary of plantation areas within the Shire is included in the desktop review.

At this point in time, there is no binding code or guidelines to manage the environmental effects of private plantation forests in NSW. The extent of privately owned timber plantations in the Shire is not documented at this time.

Forests NSW operations are subject to a wide range of environmental legislation. For each specified forestry zone, including the Lower North East Forest Agreement that encompasses the Bellingen LGA, Forests NSW has developed Integrated Forestry Operations Approvals (IFOA). The Lower North East IFOA includes all the licensing information for natural and cultural heritage protection and operations guidelines including licensing under:

- *Fisheries Management Act 1994*
- *Threatened Species Conservation Act 1995*
- *Protection of the Environment Operations Act 1997.*

The IFOA includes sections on minimising disturbance to fish and fish habitat, with particular reference to endangered species and ecological communities. It also contains regulations about erosion control measures, including post-harvest replanting, road management and maintenance of riparian buffer strips.

In addition to the IFOA, Forests NSW has an environmental policy (reading like a vision statement), a binding Code of Practice for harvesting in native forests and an Ecologically Sustainable Forestry Management Plan for the Lower North East Forest Agreement region. The Ecologically Sustainable Forestry Management Plan does not contain any guidelines specifically relevant to river health. The Code of Practice includes many protection measures, such as the maintenance of undisturbed streamside filter strips, use of silt fencing, construction of appropriate road drainage and stream crossings and limits placed on road use during wet weather. To what extent auditing uncovers breaches of the Code of Practice is unsure. In addition, privately managed plantation forests currently have no binding Code of Practice.

Historically, private forestry required consent from Council. However, with the 2003 review of the LEP, Council no longer has any control over this form of development. Notwithstanding this, Council, as previously described, is a Regulatory Authority under the POEO Act and is capable of responding to pollution events. Council currently responds to complaints, however there is no system for monitoring private forestry operations.

Community and Agency Response

Common response from community and agencies	
Facilitate the development and implementation of education strategies and workshops on best practice management Provide best practice guidelines and fact sheets to contractors and landholders	
Community specific response	*Agency specific response*
Engage and build up a cooperative working relationship with Forests NSW Regional Manager. Work together to identify ways to improve current action and meet the regulations	System needed to identify operations, need for a compliance register, service requests that can be linked to an auditing system
Department of Environment, Climate Change and Water should coordinate action	Coordinated interagency approach with identified roles and coordinated auditing and compliance program developed and implemented
Staff training in catchment management and river care practices	
Development Applications for road use by loggers to improve accountability	
Review/reintroduce Department of Environment, Climate Change and Water rules	

Best Practice Forestry Operations for River Health

The Erosion and Sediment Control Strategy developed by Department of Land and Water Conservation and Forests NSW in 1997 outlines best practice management of soil conservation measures for forestry. The strategy includes suggestions for:

- clearing, to manage the percentage of forest cleared in any one harvest (clear felling greatly increases the erosive effects of rainfall)
- fire management, to avoid the effects of ash deposition in waterways and the effects of fire denuding the ground of cover
- drainage feature management, to ensure the integrity of riparian vegetation and retain adequate buffer strips to filter and to reduce the velocity of runoff and minimise stream bank erosion
- groundcover management, to reduce the erosive effects of rainfall and the amount of sediment entering waterways
- sediment control measures, such as silt fences and sediment traps, to manage siltation of waterways downstream of active harvest areas
- management of unsealed roads, to reduce the sediment in runoff from these areas. Unsealed roads are considered the greatest contributor to sediment entering waterways from State Forests.

These measures are covered to a satisfactory extent by the Codes of Practice set by the Department of Environment, Climate Change and Water and the Department of Industry and Investment.

Barriers and Key Considerations for Change

- Lack of resources by Forests NSW to control quality of work undertaken in State Forests, Forests NSW only has access to one contractor and work staff may be unsure of the regulations covering issues impacting on water quality, such as the width of buffers needed, sloping sites, and the lack of land management plans. A lack of resources may inhibit the implementation of good practice.
- Lack of communication between Forests NSW and community
- Need for coordinated work practice between agencies
- Implement buffer zones to waters edge to decrease sedimentation entering rivers
- Increased inspection of industry to ensure regulations are adhered to, e.g. at Eco Mills where sawdust pile is getting too large and blowing into river
- Unauthorised clearing; lack of knowledge of best practice measures, attitude and lack of knowledge of impacts on water quality
- Need for a strategic, coordinated approach between Council and other agencies with a system to monitor, manage and ensure compliance of forestry, logging and clearing activities to ensure best practice management

STRATEGIC APPROACH TO FORESTRY, LOGGING AND LAND CLEARING IMPACTS: EROSION AND SEDIMENTATION			
OBJECTIVES	**STRATEGIES**	**PERFORMANCE INDICATORS**	**TIMEFRAME/ RESPONSIBILITY**
Improve logging and clearing practices both on government and private lands in order to reduce river health impacts	Facilitate a meeting with NSW Department of Industry and Investment, Forests NSW, Department of Environment, Climate Change and Water , Northern Rivers Catchment Management Authority and Council regarding regulations, guidelines and current operations to improve operations in the shire (This should include ensuring the conditions of development approval are implemented)	Council staff have an improved knowledge and understanding of the regulations and responsibilities Improved strategy to inform the community is identified and implemented A coordinated approach between Council and other agencies is developed A coordinated system to monitor manage and ensure compliance of forestry, logging and clearing activities is implemented Improved best practice management	Medium to Longer Term BSC - River Health Program Department of Environment, Climate Change and Water State Forests Department of Environment, Climate Change and Water Other key stakeholders
	Work with Council staff to develop an operation policy and system that incorporates a compliance register, service requests that can be linked to an auditing system	Operations and procedures are documented Gaps and improvements are identified A coordinated strategy for improvement is developed, implemented and evaluated	Medium to Longer Term BSC - River Health Program Environmental Health and Planning
	Facilitate staff training in relation to river care and catchment management	Increased knowledge and skills	Short to Medium Term BSC - Director of Environmental Health and Planning BSC - River Health Program
	Develop and implement an education strategy incorporating fact sheets, web site information based on Department of Environment, Climate Change and Water and Northern Rivers Catchment Management Authority Code of Practice	Increased community and contractor awareness of the legislation and guidelines for good practice	Medium to Longer Term BSC - River Health Program Environmental Health and Planning Department of Environment, Climate Change and Water Other key stakeholders
	Work with NSW Department of Industry and Investment, Forests NSW, Department of Environment, Climate Change and Water , Northern Rivers Catchment Management Authority and Council to develop and implement education sessions for contractors on good practice	Contractors are trained in good practice management techniques Decrease in complaints	Medium to Longer Term BSC - River Health Program Environmental Health and Planning, NSW Department of Industry and Investment Forests NSW, Department of Environment, Climate Change and Water, Northern Rivers Catchment Management Authority
	Liaise and work with Council's Environmental Health and Planning Department to implement a random auditing strategy and compliance strategy as appropriate	Ongoing monitoring and compliance is undertaken	Medium to Longer Term BSC - River Health Program Environmental Health and Planning Other key agency stakeholders

Stormwater and Building Construction

Overview

Plate 29. Stormwater pipes through golf course

Plate 30. Stormwater runoff to river

Stormwater is water that falls as rain and all the impurities it carries with it. In an urban environment, most rainfall that falls on hard surfaces, e.g. roofs, roads and footpaths, is transported through pipes and channels to existing water bodies. Urbanisation changes the way water flows through a catchment by increasing the area of hard surfaces and changing flow paths. This can adversely affect waterways by:

- changing flow patterns of naturally existing waterways
- increasing frequency and severity of floods
- delivering pollution in the form of nutrients, sediments, toxic chemicals, harmful bacteria, acid water or low oxygen water to naturally existing waterways.

Stormwater is not usually treated prior to discharge to receiving waters, so after heavy rains it is common to see muddy water and litter entering streams. Stormwater management is particularly important within urban areas where population density is relatively high and the proportion of impervious surfaces increases.

Due to the Shire's rainfall patterns and intensity, the issue of stormwater is seen as a significant contributor to water quality issues.

Current Status

Council engaged Resource Design and Management Pty Ltd to develop Stormwater Management Plans for both Urunga and Bellingen (April 2000). The plans were prepared in order to improve the management of stormwater within the urban areas of Urunga and Bellingen, and were designed to comply with directions given under the *Protection of the Environment Act 1991*. The plans also considered interim water quality and river flow objectives developed by the State government and were prepared in consultation with community members and stakeholder groups.

Council has undertaken various improvement works to address some stormwater issues (e.g. kerb and gutter work). However the above plans have not been fully implemented and require review to address gaps and specify more contemporary actions. These gaps include actions to address both new and existing developments. Additionally the plans need to incorporate a maintenance element in order increase their sustainability.

Council's current 'Standard Conditions for Engineering Works associated with Developments' was adopted in 1993. Section 8 of these conditions deals with drainage. The only reference to treating stormwater quality is Section 8.3.3 which deals with the provision of gross pollutant traps.

Council is in the process of updating these standard conditions with a proposal to adopt the Aus-Spec Design Specifications as modified by the Institute of Public Works Engineers Association (IPWEA) - Mid North Coast Group for developments. This change has not yet been implemented, mainly because there are no standard drawings readily available to be incorporated in the specifications. Council is currently investigating the revision of standards by Coffs Harbour City Council with the option of jointly adopting the same standards.

The relevant section of the Aus-Spec Design Specifications as modified by the IPWEA Mid North Coast Group in relation to stormwater quality management is D7 'Erosion Control and Stormwater Management'. One of the stated aims of this specification is to ensure stormwater runoff meets industry acceptable quality criteria.

This specification is more descriptive than prescriptive in that no detailed criteria are defined. For the present, Council will be guided by the existing adopted stormwater management plans for Urunga and Bellingen. This may be difficult to administer because some of the criteria relate to a percentage retention of the annual average load. While the annual average load of pollutants from the different catchments is unknown, modeling (using programs such as MUSIC – "Model for Urban Stormwater Conceptualisation") can be undertaken to estimate existing pollutant loads.

Currently Council may include a condition on development applications along the lines of 'the drainage system is to be designed using the principles of Water Sensitive Urban Design'. The difficulty with this approach is that what should Council accept when a design is submitted and how is equity achieved between developments.

Community and Agency Response

Common response from community and agencies	
Assess stormwater quality, identify high impact areas, undertake mitigation works Ensure new developments and works implement erosion and sedimentation control Need for coordinated interagency approach to improve management, e.g. Back Creek	
Community specific response	*Agency specific response*
Develop an education and compliance strategy to decrease littering	Investigate and implement best practice management
Develop an education strategy to minimise household impacts	Investigate improved street maintenance practices (e.g. vacuum broom)
Council to develop and implement a strategy to improve stormwater quality, involving industries, businesses and community	Undertake a stormwater study, and develop and implement a stormwater action plan
Develop and implement a holistic Building and Construction strategy incorporating social and environmental impacts	The creation of a Development Control Plan for stormwater management would be of particular use, especially considering the likely need for new urban subdivisions identified by the Growth Management Strategy
Ensure new developments are environmental friendly not impacting on the environment e.g. mandatory water tanks and solar panels	
Erosion and pollution caused by construction and development	
Ensure systems are built to adequate standards and dimensions to meet predicted growth in the Shire	

Best Practice

Best practice for the management of stormwater should consider factors such as:

- Utilising appropriate models (e.g. MUSIC) to estimate existing pollutant loads from the catchments
- On-site strategies for the detention of stormwater, encouraging infiltration and reducing the velocity of stormwater, reducing its capacity to carry sediment and thus protecting water quality, vegetation and habitats downstream
- Strategies to encourage the recycling of water and the installation of rainwater collection tanks, reducing the volumes of stormwater from impervious surfaces reaching downstream waterways
- Requirements for erosion and sediment control measures on all building sites and other developments, such as specifications for vehicle access, minimisation of exposed soil and disturbed areas, location of stockpiles of building materials, minimisation of cut and fill operations, use of sediment fences and traps
- Council have a peer review undertaken of proposed Stormwater Strategies. The peer review will be undertaken by independent consultants engaged by Council, at the cost of the developer, to ensure that the proposed strategies are accurate and in accordance with Council's adopted policies for stormwater disposal.
- Pollution management measures aimed at reducing chemical pollutants entering stormwater from Council works and private developers operating within the Shire
- A clear policy and implementation process for managing compliance
- The possibility of stormwater harvest and reuse plans in new urban development areas, such as a mechanism for conserving potable water and minimising stormwater management issues. This complements other approaches to sustainable urban water management, such as demand management, rainwater tanks, and the reuse of effluent and grey water.
- Emergency plan for management of spills of significant environmental risk
- Harvesting and reusing
- Methods to control stormwater pollution at the source are cost-effective ways to reduce the generation or discharge of many pollutants that cause poor quality stormwater.
- Non-structural source control, which can include community education, council management activities, operations and maintenance activities and land use and site planning. Non-structural source control is concerned with changing behaviour to reduce the amount of pollution that enters the stormwater system.
- Structural source controls which aim to reduce the quantity and/or improve the quality of stormwater at or near its source, commonly through filtration, infiltration and detention. These controls include; swales, buffer strips, infiltration basins and trenches for quantity control, and small stormwater treatment measures such as stormwater pit gross pollutant traps for quality control.

Stormwater treatment should be considered last in the hierarchy of methods for managing stormwater; (methods to control stormwater at the source and non – structural source control should be considered first as they are more cost effective in reducing the generation or discharge of many pollutants that cause poor quality stormwater) The best practice use of these engineered solutions requires a case by case assessment of individual needs that considers:

- volume of stormwater
- types and concentrations of pollutants
- existing infrastructure
- space available for a treatment measure
- capital and ongoing funding available
- hydrologic factors, such as flood levels and groundwater considerations
- community acceptance.

Barriers and Key Considerations for Change

- lack of knowledge and understanding of the impacts of stormwater (including litter) and mitigation measures
- entrenched maintenance practices for street cleaning; need to address general urban runoff (containing animal waste, plastics, cigarette butts, weeds)
- lack of baseline data and water quality objectives to guide management; inadequate information to determine development conditions
- need for coordinated approach (incorporating state agencies) to address impacts; need for ongoing training to ensure access to up to date information and expertise
- cost of stormwater mitigation works and maintenance
- lack of follow through on conditions of consent, including impacts from building sites, lack of stormwater compliance activities including business effluent
- need for Council to improve stormwater management, need for Council to access funding to address this
- need for a strategic proactive Council policy and implementation system of auditing, compliance, maintenance and education is required, linked to monitoring, evaluation and reporting; State of the Environment Report should drive actions
- lack of funding
- educate the public about Council's policies
- Council to manage and monitor the clearing of land
- Council to monitor and administer fines to those who do not comply to industry codes and practises
- building exclusion zones
- Council to work with the Department of Lands to formulate consistent criteria
- plant more riparian vegetation
- Council to undertake stringent inspections of sites to ensure compliance
- lack of education in the public and general attitude towards Council
- more consultation and education for builders at DA stage
- assign responsibility to builder, developer or residents in regards to runoff and pollution from building sites

STRATEGIC APPROACH TO STORMWATER AND BUILDING CONSTRUCTION IMPACTS: EROSION, SEDIMENTATION AND POLLUTION			
OBJECTIVES	**STRATEGIES**	**PERFORMANCE INDICATORS**	**TIMEFRAME/ RESPONSIBILITY**
Improve stormwater management in the Shire Minimise the impacts of stormwater on the aquatic system	Council to strengthen its regulatory requirements by identifying and implementing water sensitive urban design criteria for new developments	Facilitate a discussion forum with Council Engineers, Town Planners and Health and Building Surveyors and Consultant to identify criteria and develop policy. Council adopt policy on stormwater management and maintenance criteria for new developments is developed and implemented Council insert a provision in its adopted Fees and Charges Schedule that allows for the collection of funds for the peer review of proposed stormwater strategies.	Short Term BSC - River Health Program BSC - Road Asset Manager Development Engineer Strategic Planner
	Undertake a stormwater study incorporating new and current developments (that incorporate s7.3 and SMP, WSUD principles), this will include water quality information, field study to identify and map stormwater data, and the identification of assets, their location and the type of mitigation works.	The identification of an effective combination of economic and community based source control measures and incentives and engineered solutions to achieve improved water quality standards for the rivers.	Short to Medium Term BSC - River Health Program BSC - Road Asset Manager Development Engineer Strategic Planner Department of Environment, Climate Change and Water
	Ensure Council staff have access to and implement best practice strategies	Ongoing training and development is undertaken to ensure Council staff have access to new remediation measures and maintenance options	Ongoing BSC - River Health Program in conjunction with BSC - Road Asset Manager Development Engineer Strategic Planner Environmental Health and Planning Department of Environment, Climate Change and Water
	Identify community and business knowledge and understanding of impacts relating to stormwater and current practice	Community and business survey developed, implemented, analysed and reported Increased ability of community and business to address impact areas.	Medium Term BSC - River Health Program Development Engineer Department of Environment, Climate Change and Water
	Develop and implement a holistic best practice Stormwater Action Plan for Bellingen Shire	Plan developed that reflects the practical information required for Council, businesses and the community to implement a comprehensive strategy that identifies priorities, resources, practical management and maintenance to decrease the impacts of stormwater on the aquatic system Stormwater Action Plan incorporates education, monitoring and compliance Monitor and evaluate plan	Medium Term BSC - River Health Program BSC - Road Asset Manager Development Engineer Environmental Health and Planning Department of Environment, Climate Change and Water

STRATEGIC APPROACH TO STORMWATER AND BUILDING CONSTRUCTION IMPACTS: EROSION, SEDIMENTATION AND POLLUTION			
OBJECTIVES	**STRATEGIES**	**PERFORMANCE INDICATORS**	**TIMEFRAME/ RESPONSIBILITY**
	Council to undertake regular stormwater audits of businesses and business practice, such as service stations to ensure compliance	Audit identifies and rectifies areas of concern Educational strategy developed to address problem areas	Medium Term BSC - Senior Environmental Health Surveyor
	Develop and implement a policy and implementation process for managing compliance	Improved compliance Improved erosion and sediment control measures Decreased pollution	Environmental Health and Planning
	Develop and implement a holistic Building and Construction strategy incorporating social and environmental impacts Investigate and implement options for Council to oversee and ensure new developments meet Development Approval requirement to address sedimentation issues Council to undertake audits of building sites and address impacts Educate builders on correct methods to reduce sedimentation Undertake compliance as required	Reduced impacts from building sites Improved operations	Medium Term Health and Builidng Surveyors
	Investigate with Council the feasibility of providing dog waste disposal bags at key areas in the Shire, and implement	Decrease in dog waste in public areas	Short Term BSC - River Health Program Council Ranger
	Liaise with key entertainment area managers regarding a strategy to reduce cigarette butts on the streets	Decreased cigarette butt litter	Short Term BSC - River Health Program Council Ranger
	Liaise with other councils to investigate affordable options for Council to improve their operational practices in relation to street cleaning and subsequent impacts on stormwater quality Provide a range of costings and alternatives for resource sharing	A proposal for improved practices is developed in consultation with Works Engineer and presented to Council	Medium Term BSC - River Health Program Development Engineer

Rural Roads and Bridges

Overview

Plate 31. Kalang Road - Flood impact on rural roads and bridges

Council maintains a network of roads which cross the river at various locations. Many of these roads are not sealed and as a result there are sedimentation impacts on water quality during rainfall events. Maintenance of roads is undertaken on a priority basis, leaving a number of areas without adequate maintenance which exacerbates these impacts. Additionally, the collection of debris at bridges during high rainfall events leads to diverted water flows onto often unprotected banks. This can result in riverbank damage and increased erosion.

Plate 32. February 2009 Flood - Kalang Road

Plate 33. February 2009 Flood - Kalang Road

Current Status

Council has a Roadside Management Plan, developed in 1998, which consists of both management guidelines and a working document. It also utilises the Roadside Handbook, which was produced by the NSW Roadside Environment Committee. The documents provide guidelines in terms of environmental strategies, e.g. protecting vegetation, minimising disturbances to roadsides and management guidelines covering ecological social and economic issues. However, these are only guidelines and there is no action plan attached to these documents that outlines the actions and operations in relation to the associated guidelines. There are also no specific strategies in relation to bridge design, nor maintenance strategies in relation to erosion and sedimentation.

Community and Agency Response

Common response from community and agencies	
Develop and implement a holistic Rural Roads Strategy incorporating social and environmental impacts (NB Northern Rivers CMA Rural Roads Plan)	
Community specific response	*Agency specific response*
Encourage Engineers to implement strategies to address erosion, sedimentation and runoff from roads	The Rural Road Strategy needs to be practical and cost effective, some of the Northern Rivers CMA strategies don't meet these criteria
Develop a working group consisting of Council Engineers, River Keeper and landholders to audit bridges regarding impacts relating to flow, design, erosion and sedimentation	Other State agencies should have input into issues relating to that may impact on their areas of jurisdiction
	Need to identify additional funding to enable Council to implement best practice management, address erosion, sedimentation and runoff
	Need to prioritise works

Best Practice

Council needs to refer to the Local Government Rural Roads Strategy and revisit the Roadside Management Strategy to review and update recommended good practice management. A plan of action then needs to be developed, implemented, monitored and evaluated based on the management strategies.

Plates 34 and 35. February 2009 Floods – South Arm Road

Barriers and Key Considerations for Change

- Lack of funding for adequate road and bridge works, design of bridges impedes flow during floods and allows debris to build up and direct flow into bridge structure, the need for sedimentation control measures during road and bridge construction and maintenance, Council has identified costed priorities in works plan. but not the resources to implement best practice
- Runoff from rural roads causes pollution, siltation and sedimentation of water ways
- Gravel movement during floods pushes the water into the bank undermining banks and roads
- Need for a holistic approach incorporating social and environmental impacts
- Differing perspectives of community and Council
- There will never be enough resources to meet all the needs of the community; need to prioritise works.

STRATEGIC APPROACH TO RURAL ROADS AND BRIDGES IMPACTS: EROSION AND SEDIMENTATION			
OBJECTIVES	**STRATEGIES**	**PERFORMANCE INDICATORS**	**TIMEFRAME/ RESPONSIBILITY**
Decrease the impacts from road runoff and scouring from rural roads and bridges (particularly during heavy rain and flood events)	Review and upgrade Council's Roadside Management Plan incorporating appropriate strategies from Northern Rivers Catchment Management Authority's Local Government Rural Roadside Strategy	Council's Roadside Management Plan reflects priority actions and operations strategies to address environmental, social economic issues erosion incorporating roads and bridges, and sedimentation Good practice operations are detailed	Medium Term BSC - Road Asset Manager, and BSC - River Health Program
	Liaise with Development Works Operations Staff to review and document priorities and associated costs	Priority areas and associated costs are identified	Medium Term BSC - River Health Program
Increase awareness, understanding and cooperation in addressing erosion and sedimentation as a result of heavy rain and flood impacts from rural roads and bridges	Develop a working group consisting of key stakeholders, e.g. Council Engineers, landholder/community representatives, Northern Rivers Catchment Management Authority and Department of Industry and Investment (Fisheries), BSC - River Health Program to undertake an audit of bridges and key rural roads to identify and assess the major issues of concern relating to bridge design, drainage on approaches to bridges, and river flow and subsequent impacts relating to erosion and sedimentation	Cooperative response is undertaken Improved communication between Council and community	Medium Term BSC - Road Asset Manager, Development Works Operations Staff and BSC - River Health Program
		Key issues of concern are detailed, agency requirements and parameters, e.g. DPI (Fisheries), are identified	
		Increased understanding and awareness of engineering, environmental, social and economic considerations and parameters	
	Develop an action plan to address priority areas incorporating current works priorities, and best practice management in relation to engineering, environmental, social and economic considerations and parameters	Working party develop an agreed action plan	Medium to Longer term BSC - Road Asset Manager, Development Works Operations Staff and BSC - River Health Program
	Identify and source resources and funding required to implement the plan and integrate within Council's Management Plan /Plan of Works (forward plan)	Alternate funding sources are identified Funding is accessed to implement the priorities	Medium to Longer Term BSC - River Health Program
	Implement the action plan in stages according to priorities, resources and plan of works	Action plan is implemented according to best management practice	Ongoing
		Action plan is monitored, evaluated modified and reported on	Ongoing
	Promote improvements, e.g. through newsletters and media, and through the working group members	Community has an increased awareness of on-ground improvements and improved practices	Ongoing

Water Quality Monitoring

Overview

Water quality is a key measure of river health. This section of the Plan addresses water quality monitoring as one of the tools for determining the status of river health at a point in time. This section sets out the key elements in the management of Water Quality Monitoring as a tool to assist in guiding the implementation of the Plan.

Healthy aquatic systems and good water quality are dependent upon each other. Water quality refers to the suitability of water for a specific purpose or value. River water quality is usually measured in terms of its suitability for drinking, swimming, boating, aquaculture or the protection of aquatic ecosystems. The measurement of water quality involves testing the water for physical, chemical and biological parameters. Achieving appropriate water quality is fundamental to good waterway management.

Council does not have its own specific water quality objectives for the Kalang/Bellinger River system. There are however, Commonwealth and State guidelines and user group defined objectives for water quality that should guide Council decisions with respect to river water quality.

The NSW Water Quality and River Flow Objectives for the Bellinger River and Coffs Harbour document (www.environment.nsw.gov.au/ieo/Bellinger/report-02) provides relevant guidelines for water quality objectives with respect to aquatic ecosystems, visual amenity, and primary and secondary contact recreation. It is suggested that the ability to maintain a sustainable oyster industry is a base line objective for water quality (Estuary Management Plan 2008).

Catchment inputs are a major source of poor water quality in river systems. Catchment inputs are assessed and managed as either point source or diffuse source inputs. Point source inputs include effluent discharge from sewage treatment plants and licensed waste flows from industry. Point source inputs are generally monitored and easy to quantify.

Diffuse source inputs are more difficult to quantify and are dependent upon a range of factors including climatic conditions, land use choices and riparian vegetation. For relatively undeveloped catchments like the Kalang/Bellinger catchment, diffuse source inputs account for the majority of poor water quality issues. Diffuse source pollution loads include inputs from stormwater, runoff from agricultural land, runoff from on-site sewage management systems, erosion and runoff from unsealed roads, runoff from acid sulfate soils and private and state native forestry. The major pollution types delivered to waterways from diffuse sources are sediment, nutrients, pathogens, chemicals, acidity, salinity and rubbish. Priorities for the management of diffuse source water pollution in NSW are:

- excessive sediment loads affecting river health and increasing the cost of managing water infrastructure
- high nutrient loads causing weed growth and harmful algal blooms
- high pathogen levels affecting oyster growing, recreational opportunities and tourism.

Water quality information for the Kalang/Bellinger estuary has been summarized and analysed by Lawson and Treloar (2003a) and by BMT WBM (2007). The data suggests that the Kalang/Bellinger River estuary suffers from the following water quality issues:

- elevated nutrient (total nitrogen and total phosphorus) concentrations
- elevated chlorophyll a levels in the upper reaches of the estuary
- elevated faecal coliform levels – particularly after significant wet weather events
- elevated sediment levels.

Current Status

As well as monitoring drinking water and sewerage, river water quality data has traditionally been collected by Council when funding allows, and for a specific purpose (e.g. responding to incidents). (See Appendix K). This has resulted in a body of water quality data that is disjointed and does not allow for high level analysis and review.

Council undertakes bacteriological testing for swimming on a fortnightly basis from October to April at four sites, Urunga Sea Lido, Bellingen Wharf, Capararo's Hole, and Mylestom Pool. There is however, no map delineating locations for sampling swimming or drinking water, nor are the results collated. This is an area that could be addressed immediately by Council. Swimming water quality results are published in the local paper.

The Department of Industry and Investment (Fisheries) undertakes statewide monitoring of seagrass, mangroves and salt marsh habitats and fish stocks.

The oyster farmers undertake sampling of water and oyster meat as per the shellfish guidelines.

The Department of Environment, Climate Change and Water has been undertaking a hydrographic survey of both the Bellinger and Kalang Rivers. In addition, it is monitoring physical characteristics of the river and has set up stationary monitors in the estuarine area that feed information back to Manly Hydraulic Laboratories for analysis. The Department of Environment, Climate Change and Water is also engaged in a State-wide, natural resources monitoring, evaluation and reporting (MER) undertaking that will provide information about natural resource condition and pressure on estuaries and coastal lakes including the Kalang River system.

Plates 36 and 37. Water quality monitoring undertaken by Department of Environment, Climate Change and Water

Community and Agency Response

Common response from community and agencies
■ identified the need for planned and targeted monitoring ■ respondents suggesting that the monitoring program needs to be improved - more comprehensive so it can be utilised to address impacts. Suggestions for improvement included: ■ monitoring bacteriological, chemical, physical and nutrient levels all along the river and key tributaries ■ strategic rain/storm event monitoring ■ more coordinated action involving all appropriate agencies and community ■ strategic management of contamination sources ■ development of a data base available to the public ■ development and implementation of an Ecosystem Health Monitoring Program to monitor and evaluate river health. It was noted that cost may be a limiting factor to implementing a comprehensive program, however it was noted that all stakeholders could contribute to this.

Best Practice

In order to maximise the potential of water quality data as a management and policy tool, it should be collected in a fashion that is:

- regular and ongoing
- consistent between sites, locations, catchments and with respect to analyses
- comprehensive
- targeted at providing the maximum coverage of a system and delivering information about important features such as point source inputs, questionable land use, aquaculture industries, major tributary contributions and ecosystems.

Data collected in this way could then be usefully assessed and used to develop management tools. Recommended best practice has included

1. A monitoring protocol for the Kalang/Bellinger estuaries developed in 2004 (Luffman 2004). The protocol aimed to coordinate and improve upon existing programs to assess the health of the estuary in the long term. It suggested that various physical, chemical and biological samples be collected at 9 sites within the estuary on a monthly basis. The protocol is yet to be implemented.

2. BMT WBM (2007b) undertook a scoping study of an Ecosystem Health Monitoring Program (EHMP) that has been successfully implemented in SE Queensland in order to assess its suitability for application across the Northern Rivers Catchment Management Authority region. The scoping study identified the need for more integrated collection of aquatic resource information. It identified shortfalls and complications with the current monitoring activities and assessed the number of existing programs that would benefit from information collected under an EHMP. The study concluded by proposing an indicative EHMP for the Northern Rivers region and outlining particular considerations for the development of an EHMP.

In general, an EHMP will improve upon the current situation and provide many benefits for local resource management. An EHMP provides a framework for collecting information about river health that meets all the criteria for effective monitoring. Benefits of the proposed EHMP scheme for water quality management of the Kalang/Bellinger system would include:

- A system-wide approach to water quality monitoring. This would reduce the current deficit in water quality information from the freshwater reaches. It would also contribute to a total catchment management approach to the Kalang/Bellinger River system.
- Regular, consistent information on which to base decisions as opposed to inadequate needs-based sampling.
- A regular, consistent background of data to relate to special needs sampling programs that will help place special needs sampling programs within a broader longer term picture of river water quality.
- More efficient, integrated water quality sampling, resulting in cost/benefit improvements.
- An integrated system of measuring river health, including physical, chemical and biological indicators.
- The provision of improved information for the Northern Rivers Catchment Management Authority to make better decisions about funding allocation and management priorities.

STRATEGIC APPROACH TO WATER QUALITY MONITORING IMPACTS: POLLUTION AND SAFETY			
OBJECTIVES	**STRATEGIES**	**PERFORMANCE INDICATORS**	**TIMEFRAME/ RESPONSIBILITY**
Ensure water quality is appropriate for human use, protects ecological processes, sufficient to support a sustainable oyster industry	Ensure the implementation of the strategies of Management Objectives 1 and 3 of the Estuary Management Plan	Estuary Management Plan strategies are implemented	Short to Medium Term BSC - River Health Program Environmental Health Maritime BSC - Road Asset Manager BSC - Water and Sewerage Engineers
	Work with relevant stakeholders to achieve the recommendations from Department of Industry and Investment Guidelines 'Healthy Estuaries for Healthy Oysters'	Recommendations are incorporated into appropriate areas of Council's operations	Medium to Longer Term BSC - River Health Program in conjunction with Council staff
	Collate and provide access to current water sampling results Provide periodic reports on waterway health	Specific tasks under Management Objective 3 and 4 are achieved	Short Term BSC - Senior Environmental Health Officer
Develop and implement a comprehensive water quality monitoring program that can be utilised to improve river health	Work with the regional working party to develop and implement an Ecosystem Health Monitoring program for the region Ensure the program integrates current sampling Work with the Water Watch Coordinator to implement the program in the Shire	An appropriately resourced Ecosystem Health Monitoring program for the region is implemented Management Objective 4 of the Estuary Management Plan is achieved Water quality results are utilised; the program guides river health strategy implementation Increased community involvement and commitment to water quality	Short to Medium Term BSC - River Health Program

OTHER ISSUES

This section covers other issues or areas for consideration for the River Health Program. These issues do not have a specific action associated with them as they were not specifically identified by the community and agencies as priorities. However, their consideration in the context of the Plan is important in terms of implementation and operation of the River Health Plan.

Acid Sulfate Soils

Overview

Acid sulfate soils are widespread in the Kalang/Bellinger coastal floodplain. Acid sulfate soils are soils containing pyrite which become problematic only when disturbed, allowed to dry out and are exposed to oxygen. When this occurs, the pyrite is oxidised resulting in the production of sulfuric acid and its salts, which can then be transported into surface waters or be absorbed into groundwater.

Current Status

Almost the entire Kalang/Bellinger estuarine floodplain is considered to have a high probability for the occurrence of acid sulfate soil material. There is a network of drains on the floodplain and four floodgates (Lawson & Treloar 2003). Whilst the Department of Environment, Climate Change and Water mapping does not indicate any actual acid sulfate soils, it is highly likely that they exist. Drains, designed to increase the rate of removal of floodwaters from low lying agricultural lands, tend to drain groundwater if they are deep, allowing pyritic soils to dry and become oxidised. Subsequent rainfall events transport the acid created into nearby water bodies.

To date, there have been no reported general acidification effects upon the estuarine waters of the Kalang/Bellinger system. This can be explained by the adequate and consistent river flow and the regular tidal flushing of the areas most affected by drainage works. The lack of evidence for acidification of the estuary also explains the lack of water quality monitoring aimed at understanding the effects of acid sulfate soils on the health of the Kalang/Bellinger Rivers.

In NSW acid sulfate soils management is governed by the Acid Sulfate Soils Management Advisory Committee, an interdepartmental body that released the *Acid Sulfate Soil Manual (1998)*. The Manual deals with the assessment and management of acid sulfate soils with sections about drainage, groundwater and the development of acid sulfate soils management plans.

Current management of acid sulfate soils in the Kalang/Bellinger system includes a wetland care project (Wetland Care Australia 2005). The wetland care project is funded by the Northern Rivers Catchment Management Authority and aims to:

- increase the number of floodgates modified, maintained and actively managed
- increase the area of floodplain under active management and the number of landholders adopting best management
- educate landholders with respect to acid sulfate soils
- install structures to prevent overtopping of low lying areas with tidal water
- shallow drains to prevent over-drainage
- rehabilitate acid sulfate soil scalds and reintroduce natural wetting and drying cycles
- encourage off-stream watering of stock.

Within Council's own planning framework, acid sulfate soils are dealt with briefly in DCP 26 – Contaminated Land Management. The requirement is, that prior to excavation works, acid sulfate soil maps should be consulted to ensure that no disturbance of potential acid sulfate soils occurs.

Best Practice Management

Best practice management and mitigation of acid sulfate soils can be sourced from a number of documents. The *National Strategy for the Management of Coastal Acid Sulfate Soils* (National Working Party on Acid Sulfate Soils 2000) outlines the following procedures to avoid the disturbance of acid sulfate soils:

- increasing the awareness of acid sulfate soils, including both the extent and severity and the potential adverse impacts
- education of land managers and developers to understand the best management principles and technologies, and
- introduction of planning and development controls to minimise the risk of disturbing acid sulfate soils and mitigating the effects of disturbed acid sulfate soils.

Johnston *et al*. (2003) discuss best practice for the management of floodgates and drainage systems in coastal floodplain areas. Their recommendations are as follows:

- active management of floodgates, meaning that floodgates should be manually opened to improve water quality in drains by regular dilution with tidal waters
- retaining water in drains
- infilling and shallowing of drains. This is used to reduce over-drainage of natural wetland areas.

Heavy Metal Pollution

Overview

Human activities can increase the heavy metal concentrations in waterways to unnaturally high levels. Sources of heavy metal pollution include industrial waste products, urban and agricultural runoff, atmospheric deposition and runoff from mine sites or from acid sulfate soils.

Heavy metal pollution can be toxic to aquatic animals and plants, resulting in changed morphology, reduced reproduction and even death (OzCoasts 2008).

An Antimony Processing Plant (APP) operated in Urunga adjacent to the corner of Hillside Drive and the Pacific Highway between 1969 and 1974. The plant was abandoned after it ceased operating with no attempt being made to clean up tailings or rehabilitate the land. Paperbark trees in the adjacent wetland located down gradient of the site have experienced some dieback.

Current Status

The former APP is a potential source of heavy metals in the Urunga Lagoon catchment. A suite of heavy metals, including arsenic, antimony, mercury, copper, iron, aluminium and lead have been recorded on the site itself and in the groundwater surrounding the site, far in excess of ANZECC (2000) guidelines for the protection of aquatic ecosystems. Current management of the site is limited to the construction of an L-shaped drain at the downstream end that acts as a trap for pollutants bound to particulate matter. In effect, heavy metals are bonded to sediment that sinks to the bottom of the drain, protecting downstream areas. At the time of the last in-depth study (1997), no impact of pollution from the APP site had been recognised on the waters of Urunga Lagoon. It also appears that the concentrations of heavy metals on the site and in the wetland are stable, perhaps due to the high levels of caustic soda used in the original processing and a subsequent buffering capacity against acidification of the tailings.

The risk of remobilisation of heavy metal pollution originating from the APP is associated with the pH of groundwater and surface waters, along with the potential for oxidation and acidification of surface layers of sediments in the event of abnormal groundwater fluctuations. The risk of heavy metal mobilisation could be greatly reduced by the appropriate management of this site. The two main management options identified in the Department of Land and Water Conservation document *Urunga Contaminated Site – Part 2* (1997) are capping and prevention of further oxidation or removal of contaminated sediment. Capping and prevention of further oxidation has been identified as the preferred option. Funding options for the preparation of a remedial action plan for the site are being pursued and remediation would likely to involve an on-site capping and containment approach to prevent any disturbance of acid sulfate soils and potential mobilisation of metal ions.

Surface and groundwater monitoring is undertaken at the Raleigh Landfill site and includes testing for arsenic. To date there is no evidence that the runoff from the leachate is affecting surface waters or groundwater.

Best Practice

Best practice management varies from site to site. Site-specific best practice management needs to be developed and implemented to address these issues.

Licensed Source Inputs to the Kalang/Bellinger Rivers

Overview

Under the *Protection of the Environment Operations Act 1997,* the Department of Environment, Climate Change and Water (formerly EPA) grants licenses for point source inputs of pollutants into NSW waterways. The licensing conditions usually specify maximum concentrations of specific pollutants in discharge, maximum annual loads for specific pollutants or both. The licences also stipulate exemptions to the licensing conditions, sampling methods and frequency for data collection and the responsibility for recording complaints. A search of the public register, maintained by the Department of Environment, Climate Change and Water, identified a number of licences within the Kalang/Bellinger catchment. These are outlined in the Desk Top Study.

Current Status

A summation of pollutant loads suggests that the contribution of point source inputs of Total Nitrogen, Total Phosphorus and Total Suspended Solids is in the order of 2% of the total load of the Kalang/Bellinger catchment (Lawson & Treloar 2003a). This factor is approximate, as it considers only the discharges from the two sewage treatment plants, though it does account for *maximum allowable* loads from each.

Best Practice

Generally license conditions define minimum standards for outputs. Working towards best practice with licensing authority for each site should be undertaken. Relicensing is a key opportunity to move towards improved best practice.

Climate Change Considerations

Overview

The predicted changes in climatic conditions arising from increasing concentrations of greenhouse gases in the atmosphere have a number of significant implications for river health. For example, there is likely to be an increase in the intensity and severity of both drought and storms along the NSW coast. The effects of this could be large changes in flow variability, channel meandering and water availability. Additionally, climate change driven sea level rise could have particularly significant implications for low-lying areas adjacent to estuaries.

Current Status

The accurate forecasting of climate change effects is a complicated business. Despite this, the science is advancing and more reliable figures are being released as time goes by. Annual average temperatures for most of Australia are projected to increase by 0.6–1.5°C by 2030 and by 1.8–3.4°C by 2070 compared to 1990 levels (CSIRO 2007). Predicting the exact level of temperature increase is extremely difficult, but atmospheric scientists can say with a high degree of certainty that (after CSIRO 2007):

- The future climate of the Northern Rivers area of NSW is likely to be warmer.
- Predicted increases in evaporation are also likely to result in an area that is drier.
- Other likely effects are increased heat waves, extreme winds and fire risk.
- In the long term (by 2070) we are likely to see an increase in extreme rainfall events
- The most severe impacts of climate change are likely to be felt through extreme weather events such as hot days, bushfires, droughts and intense storms.

Current climate change predictions indicate a potential for decreased average rainfall. This means water security could be undermined and stream flows reduced. The follow-on effects of this phenomenon include decreases in water quality, increased saline intrusion and adverse effects on groundwater aquifers. It also means potential negative impacts on aquatic biodiversity and wetland health. Increased bushfire incidence may have adverse effects upon rivers through increased sediment loads and ash deposition (CSIRO 2007). Existing stresses on aquatic flora and fauna, such as habitat removal, modified flow regimes and poor water quality may make them more susceptible to the above impacts of climate change (Department of Environment, Climate Change and Water 2008b).

Best Practice

Potential strategic adaptations that may be relevant to the Shire in the future include:

- reducing dependency on surface waters during low flow conditions and increasing overall water use efficiency within the catchment (See section 1.3 IWCM)
- reviewing flood and erosion control management
- assessing the likelihood of saline intrusion into the vicinity of the Lower Bellinger Water Scheme borefields
- reducing emissions of greenhouse gases.

Sea Level Rise

Overview

The heat that has warmed the Earth over the past century as a result of climate change has been largely stored by the oceans. The temperature of the world's oceans rose during the 20th Century and is predicted to continue rising throughout the 21st Century. The thermal expansion associated with temperature increases is expected to be the dominant force in sea level rise throughout the 21st Century. Glacier and ice cap melt are predicted to contribute increasingly over the long term (CSIRO 2008).

The NSW State Government recently released a Draft Sea Level Rise Policy Statement (Department of Environment, Climate Change and Water 2009). The policy acknowledges the fact that sea level rise is occurring and will continue, and that among the impacts will be increased coastal hazards and greater flooding risks to coastal lands, foreshores and other low lying coastal areas. The policy sets a planning benchmark in order to provide local government with some guidance to support the consideration of sea level rise in planning and approvals decision-making processes. The benchmark adopted is an increase above 1990 mean sea levels of 40 cm by 2050 and 90 cm by 2100. The benchmark is in line with the best available international and national forecasts. Adoption of the benchmark by local government is intended to assist with the identification of potential hazards to infrastructure, essential services and the physical environment.

Current Status

The impacts of rising sea level are many. There is the predicted salt water intrusion into aquifers and estuaries, affecting coastal ecosystems, water resources and human settlements. There will be changes in the distribution and extent of coastal wetlands, impacting upon agriculture and low lying urban settlements. There will be changed flushing behaviour of estuaries. Coastal impacts are likely to include shoreline recession and realignment of beaches.

The intrusion of saltwater into the aquifer is of particular concern to Council because the extractive bores that supply the towns of Urunga and Bellingen lie approximately 1 km upstream of the current known tidal limit. In addition to this, further saltwater intrusion into the estuary might affect the utility of certain sections of the Kalang/Bellinger River for irrigation purposes.

Whilst the global impacts of climate change are becoming increasingly clear, it is still uncertain what the effects on local systems like the Kalang/Bellinger River will be. The science required is complicated. Coastal erosion effects will almost certainly result in increased sediment deposition within estuaries. The impacts of this upon estuarine ecosystems will be dependent upon specific rates of sedimentation, rates of sea level rise and elevation-dependent accommodation space for migration of mangroves, salt marshes and seagrasses.

The specific effects of sea level rise may be increased flood levels and duration, water logging of soils, soil salination and reduced irrigation amenity of groundwater due to saline intrusion (CSIRO 2007). Sea level rise will also result in an upstream migration of the saltwater/freshwater interface (Newton 2008). This could be exacerbated by reductions in average freshwater flows associated with climate change predictions. Increased acidification of estuarine waters could also result. Greater fluctuations in the levels of groundwater could potentially increase the risk of discharges from acid sulfate soils which, when combined with a higher proportion of rainfall falling in storm events, could escalate the potential for delivery of acid water to the estuary. In addition, higher concentrations of carbon dioxide in the atmosphere are lowering the pH of oceanic waters. The impacts of this on shell-forming creatures and the ecosystems they support are potentially enormous.

Planning for sea level rise is complicated by other factors. The increase in sea level will exacerbate the effects of extreme sea level events known as storm surges. Storm surges are regular events where storm-associated low air pressure systems and high winds create a temporary surge in local sea levels. Against a background of elevated sea levels, storm surges are predicted to more frequently inundate low lying urban and agricultural areas and to more fully impact upon coastal geography as seawater penetrates further inland and causes greater erosion. The worldwide increase in the number of people flooded per year with a sea level rise of 1 m is expected to increase more than tenfold (CSIRO 2008). Increases in severe storm events and an extension of the tropical cyclone zone further south will result in high winds and extreme wave events that will further erode coastlines and add to the encroachment of seawater into catchments and urban areas. In general we are likely to see increased coastal inundation, erosion, significant changes to estuarine ecosystems, water quality, coastal hydrodynamics and groundwater resources.

Best Practice

Best practice management to address this issue will need to be considered, planned for and implemented in accordance with the evolving evidence. The main effect for planning in the Shire will be to reassess the way that risk of flood is calculated. The ACE (2007) predict that by 2020 extreme sea level events will happen up to 6 times more often and by 2040 this could be up to 30 times more often. This would mean that we would see 1 in 100 year flood levels up to once every 3 years. Property development codes that have relied on a steady sea level for planning purposes will have to be reconsidered and the way in which all councils calculate risk will be need to be reviewed. A Development Control Plan for low level lands likely to be affected by future sea level rises should be investigated.

RIVER HEALTH PLAN IMPLEMENTATION

Both the agencies surveyed and the community have identified a number of areas that should be addressed in order to ensure effective implementation of the Plan. Specific plan implementation actions are identified in the relevant issue tables. These will be delivered through an integrated approach which incorporates education, coordination, communication and program sustainability.

Education

Education was seen as a key element for initiating positive change. Suggestions included:

- developing and implementing educational strategies through schools as well as workshops for landholders and the community
- using “key champions” and peers to raise awareness and change attitudes and behaviours
- raising awareness and providing information through media, marketing and advertising campaigns
- lobbying industry and businesses to sponsor educational strategies
- building on the Keep Australia Beautiful campaign and apply it to river health.

The agencies also identified the need to undertake these actions in a more coordinated manner. This would support Northern Rivers Catchment Management Authority’s role in the coordination of the natural resource management areas and the strategic direction of the Catchment Action Plan.

Integrating these actions within a holistic framework of actions such as those used in a health promoting approach (i.e. creating supportive environments, building appropriate policies, reorienting services, and strengthening community action) will increase effectiveness.

Coordination

In order to successfully implement the Plan, a number of systemic management issues need to be addressed.

Council, as the driver of the Plan will need to ensure coordination between the key agency stakeholders and the community. This coordination will be required internally with defined roles and responsibilities of Council divisions. From a wider perspective, this will require knowledge of agency roles and responsibilities and contributions to river health actions. It will assist in resource allocation and the development of alliances to achieve actions. In some instances this may need to be formalised through agreed Memorandum of Understanding or Partnership Agreements.

This approach was supported by the community who felt that the River Health Program should coordinate action for the Shire, bringing together the key stakeholders, working in with and building on existing projects and networks, such as Tidy Towns, Chambers of Commerce, Cascade Environmental Centre, Landcare groups, schools, universities, Bellingen Environment Centre, golf clubs and Rural Fire Service.

Additionally 24 agency representatives responded to the survey, however these groups identified a further 28 agency representatives who should also be consulted. These groups will be followed up through the recommended strategies in the action plan.

Communication

In order to achieve the above goals and implement the Plan, a communication strategy is needed. The community also saw effective communication as a tool, which will enable the monitoring of the program. It was noted that improved communication was needed from Council. Suggestions included providing information, updates and interaction on the program through:

- the media, through print television and radio
- a regular Newsletter – which can be made available through the Landcare network and Council's website
- Landcare office and an interactive website where people can communicate positive changes, ask for advice and contribute to the program
- utilising community notice boards, rates notices, post offices, and shops to distribute flyers
- feedback and interpretation on water quality results
- Council divisions to provide relevant information to the River Keeper
- River Keeper to have regular meetings with both residents and regular visitors at appropriate times, e.g. Saturdays and workshops and discussion forums in a safe environment where issues, problems and solutions can be addressed without fear of reprisals
- River Keeper to act as a facilitator to ensure improved communication.

Program Sustainability

The key element for the effective implementation of the Plan identified by all stakeholders will be to sustain the implementation and actions. This will require a commitment from Council and its partners to see the Plan driven and implemented.

Community suggestions for ensuring successful program implementation included:

- The River Keeper position needs to be permanent in order to oversee the long term changes needed.
- The River Keeper will need a process to win over the community as many people may be both sceptical of the program and, as an employee of Council, potentially giving rise to concerns that gaps identified in their practice may be used against them for compliance
- Work through community members or "champions" to engage other community members.
- Undertaking a community skills audit to build on and utilise community skills and assets.
- Developing proactive environmental action groups.
- Working with Youth Environment Groups.
- Having field studies and educational workshops that highlight the effects of positive actions.
- Forming committees or working groups to coordinate and monitor actions, increase community involvement so they can contribute to the implementation of the Plan – who can then act as river health watchdogs and make sure this includes involving visitors.
- Ensure that the River Health Program provides guidance to the community on how they can assist.
- Develop the capacity of the community.
- Bring government agencies in to work more with the community; lobby for more involvement from Northern Rivers Catchment Management Authority. Build on existing networks, such as. lagoon care groups, Newry Island River Care Groups, other Landcare groups, Chambers of Commerce, golf clubs, Bellingen Environment Centre, Bush Fire brigades.

It was made clear that the Plan needs to take in each reach of the river, but also needs to consider how they interact, rather than be taken in isolation.

It was also noted that this Plan and the River Health Program need to be incorporated into Council's future proposed Plan in order to ensure accountability with appropriate monitoring, evaluation and reporting structures.

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APPENDICES

The information presented in the Appendices provides:

- A summary outline of the Results of the Community Consultations by Area (as recommended by the community)
- A summary of Key Agencies and Community Priority Area of Action to Improve Water Quality and River Health
- Strategic Approach Tables for the Priority River Health Issues
- Key Stakeholder Agencies and their Roles, Responsibilities and Priorities
- Key Stakeholder Agencies' Legislative Responsibilities
- A list of Recommended Contacts from Stakeholder Surveys
- A Summary of Recommendations to Reduce River Health Impacts from Boating and Improve Behaviours
- Examples of Best Practice Guidelines
- Relevant Commonwealth and State Legislation
- Relevant Planning Framework Instruments
- 17TH NSW Coastal Conference 2008 Poster and Abstract
- Kalang Water Quality Results

Appendix A:

Summary of the Results of the Community Consultations by Area

Upper Kalang

***Cattle and Agricultural Practices* – HIGH PRIORITY**

Common Key Causes:

- runoff from cattle waste and no buffer zones
- chemicals and agricultural runoff entering the waterway
- river bank erosion caused by cattle
- debris in river and the removal and lack or riparian vegetation
- lack of fencing along rivers edge
- not removing weeds
- water extraction.

Common Current Responses:

- target owners to educate them about better practices
- plant riparian vegetation and have exclusion zones
- Council to inspect on regular basis and assign responsibility for issues
- implement better business practices with management done by relevant Council/ Government Departments
- fence off the rivers edge to cattle and install water troughs and other watering solutions
- holistic weed management and removal.

Common Barriers:

- farmers resistant to improving management practice, e.g. cattle farmers
- new residents unaware of best practices
- lack of respect for the land and river
- lack of funds to invest in better practices
- government department's ignorance of environmental issues and incorrect practices.

Suggested Actions:

- involve Landcare and other community-based work groups, hold field days
- educate and involve the community and residents
- remove debris from waters edge and in the river
- investigate funding sources
- have legislation to protect waterways from damaging agricultural practices
- increase manpower by including university groups or other education/work groups
- improved communication between community and Council regarding legislation and abilities to address issues, e.g. ability to remove debris from river
- plant more shade trees in paddocks.

***Riparian Vegetation, Erosion and Weeds* – HIGH PRIORITY**

Common Key Causes:

- weeds not being controlled or removed by land owners or Council
- larger weeds, e.g. Camphor Laurel trees, large areas of privet and lantana, unmanageable by one land owner alone
- use of chemicals for weed removal
- loss of riparian vegetation
- lack of riparian vegetation along rivers edge – erosion and siltation.

Common Current Responses:

- educate land owners about better management; hold workshops for ongoing education; educate on holistic practises
- develop guidelines for riparian and weed free zones
- remove debris, larger weed trees and weeds
- Council stop throwing rocks in to stabilise – proper management.

Common Barriers:
- neighbours not supporting each other
- lack of funding
- people's ignorance to the real issues
- bureaucracy and multiple agency involvement all with different requirements
- lack of consistent process between agencies for approval to clear river banks for replanting.

Suggested Actions:
- need to develop holistic approach to weed control and revegetation (agencies and communities); holistic plan that covers clearing, planting and maintenance
- implement plan of action, monitor and seek opportunities for continuous improvement
- involve community groups who are interested in relevant problems.

***OSMS* – HIGH PRIORITY**

Common Key Causes:
- lack of management and inspection of systems
- grey water going through systems and overloading
- trenches are not long enough allowing effluent to come to the top
- systems too close to river and water courses
- runoff going into river and water courses.

Common Current Responses:
- Council not inspecting systems on regular basis
- Council not making sure systems are adequate or working properly.

Common Barriers:
- Council not inspecting on regular basis.

Suggested Actions:
- improve publics knowledge of systems and practices/products
- investigate ocean outfall system or modern method of waste disposal
- need for public education programs and management of their systems.

***Forestry, Logging and Clearing* – HIGH PRIORITY**

Common Key Causes:
- deforestation causing erosion and higher salinity
- logging roads lead to erosion and runoff – starting on the Plateau
- contributes to siltation of water ways.

Suggested Actions:
- staff training re catchment management and river care practice
- DA application for road use by loggers to improve accountability
- bring back Department of Environment and Climate Change rules – review and reintroduce.

***Construction and Development* – HIGH PRIORITY**

Common Key Causes:
- runoff from building and excavations
- higher need of water from river.

Common Current Responses:
- educate builders/developers/residents
- ensure residents rely on water tanks for water.

***Riparian Vegetation, Erosion and Weeds* – MEDIUM PRIORITY**

Common Key Causes
- loss and degradation of riparian vegetation
- erosion caused by flooding and lack of vegetation
- large trees in river choking it up and causing erosion
- weeds taking over natural areas.

Common Current Responses:
- plant more riparian vegetation
- improve drainage by addressing silt and sediment
- remove debris and choking hazards
- remove weeds
- reduce sedimentation of water ways.

Common Barriers:
- lack of funding
- lack of resources and time
- no common plan of action
- repeating past failures – implement safeguards to stop.

Suggested Actions:

- contact appropriate government departments to setup proper plan and management solutions
- educate land owners and advise of funding opportunities
- stop logging
- inspect areas more frequently.

***OSMS* – MEDIUM PRIORITY**

Common Key Causes

- old systems
- location of systems inappropriate.

Common Current Responses:

- inspect and upgrade.

Common Barriers:

- lack of inspection and maintenance.

***Construction and Site Management* – MEDIUM PRIORITY**

Common Key Causes

- stormwater runoff
- systems not coping with volume.

Common Current Responses:

- reduce/address stormwater impacts.

***Boating and Tourism* – MEDIUM PRIORITY**

Common Key Causes

- litter left by tourists and fisherman
- pollution from campsites
- speed boats causing erosion from wake
- overfishing and overcrabbing.

Common Current Responses:

- address camp site pollution
- improve riparian vegetation
- access points to waters edge
- exclusion zones
- Fisheries (DPI) needs to be in consultation.

Common Barriers:

- Fisheries (DPI) do not respond
- speed boat owners do not think they make impacts
- different types of vessels cause different impacts.

Suggested Actions:

- educate the public
- run water skiing events with proper course layout and buoys to prevent erosion
- prevent use at times.

Middle Kalang

***Cattle and Agricultural Practices* – HIGH PRIORITY**

Common Key Causes

- cattle on the banks
- cattle allowed into water ways
- cattle causing erosion and killing riparian vegetation
- lack of fencing
- rural runoff
- pumping water from the river
- chemical and sediment runoff from agriculture
- weeds in fenced off areas
- farmers using own land for dumping rubbish.

Common Current Responses:

- riparian vegetation buffer zones
- replant riparian vegetation
- provide incentives
- need to fence off river
- provide alternative watering points
- educate the people causing the impacts
- hold workshops
- domestic waste from farmers washing into water ways.

Common Barriers:

- people need assistance
- attitude
- generational practice
- lack of knowledge
- lack of funding
- lack of physical ability to undertake work – daunted by the tasks
- city people moving into rural lands with no knowledge and skills to address issues
- perceived conflict between needs e.g. Clearing for fishing and grazing
- service costs.

Suggested Actions:

- educate the youth
- need water pumping licence
- share neighbour skills to help each other out
- educate about responsible use of fertilizers and poisons.

***Boating and Tourism* – HIGH PRIORITY**

Current Key Causes

- erosion from wake boarding, jet skis and motor boats
- human waste from lack of boating toilet facilities
- increase in general waste from increase in tip fees
- oyster industry waste
- overcrabbing between 11 p.m.–1 a.m.
- inappropriate boats used on parts of river
- pollution from camping.

Common Current Responses:

- improve policing of river users and vehicular access points
- address hygiene at picnic and camping areas along river
- plant more riparian vegetation
- community education
- reduce speed limits
- maritime enforcement
- council to develop a camping area with facilities.

Common Barriers:

- it takes an hour for Fisheries (DPI) to get here from Coffs Harbour
- too many exit points from river
- inappropriate speed limits
- can't meet safety regulations with speed boats and canoes trying to share same narrow stretch of river.

Suggested Actions:

- there are good regions of riparian vegetation – but not enough to stop erosion

***Forestry, Logging and Clearing* – HIGH PRIORITY**

Current Key Causes

- pollution from Eco sawmill is due to stockpiling and saw dust blows into river
- sedimentation from clearing and runoff
- no buffer zones down to waters edge.

Common Current Responses:

- Council to follow up and enforce DA conditions
- work with NSW Forests to ensure implementation of good practices.

***OSMS* – HIGH PRIORITY**

Current Key Causes

- old systems
- Council not inspecting systems
- effluent flowing into the water ways.

Common Current Responses:

- regular inspections
- need for up to date qualified information on appropriate and alternative systems suited to areas
- reuse
- stop stormwater going into sewerage pipes.

Common Barriers:

- lack of knowledge.

***Riparian Vegetation, Erosion and Weeds* – HIGH PRIORITY**

Current Key Causes

- loss of riparian vegetation
- erosion from debris brought down by flood directing flow to roads and eroding them.

Common Current Responses:

- remove debris build up

Common Barriers:

- Fisheries (DPI) barriers regarding debris for aquatic life habitat
- cost.

Suggested Actions:

- Council is stacking boulders to prevent undercutting.

Lower Kalang

***Boating and Tourism* – HIGH PRIORITY**

Common Key Causes:

- ski boating causing erosion, pollution, noise pollution
- safety on the water – no observers on ski boats
- ski boats with ballast
- jet skis
- terrifying wildlife and destroying their habitat
- overfishing and crabbing
- litter, rubbish and human waste.

Common Current Responses:

- lower speed zones
- limit hours of usage
- passive use only zones
- buffer zones
- ban stereos on speed boats
- need public education programs re breeding stock and breeding times
- floating barrage to protect banks from erosion
- assign responsibility.

Common Barriers:

- Fisheries (DPI) never in remote areas
- people launching vessels in non-compliant manners
- conflict between ski boats and fishing boats
- areas not policed.

Suggested Actions:

- more legal enforcement
- improve compliance strategies
- study and observe usage and implement strategies to improve
- signage.

***OSMS* – HIGH PRIORITY**

Common Key Causes:

- no inspections of OSMS
- poorly maintained septics
- putting incorrect things into septics
- too close to the river
- outdated approvals
- increase in effluent due to population growth.

Common Current Responses:

- regular inspections
- Council take a more proactive approach
- move systems away from water courses
- upgrade systems
- need better management.

Common Barriers:

- Council not doing their job
- owners are uneducated and do not know what to do with OSMS.

***Riparian Vegetation, Erosion and Weeds* – HIGH PRIORITY**

Common Key Causes:

- erosion due to lack of riparian vegetation
- clearing in riparian zones
- pollution after rain
- weeds and introduced species taking over
- weeds and introduced species spreading down stream
- river oaks falling and gouging out other trees
- clearing banks when building new homes.

Common Current Responses:

- need buffer zones
- increased management of riparian vegetation
- educate community about current laws
- educate landowners of weeds
- undertake Water Watch program
- more weed inspections
- send letters to raise awareness
- compliance.

Common Barriers:

- lack of knowledge
- lack of time to manage weeds
- lack of finances to improve techniques
- large amounts of Roundup© being used by contractors
- communication between neighbours.

Suggested Actions:

- put water sampling information on website
- hold workshops and field days, promote working on each other's farms
- sample after rain
- holistic weed spraying practices.

***Cattle and Agricultural Practices* – HIGH PRIORITY**

Common Key Causes:

- lack of fencing
- cattle have access to river
- cattle causing erosion and pollution in the river
- no riparian vegetation in exclusion zones
- fences washing into the river.

Common Current Responses:

- workshops and education
- educate about improved management, compliance and legislation
- write letters to raise awareness
- undertake audit of stock impacts from river.

Common Barriers:

- people's minds sets
- lack of knowledge of legislation
- how to get neighbours to comply
- adjustment issues.

Suggested Actions:

- relocate watering points
- improve strategies and knowledge.

***Construction and Site Management* – HIGH PRIORITY**

Common Key Causes:

- no on-site management of stormwater
- runoff from population growth and new developments
- clearing of land
- pollution from industry.

Common Current Responses:

- more exclusion zones
- Council to work together with Department of Planning and Department of Environment and Climate Change (EPA) to formulate consistent criteria
- Plant more riparian vegetation
- provide treatment on site
- causing erosion and siltation
- inspect to ensure compliance.

Common Barriers:

- lack of education and knowledge of legislation
- attitude.

Suggested Actions:

- More consultation and education at DA stage

***Rural Roads* – HIGH PRIORITY**

Common Key Causes:

- poorly maintained vehicles and tractors leaking oils

Common Current Responses:

- raise awareness of effects and maintenance needs.

Common Barriers:

- isolated area
- financial considerations
- people's mindsets.

***Riparian Vegetation, Weeds, Erosion and Wetland Management* – MEDIUM PRIORITY**

Common Key Causes:

- weeds brought down in the floods
- pines causing tannin in river
- Envite cleared but didn't replant
- Council landfill washes into river when it rains
- large trees jamming up the river, island building and causing erosion
- fences in river causing blockages.

Common Current Responses:

- active weed cleanup all along river
- improve riparian vegetation to stabilise banks
- provide assistance packages to help with replanting and clearing introduced species
- replant
- improve stormwater management.

Common Barriers:

- new weeds
- lack of finances
- lack of resources
- lack of knowledge of current better practice
- how to improve management of these issues.

Suggested Actions:

- horses eat tobacco plants
- improve riparian vegetation.

***Boating and Tourism* – MEDIUM PRIORITY**

Common Key Causes:

- pollution from camping at Spiketts Creek and in the forestry areas.

Common Current Responses:

- need to address pollution from camping without adequate toilet facilities.

Common Barriers:

- property owners illegally hiring out cabins with no adequate toilet facilities.

***Cattle and Agricultural Practices* – MEDIUM PRIORITY**

Common Key Causes:

- cattle causing erosion and spreading weeds
- cattle on Crown land.

Common Current Responses:

- keep cattle out of the river
- target key graziers

***OSMS* – MEDIUM PRIORITY**

Common Key Causes:

- systems failing with high rainfall
- Council not inspecting systems, need to ensure they are working correctly.

Common Current Responses:

- offer holistic service
- Council should provide whole service solutions
- improvements to undertake education of public on systems and ranges of products
- need better development controls.

Common Barriers:

- is there a fee for service.

Suggested Actions:

- put in a pool of money for upgrades.

***Rural Roads and Bridges* – MEDIUM PRIORITY**

Common Key Causes:

- rain washing sediment from roadsides.

Common Current Responses:

- Council to improve drainage
- Council to implement strategies like Ku-ring-gai and Hornsby Councils have.

Newry Island

***Waste water and Treatment Plants* – HIGH PRIORITY**

Common Key Causes:

- oil slicks on water
- human waste
- water quality
- effluent flowing into lagoon and river
- nutrient build up
- Norovirus.

Common Current Responses:

- stop all effluent flowing into water ways
- water testing and sampling done routinely
- Water Watch
- effluent dumping points
- monitoring for viruses
- meet Council's protocols for prevention, detection and management
- licensing requirements don't cover viruses
- signage
- public education
- pump waste water inland and release on outgoing tides only
- caravan parks check more frequently
- Council to be more proactive in water quality and the health of the river systems
- Council to regularly inspect, maintain and improve current practices.

Common Barriers:

- lack of signage
- misinformation from all parties
- no accountability or known responsibilities
- Council doesn't follow up with testing quickly enough after complaints are made
- Council doesn't think water quality is a high priority
- Council doesn't care about the contamination of oyster-growing areas
- rock walls and Sea Lido.

Suggested Actions:

- unsure of what to do
- get university groups involved
- investigate alternative disposal methods – reuse, recycle, wetlands.

***Cattle and Agricultural Practices* – HIGH PRIORITY**

Common Key Causes:

- cattle defecation – faecal contamination
- runoff
- erosion
- destruction of mangroves
- oyster farms polluting the water and eroding the banks
- sewage contamination in oyster-growing areas
- clearing of land causing erosion and siltation in river.

Common Current Responses:

- fence out of riparian area
- revegetate and restore
- oyster farmers and farmers/graziers to work together on joint programs
- promotion and education of better business practises
- lack of funding
- exclusion zones
- setup community groups and consult with them
- Council will not take ownership of cattle issue.

Common Barriers:

- awareness of issues
- attitudes to damage caused by cattle
- lack of funding
- licensing requirements don't cover viruses
- hidden information
- poor signage.

Suggested Actions:

- better management has benefits to river health and productivity
- clean up the oyster-growing industry as a whole.

***Riparian Vegetation, Weeds, Erosion and Wetland Management* – HIGH PRIORITY**

Common Key Causes:

- silt has caused the river not to flush properly
- weeds on rivers edge and road ways
- poor riparian vegetation along rivers edge.

Common Current Responses:

- need to dredge to improve flushing
- clear weeds
- plant more riparian vegetation
- have exclusion zones
- improve water quality.

Common Barriers:

- lack of dredging
- oyster farmers need clean water.

Suggested Actions:

- increase vegetation only zones along rivers edge
- reform and increase river care groups and have landholders work together
- have different industries working together
- utilise programs that have worked elsewhere

***OSMS* – HIGH PRIORITY**

Common Key Causes:

- human waste
- maintenance of OSMS systems
- no sewerage facilities
- presence of norovirus.

Common Current Responses:

- improve testing methodology and systems
- implementation of septic safe guidelines and systems from Department of Health
- educate people about OSMS and what to put in their drains
- push for a user pays system
- Council to develop guidelines
- link the whole island to council sewerage system.

Common Barriers:

- Council is not responsible enough for the systems checking and maintenance of OSMS or the health of the river.

Suggested Actions:

- licensing requirements don't cover viruses.

***Forestry and Logging* – HIGH PRIORITY**

Common Key Causes:

- forestry road runoff causing pollution and siltation in river.

Suggested Actions:

- Unsure

***Boating and Tourism* – HIGH PRIORITY**

Common Key Causes:

- boating causing erosion, pollution and killing vegetation
- sewerage of boats
- tourism increase impacts on services and sewerage systems.

Common Current Responses:

- educate from children up
- build board walks, undertake beautification programs
- involve community groups to promote respect
- promotion of what is happening
- signage
- effluent dumping points
- more speed-limited zones
- improve inspections of boats
- no houseboats on river and limit the size
- new and more prominent no wash zones
- improve enforcement.

Common Barriers:

- nightmare with too many organisations – one working group
- funding.

Suggested Actions:

- raise awareness
- consult with community groups
- improvement in community education and knowledge
- assign responsibilities
- user pays systems
- tourist information centre signage.

Urunga

***Boating and Tourism* – HIGH PRIORITY**

Common Key Causes:

- boating causing erosion and muddy wash
- boating causing pollution
- boating causing noise pollution
- litter caught in mangroves
- boat users defecating in the river and leaving nappies and rubbish behind
- speeding boats causing too much wash
- people stomping through mangroves
- overloading of septics at holiday time.

Common Current Responses:

- education on environmental awareness
- replant riparian vegetation
- restoration of river banks
- setup guidelines for the community
- community liaison
- provision of more bins
- more compliance
- develop campaigns and Neighbourhood Watch programs in liaison with NSW Maritime
- designate 'ski only' zones
- inspect and improve amenities.

Common Barriers:

- funding
- lack of affordable options
- knowledge of good practices
- knowledge of who is responsible for restoring river banks
- ignorance and laziness
- fines are not harsh enough
- signage is too old and hard to read.

Suggested Actions:

- it is mostly locals at fault
- raise community awareness
- feedback to the community from Council
- build a public ramp above Newry Island so river is not used as a transit lane
- install speed cameras, increase fines, increase enforcement
- offenders do community river bank care work
- increase signage.

***Riparian Vegetation, Weeds, Erosion and Wetland Management* – HIGH PRIORITY**

Common Key Causes:

- erosion from clearing vegetation
- siltation
- cut-off of flow to mangroves
- debris and litter from erosion
- contamination of soil, water and groundwater.

Common Current Responses:

- more compliance regarding riparian vegetation
- plant more riparian vegetation
- regular inspection of river banks
- dredge the river
- raise community awareness of laws regarding clearing
- find funding to do remediation work
- find common solution to stabilise banks
- cultivate oysters in the estuary to monitor water quality.

Common Barriers:

- people want river views
- red tape
- funding
- sea wall prevents river self clearing
- Council's attitude towards dredging
- opposing vested interests, particularly when livelihoods are threatened
- changed practices
- No Council funding to address emerging issues.

Suggested Actions:

- coordinated effort between departments to address river bank stabilisation
- encourage and setup community river care groups
- plan land usage.

***Cattle and Agricultural Practises* – HIGH PRIORITY**

Common Key Causes:

- cattle impacts causing erosion and pollution
- agricultural runoff
- cattle defecating in the river
- increase in land use.

Common Current Responses:

- increase riparian zones
- prohibit non-organic fertilizers
- limit fertilizer usage close to river.

Common Barriers:

- opposing interests
- need to change practices
- Council revenue needed to address emerging issues.

Suggested Actions:

- increase flow of river by removing silt.

***OSMS* – HIGH PRIORITY**

Common Key Causes:

- human waste from OSMS in the river
- overloading systems in high peak tourist times
- poorly maintained OSMS
- no or not working OSMS upstream
- increased people.

Common Current Responses:

- inspect OSMS
- address the impacts of OSMS
- improve current OSMS
- Council to inspect on regular basis
- Council to approve installation of OSMS.

Common Barriers:

- Council not encouraging OSMS upkeep/ upgrades
- lack of inspections.

***Waste Water and Treatment Plants* – HIGH PRIORITY**

Common Key Causes:

- increased population
- runoff from development
- stormwater runoff causing pollution into the river
- caravan park overflows adjacent to oyster leases.

Common Current Responses:

- reuse of sewerage water
- decrease the impacts of developments
- caravan park pump stations to have overflow tanks
- do pollution identification study.

Common Barriers:

- Council's lack of revenue to address emerging issues
- lack of inspections
- no site supervisors.

Suggested Actions:

- improve inspections.

Appendix B:

Summary of Key Agencies and Community Priority Areas of Action to Improve Water Quality and River Health

Impacts								
	Cattle and Agriculture	OSMS	Loss of Riparian Vegetation, Weeds and Wetland Management	Boating and Tourism	Wastewater Treatment and Management	Forestry, Logging and Clearing	Stormwater and Building Construction	Rural Roads and Bridges
Upper Kalang	High	High	High			High	High	
Middle Kalang	High	High	High	High		High		
Lower Kalang	High	Medium	High	High			High	High
Newry Island	High	High	High	High	High	High		
Urunga	High	High	High	High	High			
Agencies	High	High	High		High			

Appendix C:
Strategic Approach Tables for the Priority River Health Issues

STRATEGIC APPROACH TO AGRICULTURAL PRACTICES IMPACTS: EROSION, SEDIMENTATION AND POLLUTION			
OBJECTIVES	**STRATEGIES**	**PERFORMANCE INDICATORS**	**TIMEFRAME/ RESPONSIBILITY**
Increase the number of farmers who are implementing sustainable farm management practice	Review locally relevant sustainable farming, engagement and implementation of strategies/programs	Evidence-based successful intervention strategies and programs are documented	Short to Medium Term BSC - River Health Program
	Map respondents and farming areas who have shown a commitment to Landcare improvement and river health Map farming areas to identify cattle access to river	Baseline spatial/community information for intervention is established	Short Term BSC - River Health Program
	Develop calendars of farming production/ work schedules to identify intervention times and plan appropriate times for strategic workshops and on-ground activities	Key intervention times are identified	Short Term BSC - River Health Program
	Facilitate a working group of key stakeholders, e.g. Department of Industry and Investment (Agriculture and Fisheries), Department of Water and Energy, Northern Rivers Catchment Management Authority, Council, Landcare, farming representatives, BSC - River Health Program and oyster industry Identify core duties, functions, legal responsibilities, jurisdictions and resource availability; and clarify with landholders	A coordinated response and implementation plan is developed	Short Term All core stakeholders
Decrease the impacts of farming in relation to improving water quality, increasing healthy riparian vegetation and improving river bank stability	Develop an agreed strategy to implement a staged adoption of good management practice across the Shire Integrate strategic action utilising universities and schools	Improved and increased resources to address agricultural impacts	Short Term All stakeholders
	Identify other key farmers and community members who can be utilised as “key champions” as part of a “train the trainer” process	A pool of farmers across the Shire agree to be trained in farm management practice	Short Term Landcare BSC - River Health Program Northern Rivers Catchment Management Authority Farmers
	In conjunction with agencies and farming representatives, develop a toolbox of key improvement resources, e.g. farm assessment tools, management options, funding information	Resource kit addresses the issues from both farmer and agencies perspectives	Short-Term Department of Environment, Climate Change and Water Landcare BSC - River Health Program Northern Rivers Catchment Management Authority Farmers

STRATEGIC APPROACH TO AGRICULTURAL PRACTICES IMPACTS: EROSION, SEDIMENTATION AND POLLUTION			
OBJECTIVES	**STRATEGIES**	**PERFORMANCE INDICATORS**	**TIMEFRAME/ RESPONSIBILITY**
	Identify and gain funding to develop and implement an awareness-raising and media strategy to highlight the impacts of agriculture on water quality and river health - highlight POEO Act implications and pollution and promote the benefits of sustainable farming incorporating a range of best practice issues including improved chemical fertilizer use or alternatives to chemicals	Increased awareness and knowledge of agricultural impacts and improvement strategies	Short to Medium Term Department of Environment, Climate Change and Water Landcare BSC - River Health Program Northern Rivers Catchment Management Authority Department of Industry and Investment Farmers BSC - Environmental Health and Building Surveyors
	Organise and facilitate “train the trainer” workshops for key peer farming representatives to develop awareness ,improved farm management and production information, and address river health impacts	Workshops are undertaken	Short to Medium Term Landcare BSC - River Health Program Northern Rivers Catchment Management Authority Department of Industry and Investment Farmers
	Strategically contact farmers in reaches to organise workshops and information and assessment days Target key people identified from consultations Target new residents to increase knowledge and skills to address impacts; encourage the formation of river care groups/neighbourhood groups to improve resources	Number of farmers agreeing to participate in workshops Number of new residents participating in education sessions Number of new river care/ neighbourhood groups participating in improved practices	Short to Medium Term Landcare Northern Rivers Catchment Management Authority BSC - River Health Program
	Organise and facilitate workshops, on good practice management, identify enabling factors and barriers to good practice management in order to utilise an “Education for Sustainability” approach, review and address as appropriate	Number of workshops undertaken and attendance Farmers’ satisfaction with the work shops Increase in farmers participating in a problem-solving approach Number of farmers committed to future planning and implementation of improvements Number of farmers implementing improvements	Short to Medium Term Northern Rivers Catchment Management Authority BSC - River Health Program Landcare Department of Industry and Investment Farmers

STRATEGIC APPROACH TO AGRICULTURAL PRACTICES IMPACTS: EROSION, SEDIMENTATION AND POLLUTION			
OBJECTIVES	**STRATEGIES**	**PERFORMANCE INDICATORS**	**TIMEFRAME/ RESPONSIBILITY**
	Work with farmers to develop 5-year management plans to improve outcomes	Number of farmers who have developed plans Extent of improved management strategies being implemented	Medium to Longer Term All stakeholders
	Identify resource and funding needs, and work in reaches to access funding	Improved cooperative approach to accessing funding Number of farming groups who have accessed funding	Ongoing Department of Environment, Climate Change and Water Northern Rivers Catchment Management Authority Landcare Department of Industry and Investment BSC - River Health Program
	Promote landholders who have adopted good practice management strategies Highlight landholder improvement issues	Number of media and promotion events Increased number of landholders involved in promotion Areas still in need of attention are identified	Ongoing Department of Environment, Climate Change and Water Northern Rivers Catchment Management Authority Landcare Department of Industry and Investment BSC - River Health Program
	Assess and report on improvements, review any identify next stage of the strategy	Farmer satisfaction with the programs Extent to which the coordinated working groups have implemented the proposed program Working groups develop the next stage of the Plan	Ongoing Department of Environment, Climate Change and Water Northern Rivers Catchment Management Authority Landcare Department of Industry and Investment BSC - River Health Program
	Work with the Department of Water and Energy to address more responsible and efficient water use (in relation to water licences)	Improvements in water use are identified and implemented	Department of Water and Energy Landcare BSC - River Health Program
	Liaise and work with all relevant stakeholders to develop and implement strategies to address debris removal in relation to flood impacts	Knowledge and awareness of processes undertaken to address debris removal	Department of Industry and Investment Bellingen Shire Council Department of Lands All relevant parties

STRATEGIC APPROACH TO MANAGEMENT OF OSMS IMPACTS: POLLUTION			
OBJECTIVES	**STRATEGIES**	**PERFORMANCE INDICATORS**	**TIMEFRAME/ RESPONSIBILITY**
Ensure sustainable on-site management of domestic sewage and waste water while protecting and enhancing the quality of public and environmental health	Facilitate a presentation to Council by key agency representatives who have been involved with successfully developing and implementing a comprehensive OSMS strategy Present the proposal to the group	Council commits to the development and implementation of an OSMS strategy for the Shire A process and timeframe is agreed to and commenced	Short Term BSC - Director of Environmental Health and Planning BSC - River Health Program Department of Environment, Climate Change and Water
Develop and implement a sustainable OSMS strategy for Bellingen Shire	Consult with key agency representatives who have been involved with successfully developing and implementing a comprehensive OSMS strategy to identify the processes and information needed for development and implementation Liaise with other Councils to identify key expert personnel utilised. Key OSMS experts and staff to review performance of current systems in the Shire, gather information on other systems and shire requirements and improve systems performance	Processes and information needed for implementing the strategy are identified Implementation strategy commenced Accurate register of systems is established Development of a database identifying the levels of risk of the OSMS in the Shire in accordance with legislative requirements System validated Data needs and systems are established and linked to a risk rating recall process Shire specific issues are identified A range of systems are reviewed regarding suitability Council officers have access to, and support of, a range of expertise Council officers utilise expertise A comprehensive Bellingen Shire specific OSMS based on the legal responsibilities and the guidelines for On-site Sewage Management Systems for Single households is developed Risk assessment and management options for the Shire developed and implemented Design guide of systems is developed and implemented	Short to Long Term BSC - Director of Environmental Health and Planning, with the support of relevant Council officers Department of Environment, Climate Change and Water Department of Water and Energy Department of Health Department of Lands NB A coordinated approach to waste management should be undertaken
	Market the “fee for service” needed for implementing the OSMS strategy and promote the benefits to the community	Communication strategy informing the community of the new process is implemented Community have the knowledge and awareness of the need for Council’s new strategy Community satisfaction with Council’s new strategy	Short Term BSC - Senior Environmental Health Officer BSC - River Health Program

STRATEGIC APPROACH TO MANAGEMENT OF OSMS IMPACTS: POLLUTION			
OBJECTIVES	**STRATEGIES**	**PERFORMANCE INDICATORS**	**TIMEFRAME/ RESPONSIBILITY**
	Implement the OSMS strategy utilising a "fee for service" monitoring program of all OSMS in Bellingen Shire	Council meets its legislative requirements under the *Local Government Act* and Regulations and the *Protection of the Environment Operations Act* OSMS are inspected according to Council's risk rating systems of 1, 3, and 5 years Existing system upgrades are identified and rectified to meet the requirements of the recommended management options and design guidelines. The number of systems meeting performance standards including the number of upgrades of existing systems	Short Term - Ongoing BSC - Director of Environmental Health and Planning BSC - Senior Environmental Health Officer with the support of relevant Council officers Department of Environment, Climate Change and Water Department of Water and Energy Department of Health
	Ensure Council staff have access to training and development on best practice strategies Ensure the implementation of ongoing best practice development	Regular ongoing training and development is undertaken to ensure Council staff have access to and can apply new performance guidelines and best practice strategies for OSMS management, e.g. The Centre for Environmental Training, On-site Waste Water Treatment: Best Practice Conference held in Armidale biannually, and North Coast forums such as Septic Tank Action Group (STAG). Number of Environmental Health and Building staff attending training and development, frequency of attendance and/or number of reports and in-service courses regarding training and development attended by Environmental Health and Building personnel and reported back to the BSC - Director of Environmental Health and Planning and relevant Council staff Staff application of best practice management	Ongoing BSC - River Health Program in conjunction with the BSC - Director of Environmental Health and Planning
	Assess the needs of owner/occupiers in relation to best practice management of OSMS To continue and expand an educational program to improve owner/occupier management using adult education principles	Owner/occupier OSMS needs assessment identifies management knowledge and skills, and areas of need River Health education program addresses management needs Reach of education program Owners and occupiers of premises with OSMS have increased knowledge and skills to manage systems Number of owners/occupiers who are implementing best practice management Community satisfaction with Council's OSMS Strategy particularly in relation to communication and transparency	Short Term – ongoing BSC - Director of Environmental Health and Planning BSC - Senior Environmental Health Officer in conjunction with BSC - River Health Program and other relevant Council Officers
	Investigate and address impacts from camping along the river incorporating compliance where appropriate	The issue of proper liquid/solid waste disposal is addressed	Short Term to ongoing BSC - Senior Environmental Health Officer in conjunction with BSC - River Health Program

STRATEGIC APPROACH TO RIPARIAN AND WETLAND MANAGEMENT IMPACTS: EROSION, SEDIMENTATION, FLOOD IMPACTS AND BIODIVERSITY			
OBJECTIVES	**STRATEGIES**	**PERFORMANCE INDICATORS**	**TIMEFRAME/RESPONSIBILITY**
Increase the extent of healthy riparian vegetation Improve the management of riparian zones	Implement the strategies of the Council's Estuary Management Plan – Management Objective 21 – Incorporate appropriate riparian protection zones within Council's planning framework to safeguard against potential future development and land use change	Improved riparian protection	Short Term BSC - Director of Environmental Health and Planning Strategic Planners BSC - River Health Program Coastline and Estuary Management Committee
	Liaise with key groups, e.g. Northern Rivers Catchment Management Authority, Department of Environment, Climate Change and Water , Bellinger Landcare and land care and river care groups to develop a process to undertake a vegetation mapping survey building on previous work undertaken (in conjunction with the Estuary Management Plan's erosion study) Investigate options to assist landholders with weeds management and revegetation	Baseline information regarding current status of riparian vegetation is established Landholders and community groups have access to assistance to implement improvement strategies	Short to Medium Term BSC - River Health Program Department of Environment, Climate Change and Water Northern Rivers Catchment Management Authority Landcare
Decrease the impacts from heavy rainfall and flooding	Facilitate a working group of Council, government agencies and community members to develop a strategic coordinated weeds management and vegetation action plan, incorporating communication, awareness raising, participatory educational strategies and implementation	Cooperative partnership developed An agreed vegetation implementation plan is established Action plan is implemented Improved coordination and communication between agencies and communities	Short to Medium Term BSC - River Health Program Landcare Groups Northern Rivers Catchment Management Authority Other Key agencies
	Investigate options to assist landholders with weeds management and revegetation	Landholders and community groups have access to assistance to implement improvement strategies	Medium Term BSC - River Health Program Landcare Groups Northern Rivers Catchment Management Authority Department of Environment, Climate Change and Water
	Undertake a community and agency skills audit to identify key people who can and are willing to develop community capacity to improve river bank stability and improve riparian vegetation	Register of key personnel to assist with the program is established	Medium to longer term BSC - River Health Program in conjunction with working group

STRATEGIC APPROACH TO RIPARIAN AND WETLAND MANAGEMENT IMPACTS: EROSION, SEDIMENTATION, FLOOD IMPACTS AND BIODIVERSITY			
OBJECTIVES	**STRATEGIES**	**PERFORMANCE INDICATORS**	**TIMEFRAME/RESPONSIBILITY**
	Raise awareness of the needs and purpose of improving riparian vegetation through the media, letters to landholders, and promotion through suggested local networks and Landcare/river care groups Promote and support with resources as appropriate neighbourhood and Landcare approaches to riparian management Liaise and work with communities to identify needs, information and assistance required to implement good practice management including alternatives to chemical use	Increased knowledge and understanding of enhancing riparian vegetation and improving bank stability Increased number of groups involved in the program No. of articles, no. of landholders accessed Needs are identified Program implementation is appropriately targeted	Medium Term BSC - River Health Program in conjunction with working group Department of Environment, Climate Change and Water
	Utilising key stakeholders, facilitate workshops to assist landholders with improving management and maintenance of riparian land Hold field days to showcase good practice management for riverbank restoration and investigate options for increasing landholder participation. Provide discussion forums on overcoming difficult management issues	Number of workshops undertaken Number of participants Workshop satisfaction Commitments to improvements	Medium Term BSC - River Health Program Landcare Northern Rivers Catchment Management Authority
	Work with key stakeholders and land owners and raise awareness on the issues concerning river oaks and the recommendations for managing them and improving bank stability as outlined in the leaflet released by Bellingen Landcare in cooperation with Northern Rivers Northern Rivers Catchment Management Authority. Discuss issues at workshops	Increased community awareness and knowledge of Casuarina management Increased awareness of riverbank management	Medium Term BSC - River Health Program in conjunction with working group

STRATEGIC APPROACH TO RIPARIAN AND WETLAND MANAGEMENT IMPACTS: EROSION, SEDIMENTATION, FLOOD IMPACTS AND BIODIVERSITY			
OBJECTIVES	**STRATEGIES**	**PERFORMANCE INDICATORS**	**TIMEFRAME/RESPONSIBILITY**
	Liaise with funding bodies in relation to landholders concerns regarding funding access and utilisation Work with Council's Grants Officer and other key stakeholders to investigate funding to implement actions Facilitate working groups with agencies and communities to improve access to funding	Agencies recognise funding barriers and agree to improve funding accessibility and appropriateness Database of funding is identified Increased numbers of groups access funding Increased number of groups making improvements Increasing healthy riparian vegetation Improving weeds management	Ongoing BSC - River Health Program Department of Environment, Climate Change and Water
	Liaise with Council representatives regarding improving vegetation management that involves work across private and public land. Reconvene the working group with key Council stakeholders and Landcare/ river care representatives to improve processes and cooperation	A streamlined and cooperative process for integrating work on private and council land is developed and implemented	Short Term BSC - River Health Program
	Promote improvements and achievements through the media, newsletters. Investigate rewards systems	Increased recognition is given to good practice Decreasing impacts as a result of runoff Improved bank stability	Ongoing BSC - River Health Program in conjunction with working group
Improve river bank works and processes	In conjunction with Land care facilitate the development of a working group of all key agencies that are involved with riverbank restoration. Identify requirements needed from each agency for undertaking riverbank restoration works; identify good practice processes needed for approvals Develop an information kit outlining the approval process requirements and providing information regarding approved management options	Coordinated streamlined process for river bank approval process is developed Coordination and cooperation by departments and agencies Increased community knowledge and understanding of the approval process Decreased approval time Increased formally approved restoration works undertaken Improved community satisfaction	Short Term Landcare

STRATEGIC APPROACH TO BOATING, TOURISM AND RECREATIONAL USE IMPACTS: POLLUTION, EROSION, SEDIMENTATION AND SAFETY			
OBJECTIVES	**STRATEGIES**	**PERFORMANCE INDICATORS**	**TIMEFRAME/ RESPONSIBILITY**
Decrease the negative boating and recreational impacts	Implement the recommendations of the Estuary Management Plan Incorporate the recommendations of the consultations within the code of conduct	Further studies and surveys in relation to boating impacts and river user behaviour are completed Coordinated interim code of conduct is developed, implemented and evaluated by NSW Maritime and Council	Short to Medium Term BSC - River Health Program NSW Maritime Department of Environment, Climate Change and Water
Develop a sustainable boating and recreational strategy	Engage with key representative groups including university and schools, to implement good practice behaviour	A range of river user representatives encourage and promote good behaviours and river management	Short Term BSC - River Health Program NSW Maritime
	Work with and motivate the community to identify and report negative behaviours as well as noting successful positive strategies (including noise) In conjunction with NSW Maritime provide and promote to the community the required information needed for reporting breaches and negative behaviours	User groups identify positive and negative behaviours and report back to Council and NSW Maritime Increased and improved reporting of issues to Maritime NSW Maritime addresses negative issues	Short Term and Ongoing BSC - River Health Program
	Liaise with NSW Maritime to raise the profile and presence on the rivers particularly during peak periods Liaise with NSW Maritime to improve and update signage around the rivers	Increased presence of NSW Maritime Increased awareness by the community of NSW Maritime presence Increasing compliance with rules Broken and old signage replaced	Short Term BSC - River Health Program NSW Maritime
	NSW Maritime, Council and Coastline and Estuary Management Committee review information at the completion of studies, surveys and implementation of interim code of conduct	A new river use plan is developed	Medium to Longer Term NSW Maritime BSC - River Health Program Coastline and Estuary Management Committee
	Investigate options for a user pays system to assist with funding to address erosion and sedimentation	A range of options utilised in other areas are documented Recommendation for implementing options are identified, reviewed and discussed with Reference Group and Council for practicality. Implementation of system is commenced as appropriate	Longer Term BSC - River Health Program

STRATEGIC APPROACH TO BOATING, TOURISM AND RECREATIONAL USE IMPACTS: POLLUTION, EROSION, SEDIMENTATION AND SAFETY			
OBJECTIVES	**STRATEGIES**	**PERFORMANCE INDICATORS**	**TIMEFRAME/ RESPONSIBILITY**
	Work with Coffs Coast Tourism Alliance (Tourism Bellinger, Council's Tourism and river user representatives including schools, and universities) to develop and implement strategies to promote sustainable and responsible use of the river through regular media, public relations and promotions activities targeting potential and actual visitors and community members	Strategies reach targeted groups Increased knowledge and awareness of impacts Improving behaviours Sustainable river use is integrated into the Coffs Coast Tourism Marketing, Development and Resourcing Plans	Medium to Longer Term BSC - River Health Program BSC - Manager Economic Development and Tourism
	Undertake and compile research and market intelligence, which identifies and communicates the importance of sustainable river use for recreation and tourism. Use these findings to support the attraction of funding and development of policy to support the objectives of the program.	Research completed, sustainable river use evidence gathered Evidence based information is utilised for funding Increased funding support	Medium Term BSC - Manager Economic Development and Tourism BSC - River Health Program Department of Environment, Climate Change and Water
	Collaborate with local Chambers of Commerce and individual businesses operating in the marine recreational tourism market to promote and regulate responsible use of the river system	Number. of businesses promoting responsible use of the rivers Number of flyers/pamphlets distributed	Medium to Longer Term BSC - Manager Economic Development and Tourism BSC - River Health Program
	Work with Coffs Coast Tourism Alliance, events organisers and tourism venues to: a) develop and implement strategies to raise awareness of the impacts and promote good practice when utilising the river particularly addressing waste, littering, inappropriate driving b) ensure event managers have considered, and provide facilities to address, impacts from human waste and littering c) address non-approved rentals that have inadequate toilet facilities d) beautify land adjoining the river and promote respect of river health issues (construct boardwalks) Liaise with Council's Ranger regarding a strategy to improve compliance issues in key areas, e.g. litter, driving on river banks	Strategies reaching targeted groups Increased knowledge and awareness of impacts Tourism venues promote good practice Improving behaviours Event managers provide adequate facilities to cater for events Education and compliance strategy targets key issues at events and key recreational areas Community liaison and input	Medium to Longer Term BSC - Manager Economic Development and Tourism BSC - River Health Program Council Ranger

STRATEGIC APPROACH TO BOATING, TOURISM AND RECREATIONAL USE IMPACTS: POLLUTION, EROSION, SEDIMENTATION AND SAFETY			
OBJECTIVES	**STRATEGIES**	**PERFORMANCE INDICATORS**	**TIMEFRAME/ RESPONSIBILITY**
	Liaise with Council and undertake an audit of public toilets in recreational areas that are unsewered to ascertain whether they are functioning properly Rectify any problems	Public can utilise functional toilets Improved waste management, waste not being disposed of in toilets	Short Term BSC - Department of Environmental Health and Planning, BSC - Senior Environmental Health Officer
	Improve knowledge and awareness of Council's effluent dumping points	Council provides signage for effluent dumping points	BSC - Engineering and Operations
	Liaise with Council and key stakeholders, e.g. in Mylestom and Repton, to improve the reserve areas and decrease erosion on river banks from indiscriminate pedestrian use	Improved visibility and repair of steps River care group formed and implement actions to improving riverbanks and recreational areas	Short to Medium Term BSC - River Health Program BSC - Manager of Buildings and Services
	Liaise with key stakeholders and other Councils to develop and implement a strategy to lobby government to have Australia-wide best practice emission standards	Increased government awareness of need for standards Regional/state wide lobby group is formed Emission standards are placed on the government agenda for investigation	Longer Term Coastline and Estuary Management Committee
	To work with Department of Industry and Investment-Fisheries, community groups, schools and universities to address over fishing and overcrabbing	Increased compliance Increased knowledge and awareness of the principles of sustainable fishing	Short to Medium Term NSW Maritime Department of Industry and Investment-Fisheries BSC - River Health Program

STRATEGIC APPROACH TO WASTE WATER TREATMENT PLANTS IMPACT: POLLUTION			
OBJECTIVES	**STRATEGIES**	**PERFORMANCE INDICATORS**	**TIMEFRAME/ RESPONSIBILITY**
Implement ongoing improvements to Waste Water Treatment Plants and practices to reduce impacts on water quality	Council to install back-up generators for Waste Water Treatment Plants to stop surcharges during blackouts	Back-up generators are installed Decreased surcharges	Short Term BSC - Water and Sewerage Engineers
	Improve management and operations to minimise license breaches Update and implement new emergency spill procedures and complaint procedures Raise awareness within the community to notify Water and Sewerage Department of any sewerage overflows or spills Investigate and implement options to reduce sediment and nutrient concentrations leaving facilities, e.g. through constructed wetlands	Decreased license breach frequency Relevant agencies are notified of spills Procedures to address spills are implemented correctly Increase in the number of notifications Improved notification time frames Ongoing improvement strategy is implemented	Ongoing BSC - Water and Sewerage Engineers
	Liaise with Department of Environment, Climate Change and Water (EPA) and Area Health Services to investigate strategies to develop and implement best practice to plan for medium and long term improvements Consult with Water and Sewerage staff to identify strategies for medium and longer term improvement Work with BSC - Water and Sewerage Engineers to develop and implement a best practice strategy and implement best practice pilot projects	Best practice environmental and public health strategies are identified and pilot trialled Council implements best practice plan Reduced impacts on water quality	Longer Term BSC - River Health Program with Department of Environment, Climate Change and Water Department of Health BSC - Water and Sewerage Engineers
	Undertake testing to identify and reduce leakages Proactively promote Council improvements through the media Undertake inspections to rectify illegal connections	Improved management and maintenance Decreased volume of waste water Reduced illegal connections Increased community awareness of Council's operations for improvement	Short term BSC - Water and Sewerage Engineers Short Term BSC - Water and Sewerage Engineers BSC - River Health Program Department of Environment, Climate Change and Water Short Term Environmental Health Health and Building

STRATEGIC APPROACH TO WASTE WATER TREATMENT PLANTS IMPACT: POLLUTION			
OBJECTIVES	**STRATEGIES**	**PERFORMANCE INDICATORS**	**TIMEFRAME/ RESPONSIBILITY**
	Work with BSC - Water and Sewerage Engineers and staff, businesses and community, Tourism, (incorporating events and festivals) to identify current practices, and develop and implement strategies to improve impacts on water quality.	Current practices identified Improvement strategies identified and implemented Decreased license breach frequency Improved management and maintenance Increased community and business knowledge of impacts on water quality Reduced impacts on water quality	Short Term - ongoing BSC - Water and Sewerage staff BSC - River Health Program Tourism Community Businesses
	On completion of the Trade Waste survey, determine the appropriate fees and charges according to the business type discharge factors Review and modify as necessary Council's Trade Waste Policy Investigate and incorporate appropriate strategy to cover liquid trade waste for industrial areas that are not connected to the sewer Develop a Trade Waste Agreement with each business Undertake regular audits to ensure compliance with the agreements and in accordance with Council's Trade Waste Policy	Business fees and charges are completed Trade Waste Policy and Strategy is implemented and evaluated	Medium Term BSC - Water and Sewerage Engineers Medium Term BSC - Senior Environmental Health Officer

STRATEGIC APPROACH TO FORESTRY, LOGGING AND LAND CLEARING IMPACTS: EROSION AND SEDIMENTATION			
OBJECTIVES	**STRATEGIES**	**PERFORMANCE INDICATORS**	**TIMEFRAME/ RESPONSIBILITY**
Improve logging and clearing practices both on government and private lands in order to reduce river health impacts	Facilitate a meeting with NSW Department of Industry and Investment, Forests NSW, Department of Environment, Climate Change and Water , Northern Rivers Catchment Management Authority and Council regarding regulations, guidelines and current operations to improve operations in the shire (This should include ensuring the conditions of development approval are implemented)	Council staff have an improved knowledge and understanding of the regulations and responsibilities Improved strategy to inform the community is identified and implemented A coordinated approach between Council and other agencies is developed A coordinated system to monitor manage and ensure compliance of forestry, logging and clearing activities is implemented Improved best practice management	Medium to Longer Term BSC - River Health Program Department of Environment, Climate Change and Water State Forests Department of Environment, Climate Change and Water Other key stakeholders
	Work with Council staff to develop an operation policy and system that incorporates a compliance register, service requests that can be linked to an auditing system	Operations and procedures are documented Gaps and improvements are identified A coordinated strategy for improvement is developed, implemented and evaluated	Medium to Longer Term BSC - River Health Program Environmental Health and Planning
	Facilitate staff training in relation to river care and catchment management	Increased knowledge and skills	Short to Medium Term BSC - Director of Environmental Health and Planning BSC - River Health Program
	Develop and implement an education strategy incorporating fact sheets, web site information based on Department of Environment, Climate Change and Water and Northern Rivers Catchment Management Authority Code of Practice	Increased community and contractor awareness of the legislation and guidelines for good practice	Medium to Longer Term BSC - River Health Program Environmental Health and Planning Department of Environment, Climate Change and Water Other key stakeholders
	Work with NSW Department of Industry and Investment, Forests NSW, Department of Environment, Climate Change and Water , Northern Rivers Catchment Management Authority and Council to develop and implement education sessions for contractors on good practice	Contractors are trained in good practice management techniques Decrease in complaints	Medium to Longer Term BSC - River Health Program Environmental Health and Planning, NSW Department of Industry and Investment Forests NSW, Department of Environment, Climate Change and Water, Northern Rivers Catchment Management Authority
	Liaise and work with Council's Environmental Health and Planning Department to implement a random auditing strategy and compliance strategy as appropriate	Ongoing monitoring and compliance is undertaken	Medium to Longer Term BSC - River Health Program Environmental Health and Planning Other key agency stakeholders

STRATEGIC APPROACH TO STORMWATER AND BUILDING CONSTRUCTION IMPACTS: EROSION, SEDIMENTATION AND POLLUTION			
OBJECTIVES	**STRATEGIES**	**PERFORMANCE INDICATORS**	**TIMEFRAME/ RESPONSIBILITY**
Improve stormwater management in the Shire Minimise the impacts of stormwater on the aquatic system	Council to strengthen its regulatory requirements by identifying and implementing water sensitive urban design criteria for new developments	Facilitate a discussion forum with Council Engineers, Town Planners and Health and Building Surveyors and Consultant to identify criteria and develop policy. Council adopt policy on stormwater management and maintenance criteria for new developments is developed and implemented Council insert a provision in its adopted Fees and Charges Schedule that allows for the collection of funds for the peer review of proposed stormwater strategies.	Short Term BSC - River Health Program BSC - Road Asset Manager Development Engineer Strategic Planner
	Undertake a stormwater study incorporating new and current developments (that incorporate s7.3 and SMP, WSUD principles), this will include water quality information, field study to identify and map stormwater data, and the identification of assets, their location and the type of mitigation works.	The identification of an effective combination of economic and community based source control measures and incentives and engineered solutions to achieve improved water quality standards for the rivers.	Short to Medium Term BSC - River Health Program BSC - Road Asset Manager Development Engineer Strategic Planner Department of Environment, Climate Change and Water
	Ensure Council staff have access to and implement best practice strategies	Ongoing training and development is undertaken to ensure Council staff have access to new remediation measures and maintenance options	Ongoing BSC - River Health Program in conjunction with BSC - Road Asset Manager Development Engineer Strategic Planner Environmental Health and Planning Department of Environment, Climate Change and Water
	Identify community and business knowledge and understanding of impacts relating to stormwater and current practice	Community and business survey developed, implemented, analysed and reported Increased ability of community and business to address impact areas.	Medium Term BSC - River Health Program Development Engineer Department of Environment, Climate Change and Water
	Develop and implement a holistic best practice Stormwater Action Plan for Bellingen Shire	Plan developed that reflects the practical information required for Council, businesses and the community to implement a comprehensive strategy that identifies priorities, resources, practical management and maintenance to decrease the impacts of stormwater on the aquatic system Stormwater Action Plan incorporates education, monitoring and compliance Monitor and evaluate plan	Medium Term BSC - River Health Program BSC - Road Asset Manager Development Engineer Environmental Health and Planning Department of Environment, Climate Change and Water

STRATEGIC APPROACH TO STORMWATER AND BUILDING CONSTRUCTION IMPACTS: EROSION, SEDIMENTATION AND POLLUTION			
OBJECTIVES	**STRATEGIES**	**PERFORMANCE INDICATORS**	**TIMEFRAME/ RESPONSIBILITY**
	Council to undertake regular stormwater audits of businesses and business practice, such as service stations to ensure compliance	Audit identifies and rectifies areas of concern Educational strategy developed to address problem areas	Medium Term BSC - Senior Environmental Health Surveyor
	Develop and implement a policy and implementation process for managing compliance	Improved compliance Improved erosion and sediment control measures Decreased pollution	Environmental Health and Planning
	Develop and implement a holistic Building and Construction strategy incorporating social and environmental impacts Investigate and implement options for Council to oversee and ensure new developments meet Development Approval requirement to address sedimentation issues Council to undertake audits of building sites and address impacts Educate builders on correct methods to reduce sedimentation Undertake compliance as required	Reduced impacts from building sites Improved operations	Medium Term Health and Builidng Surveyors
	Investigate with Council the feasibility of providing dog waste disposal bags at key areas in the Shire, and implement	Decrease in dog waste in public areas	Short Term BSC - River Health Program Council Ranger
	Liaise with key entertainment area managers regarding a strategy to reduce cigarette butts on the streets	Decreased cigarette butt litter	Short Term BSC - River Health Program Council Ranger
	Liaise with other councils to investigate affordable options for Council to improve their operational practices in relation to street cleaning and subsequent impacts on stormwater quality Provide a range of costings and alternatives for resource sharing	A proposal for improved practices is developed in consultation with Works Engineer and presented to Council	Medium Term BSC - River Health Program Development Engineer

STRATEGIC APPROACH TO RURAL ROADS AND BRIDGES IMPACTS: EROSION AND SEDIMENTATION			
OBJECTIVES	**STRATEGIES**	**PERFORMANCE INDICATORS**	**TIMEFRAME/ RESPONSIBILITY**
Decrease the impacts from road runoff and scouring from rural roads and bridges (particularly during heavy rain and flood events)	Review and upgrade Council's Roadside Management Plan incorporating appropriate strategies from Northern Rivers Catchment Management Authority's Local Government Rural Roadside Strategy	Council's Roadside Management Plan reflects priority actions and operations strategies to address environmental, social economic issues erosion incorporating roads and bridges, and sedimentation Good practice operations are detailed	Medium Term BSC - Road Asset Manager, and BSC - River Health Program
	Liaise with Development Works Operations Staff to review and document priorities and associated costs	Priority areas and associated costs are identified	Medium Term BSC - River Health Program
Increase awareness, understanding and cooperation in addressing erosion and sedimentation as a result of heavy rain and flood impacts from rural roads and bridges	Develop a working group consisting of key stakeholders, e.g. Council Engineers, landholder/community representatives, Northern Rivers Catchment Management Authority and Department of Industry and Investment (Fisheries), BSC - River Health Program to undertake an audit of bridges and key rural roads to identify and assess the major issues of concern relating to bridge design, drainage on approaches to bridges, and river flow and subsequent impacts relating to erosion and sedimentation	Cooperative response is undertaken Improved communication between Council and community	Medium Term BSC - Road Asset Manager, Development Works Operations Staff and BSC - River Health Program
		Key issues of concern are detailed, agency requirements and parameters, e.g. DPI (Fisheries), are identified	
		Increased understanding and awareness of engineering, environmental, social and economic considerations and parameters	
	Develop an action plan to address priority areas incorporating current works priorities, and best practice management in relation to engineering, environmental, social and economic considerations and parameters	Working party develop an agreed action plan	Medium to Longer term BSC - Road Asset Manager, Development Works Operations Staff and BSC - River Health Program
	Identify and source resources and funding required to implement the plan and integrate within Council's Management Plan /Plan of Works (forward plan)	Alternate funding sources are identified Funding is accessed to implement the priorities	Medium to Longer Term BSC - River Health Program
	Implement the action plan in stages according to priorities, resources and plan of works	Action plan is implemented according to best management practice	Ongoing
		Action plan is monitored, evaluated modified and reported on	Ongoing
	Promote improvements, e.g. through newsletters and media, and through the working group members	Community has an increased awareness of on-ground improvements and improved practices	Ongoing

STRATEGIC APPROACH TO WATER QUALITY MONITORING IMPACTS: POLLUTION AND SAFETY			
OBJECTIVES	**STRATEGIES**	**PERFORMANCE INDICATORS**	**TIMEFRAME/ RESPONSIBILITY**
Ensure water quality is appropriate for human use, protects ecological processes, sufficient to support a sustainable oyster industry	Ensure the implementation of the strategies of Management Objectives 1 and 3 of the Estuary Management Plan	Estuary Management Plan strategies are implemented	Short to Medium Term BSC - River Health Program Environmental Health Maritime BSC - Road Asset Manager BSC - Water and Sewerage Engineers
	Work with relevant stakeholders to achieve the recommendations from Department of Industry and Investment Guidelines 'Healthy Estuaries for Healthy Oysters'	Recommendations are incorporated into appropriate areas of Council's operations	Medium to Longer Term BSC - River Health Program in conjunction with Council staff
	Collate and provide access to current water sampling results Provide periodic reports on waterway health	Specific tasks under Management Objective 3 and 4 are achieved	Short Term BSC - Senior Environmental Health Officer
Develop and implement a comprehensive water quality monitoring program that can be utilised to improve river health	Work with the regional working party to develop and implement an Ecosystem Health Monitoring program for the region Ensure the program integrates current sampling Work with the Water Watch Coordinator to implement the program in the Shire	An appropriately resourced Ecosystem Health Monitoring program for the region is implemented Management Objective 4 of the Estuary Management Plan is achieved Water quality results are utilised; the program guides river health strategy implementation Increased community involvement and commitment to water quality	Short to Medium Term BSC - River Health Program

Appendix D:

Key Stakeholder Agencies and their Roles, Responsibilities and Priorities

Stakeholder	Contact	Roles and Responsibilities	Priorities	Resource Needs
Bellingen Shire Council (Environmental Health)	Gary Hankinson 02 66557331	Public health, environmental, NRM. Ensuring suitable monitoring of impacts, input to management and stakeholder consultation. OSMS regulation.	Establishing suitable monitoring, of stormwater and swimming water, augmenting OSMS program, routine surveillance of DECCW licence holders and potential sources of pollution.	A NRM officer to look at Private Native Forestry arrangements, MOUs to coordinate River Health Plan, a compliance officer, an education officer, funds for creating a database of monitoring results.
Bellingen Shire Council (Health and Building)	Anthony Brandie 02 66557326	Assess development applications for impacts, engage consultants to assess damage and suggest remedies, respond to complaints about vegetation removal, sediment control on building sites, earthworks and septics.	Processing development applications and responding to and acting upon complaints immediately.	Better stormwater management, more environmental health officers, more strategic direction and a culture change in Council.
Bellingen Shire Council (Planning Department)	Melanie Green 02 66557330	Development control, including setbacks and soil erosion conditions, stormwater assessment, ensuring minimal impact.	Minimisation of impacts of residential and industrial development.	
Bellingen Shire Council (Strategic Planning)	Dan Bennett 02 66557352 And Denique Littler 02 6655335	Write policies and planning instruments to regulate land use and conditions on development.	To meet the objectives in the LEP and DCPs. Protecting waterways and balancing development needs.	Information sheets that give consistent advice and an Education and Compliance officer.
Bellingen Shire Council Tourism)	Bryan Stokes 02 66557306 0428670357	Promoting the Bellingen Shire as a travel destination, promoting and developing products and experiences that encourage tourism an return visitation	Implementation of the Bellingen Shire Tourism Strategy.	Better marketing budget and improved coordination of activities.
Bellingen Shire Council (Water and Sewage Services)	Craig Salmon 02 66557356	Monitoring sewage and town water	Ensuring that sewage meets EPA licensing conditions and that water meets Australian drinking water guidelines. Policing water restrictions at low river flow (95%, 98% or 99%).	Slowly upgrading plants.
Department of Lands (Crown Lands Division)	Richard Dunning Grafton 02 66428124 0412152185	Proper assessment, management, development and conservation, reservation or dedication of Crown land. Also the regulation of conditions and the recording of information in relation to Crown land.		

Stakeholder	Contact	Roles and Responsibilities	Priorities	Resource Needs
Department of Environment, Climate Change and Water (Estuary Management)	Mohammed Hanif Coffs Harbour 02 66530102	Coast and Estuaries Management Program, Policy and Technical Advice.	Improving estuary health.	
Department of Environment, Climate Change and Water (Conservation Programs and Planning)	Estelle Blair Coffs Harbour 02 66598256	Air, noise, water quality and licensing of pollution, biodiversity conservation and management of the DECCW estate. Also contribute to Water Sharing Plans.	Managing natural and cultural values of NSW ecosystems and landscapes and promoting the recovery of threatened species, populations and ecological communities and managing key threatening processes.	Increased funding.
Department of Environment, Climate Change and Water (NPWS)	Anton Ingarfield Dorrigo 02 66572309	Managing reserves within the Bellinger Catchment, Bellinger River NP, Baalijin NP and Dorrigo NP for the conservation of biodiversity, habitats, cultural and historic heritage and scenic values.	Protection of scenic and natural features, conservation of wildlife, maintaining natural processes, preserving cultural and historic heritage, providing for appropriate recreational use and encouraging scientific and educational enquiry.	Staff and funding required for adequate weed control and road maintenance.
Department of Planning (Northern Region)	Craig Bellamy Grafton 02 66416600	The protection of the SEPP 14 wetlands and SEPP 26 littoral rainforests.	Protection of SEPP 14 and SEPP 26 areas.	
Department of Premier and Cabinet (North Coast)	Julie Byers Coffs Harbour Ph 66487239 0404064101	Play a coordinating role with government agencies in the region on issues of strategic importance. May lead multi-agency efforts under the structure of the Regional Coordination Management Group.		
Department of Industry and Investment (Aquaculture Unit and Fisheries Ecosystems Unit)	Katie Sachs Grafton 6640 1600 Marcus Riches Wollongbar 02 66261370	Managing marine protected areas, conserving aquatic biodiversity, sustainable development of the aquaculture industry and minimising impacts to the aquatic environment.	Sanitary water quality for aquaculture, protection of fish habitat and threatened species.	Additional resources always welcome
Department of Industry and Investment (Aquatic Habitat Protection)	Patrick Dwyer Wollongbar 02 66261397 0407264391	Administering sections of the *Fisheries Management Act 1994* that relate to impacts on fish and fish habitats, administering relevant aspects of *Threatened Species Conservation Act 1995*.	Protecting fish habitat in marine and coastal waters, 3rd order creeks, freshwater lakes and billabongs, lagoons and wetlands, and any habitat that is known to support threatened species.	Improved coordination of approaches to foreshore structures.
Department of Industry and Investment (Aquatic Habitat Rehabilitation).	Simon Walsh Wollongbar 02 66261256 0438465882	Running externally funded programs to improve fish habitat and water quality across NSW.	Fish habitat, fish passage and water quality.	More funds and better communications on all levels.

Stakeholder	Contact	Roles and Responsibilities	Priorities	Resource Needs
Department of Industry and Investment (Dairy)	Tony Dowman West Kempsey 02 65626244 0427102263	Offer advice to farmers on the most appropriate ways to minimise the environmental impacts of farm business.	A whole farm approach to dairy and beef cattle, primarily concentrating on cattle restriction facilities.	Money and staff in short supply
Department of Industry and Investment (Fisheries)	Nick Giles Coffs Harbour 02 66523977 0419185540	Protect all habitat below the mean high water mark, authorise dredging and reclamation matters. Ensure compliance with area closures, fishing methods, size and bag limits and protected species.	No net negative impact on marine habitat and fish resources. Ensure sustainable use and economic development of fisheries resources.	More staff would be good
Department of Industry and Investment (Land Use and Planning)	Rik Whitehead 02 66261349 0427201835	DPI has a change management and advisory role in relation to land use and land management as well as a regulatory role with respect to aquatic habitats.	Sustainable, adaptable and profitable primary industries. Wise use of resources, support for partnerships to manage complex NRM issues and research to assist primary industries to be competitive and sustainable.	
Department of Industry and Investment (Wollongbar Agricultural Institute)	John Williams Wollongbar 02 66261200	Administer the *Fisheries Management Act 1994*, implementing the sustainable aquaculture strategy, providing advice and implementing programs relevant to sustainable farming and working with councils.	To achieve profitable and sustainable primary industries, contributing to the growth of rural and regional communities.	Never enough resources, money, people and attitude.
Department of Water and Energy (Environmental Evaluation and Performance Water Management Division)	Maxine Rowley Coffs Harbour 02 66530120	Administrate the *Water Management Act 2000* with respect to water extraction and works within river systems.	Water extraction and works within river systems.	
North Coast Area Health Service	Greg Bell Lismore 02 66207500	NSW Health has regulatory functions in regards to any water used for public water supplies.	Public health issues and public water supplies.	Never enough resources
Northern Rivers Catchment Management Authority	Ian Simpson Grafton 02 65614961 0428824378	Implementation of the NR Catchment Action Plan. Providing advisory information services to stakeholders, funding works and gathering and managing information.	Investing in riverine management, planning works and advisory services.	Could use resources of every description
Northern Rivers Catchment Management Authority (Coastal and Marine)	Rebecca Keech Kempsey 02 65614968	Support local councils and other Natural Resource Managers to implement natural resource management actions from completed plans of management for our coasts and estuaries. This is achieved by developing and funding projects.	Acid sulfate soils, wetland restoration, boating, aquaculture, fishing, pollution, erosion and entrance management.	
Northern Rivers Catchment Management Authority (Water and Central Area)	Peter Corlis 02 66530115	To support and engage the community to actively maintain and sustainable manage the natural resources within the catchment and marine environment.	Community, land use planning, biodiversity, water, coastal management, marine, soil/land resource management.	The key lies in using available resources and developing partnerships

Appendix E:

Key Stakeholder Agencies and their Legislative Responsibilities

Agency (Area)	Legislative Responsibility	Compliance Activities and Breaches	Difficulties with Legislation	Areas for Improvement
Bellingen Shire Council (Environmental Health)	*Protection of the Environment Operations Act1997*, *Local Government Act 1993* and *Public Health Act 1991*	Septic complaints, erosion, cattle in rivers. Compliance actions are to investigate every complaint and to take action depending on resources available. Issue orders for septic and erosion control on building sites.	No orders for forestry or agriculture, little checking or control of business effluent. Lack of political will to carry out orders.	
Bellingen Shire Council (Planning)	*Environmental Planning and Assessment Act 1979*.	Unvegetated soil stockpiles after road grading, tree clearing without consent, lack of sediment control on construction sites and lack of follow through on revegetation conditions. Septics too close to waterways. Compliance usually a verbal warning.	Rely on complaints to find out about problems. Earthworks laws do not cover small works, no final inspection required for DAs unless construction involved, No checking of environmental impacts required for harvestable rights under WSP. Lack of prosecution with respect to cattle in rivers.	10-year grace period for farmers to get cattle out of the river and address effluent.
Bellingen Shire Council (Strategic Planning)	*Environmental Planning and Assessment Act 1979*, the *Local Government Act 1993* and the *Protection of the Environment Operations Act 1997*.	Refer elsewhere for compliance, breaches generally unauthorised land use or clearing, and contractors working without consent.		Better consultation with LGA when developing State policies.
Department of Environment, Climate Change and Water (Coastal Management)	*Coastal Protection Act 1979* primarily. Also work under *Protection of the Environment Operations Act 1997*, *Soil Conservation Act 1938* and *Catchment Management Authorities Act 2003*.	No compliance in this branch of Department of Environment, Climate Change and Water		
Department of Environment, Climate Change and Water (Conservation Unit)	Primarily *Protection of the Environment Operations Act 1997*, *National Parks and Wildlife Act 1974*, *Threatened Species Conservation Act 1995*. Concurrence roles under *Environmental Planning and Assessment Act 1979* and *Water Management Act 2000* and *Native Vegetation Act 2003*.	Clearing and removal of threatened species, unlicensed pollution emissions and disturbance of Aboriginal objects.	Constraints are primarily financial and political.	Tightening the wording of legislation may assist.

Agency (Area)	Legislative Responsibility	Compliance Activities and Breaches	Difficulties with Legislation	Areas for Improvement
Department of Environment, Climate Change and Water (Parks and Wildlife Division)	*National Parks and Wildlife Act 1974*, *Wilderness Act 1987, Threatened Species Conservation Act 1995.*	Inappropriate behaviour and activities in reserves and bringing pets into reserves, dumping of waste. Compliance activities include patrols, barrier erection and education	Barriers to enforcing legislation regarding unauthorised fires. Inadequacies in the permit system and difficulties prosecuting offenders.	
Department of Lands (Crown Lands Division)	*Crown Lands Act 1989*	Unauthorised activities on Crown lands, including dumping of rubbish.		
Department of Planning (Northern Region)	*Environmental Planning and Assessment Act 1979*	Illegal clearing, filling, leveeing and draining of SEPP 14 wetlands and works within SEPP 26 littoral rainforests.		
Department of Industry and Investment (Aquatic Habitat Protection)	*Fisheries Management Act 1994*	Breaches include minor dredging and reclamation works, minor harm to vegetation and unauthorised obstruction to fish passage.		Enforcement of legislation difficult due to lack of resources.
Department of Industry and Investment (Conservation and Aquaculture)	*Fisheries Management Act 1994* and *Fisheries Management (Aquaculture) Regulation 2007.*	No compliance for this branch of Department of Industry and Investment.	Very few cases make it to court due to uncertainty, lake of inter-agency cohesion and cost.	Greater cooperation between industries and pooling of resources.
Department of Industry and Investment (Fisheries)	*Fisheries Management Act 1994*	Patrolling. Key breaches include no fishing licence, recreational fishers selling fish, excessive catches, gear, and undersized fish. Monitoring new development proposals for potential impact on aquatic habitats.	Not enough staff to implement legislation.	
Department of Water and Energy (Water Management Division)	*Water Management Act 2000*	No Compliance.		
North Coast Area Health Service	*Public Health Act 1991.*	Potential problems in regards to effluent/water reuse schemes.	Lack of inter-agency planning, operations and reporting.	
Northern Rivers Catchment Management Authority	*Catchment Management Authorities Act 2003.* Approve native vegetation clearance on non-residential land under the *Native Vegetation Act 2003.*	No compliance	In the case of Department of Environment, Climate Change and Water small breaches of legislation often attract no compliance attention. Under-resourcing of compliance arms across state government is an issue.	

Appendix F:

Summary of Recommendations to Reduce River Health Impacts from Boating and Improve Behaviours

Suggestions for Zoned Areas:

- No ski zone near Raleigh.
- Restrict wake boarding to areas where erosion isn't a problem.
- Have separate areas for activities, eg wake boarding.
- Open up more skiing areas on Urunga side so skiing isn't concentrated to one area.
- Maintain current speed limits.
- Restrict wake boats east and south of Mylestom Pool.
- Skiing to occur east of Mylestom Pool.
- Wake boarding and jet skiing to occur where river is wider.
- Ski restriction zones to protect oyster leases.
- Restrict wake producing boats near oyster leases and other sensitive areas.
- No skiing in sea grass areas.
- Have different speed zones
- Stop jet skiing here
- Prevent skiing along the narrow shallow areas east of Raleigh, zone other areas for skiing.
- Wake producing recreation including jet skiing to be undertaken in wide area of the river, same with water skiing.
- Have higher speeds in the open areas, lower speeds near boat ramps.
- Zone different areas for appropriate use.
- Low speeds in narrow sections of the river.
- Have no wash zones.
- Zone according to condition of the river banks, stop high speed boating in the most fragile areas.
- Ban wake boarding and biscuits.
- Restrict wake boarding to the ocean or as second option east of Mylestom Pool.
- No skiing, wake boarding, use of biscuits or jet skiing as the river can't support this – should go to other larger rivers or areas designed for skiing, e.g. Telegraph Point.
- Make improvements in a section, e.g. redesign riverbanks or strengthen and repair river banks to address erosion, and then allow skiing in this section.
- The area along Riverside Drive used to be 8 knots why isn't it any more?
- Have agreed zoned areas.
- Ski zone could be extended to Urunga Mylestom area for another 500 m as it is wider.
- Reduce the speed to 8 knots around Mylestom pool as it is used a lot by non motorised craft.
- Reduce wake near boat ramps.
- Water ski from Norco to Old Raleigh Bridge.
- From old Raleigh Bridge to Pacific Highway Bridge restrict speed to 4 knots to reduce noise and wake.
- Use wider areas of the river for skiing, e.g. near oyster lease and housing area.
- Skiing should occur from Repton Caravan Park up to Norco, and from Mylestom Pool down to the river mouth.
- 4–6 knots in sensitive areas.
- No wash zones in sensitive areas.
- Have speed limits around oyster leases.
- No ballast boats or jet skis except from Mylestom to river mouth.
- Leave the Kalang as is.

Suggestions for Boating Code of Conduct:

- Develop a water ski protocol and driving technique requirements in sensitive areas.
- Develop a code of conduct with all river users including skiers, wake boarders and fishermen and then have an education campaign with it.
- Develop and implement a code of conduct to allow all recreational use to be undertaken safely.
- Jet skiers need to just travel in a straight line.
- No speeding or spinning around along Riverside Drive.
- Slow boats down.
- Improve boating practice.
- Skiers not to turn at high speeds, particularly in narrow sections of the river.
- Have a skiing duty person to provide information on good practice.
- Restrict number of skiers using river at the one time.
- Have a water ski season and then a recovery period for the river.
- Set up a safe skiing group.

Suggestions for Education/Enforcement:

- Educate ski boats to reduce wake.
- Promote/educate river health issues.
- Increase profile/presence of NSW Maritime enforcement until negative behaviours change – Council to lobby NSW Maritime to undertake this.
- Educate re safe tubing.
- Introduce river safety into school curriculum.
- Have community education program on how to look after the river.
- Have a map of new zoned areas.
- Educate visiting boat owners re their impacts, e.g. erosion, turbidity via brochures at caravan park and signs at boat ramps.
- Better signage to indicate where sea grasses and other sensitive areas are, e.g. Shallow Water Keep Out.
- Promote good behaviours.
- Educate community about fish breeding season.
- Raise awareness of issues and impacts so people know how to look after the river.
- Have restrictions on boat sizes/hull displacement and speeds.
- Provide information and education through rates, notice boards, post offices, shops, flyers and have a media campaign.
- Promote good behaviours with education during licensing.
- Utilise caravan parks and peers to give out information on acceptable behaviours.
- Develop a partnership between NSW Maritime and the Healthy Rivers Program to promote good behaviours.
- Work with NSW Maritime to work out ways to assist them.
- Provide good practice fact sheets on maintenance (like car rego checks) to minimise pollution.
- Promote flat-bottomed boats.
- Education and promotion of good practice at launching areas.

Suggested Process:

- Assess needs before altering boat speed limits.
- Complete a study of recreational sports.
- Undertake observational studies of boating activities during peak times.
- Ensure balanced outcome to suit all river users.
- A minimal fee with boat registrations to go towards a Healthy Rivers fund.
- Have levy to protect the environment, e.g. 50 c per horsepower and $1 per horsepower for wake boats.
- Levy to be used for river bank restoration.
- Have a user pay system/levy / toll to fund the Bellinger/Kalang Healthy Rivers Program – maybe through registration.
- User pays system set up at boat ramps.
- Boat users and NSW Maritime should put money in to the Healthy Rivers Program to address impacts.
- Ensure there is opportunity for all people across the Shire as well as visitors to participate in code of conduct (not just some boat users).

Appendix G:

Examples of Best Practice Guidelines

1. Managing Waterways on Farms
Outlines how to manage creeks and streams to prevent erosion, reduce salinity and improve water quality. The role of plants and buffer zones. Includes case studies.
Author: NSW Department of Primary Industries, Tocal College, 1997
Web: www.agric.nsw.gov.au

2. Stock and Waterways: A Manager's Guide
Assists farmers to identify their riparian land and understand the role it plays in maintaining a healthy waterway.
Author: Australian Government - Land and Water Australia
Web: www.rivers.gov.au

3. Bellinger River - Estuary Revegetation Guide
Recommends species assemblages for riparian revegetation on a reach by reach basis.
Author: Stuart Johnstone for Bellinger Valley Landcare/Coastcare
Available: Hard copy with Council

4. Land and Water Restoration of Riparian Vegetation 2006
Various documents aimed at the restoration and maintenance of riparian lands for reducing pollution and stabilising streambanks.
Author: Australian Government - Land and Water Australia
Web: www.rivers.gov.au

5. Acid Sulfate Soils Remediation Guidelines
Best practice management of floodplain drainage to minimise the impacts of actual Acid Sulfate Soils.
Author: Mitch Tulau for the Department of Environment, Climate Change and Water
Available: Hard copy from Kempsey Office, Department of Environment, Climate Change and Water

6. Guidelines for Managing Floodgates and Drainage Systems on Coastal Floodplains
Written for local government, landholders, drainage unions industry and community to encourage and improved balance between economic, environmental and social aspects of drainage.
Author: New South Wales Department of Primary Industries
Web: www.dpi.nsw.gov.au

7. DECC Stormwater Guidelines
A variety of publications aimed at local councils, construction industry and the education section
Author: Department of Environment, Climate Change and Water
Web: www.environment.nsw.gov.au

8. Best Practice Management of Water Supply and Sewerage - Guidelines
Assists Local Water Utilities to formulate a business plan that reflects best practice management of water resources.
Author: Department of Water and Energy
Web: www.dwe.nsw.gov.au

9. Liquid Trade Waste Regulation Guidelines
An integrated approach to liquid waste management to assist Local Water Utilities
Author: Department of Water and Energy
Web: www.dwe.nsw.gov.au

10. National Environmental Guidelines for Piggeries
Current best practice guidelines for piggery operators.
Author: Australian Pork Limited
Web: www.ausralianpork.com.au

11. The Effluent and Manure Management Database for the Australian Dairy Industry
Current best practice guidelines for managing effluent from dairies.
Author: Dairy Australia
Web: www.dairyingfortomorrow.com

Appendix H:

Relevant Commonwealth and State Legislation

Commonwealth Legislation

Aboriginal and Torres Strait Islander Heritage Protection Act 1984
Australian Heritage Council Act 2003
Environment and Heritage Legislation Amendment Act (No. 1) 2003
Environment and Heritage Legislation Amendment Act (No. 1) 2006
Environment Protection and Biodiversity Conservation Act 1999
National Environment Protection Council Act 1994
National Environment Protection Measures (Implementation) Act 1998
National Water Commission Act 2004
Natural Heritage Trust of Australia Act 1997

NSW State Legislation

Catchment Management Authorities Act 2003
Coastal Protection Act 1979
Crown Lands (Continued Tenures) Act 1989
Environmental Planning and Assessment Act 1979
Environmental Trust Act 1998
Fisheries Management Act 1994
Forestry Act 1916
Forestry and National Park Estate Act 1998
Heritage Act 1977
Local Government Act 1993
National Environment Protection Council (New South Wales) Act 1995
National Parks and Wildlife Act 1974
Native Vegetation Act 2003
Natural Resources Commission Act 2003
Nature Conservation Trust Act 2001
Plantations and Reafforestation Act 1999
Protection of the Environment Administration Act 1991
Protection of the Environment Operations Act 1997
Public Health Act 1991
Rural Lands Protection Act1998
Soil Conservation Act 1938
State Emergency and Rescue Management Act 1989
Threatened Species Conservation Act 1995
Water Act 1912
Water Management Act 2000
Wilderness Act 1987

Appendix I:

Relevant Planning Framework Instruments

NSW Estuary Management Policy

NSW Coastal Policy
North Coast Regional Environmental Plan
Northern Rivers Catchment Action Plan
NSW Water Quality and River Flow Objectives – Bellinger River and Coffs Harbour
Healthy Estuaries for Healthy Oysters – Guidelines
Healthy Rivers Commission – Independent Inquiry into Coastal Lakes
Healthy Rivers Commission – Healthy Rivers for Tomorrow
State Environmental Planning Policies

- SEPP 14 – Coastal Wetlands
- SEPP 26 – Littoral Rainforests
- SEPP 71 – Coastal Protection

Bellingen and Urunga Stormwater Management Plans
Bellingen Local Environmental Plan
Bellingen Pollution Reduction Program for Bellingen Shire Council
Bellingen Shire Growth Management Strategy
Bellingen Shire Local Government Development Control Plans

- DCP 6 – On-site Sewage Management Strategy
- DCP 22 – Mylestom Development Policy
- DCP 23 – Flood and Riverine Processes
- DCP 26 – Contaminated Land Management

Kalang/Bellinger Water Sharing Plan
Bellinger and Kalang Rivers Estuary Management Plan.

Appendix J:

Partnership Approach Poster and Abstract

Abstract to accompany 17th NSW Coastal Conference Poster

BELLINGER AND KALANG RIVERS

A PARTNERSHIP APPROACH IMPROVE RIVER HEALTH

Malone T[1], Hanif M[2], Turnbull I[3]

The Bellinger River catchment is located on the mid-north coast of NSW about 600 km from Sydney. The aim of the River Health Plan is to present a holistic view of the factors which affect Bellinger River health and provide actions for addressing the issues that influence river health. In April 2006 the Bellinger River was closed to oyster harvesting by the NSW Food Authority due to actual and potential pollution sources which may impact on the harvest area. The closure resulted in a number of responses, highlighting the community's anger and concern over the evident poor water quality for recreation and industry, and the onset of a public blame game as to who was and who is responsible for maintaining river health in the catchment.

The closure and responses led to the formation of a working group, steered by the NSW Department of Premier and Cabinet, with an initial charter to implement a rigorous monitoring regime in order to identify the source and origin of the pollution. The group make-up provided for a 'Whole of Government' response to the issue. Nevertheless, after 18 months of monitoring no precisely identified key sources were found and the consensus was that multiple factors were contributing to the water quality issues.

Concurrent with the working group's activities was the successful partnership of NSW DECC (DNR) and Bellingen Shire Council in the engagement of a River Keeper charged with the task of preparing a River Health Plan. That Plan has now been developed through consultation via focus groups and interviews with community and key agency stakeholders. The Plan is a community plan in response to identified issues affecting river health. Overwhelming support for this Plan has been achieved as a result of the community engagement process.

The key outcomes of the Plan are that the actions are owned and authored by the community with Council and other agencies as facilitators. The Plan has clearly identified on-ground practical actions rather than management strategies. The Plan is a valid community response to a real community need with the crucial input of industry and departmental stakeholders.

References:

NSW Dept. of Land and Water Conservation - NSW Estuary Management Manual (1992)
BMT WBM Pty Ltd - Bellinger and Kalang Rivers Estuary Management Plan (May 2008)
Bellingen Shire Council - Draft Bellinger River Health Management Plan (2008).

[1]Bellingen Shire Council, NSW
[2]Department of Environment and Climate Change, NSW
[3]Bellingen Shire Council, NSW.

17th NSW COASTAL CONFERENCE 2008

Bellinger River & Kalang River

A Partnership Approach to Improve River Health

Background

Bellingen Shire Council identified that the Bellinger and Kalang Rivers suffer from bacteriological contamination that is often unpredictable and has multifaceted sources.

Council identified a need for a program that would take a holistic approach in relation to the factors that affect river health. This program needs to develop and implement evidence based strategies to address and improve river health.

The need for this program was further emphasised when, in April 2006 the Bellingen River was closed to oyster harvesting by the NSW Food Authority due to pollution impacting harvest areas. The closure instigated community concern over the poor water quality for recreation and industry.

This resulted in the development of a partnership approach involving various groups including Council, Community, Industry and NSW Government to improve river health in the Bellingen Shire.

Waterfall Way

Bellinger Valley

Mylestom Pool

Partnership Development

A "Whole of Government" working group under the auspices of the NSW Premiers Department Regional Coordination Group was formed to identify pollution sources. Membership involves representatives from key areas of Bellingen Shire Council, Department of Environment and Climate Change, Department of Primary Industries, Department of Premier and Cabinet, NSW Food Authority, Department of Water and Energy, Northern Rivers Catchment Management Authority, North Coast Area Health Service and the Oyster industry.

NSW Department of Environment and Climate Change and Bellingen Shire Council through a grant from the Estuary Management Program, have jointly funded the development of a Healthy Rivers Plan. To develop, implement and manage the Healthy Rivers Plan and Program, Bellingen Shire Council has engaged a River Keeper

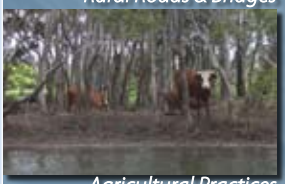
The Bellingen Shire Council has formed partnerships with community members and government agencies as well as linking in as a member of the Premiers Working Group. Over 300 landholders, community members, visitors and industry groups as well as 24 agency representatives are participating in the development of the Healthy Rivers Plan and have committed to being involved with the implementation of the plan.

River Health Plan

The aim of the River Health Plan is to present a holistic view of the factors which affect river health and provide actions for addressing these issues in order to:

- Identify major issues influencing water quality
- Identify barriers, overlaps and gaps in implementation
- Engage and motivate the community to change activities that result in poor water quality
- Identify areas to improve agency engagement and coordination
- To initiate action with all stakeholders
- Inform Council and the community on water quality issues
- Provide a vehicle for monitoring and evaluating change, and hence
- Improve water quality and River Health through improved management practice

Rural Roads & Bridges



Agricultural Practices

Riverbank Management

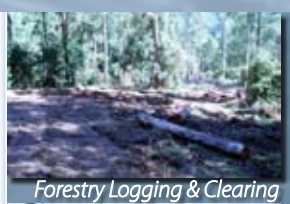
Wetland Management

OSMS Management

Stormwater & Construction Site Management

Priority Issues for Attention

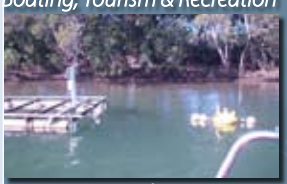
- Rural Roads and Bridges
- Agricultural Practices
- Riverbank and Wetland Management
- Oil and Diesel Spills from Roads
- Management of OSMS
- Stormwater and Construction Site Management
- Forestry Logging and Clearing
- Waste Water Treatment Plants
- Boating, Tourism and Recreation Use
- Water Quality Monitoring and Management



Forestry Logging & Clearing

Waste Water Treatment Plants

Boating, Tourism & Recreation



Water Quality Monitoring & Management

Department of Environment & Climate Change NSW

BELLINGEN SHIRE COUNCIL

Authors: Mohammed Hanif, Department of of Environment and Climate Change NSW; Tania Malone, Bellingen Shire Council; Ian Turnbull, Bellingen Shire Council

Appendix K:

Kalang Water Quality Results

Kalang River Water Testing
Faecal Coliform Results (APHA 9222D) cfu/100mL

Chart No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Site No.	1	1a	4	4A	4B	2	3	4						
Location	East Junction	East Junction 1A	Nth East Channel	Nth East Channel 4A	Nth East Channel 4B	Hotspot	South West Leases	West Junction	Bridge	North East Pump Station	West Sample	SE Sample	Gundamain Ck	Brigalow Ck
20/08/2008	25		50			2	2	1						
3/09/2008	6	4	8	7	4	0	1	1						
27/10/2008	0		4			0	0	0						
18/11/2008	25		55	15		30	100	50	5	65	83	55	45	50

note: water faecal coliform limit = 70 cfu/100mL
= meets criteria for oyster harvest and depuration
= exceeds criteria for oyster harvest and depuration