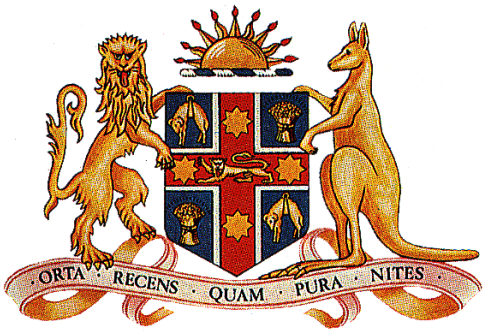

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COUNCIL NOTICES

COFFS HARBOUR CITY COUNCIL

Coastal Protection Act 1979, Section 55H

Gazettal and Commencement of a Coastal Zone Management Plan

COFFS HARBOUR CITY COUNCIL with the certification of the Minister for the Environment, have prepared and adopted the Woolgoolga Lake Estuary Coastal Zone Management Plan in accordance with Section 55 of the *Coastal Protection Act 1979*.

The Plan is a strategic and long term plan developed to provide guidance for achieving a sustainable estuary in the future, giving balanced consideration to environmental, social and economic demands on the estuarine system and its catchment area.

The Plan will remain in force until such time as it is amended or repealed by a coastal management program that replaces it.

The Plan may be viewed on Coffs Harbour City Council's website at www.coffsharbour.nsw.gov.au For more information, call 02 6648 4000.

Steve McGrath
General Manager
Coffs Harbour City Council
Locked Bag 155, Coffs Harbour NSW 2450

Woolgoolga Lake Estuary Coastal Zone Management Plan

Coffs Harbour City Council has prepared this document with financial assistance from the NSW Government through the Office of Environment and Heritage. This document does not necessarily represent the opinions of the NSW Government or the Office of Environment and Heritage.

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Coastal Zone Management Plan

Woolgoolga Lake Estuary

Prepared for: Coffs Harbour City Council and
Office of Environment and Heritage

Amended January 2018 for Certification

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Version History				
UPR	*Description*	*Date Issued*	*Issued By*	*Reviewed By*
1616692	Initial Draft	08/03/2012	Tim Ruge	Garry Murray
1616935	Final Draft	06/07/2012	Tim Ruge	Cate Walsh
1616614	Draft for Public Exhibition	30/08/2012	Tim Ruge	Cate Walsh
1616614	Draft for Public Exhibition-Rev1	07/11/2012	Tim Ruge	Cate Walsh
1616-1004	Final report	31/01/2013	Tim Ruge	Kim Casson

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Executive Summary

This Coastal Zone Management Plan (CZMP) describes proposed actions to be implemented by Coffs Harbour City Council, other public authorities and the private sector to address priority management issues for the Woolgoolga Lake estuary. The area addressed by this CZMP comprises the Woolgoolga Lake waterway and tributaries, foreshores and the catchment draining to the estuary up to the tidal limit of the tributary creeks. The CZMP also considers issues associated with the wider catchment upstream of the tidal limit.

Woolgoolga Lake is an Intermittently Closed and Open Lakes and Lagoon (ICOLL) meaning the entrance naturally alternates between being open or closed to the ocean. The estuary is part of the Solitary Islands Marine Park.

The estuary has areas of high environmental, recreational and aesthetic value. A key focus of recreational activity occurs at the public picnic area adjacent to the Woolgoolga Lakeside Holiday Park near the estuary entrance. The close proximity of residential communities and the variety of natural settings around Woolgoolga Lake combine to create a broad range of passive land and water based recreational opportunities that optimise the scenic potential of the area.

The catchment area of Woolgoolga Lake includes a significant area of State Forest in the upper limits of the catchment. Banana plantations and blueberry farms cover a significant proportion of the upper slopes in the mid-catchment. Residential development and the commercial centre of Woolgoolga occupy a significant proportion of the lower catchment.

Identification of key estuary management issues and development of management strategies has been undertaken based on technical studies and consultation with the community and key stakeholder organisations. Consultation has included community workshops in 2010 and 2011, a community survey in 2011. The outcomes from community consultation for the 1991 Woolgoolga Lake Plan of Management have also been considered.

Estuary Management Issues

The key estuary management issues for the estuary relate to:

- artificial opening of the estuary entrance to address flood mitigation and other issues while minimising interference with the natural opening and closing processes and associated estuary processes;
- management of sediment, nutrient and other pollutant inputs from the catchment;
- poorly managed recreational activities and land management practices have the potential to impact on riparian vegetation and also degrade the recreational experience and scenic / natural amenity of the lake;
- climate change impacts on the estuarine ecology and water quality (particularly as a result of sea level rise and consequent lake water level increases); and
- the need to upgrade and manage existing recreational facilities and opportunities to enhance and protect the recreational experience offered by Woolgoolga Lake.

Estuary Management Strategies

A range of potential management strategies have been developed, prioritised and detailed to address the key issues. These strategies are summarised in the following Implementation Schedule. The key management strategies include:

- formalising a policy for artificial opening of the entrance and minimising the need for artificial opening in the long-term by active measures such as implementing flood mitigation measures for flood-risk properties and removing, relocating or otherwise managing items of low-lying infrastructure that currently necessitate openings;

- continue educational and incentive schemes that address the management of soil resources and pesticide / herbicide / fertiliser use in agricultural activities, encourage establishment of vegetated riparian zones on farm watercourses, and ensure that best practice erosion control methods are applied during forestry operations in the upper catchment;
- control significant land modification activities on rural lands by enforcing development consent where required under Council's Local Environmental Plan to enforce erosion and sediment controls for significant earthworks;
- encourage the regeneration of riparian vegetation on the southern foreshores of the lake. This would include developing a landscape plan with the input of local landholders / residents and actively re-establishing riparian vegetation along sections of the foreshore reserve with due regard to the amenity of adjoining residents;
- manage inappropriate mowing practices that impact on riparian vegetation using measures such as establishing a defined maintenance boundary between riparian vegetation and mown grass areas at key locations such as the foreshore residences on the southern foreshores of the lake and the foreshores of the Woolgoolga Lakeside Reserve Picnic Area and Woolgoolga Lakeside Caravan Park;
- implement development control provisions to facilitate upslope migration of mangroves and saltmarsh in response to sea level rise;
- maintain and consolidate the existing function and capacity of the Woolgoolga Lakeside Reserve Picnic Area as the main focus for family, water and land based recreational activity around the lake (including addressing bank erosion). This includes constructing a foreshore platform to enhance water edge recreational use and address bank erosion at the central and most popular section of the Lakeside Reserve Picnic Area; and
- consolidate and upgrade walking trails around the lake, replace and rationalise the existing signage system, remove and revegetate unnecessary routes and provide a continuous walking track along the southern shore of the lake, Jarrett and Woolgoolga Creeks to formalise and enhance the recreational experience for public use.

Dredging of the lake has been recommended by some community groups. Anecdotal evidence suggests that the estuary was previously deeper in the 1970's. Community consultation has highlighted a perceived loss of recreational opportunity due to decreased waterway depth relative to this period. Historical aerial photography indicates that water depths in 1943 were similar to present conditions, and deeper water depths were experienced in the 1960's and 1970's. This is attributed to very large flooding events in combination with large ocean swell events during the 1960's and 1970's which had the effect of removing a significant amount of marine derived sediments near the entrance. Since the 1960's and 1970's marine derived sediments have gradually built-up and subsequently reduced water depths in the vicinity of the lake picnic area / lake entrance. Fluctuations in the amount of marine sediment in the estuary and consequent fluctuations in water depths are a natural trend.

This estuary management study does not recommend dredging of Woolgoolga Lake for the purpose of providing deeper water depths on the basis of the following considerations:

- long-term fluctuations in water depths associated with infilling of the estuary by marine derived sands is a natural process that has occurred prior to the 1970's;
- dredging is expensive and generally only achieves short-term benefits in respect to removal of sediment;
- dredging can have significant negative impacts on water quality, estuary processes, health, and ecology;
- the lake is part of the Solitary Islands Marine Park and is listed as 'Habitat Protection Zone' which has the objective of protecting habitats and reducing high impact activities (e.g. dredging); and
- an approval process involving NSW government agencies is required before dredging is undertaken and it is considered unlikely that dredging would be approved for Woolgoolga Lake for the primary purpose of increasing water depths for improved swimming amenity.

Review and Reporting

This document will be reviewed every 5-10 years to ensure its effectiveness and consistency with State Government policy. A comprehensive review will be required prior to 31 December 2021 to transition this CZMP into a Coastal Management Plan in order to retain its certification status under the Coastal Management Act 2016. Implementation of the strategies and the associated tasks will be coordinated by Council staff and monitored by the Coast and Estuary Management Advisory Committee (CEMAC) throughout the duration of the CZMP. During the revision phase of this document, any substantial changes to the Plan and strategies will be reported to Council, CEMAC, and State government and appropriate agencies to ensure that all relevant stakeholders are informed.

Throughout the revision process all relevant information will be made available to the community via the Council website and will be open for community feedback as a means of community reporting.

Implementation Schedule

The proposed management strategy actions are detailed in the following Implementation Schedule. Included in the schedule is:

- the lead agency responsible for executing the strategy action (other relevant support agencies are included in the strategy action details in the main body of the CZMP);
- the timeframe for implementing the strategy action. The year relates to the time following adoption of this CZMP e.g. “Years 2 – 5” indicates the strategy action should be implemented within 2 to 5 years of adoption of the CZMP (refer to strategy action details in the main body of the CZMP with respect to monitoring of each action);
- The strategy actions are listed in general order of priority with a specific priority assigned to each strategy action in terms of “very high”, “high”, “medium” or “low” priority.

Prior to implementation of the Woolgoolga Lake estuary strategy actions Council will need to review to ensure consistency with the Coastal Zone Management Plan for the Coffs Harbour coastline and consistency with the Regional Park Management Plan.

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Implementation Schedule

Strategy Action No.	*Description*	*Lead Agency (refer to strategy details for related agencies)*	*Timeframe*	*Cost*	*Potential Funding Sources*	*Priority*
Strategy 1 - Entrance Management						
1.1	Prepare a Review of Environmental Factors for artificial opening of the entrance to Woolgoolga Lake estuary	CHCC	Year 1	Staff time	CHCC operating budget	High
1.2	Refine, adopt and implement Woolgoolga Lake Entrance Management Policy	CHCC	Year 1	▪ Staff time for adoption of policy. ▪ Internal costs associated with backhoe, personnel and monitoring / reporting for each artificial opening event.	CHCC operating budget	High
1.3	Prepare a Floodplain Risk Management Study and Plan for Woolgoolga Lake and address flooding risks that have the potential to trigger artificial opening of the entrance	CHCC	▪ Years 1 - 2 for Floodplain Risk Study and Plan ▪ Years 2 – 5: audit and assessment ▪ Years 5 – 25: implement measures	▪ $100,000 for Floodplain Risk Management Study and Plan ▪ Audit and assessment: Council Staff time ▪ Implement measures: dependant on proposed works	▪ OEH Floodplain Management Grants ▪ CHCC – Coffs Harbour Water budget for audit and assessment and subsequent implementation of measures / augmentation works	Medium
1.4	Raise community awareness of the natural opening and closing regime of Woolgoolga Lake	CHCC	Years 1 - 5	Included in the costs in Strategy Action 3.2	▪ Caring for Our Country. ▪ CHCC Environmental Levy. ▪ OEH Coastal and Estuary Management Program.	Low

Strategy Action No.	*Description*	*Lead Agency (refer to strategy details for related agencies)*	*Timeframe*	*Cost*	*Potential Funding Sources*	*Priority*
Strategy 2 – Stormwater Management and Catchment Pollutants						
2.1	Educational strategies to address soil management and pesticide, herbicide and fertiliser use in agricultural activities	DPI – Agriculture NSW	Year 1	$5,000 per workshop for preparation, materials and delivery.	▪ Caring for Our Country ▪ CHCC Environmental Levy ▪ North Coast LLS ▪ OEH - Environmental Education Grants	High
2.2	Encourage horticultural landowners to uptake incentives program for Best Practice Management	North Coast LLS	Years 1 – 5	▪ Staff budget time for coordinating uptake of the incentives program ▪ $20,000 pa for incentives funding from CHCC Environmental Levy (Subject to funding and relevant processes) ▪ $20,000 pa for incentives funding from North Coast LLS (Subject to approval and available funding)	▪ CHCC Environmental Levy ▪ North Coast LLS – Relevant Programs	Very High
2.3	Best practice sediment, erosion and water quality management on forestry operations in the catchment	Forestry Corporation NSW (FCNSW)	Life of the Plan	FCNSW operating budget	n/a	Medium
2.4	Stormwater management for new urban development	CHCC	Review policy and guidelines every 5 years	Part of Council's operational budget	n/a	Medium

Strategy Action No.	*Description*	*Lead Agency (refer to strategy details for related agencies)*	*Timeframe*	*Cost*	*Potential Funding Sources*	*Priority*
2.5	Stormwater management for existing urban development	CHCC	Initial audit: Years 1 – 5 Retrofit works: long term	▪ Stormwater management plan: $50 - $80k ▪ Retrofit works: dependant on proposed works	CHCC Environmental Levy	Medium
2.6	Encourage horticultural landowners to establish vegetated riparian zones on farm watercourses via the incentives program for Best Practice Management	North Coast LLS	Years 1 – 5	Part of cost listed in Strategy Action 2.2.	Same funding as listed in Strategy Action 2.2.	Very High
2.7	Control land modification activities on rural lands	CHCC	Year 1	Unknown additional staffing resources and additional costs to Council's operational budget	n/a	Very High
Strategy 3 - Foreshores and Riparian Areas						
3.1	Establish a defined edge between mown land and riparian vegetation along the southern foreshore of Woolgoolga Lake adjacent to Sunset Lakes Estate.	CHCC	Years 1 - 2	▪ Establishment of defined edge and initial re-establishment of riparian vegetation: $5,000 ▪ Management / consultation: staff time ▪ Landscape Plan: CHCC staff time	▪ Caring for Our Country ▪ CHCC Environmental Levy	Very High

Strategy Action No.	*Description*	*Lead Agency (refer to strategy details for related agencies)*	*Timeframe*	*Cost*	*Potential Funding Sources*	*Priority*
3.2	Improve the extent of riparian vegetation along the southern foreshore of Woolgoolga Lake adjacent to Sunset Lakes Estate.	CHCC	Years 3 – 5	▪ Planting works: $5,000 ▪ Management / consultation: staff time	CHCC Environmental Levy	High
3.3	Modify the existing landscape plan for the Woolgoolga Lakeside Reserve Picnic Area	CHCC	Year 1	▪ Landscape Plan: no cost - CHCC and Coffs Coast State Park Trust (CCSPT) staff time	Not applicable	High
3.4	Establish a defined edge between mown land and riparian vegetation along the foreshore of Woolgoolga Lakeside Reserve Picnic Area and Woolgoolga Lakeside Caravan Park and revegetate riparian areas	CHCC as Reserve Trust Manager	Years 1 - 2	▪ Establishment of defined edge and initial re-establishment of riparian vegetation: $5,000	▪ CHCC Environmental Levy	Very High
3.5	Construct a foreshore platform to enhance water edge recreational use and address bank erosion at the central and most popular section of the Lakeside Reserve Picnic Area	CHCC	Years 1 - 5	▪ Foreshore structure[1]: $50,000 ▪ General site upgrades: new edging, paths, plants and signage: $20,000	▪ CHCC Environmental Levy ▪ Caring for Our Country	Medium
3.6	Maintain and enhance other water edge access points at Lakeside Reserve Picnic Area.	CHCC	Years 1 - 5	$2,000 for any general site upgrades	▪ CHCC Environmental Levy	Medium

Strategy Action No.	*Description*	*Lead Agency (refer to strategy details for related agencies)*	*Timeframe*	*Cost*	*Potential Funding Sources*	*Priority*
Strategy 4 - Water Quality						
4.1	Minimise the input of domestic animal faecal materials into the waterway.	CHCC	Years 2 – 3	▪ Staff time ▪ Installation of units $1,500 p/unit ▪ Maintenance of units $1000 per unit p/annum	Caring for Our Country	Medium
Strategy 5 - Climate Change Impacts on Estuary Ecology						
5.1	Implement development control provisions to facilitate upslope migration of mangroves and saltmarsh in response to sea level rise	CHCC	Years 1 – 2	Staff time	CHCC operating budget	High
Strategy 6 – Fish Stocks - No direct fish stock improvement actions are proposed such as artificially stocking the lake. Other strategies and actions proposed in this CZMP will adequately address the issue of fish stocks. These strategies include: improve the extent and condition of aquatic habitat (Strategy 7 actions); improve the condition and continuity of riparian vegetation (Strategy 3 and Strategy 8 actions) and improve water quality (Strategy 2 actions).						
Strategy 7 – Aquatic Habitats						
7.1	Liaise with landholders around the foreshore of Woolgoolga Lake to address impact to aquatic habitats	CHCC	Years 1 - 5	Staff time	▪ CHCC operating budget. ▪ MPA - SIMP operating budget	High

Strategy Action No.	*Description*	*Lead Agency (refer to strategy details for related agencies)*	*Timeframe*	*Cost*	*Potential Funding Sources*	*Priority*
Strategy 8 - Environmental Weeds						
8.1	Develop a weed management strategy which prioritises areas of riparian foreshore to be treated and priority weeds to be targeted.	CHCC	Years 1 - 2	Strategy development: $5,000 if done external to CHCC.	North Coast LLS through relevant programs.	High
8.2	Utilise specialist bush regeneration contractors to undertake primary weed control in priority areas.	CHCC	Years 2 – 5	Subject to development of the Weeds Management Strategy under Strategy Action 8.1 above. If external contractors are to be used, funds required is subject to the Weed Management Strategy but initially estimated at 400 hours per year @ $35/hr ($14,000/yr) over 5 years.	▪ North Coast LLS through relevant programs. ▪ Environmental Trust Restoration and Rehabilitation grants. ▪ Grants through NSW Government for weed control works on Crown Lands ▪ CHCC Environmental Levy.	High
8.3	Foster a local Bushcare group to undertake the secondary control or follow-up maintenance of areas treated by contractors.	CHCC	Long term commitment required to support community groups	Dependent on activities, but generally limited to provision of tools, consumables, and support.	Support available through Coffs Landcare Network. Funding available through North Coast LLS – Relevant programs. CHCC Environmental Levy	Medium
Strategy 9 - Climate Change Impacts on Water Quality - Addressing current issues in accordance with Strategy Action 1.2 and Strategy 2 actions will be the best preparation						

Strategy Action No.	*Description*	*Lead Agency (refer to strategy details for related agencies)*	*Timeframe*	*Cost*	*Potential Funding Sources*	*Priority*
for the impacts of climate change on water quality. No further actions are proposed to address this issue.						
Strategy 10 - Water Quality Monitoring						
10.1	Continue to implement the Ecohealth water quality monitoring program for Woolgoolga Lake	CHCC	Ongoing	$20,000 every 4 years	▪ CHCC operating budget. ▪ MPA - SIMP: in kind assistance	Medium
Strategy 11 - Recreational Facilities and Opportunities						
11.1	Maintain and improve facilities that support existing passive recreational activities at Woolgoolga Lakeside Reserve and along the foreshores of the Lakeside Caravan Park.	CHCC	Years 1 - 5	▪ Upgrade park furniture and signage: $20,000 ▪ Visitor surveys: CHCC staff time	▪ Caring for Our Country ▪ Sport and Recreation Facility Grant program	Medium
11.2	Improve the path network around the foreshores and tributaries of the lake	CHCC	Years 5 – 10	▪ Cycle path plan: CHCC staff. ▪ New signage system: $15,000. ▪ Upgraded tracks - north side $5,000. ▪ Upgraded tracks – south side: $20,000. ▪ High school path: $2,000. ▪ Lake mouth path: $2,000.	▪ Caring for Our Country. ▪ Sport and Recreation Facility Grant program. ▪ CHCC Environmental Levy	Medium
11.3	Modify existing and proposed uses along Lake Road to ensure that	CCSPT, CHCC as appointed Trust	Years 1 – 5:	▪ $5,000 - create a barrier along Lake Road and restore cleared	▪ Caring for Our Country. ▪ CHCC Environmental Levy.	High

Strategy Action No.	*Description*	*Lead Agency (refer to strategy details for related agencies)*	*Timeframe*	*Cost*	*Potential Funding Sources*	*Priority*
	environmental values are protected.	manager		areas / manage Rainbow Bee-Eater nesting locations	▪ North Coast LLS	
11.4	Address Rubbish Around the Foreshores	CHCC	Ongoing	CHCC staff time for liaison, maintenance and Clean Up Australia support	NSW Government Litter Prevention Program – grants managed by the Sustainability Programs Division of OEH	Low
Strategy 12 - Flying-Fox Camp						
12.1	Ensure consistency between the Flying-fox management strategy and any related CZMP actions	CHCC	1 – 2 years	CHCC staff time for internal liaison.	Nil	High
Strategy 13 - Visual Amenity						
13.1	Preserve and enhance the natural values of Woolgoolga Lake to maintain its high level of visual amenity.	CHCC	1 - 2 years	▪ Car tyre removal: $2,000 assuming CHCC staff time ▪ Replace / modify timber wall: $5,000 assuming CHCC staff time	▪ CHCC operating budget ▪ CHCC Environmental Levy.	Medium - Low

Introduction

This document presents a Coastal Zone Management Plan (CZMP) for Woolgoolga Lake estuary. The primary purpose of this CZMP is to describe proposed actions to be implemented by Coffs Harbour City Council, other public authorities and the private sector to address priority management issues for the Woolgoolga Lake estuary. These management issues relate to:

- pressures on estuary health;
- community uses of the estuary; and
- estuarine risks to public safety and built assets*

The area addressed by this CZMP comprises the Woolgoolga Lake waterway and tributaries, foreshores and the catchment draining to the estuary up to the tidal limit of the tributary creeks. The CZMP also considers issues associated with the wider catchment upstream of the tidal limit. The Woolgoolga Lake estuary is shown below and the extents of this area are mapped overleaf in Illustration I.1.

*It should be noted that the Coffs Harbour CZMP, when released, will act as the primary coastal management plan and will address coastal hazard risks to development, infrastructure and public safety. While the Woolgoolga Lake estuary CZMP principally focuses on estuary management issues it will, where necessary assist in addressing these issues where necessary.

Source: NSW Office of Environment and Heritage

Plate I.1 Aerial Image of Woolgoolga Lake Estuary

Background

In 2010, Coffs Harbour City Council (Council) and Office of Environment and Heritage (OEH) engaged GeoLINK in association with Aquatic Science and Management and GECO Environmental to develop a CZMP for Woolgoolga Lake estuary. Council's Coastal Estuary Management Advisory Committee's goal for the CZMP is to "to assist Council in achieving an integrated, balanced, responsible and ecologically sustainable use of the Woolgoolga Lake Estuary."

Information shown is for illustrative purposes only

Drawn by: RE Checked by: MVE Reviewed by: TIM Date: April 2012
Source of base data: Coffs Harbour City Council

0 300

North

Geographical Extent of Coastal Zone Management Plan

GeoLINK

Coastal Zone Management Plan - Woolgoolga Lake Estuary
1616412

Illustration I.1

Development of this CZMP has included the following preliminary phases: literature and information review; technical study of the relationship between the estuary processes, external influences and issues of concern; community uses assessment and development of key management objectives and issues. These preliminary studies are reported in the following documents:

- *Data Compilation and Estuary Processes Study – Darkum Creek, Woolgoolga Lake and Willis Creek* (GeoLINK *et al.*, 2011a); and
- *Estuary Management Study – Woolgoolga Lake* (GeoLINK *et al.*, 2011b).

Summaries of these preliminary phases are contained in:

- Appendix D – summary of literature and information review and technical study of estuary processes;
- Appendix E – summary of community uses assessment; and
- Appendix F – summary of development of key management objectives and issues.

Consultation

Community and stakeholder consultation was undertaken to gain input to the development of management action for Woolgoolga Lake estuary. Consultation has included community workshops in 2010 and 2011, a community survey in 2011 and liaison with relevant stakeholders. The outcomes from community consultation for the 1991 Woolgoolga Lake Plan of Management have also been considered.

Addressing Coastal Management Principles

The notes below describe how this CZMP has considered the relevant Coastal Management Principles as detailed in the *Guideline for Preparing Coastal Zone Management Plans* (DECCW, 2010).

***Principle** 1: The Plan will consider the objects of the Coastal Protection Act 1979 and the goals, objectives and principles of the NSW Coastal Policy 1997.*

The NSW Coastal Policy deals with population and economic growth whilst protecting the natural, cultural, heritage and spiritual values of the coastal environment. The policy has a strong focus on the principles of Ecologically Sustainable Development. The NSW Coastal Protection Act 1979 aims to protect, enhance, maintain and restore the environment with concern for both the natural and built environments. These principles formed the basis of development and prioritisation of management strategies for Woolgoolga Lake estuary.

***Principle** 2: Optimise links between plans relating to the management of the coastal zone.*

Development of this CZMP including the literature review component has considered Council's Coastal Processes and Hazard Definition Study and Coastal Zone Management Study for the coastline, Council's Climate Change Mitigation and Adaptation Action Plan and other studies and management plans related to Woolgoolga Lake estuary.

***Principle** 3: Involve the community in decision-making and make coastal information publicly available.*

As indicated above, community consultation was undertaken to gain input to the development of management action for Woolgoolga Lake estuary including community workshops in 2010 and 2011, and a community survey in 2011 and liaison with relevant stakeholders. The outcomes from community consultation for the 1991 Woolgoolga Lake Plan of Management have also been considered.

Principle 4: Base decisions on the best available information and reasonable practice; acknowledge the interrelationship between catchment, estuarine and coastal processes; adopt a continuous improvement management approach.

The estuary processes study component of the CZMP considered the above issues. Development of management strategies has included a continuous improvement management approach such as the measures outlined in the entrance management strategy to minimise the future need for artificial opening events.

Principle 5: The priority for public expenditure is public benefit; public expenditure should cost effectively achieve the best practical long-term outcomes.

Development of strategies and priorities has included consideration of public expenditure.

Principle 6: Adopt a risk management approach to managing risks to public safety and assets; adopt a risk management hierarchy involving avoiding risks where feasible and mitigation where risks cannot be reasonably avoided; adopt interim actions to manage high risks while long-term options are implemented.

This principle is not directly applicable to the issues for the Woolgoolga Lake estuary.

Principle 7: Adopt an adaptive risk management approach if risks are expected to increase over time, or to accommodate uncertainty in risk predictions.

This principle is not directly applicable to the issues for the Woolgoolga Lake estuary.

Principle 8: Maintain the condition of high value coastal ecosystems; rehabilitate priority degraded coastal ecosystems.

Development and prioritisation of strategies has considered the above approach such as management of environmental weeds which has been prioritised for riparian vegetation classified as either 'good' or 'very good' condition.

Principle 9: Maintain and improve safe public access to beaches and headlands consistent with the goals of the NSW Coastal Policy.

This principle is not directly applicable to the issues for the Woolgoolga Lake estuary, however, actions under Strategy 11 address a key public access location for swimming and canoeing in Woolgoolga Lake.

Principle 10: Support recreational activities consistent with the goals of the NSW Coastal Policy.

Strategy 11 in this CZMP directly addresses recreational activities related to Woolgoolga Lake estuary.

Key Values of Woolgoolga Lake Estuary

The natural settings of the estuaries and coast within the Mid North Coast are a feature that attracts visitors and locals to the area. Woolgoolga Lake estuary is in keeping with this natural setting, and forms part of a network of bushland settings along the coastal zone of the Coffs Harbour region.

Key values of the estuary include its natural setting and recreational opportunities including the public picnic area adjacent to the lake and the walking and cycling track network. A key focus of recreational activity occurs at the public picnic area adjacent to the Woolgoolga Lakeside Holiday Park. The area has a long open foreshore that allows easy, soft water entry for swimming and canoe / kayak launching.

The close proximity of residential communities and the variety of natural settings around Woolgoolga Lake combine to create a broad range of passive land and water based recreational opportunities that optimise the scenic potential of the area. The sites attributes create a highly attractive and popular recreation destination for the local and wider community.

The majority of the foreshores around the lake comprise a continuous edge of natural vegetation, often extending well back from the foreshores and rising up adjoining slopes. This mostly intact and healthy riparian vegetation contributes significantly to the value and health of the estuary.

Water quality in the lake shows high levels of variability common to this type of estuary. However, the water quality is generally acceptable for primary contact recreation and protection of aquatic ecosystems.

The entrance to the Woolgoolga Lake estuary naturally alternates between being open or closed to the ocean. These types of estuaries are known as an ICOLL's - Intermittently Closed and Open Lakes and Lagoons.

Key Management Issues

The key estuary management issues that have been identified relate to:

- the estuary entrance which naturally alternates between being open or closed to the ocean. The issue relates to artificial opening of the entrance to address flood mitigation while minimising interference with the natural opening and closing regime and associated estuary processes;
- sediment, nutrient and other pollutant inputs from the catchment;
- recreational activities and other practices that have the potential to impact on riparian vegetation and degrade the recreational experience and scenic / natural amenity of the lake;
- climate change impacts (particularly sea level rise and consequent lake water level increases) on the estuarine ecology and water quality; and
- the need to upgrade and manage existing recreational facilities and opportunities to enhance and protect the recreational experience offered by Woolgoolga Lake.

Key Management Strategies

Key management strategies for Woolgoolga Lake estuary include:

- adoption of an entrance management policy that addresses flood mitigation issues but minimises interference with the natural opening and closing regime of the lake. The entrance management strategy also includes minimising the need for artificial entrance opening in the long-term by active measures such as removing flooding risks to low-lying infrastructure;
- a range of actions addressing soil erosion, stormwater management and pesticide / herbicide / fertiliser use in agricultural activities;
- undertaking better maintenance practices and restoring riparian vegetation in poorly or inappropriately maintained areas such as the southern foreshores of the lake;

- maintain and consolidate the existing function and capacity of the lakeside picnic area as the main focus for family, water and land based recreational activity around the lake while addressing issues that impact on bank erosion and riparian vegetation; and
- consolidate and upgrade walking trails around the lake, remove and revegetate unnecessary routes and other works required to formalise and enhance the recreational experience for public use.

The management strategies in this document are presented in general order of priority (Strategy 1 being the highest priority). Specific priorities have also been assigned to each strategy action in terms of "very high", "high", "medium" or "low" priority. The priorities and timeframes provided in this CZMP are indicative and are to be used to guide the order of implementation. Priorities were established in response to:

- the degree to which the management strategies will impact on estuary issues;
- timeframe over which the strategy impacts will extend (the longer the better);
- extent of the estuary addressed by each management strategy;
- community rating of issues addressed by each management strategy (based on a community survey); and
- the likely cost of effective implementation of the management strategy.

Coffs Harbour 2030 Plan

The Coffs Harbour 2030 Plan (CHCC, 2009), a strategic plan for the Coffs Harbour community ('the 2030 Plan'), was adopted by Council in December 2009. The 2030 Plan is driven by the Community Vision 2030 and outlines the steps needed to create a sustainable future for Coffs Harbour LGA. It is the overarching plan that integrates planning and reporting frameworks, while mapping out the community's aspirations for the future of the Coffs Harbour LGA to 2030 and beyond.

This CZMP is consistent with the aspirations of the Coffs Harbour community as articulated in the 2030 Plan. The 2030 Plan covers five themes including *Moving Around* and *Looking after our Environment* which are more directly applicable to this CZMP. The 2030 Plan outlines outcomes, objectives and actions for each theme. The actions applicable to this CZMP are listed in Table I.1 below. The final two columns of the table list the CZMP strategy actions that address the listed 2030 Plan strategies.

Table I.1 – Coffs Harbour 2030 Plan

Coffs Harbour 2030 Plan			*Related CZMP Strategy*	
Outcome	*Objective*	*Strategy*	*Strategy Action No.*	*Description*
MA2 Many of us walk and cycle from place to place	MA2.2 We have constructed an interconnected network of cycle ways, footpaths and walking tracks that connect our urban communities, hinterland and coastal villages.	MA 2.2.1 Work in partnership to provide cycle ways and footpaths.	11.2 3.1	Improve the path network around the foreshores and tributaries of the lake Potential future path along southern foreshore
LE1 We understand and value our unique natural environment and its cultural connections	LE1.3 We have many opportunities for nature experiences and learning through improved access to natural areas.	LE1.3.1 Promote connection to the environment through learning in the environment.	11.1 11.2	Interpretive signage
		LE1.3.2 Create and extend walking trails and other opportunities for environmental experiences.	3.5 11.2	Construct foreshore platform Improve the path network around the foreshores and tributaries of the lake

Coffs Harbour 2030 Plan			*Related CZMP Strategy*	
Outcome	*Objective*	*Strategy*	*Strategy Action No.*	*Description*
LE2 We protect and restore our environment to conserve its unique biodiversity for future generations	LE2.1 Our forests, beaches, headlands, ocean, rivers, forested mountain backdrop, plants and animals are conserved for future generations.	LE2.1.1 Ensure land use management policies and practices conserve the region's unique environmental and biodiversity values.	Strategy 2 actions Strategy 3 actions Strategy 8 actions 11.3 12.1	Best Practice Management for soil management and pesticide, herbicide and fertiliser use in agricultural activities and forestry operations Urban stormwater management Management of foreshores and riparian vegetation Environmental weed strategy Modify uses along Lake Road to ensure environmental values predominate Ensure consistency with Flying-fox management strategy
		LE2.1.2 Enhance protection of our marine areas and manage for change.	As above with respect to Strategy 2 and 3 5.1	As above with respect to Strategy 2 and 3 actions Buffers to enable aquatic habitats to respond to sea level rise
		LE2.1.3 Maintain and conserve biodiversity through protected reserve systems and other land conservation mechanisms.	5.1 12.1	Buffers to enable aquatic habitats to respond to sea level rise Ensure consistency with Flying-fox management strategy
		LE2.1.5 Implement climate change planning, adaptation and mitigation strategies.	1.3 5.1	Address increased flooding risks that will impact on artificial entrance openings Buffers to enable aquatic habitats to respond to sea level rise
	LE2.2 We have active programs to restore and improve our environment.	LE2.2.2 Manage our catchments effectively and adaptably.	Strategy 2 actions	Best Practice Management for soil management and pesticide, herbicide and fertiliser use in agricultural activities and forestry operations Urban stormwater management

Coffs Harbour 2030 Plan			*Related CZMP Strategy*	
Outcome	*Objective*	*Strategy*	*Strategy Action No.*	*Description*
		LE2.2.3 Build ecosystem resilience through a system of local and regional habitat corridors.	Strategy 3 actions 5.1	Management of foreshores and riparian vegetation Buffers to enable aquatic habitats to respond to sea level rise
LE3 We manage our resources and development sustainably.	LE3.1 We are responsible in the use and management of our natural resources and work to reduce our ecological footprint.	LE3.1.2 Use best practice to prevent pollution impacts on our environment.	Strategy 2 actions	Best Practice Management for soil management and pesticide, herbicide and fertiliser use in agricultural activities and forestry operations Urban stormwater management

Coffs Harbour Coastal Zone Management Plan Management Plan

Council is preparing a separate Coastal Zone Management Plan that addresses coastal risks along the Coffs Harbour coastline. This coastline plan will define the level of risk from coastal hazards and provide a co-ordinated approach to management of coastal hazards.

Initial review of draft actions proposed in the coastline plan does not indicate any inconsistencies with the Woolgoolga Lake estuary strategy actions. However, prior to implementation of the Woolgoolga Lake estuary strategy actions Council will need to review to ensure consistency with the Coastal Zone Management Plan for the Coffs Harbour coastline.

Coffs Harbour Regional Park Management Plan

Council is also preparing a Regional Park Management Plan. Prior to implementation of the Woolgoolga Lake estuary strategy actions Council will need to review to ensure consistency with the Regional Park Management Plan.

Native Title Act 1993 (Commonwealth) and *Aboriginal Land Rights Act 1983* (NSW) Considerations / Obligations

Where actions proposed on Crown Land consideration of Aboriginal Land Claims lodged under NSW *Aboriginal Land Rights Act 1983* will need to be undertaken. Any works will need to be compliant with the Commonwealth *Native Title Act 1993.*

1

Strategy 1 - Entrance Management

The entrance to the Woolgoolga Lake estuary naturally alternates between being open or closed to the ocean. These types of estuaries are known as an ICOLL's - Intermittently Closed and Open Lakes and Lagoons.

Many ICOLL's are manually or artificially opened to the ocean by authorities to 'drain' the estuary for a range of reasons, often to reduce the impacts of flooding around the estuary foreshores. Artificial opening of the Woolgoolga Lake entrance has been initiated in the past by Council to prevent flooding of the adjoining sewerage system.

However, artificially opening ICOLL's can impact on the health of the estuary. Therefore it is desirable to minimise interference with the natural opening and closing regime of ICOLL's. Therefore a policy is required to outline if and when the entrance to Woolgoolga Lake estuary should be artificially opened.

1.1 Summary of Proposed Actions

- Prepare a Review of Environmental Factors for artificial opening of the entrance to Woolgoolga Lake estuary;
- Refine, adopt and implement the Woolgoolga Lake Entrance Management Policy outlined in this CZMP;
- Prepare a Floodplain Risk Management Study and Plan for Woolgoolga Lake and address flooding risks that have the potential to trigger artificial opening of the entrance; and
- Raise community awareness of the natural opening and closing regime of Woolgoolga Lake.

1.1.1 Related Strategies

- Strategy 2 Stormwater Management and Catchment Pollutants
- Strategy 4 Water Quality
- Strategy 6 Fish Stocks
- Strategy 7 Aquatic Habitats
- Strategy 9 Climate Change and Sea Level Rise Impacts on Water Quality
- Strategy 14 Dredging

1.1.2 Objectives Addressed

- Develop a formal Entrance Management Policy;
- Minimise interference with natural entrance opening / closing processes; and
- Minimise flooding of properties and infrastructure.

1.2 Details of Proposed Actions

Strategy Action 1.1 Prepare a Review of Environmental Factors for artificial opening of the entrance to Woolgoolga Lake estuary				
Background: Artificial opening of the entrance to Woolgoolga Lake estuary for the purpose of flood mitigation (a key objective of the entrance management policy) is permitted without consent under Clause 50 of the State Environmental Planning Policy (Infrastructure), 2007. However the requirements of Part 5 of the EP&A Act 1979 must be fulfilled and Council is required to prepare a Review of Environmental Factors (REF) for proposed artificial opening of the entrance to Woolgoolga Lake estuary. The REF needs to be consistent with the adopted CZMP and entrance management policy for Woolgoolga Lake estuary. *Specific Tasks* Prepare an REF for artificial opening of the entrance to Woolgoolga Lake estuary in consultation with relevant state government agencies. The REF will confirm the necessary approvals and licences required for artificial opening of the entrance. Note: Council has prepared the REF with endorsement from all relevant authorities. Commencement Date: 14/04/14, Expiry: 5 years from the commencement date.				
Responsible Agencies	*Timeframe*[1]	*Cost*	*Potential Funding Sources*	*Monitoring*
CHCC	Year 1	Staff time	CHCC operating budget	Implementation of this action is an appropriate benchmark.

Strategy Action 1.2 Refine, adopt and implement Woolgoolga Lake Entrance Management Policy				
Background: The development of an entrance management policy is a requirement for Coastal Zone Management Plans for ICOLL's under the OEH *Guidelines for Preparing Coastal Zone Management Plans* (DECCW, 2010). Therefore a policy has been drafted with the aim to: ▪ minimise interference with the natural opening and closing regime for the estuary; ▪ minimise flooding of the local sewerage system from elevated water levels in the estuary; and ▪ minimise flooding of properties from elevated water levels in the estuary. *Specific Tasks* ▪ Refine the Woolgoolga Lake Entrance Management Policy outlined in this CZMP (refer to Appendix A) based on the outcomes of the REF under Strategy Action 1.1. ▪ Adopt and implement the Woolgoolga Lake Entrance Management Policy.				
Responsible Agencies	*Timeframe*[1]	*Cost*	*Potential Funding Sources*	*Monitoring*
CHCC	Year 1	▪ Staff time for adoption of policy. ▪ Internal costs associated with backhoe, personnel etc for each artificial opening event.	CHCC operating budget	Implementation of this action is an appropriate benchmark.

Strategy Action 1.3

Prepare a Floodplain Risk Management Study and Plan for Woolgoolga Lake and address flooding risks that have the potential to trigger artificial opening of the entrance

Background:

The current need for artificial opening of the entrance is largely dictated by the need to prevent flooding of low-lying properties such as Sunset Caravan Park and properties in Pacific Street, Wharf Street, Boundary Street and Haines Close. This necessitates opening the lake entrance when lake water levels reach 1.6 m AHD which is at the higher end of the range of water levels at which the lake opens naturally. Therefore the policy to open at 1.6 m AHD will generally not impact on the natural opening and closing regime of the lake entrance. However, as sea level rise is realised, the lake water levels will rise by similar values as will the natural breakout levels of the lake. This will potentially result in the 1.6 m AHD trigger water level encroaching into the natural breakout levels thereby impacting on the natural opening and closing regime of the lake entrance. Therefore it may be necessary to raise the trigger level in the future by a similar amount as sea level rise.

It is noted that the local sewerage scheme experiences flooding at lake water levels of 1.8 m AHD.

The trigger water level for artificial opening can be raised in the future by implementing flood mitigation measures for at-risk properties and items of low-lying infrastructure. The intention of this objective is to minimise the need for interference to the natural opening / closing regime of the lake entrance.

Specific Tasks

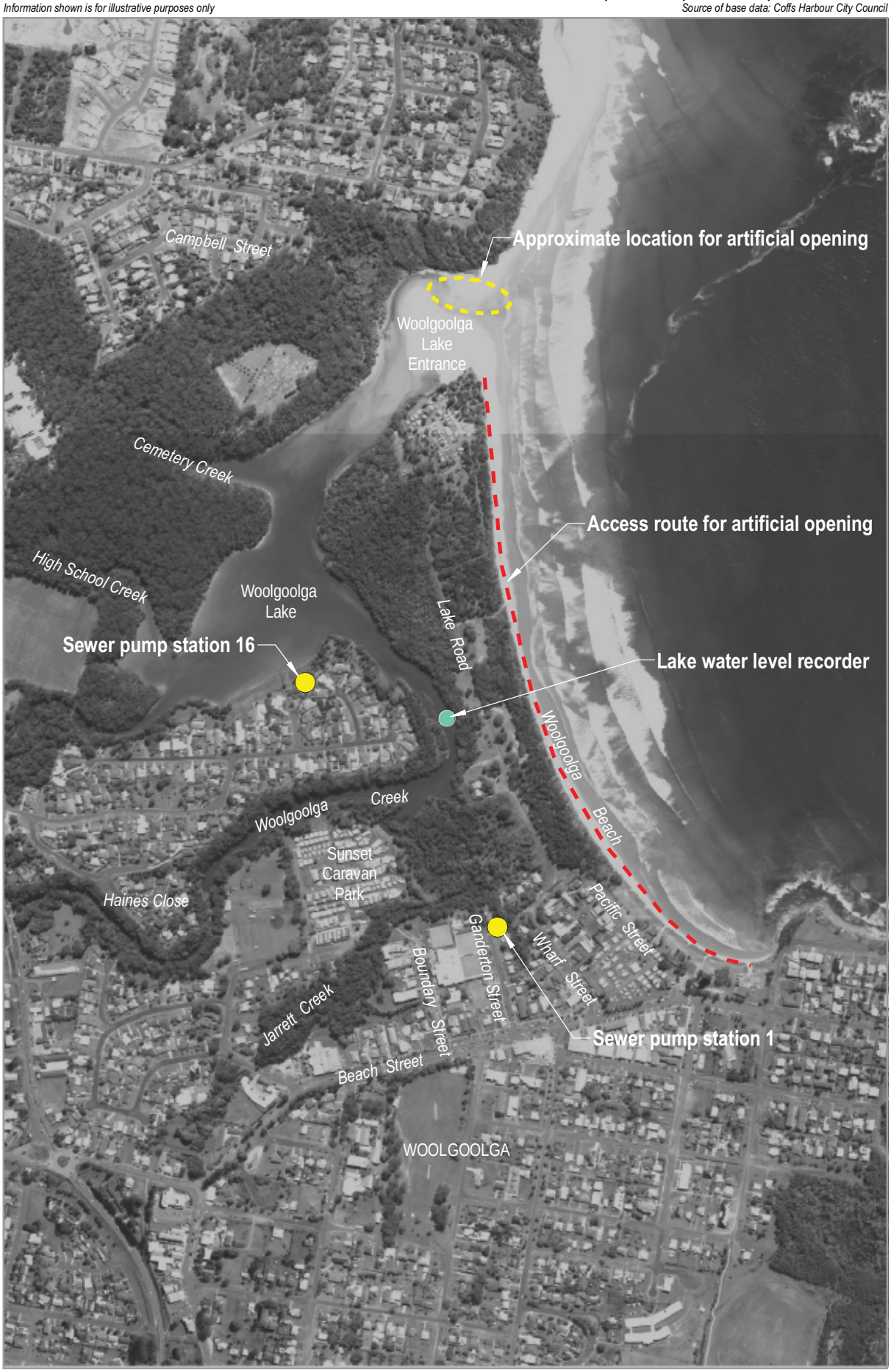
- Prepare a Floodplain Risk Management Study and Plan for Woolgoolga Lake which addresses the objective of minimising interference to the natural opening / closing regime of the lake entrance;
- In association with Council's *Climate Change Mitigation and Adaptation Action Plan* (BMT WBM, 2010):
  - undertake an audit and assessment to identify key services and assets vulnerable to sea level rise impacts around Woolgoolga Lake which have the potential to necessitate artificial opening of the lake entrance (e.g. sewer PS 1 and PS 16 and low-lying properties). Develop appropriate strategies for relocation, replacement or modification of these services and assets (this relates to Action A-3 and A-4 in Council's *Climate Change Mitigation and Adaptation Action Plan*);
  - relocate, replace or modify essential services and assets where appropriate to reduce potential for disruption and/or the need for artificial opening of the entrance (this relates to Action A-7 in Council's *Climate Change Mitigation and Adaptation Action Plan*).

Responsible Agencies	*Timeframe*[1]	*Cost*	*Potential Funding Sources*	*Monitoring*
CHCC	▪ Years 1 - 2 for Floodplain Risk Management Study and Plan Years 2 - 5 for audit and assessment ▪ Years 5 – 25 implement measures	▪ $100,000 for Floodplain Risk Management Study and Plan ▪ Audit and assessment: Council Staff time ▪ Implement measures: dependant on proposed works	▪ OEH Floodplain Management Grants ▪ CHCC – Coffs Harbour Water budget for audit & assessment and subsequent implementation of measures / augmentation works	Implementation of this action is an appropriate benchmark

Strategy Action 1.4 Raise community awareness of the natural opening and closing regime of Woolgoolga Lake				
Specific Tasks To assist with establishing broad based community understanding and support for the entrance management policy for Woolgoolga Lake it is recommended that information on the natural opening and closing regime of Woolgoolga Lake is included in the interpretive centre proposed under Strategy Action 3.2 (Strategy 3).				
Responsible Agencies	*Timeframe*[1]	*Cost*	*Potential Funding Sources*	*Monitoring*
CHCC	Years 1 - 5	Included in the costs in Strategy Action 3.2	▪ Caring for Our Country. ▪ CHCC Environmental Levy. ▪ OEH Coastal and Estuary Management Program.	Implementation of this action is an appropriate benchmark.

Note: 1. Timeframe: the year relates to the time following adoption of this CZMP eg. "Years 2 – 5" indicates the strategy action should be implemented within 2 to 5 years of adoption of the CZMP

Information shown is for illustrative purposes only



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North

Strategy 1 - Entrance Management

GeoLINK

Coastal Zone Management Plan - Woolgoolga Lake Estuary
1616812

Illustration 1.1

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Strategy 2 – Stormwater Management and Catchment Pollutants

Catchment inputs in the form of stormwater, diffuse runoff and point source inputs are typically the major sources of poor water quality in estuaries and other coastal water bodies. The effects of poor water quality inputs can be magnified in ICOLLs such as Woolgoolga Lake depending on the status of the entrance.

An overview of the various land uses in the Woolgoolga Lake catchment is shown overleaf in Illustration 2.2. Stormwater and catchment pollutant modelling undertaken during the Woolgoolga Lake Estuary Processes Study (EPS) suggests that in the absence of erosion and sediment controls forestry operations in the upper catchment has the potential to be the major source of sediment and nitrogen inputs to the estuary (refer to Illustration 2.1). It is noted that forestry operations currently employ best-practise controls which need to continue to avoid these potential pollutant impacts. The modelling also suggests that phosphorus input is dominated by agricultural land uses. Careful management of agricultural land uses within the catchment may lead to long term improvements in water quality.

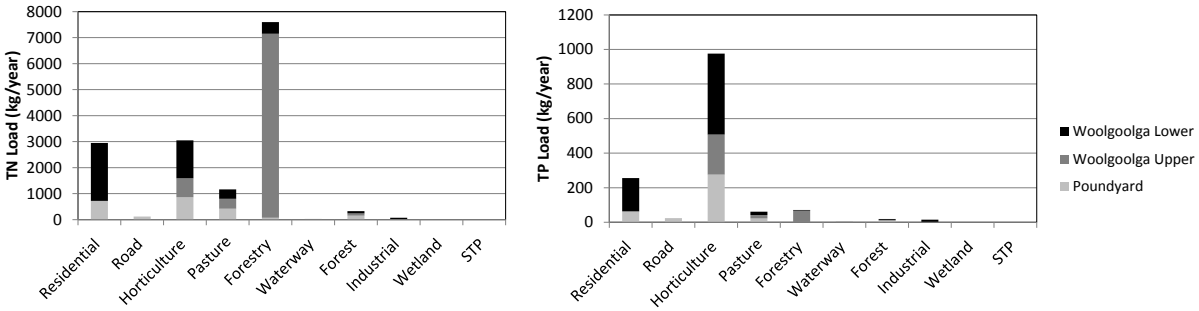


Illustration 2.1 Modelled Nitrogen and Phosphorus Loads for Woolgoolga Lake by Land Use – assuming no erosion and sediment controls

Community consultation indicates concern regarding pesticide and herbicide runoff from agricultural activities (mostly blueberry and banana farming and hothouse horticulture). Guidelines for best practice management of soil and water resources on blueberry (NSW DPI 2008a) and banana farms (NSW DPI 2008b) are available and have been used in the study area in the past as a basis for workshops and training activities for farmers.

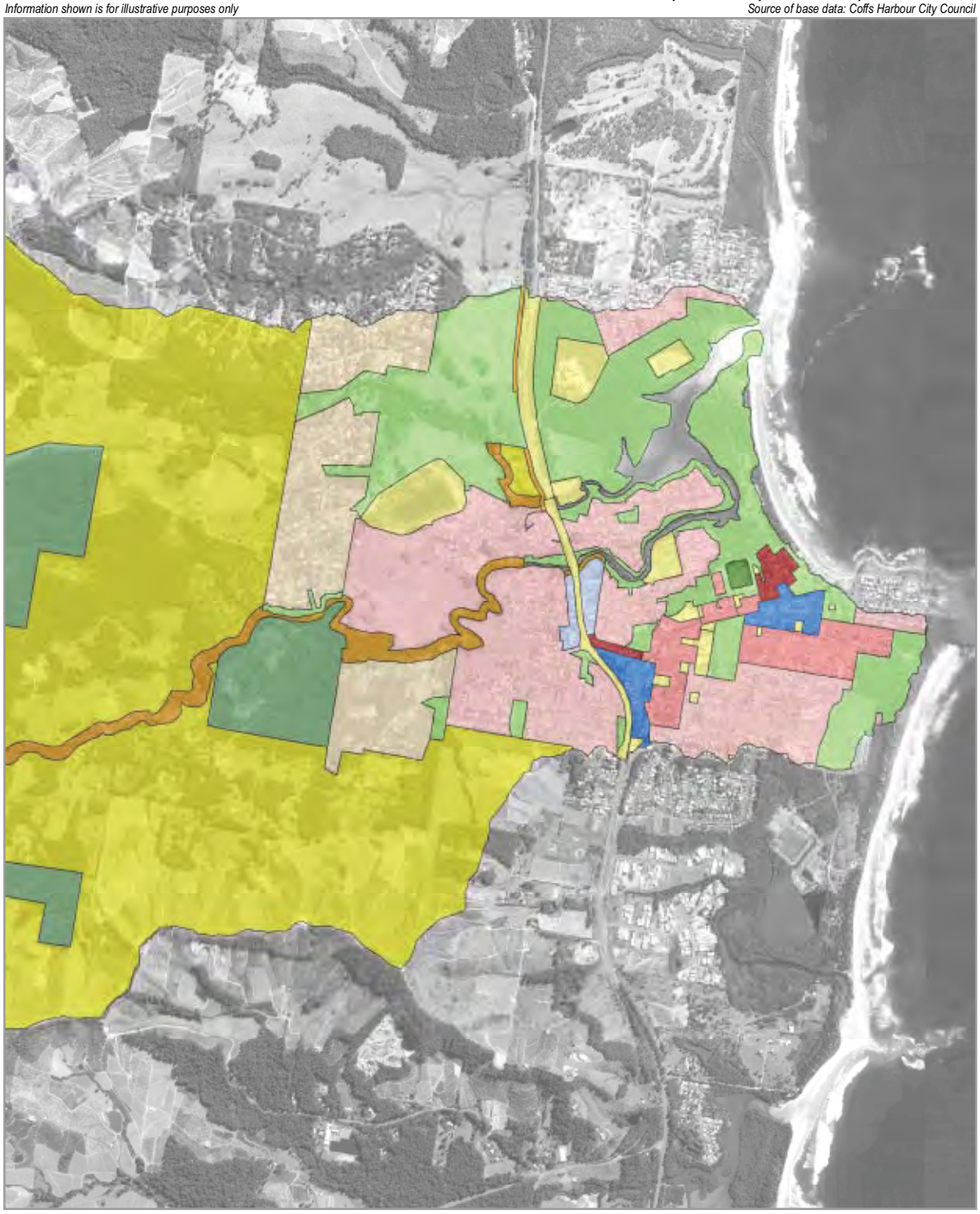
Of a more direct nature, investigation of a fish kill led to a prosecution of a Woolgoolga resident accused of dumping pesticides (dieldrin and aldrin) directly into Woolgoolga Creek. This specific issue is addressed in Strategy 15.

There have also been occasions when sewage infrastructure has flooded leading to direct inputs of untreated sewage into the waterway.

Drawn by: RE Checked by: MVE Reviewed by: TIM Date: June 2012

Information shown is for illustrative purposes only

Source of base data: Coffs Harbour City Council



LEGEND

- Agriculture
- Urban
- Business
- Industrial
- Community purpose
- Open space recreation
- Environmental protection

0 600

North

Landuse in the Woolgoolga Lake Catchment Area

GeoLINK

Coastal Zone Management Plan - Woolgoolga Lake Estuary

1616169

Illustration 2.2

2.1 Summary of Proposed Actions

- Educational strategies to address soil management and pesticide, herbicide and fertiliser use in agricultural activities.
- Encourage horticultural landowners to uptake incentives program for Best Practice Management.
- Best practice sediment, erosion and water quality management on forestry operations in the catchment.
- Stormwater management for new urban development.
- Stormwater management for existing urban development.
- Encourage horticultural landowners to establish vegetated riparian zones on farm watercourses via the incentives program for Best Practice Management.
- Control land modification activities on rural lands.

2.1.1 Related Strategies

- Strategy 1 Entrance Management.
- Strategy 4 Water Quality.
- Strategy 6 Fish Stocks.
- Strategy 7 Aquatic Habitats.
- Strategy 9 Climate Change and Sea Level Rise Impacts on Water Quality.
- Strategy 10 Water Quality Monitoring.
- Strategy 15 Residues from the 1989 Dieldrin/Aldrin Spill.

2.1.2 Objectives Addressed

- Improve the condition and extent of aquatic habitats.
- Make provisions for the ecological effects of climate change and sea level rise.
- Improved water quality.

2.2 Details of Proposed Actions

Strategy Action 2.1

Educational strategies to address soil management and pesticide, herbicide and fertiliser use in agricultural activities

Background:

Community consultation indicates concern that agricultural activities (mostly blueberry and banana farming and hothouse horticulture) may be negatively impacting water quality in Woolgoolga Lake via inputs of sediment, nutrients and agricultural chemicals.

A campaign of awareness targeting rural landholders is considered an appropriate way of addressing these concerns, improving agricultural practices and having a positive effect on water quality in Woolgoolga Lake. Workshops run by Coffs Harbour Regional Landcare in 2011 (Coffs Harbour Landcare 2011) targeting fertiliser use on blueberry farms are an example of recent initiatives that could be expanded upon. Workshops could be based upon existing guidelines (NSW DPI 2008a & b) and utilise the expertise of NSW DPI (Agriculture) staff from the Coffs Harbour region. In order to achieve the best outcomes for waterways the workshops should focus on best practice soil management and chemical use.

Specific Tasks

Develop and deliver a series of workshops aimed at blueberry and banana farmers in the catchment that describe:

- strategies to reduce erosion, such as contour alignment of rows, installation of trafficable cross banks at regular intervals, establishment of groundcovers, adequate riparian buffer widths on rural properties and the use of subsurface drainage;

- strategies to maintain and monitor soil moisture such that irrigation is always used in the most efficient manner;
- strategies to maximise the efficiency of fertiliser, herbicide and pesticide use and application, such that the overall use is minimised and concentrations in runoff can be minimised; and
- strategies to minimise the risk of accidental spillage of fertiliser, herbicides and pesticides such as appropriate storage, transport and disposal.

Responsible Agencies	*Timeframe*	*Cost*	*Potential Funding Sources*	*Monitoring*
Lead Agency: ▪ DPI - Agriculture NSW Related Agencies: ▪ CHCC; ▪ North Coast LLS; ▪ Landcare.	Year 1	$5,000 per workshop for preparation, materials and delivery.	▪ Caring for Our Country ▪ CHCC Environmental Levy ▪ North Coast LLS ▪ OEH - Environmental Education Grants	Delivery of workshops is an appropriate benchmark.

Strategy Action 2.2

Encourage horticultural landowners to uptake incentives program for Best Practice Management

Background:

Community consultation indicates concern that agricultural activities (mostly blueberry and banana farming) may be negatively impacting water quality in Woolgoolga Lake via inputs of sediment, nutrients and agricultural chemicals.

The North Coast Local Lands Services (LLS) provides support for landholders in specific horticultural industries to assist with the adoption of Best Management Practices for soil health in high priority landscapes including the Woolgoolga area. The targeted horticultural industries include blueberry, banana, macadamia, vegetable and coffee growers and growers of other perennial horticulture crops.

Eligible project activities include, but are not limited to improvements to soil condition / soil health through application of mulch, organic matter, compost, cover crops, minimum tillage, use of crop residues etc. or other biological farming techniques; soil conservation works such as runoff controls, diversion banks, waterways or other erosion control earthworks; and, establishment / improvement of ground cover to stabilise soil. It is also proposed that establishing a vegetated riparian zone along watercourses on horticultural land is encouraged via the incentives program – refer to Strategy Action 2.6.

Successful applications use the Best Management Practice techniques outlined in the Horticulture BMP Guidelines (eg. *Soil and Water Management Practices for Blueberry growers in Northern NSW*, 2008) and have in-kind contributions from the landholder with an ongoing commitment to maintaining the project.

Specific Tasks

Council, North Coast LLS and Regional Landcare to promote and coordinate uptake of the incentives program amongst horticultural landowners.

Responsible Agencies	*Timeframe*	*Cost*	*Potential Funding Sources*	*Monitoring*
Lead Agency: ▪ North Coast LLS Related Agencies: ▪ CHCC;	Years 1 – 5	▪ Staff budget time for coordinating uptake of the incentives program ▪ $20,000 pa for	▪ CHCC Environmental Levy North Coast LLS – Relevant Programs	CHCC to report annually on uptake numbers and implemented measures

▪ Landcare; ▪ DPI - Agriculture		incentives funding from CHCC Environmental Levy (Subject to funding and relevant processes) ▪ $20,000 pa for incentives funding from North Coast LLS (Subject to approval and available funding)		

Strategy Action 2.3

Best practice sediment, erosion and water quality management on forestry operations in the catchment

Background:

It is important that forestry operations in the upper catchment be undertaken in accordance with best practice management measures outlined in the licences and codes under which native forest and plantation harvesting is regulated. A failure to implement best practice forestry management could impact upon water quality in Woolgoolga Creek and its tributaries through increased sediment loads.

Specific Tasks

Ensure that best practice methods with respect to soil erosion and water quality are applied during forestry operations within the Woolgoolga Lake catchment.

Responsible Agencies	*Timeframe*	*Cost*	*Potential Funding Sources*	*Monitoring*
▪ DoI – Lands and Forestry, Forestry Corporation NSW (FCNSW); ▪ NSW Environment Protection Authority – Crown Forestry Policy & Regulation Section	Life of the Plan	DoI Lands and Forestry, FCNSW and EPA operating budget.	n/a	Compliance with DoI – Lands and Forestry, EPA and FCNSW auditing procedures.

Strategy Action 2.4

Stormwater management for new urban development

Background:

Future urban growth areas are proposed in the estuary catchment as shown in Plate 2.1. New development areas have the potential to reduce the quality of catchment runoff during and after the construction phase. It is important that controls placed on new developments are sufficient and enforced to ensure no negative net impact upon water quality.

Council currently has a contemporary policy and associated guidelines addressing stormwater management for new development (Coffs Harbour City Council Water Sensitive Urban Design (WSUD) Policy, 2009). These guidelines are consistent with current best-practice management measures in the industry. Therefore, this estuary management plan recommends continued implementation of Council's policy and guidelines for stormwater management and ongoing updating of the policy and guidelines in line with developments in the stormwater management industry. No additional strategies are considered necessary in respect to controlling stormwater management for new development.

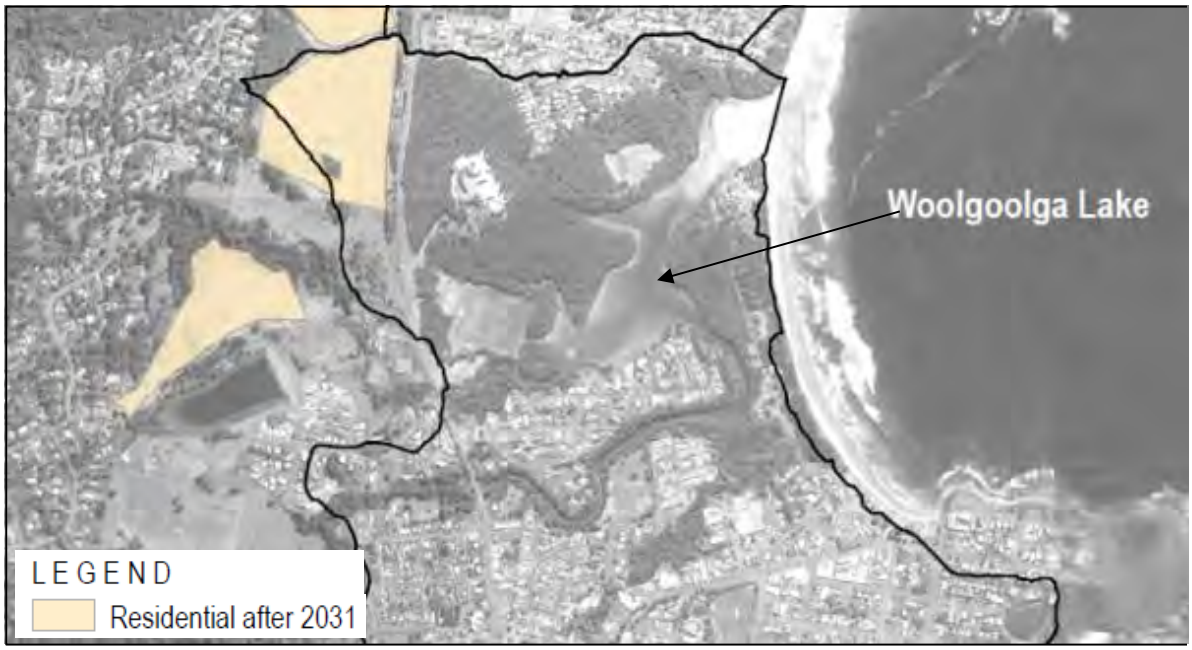


Plate 2.1 Future Growth Areas

Specific Tasks

- Ongoing updating of Council's Water Sensitive Urban Design (WSUD) Policy (2009) and associated guidelines in line with developments in the stormwater management industry.

Responsible Agencies	*Timeframe*	*Cost*	*Potential Funding Sources*	*Monitoring*
CHCC	Review policy and guidelines every 5 years	Part of Council's operational budget	n/a	Review policy and guidelines every 5 years

Strategy Action 2.5

Stormwater management for existing urban development

Background:

Urban development comprises over half of the immediate estuary catchment area of Woolgoolga Lake. It is important that stormwater management improvements (treatment and detention) are pursued in existing urban areas where existing arrangements are deficient. This may include retrofitting of existing drainage systems to improve treatment and detention as opportunities arise in association with redevelopment.

Specific Tasks

- Develop a stormwater management plan for the existing urban area of Woolgoolga Lake catchment with a focus on auditing key stormwater outlets and associated drainage catchments to identify sub-standard treatment or sub-standard detention of flows and opportunities for retrofitting of the existing system. It is recommended this task is undertaken in association with Action A-3 in Council's Climate Change Mitigation and Adaptation Action Plan (BMT WBM, *et al*, 2010) which aims to identify vulnerable essential services (e.g. stormwater) to determine assets at risk from sea level rise (refer also to Strategy Action 1.2);
- Based on the above audit, retrofit high-priority stormwater drainage systems with treatment and/or detention systems. It is recommended this task is undertaken in association with Action A-7 in Council's Climate Change Mitigation and Adaptation Action Plan (BMT WBM, *et al*, 2010) which aims to relocate or replace vulnerable essential services (e.g. stormwater) to reduce potential for interference from sea level rise (refer also to Strategy Action 1.2).

Responsible Agencies	*Timeframe*	*Cost*	*Potential Funding Sources*	*Monitoring*
CHCC	Initial audit: Years 1 – 5 Retrofit works: long term	▪ Stormwater management plan: $50 - $80k ▪ Retrofit works: dependant on proposed works	CHCC Environmental Levy	Implementation of this action is an appropriate benchmark

Strategy Action 2.6

Encourage horticultural landowners to establish vegetated riparian zones on farm watercourses via the incentives program for Best Practice Management

Background:

When looked at over the whole state of NSW, water quality data shows that the condition of an ICOLL degrades significantly once natural vegetation is lost from more than half of the catchment (Haines 2008). Clearly increased urban and agricultural development can result in negative impacts on waterways within the catchment. However, making provisions for adequate riparian buffer widths throughout a catchment can result in a number of benefits to receiving waters, such as reduced sediment and nutrient loads. It can also serve greater environmental purposes such as provision of wildlife corridors between alternative habitats.

Generally, the urbanised tributaries of Woolgoolga Lake are provided with vegetated riparian buffers of a minimum of 10 to 20 m width. The Processes Study indicates that riparian vegetation in the study area is predominately in moderate to good condition (GeoLINK *et al*., 2011a). However, some tributaries in the upper catchment in horticultural areas are lacking any vegetated riparian buffer as indicated in the following plate.

NSW DPI recommend a minimum buffer of 50 m between watercourses and greenhouse horticulture in its handbook for managing land use conflict issues on the NSW North Coast (Learmonth, *at. al.*, 2007). The handbook recommends minimum buffer distances between watercourses and grazing land or non-greenhouse horticulture to be based on 'best practice management'.

An indication of what may be considered 'best practice management' is provided in DPI Water recommendations for vegetated riparian zone widths – these widths should contain fully structured native vegetation (including groundcovers, shrubs and trees). These recommended widths are based on watercourse order as classified under the Strahler System of ordering watercourses and based on current 1:25 000 topographic maps (see table below). The width of the riparian zone should be measured from the top of the highest bank and on both sides of the watercourse. Based on the table below a minimum 10 metre wide vegetated riparian zone on either side of the watercourses is recommended in the upper tributaries.

Watercourse type	**VRZ width** (each side of watercourse)	**Total RC width**
1st order	10 metres	20 m + channel width
2nd order	20 metres	40 m + channel width
3rd order	30 metres	60 m + channel width
4th order and greater (includes estuaries, wetlands and any parts of rivers influenced by tidal waters)	40 metres	80 m + channel width

Source: NSW Office of Water, 2012

It is considered that the best approach to establishing a vegetated riparian zone in the upper tributaries on rural land is via the incentives program for Best Practice Management for horticultural landowners in Strategy Action 2.2. Therefore no additional actions or tasks are proposed.

Responsible Agencies	*Timeframe*	*Cost*	*Potential Funding Sources*	*Monitoring*
Lead Agency: ▪ North Coast LLS. Related Agencies: ▪ CHCC; ▪ Landcare; ▪ DPI – Agriculture	Years 1 – 5	Part of cost listed in Strategy Action 2.2.	Same funding as listed in Strategy Action 2.2.	Part of reporting as described for Strategy Action 2.2.

Strategy Action 2.7

Control land modification activities on rural lands

Background:

Land disturbance associated with the construction, installation or maintenance of buildings, roads, or other infrastructure creates the potential for increased levels of soil erosion and consequent sediment pollution of waterways.

There has been significant development of the greenhouse horticulture industry in the upper catchment of Woolgoolga Lake. Development of this industry can involve significant earthworks associated with the construction of building pads for greenhouse structures. These earthworks create the potential for significant sediment pollution of waterways without proper erosion and sediment control measures.

Past development of the greenhouse horticulture industry has generally proceeded without the requirement for development consent. There have been reported incidences where significant erosion and sediment control issues have occurred in association with construction of greenhouse structures. These incidences have been addressed under the Protection of the Environment Operations Act 1997. It is considered that a more proactive approach by Council to ensuring implementation of proper erosion and sediment control measures will provide a better outcome. This can be achieved through the development consent approach utilising relevant provisions from the proposed Standard Instrument Local Environment Plan (SiLEP) such as Clause 7.7 Earthworks of the draft SiLEP (2012).

Specific Tasks

- Educate rural land holders about the above provisions / requirement for development consent in timing with the adoption of the proposed SiLEP.
- With respect to enforcing the provisions of the proposed SiLEP relevant to the above issues, Council is to undertake the following tasks when issues are brought to Council's attention:
  - investigate the requirement for consent for development captured by the relevant SiLEP provisions;
  - investigate compliance with development conditions in regard to erosion and sediment control measures;
  - investigate compliance where development has occurred without consent (and not been exempt development under the SiLEP or SEPP (Exempt and Complying Development Codes) 2008; and
  - utilise the provisions of the Protection of the Environment Operations Act 1997 to enforce erosion and sedimentation control where poorly managed earthworks pose a risk to, or have impacted, the environment.

Responsible Agencies	*Timeframe*	*Cost*	*Potential Funding Sources*	*Monitoring*
CHCC	Year 1	Unknown additional staffing resources and additional costs to Council's operational budget	n/a	Review development application / consent numbers and comparison with hothouse development based on aerial imagery

Information shown is for illustrative purposes only

Drawn by: RE Checked by: MVE Reviewed by: TIM Date: June 2012
Source of base data: Coffs Harbour City Council

LEGEND

- 1A Rural Agriculture
- 1B Rural Living
- 1F Rural State Forest
- 2A Residential Low Density
- 2B Residential Low Density
- 2C Residential Medium-High Density
- 2E Residential Tourist
- 3C Business Town Centre
- 3D Business Tourist Service Centre
- 3E Business Town Centre Support
- 5A Special Uses
- 6A Open Space and Public Recreation
- 6C Open Space Private Recreation
- 7A Environmental Protection Habitat and Catchment
- 7B Environmental Protection Scenic Buffer

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North

Strategy 2 - Stormwater Management and Catchment Pollutants

GeoLINK

Coastal Zone Management Plan - Woolgoolga Lake Estuary
1616813

Illustration 2.3

3

Strategy 3 - Foreshores and Riparian Areas

The riparian vegetation of the estuary (vegetation bordering the waterway) is predominantly in moderate to very good condition (GeoLINK *et al*, 2011). Only a small area of the riparian zone is in very poor condition, occurring on the southern foreshore of Woolgoolga Lake, immediately adjacent to the residential area of Sunset Lakes Estate.

The riparian vegetation along the foreshores of Woolgoolga Lake provides a significant contribution to maintaining estuary health, ecology, bank stability and the scenic values of Woolgoolga Lake. The objectives of this strategy are to enhance, protect and restore natural values to riparian and foreshore areas while maintaining and enhancing existing passive water and land based recreational experiences and opportunities and the scenic values of the lake.

This strategy also addresses bank erosion impacts to foreshore values of Woolgoolga Lake. Bank erosion is not a significant issue in the Woolgoolga Lake estuary (GeoLINK *et al*., 2011) due to the relatively low energy environment of the estuary, the cohesive nature of the bank materials, and the mostly well-vegetated estuary banks. Nevertheless, active management is required in some locations where minor bank erosion intersects with areas of importance from a recreational, estuarine health, or estuarine ecology perspective.

3.1 Summary of Proposed Actions

- Establish a defined edge between mown land and riparian vegetation along the southern foreshore of Woolgoolga Lake adjacent to Sunset Lakes Estate.
- Improve the extent of riparian vegetation along the southern foreshore of Woolgoolga Lake adjacent to Sunset Lakes Estate.
- Modify the existing landscape plan for the Woolgoolga Lakeside Reserve Picnic Area.
- Establish a defined edge between mown land and riparian vegetation along the foreshore of Woolgoolga Lakeside Reserve Picnic Area and Woolgoolga Lakeside Caravan Park and revegetate riparian areas.
- Construct a foreshore platform to enhance water edge recreational use and address bank erosion at the central and most popular section of the Lakeside Reserve Picnic Area.
- Maintain and enhance other water edge access points at Lakeside Reserve Picnic Area.

3.1.1 Related Strategies

- Strategy 11 Recreational facilities and opportunities.
- Strategy 13 Visual amenity.

3.1.2 Objectives Addressed

- Implement bank stabilisation and rehabilitation works in areas with important estuary values.
- Restore terrestrial habitats of high ecological or conservation value.
- Maintain and enhance existing passive water and land based recreational experiences and opportunities in a manner that complements and sustains the natural values of the estuary.
- Enhance, protect and restore natural values to foreshore areas.
- Preserve and enhance the natural appearance of the lake particularly along the foreshores.
- Optimise the attractive outlook across the lake and creeks from path routes, recreation areas and other destinations for public enjoyment.

3.2 Details of Proposed Actions

Strategy Action 3.1

Establish a defined edge between mown land and riparian vegetation along the southern foreshore of Woolgoolga Lake adjacent to Sunset Lakes Estate.

Background:

While the majority of the foreshore environment around Woolgoolga Creek and Lake estuary is considered to be in moderate to very good condition (GeoLINK *et al*, 2011), there is a contrasting lack of vegetation around the lake's southern edge adjacent to the residential community of Sunset Lakes Estate. This area includes Crown Reserve No. 752853 for Future Public Requirements – managed by NSW Department of Industry – Crown Lands & Water.

A primary objective of estuary management is to establish a more diverse structure of riparian vegetation along the estuary foreshores and banks to maintain estuary health, biodiversity, bank stability and visual amenity. The re-establishment of native riparian vegetation including saltmarsh habitats across this site is therefore considered a high priority toward meeting this objective.

Plate 3.1 Southern Foreshore of Woolgoolga Lake

Specific Tasks

- Given the complex nature of land ownership in the area, further investigation regarding infrastructure, land ownership and management arrangements / land status is required.
- Where works are proposed on Crown Lands, not under Council management, appropriate authorisation from DoI – Crown Lands & Water will be required prior to the works commencing.
- Seek any required relevant approvals / licenses.
- Liaise with local residents and landholders to seek support for the implementation of the general strategy and the following tasks.
- Develop a landscape plan with the input of local landholders/residents that sets out the scope of implementation tasks as set out in this strategy action and Strategy Action No. 3.2.
- Reduce the extent of mowing within the public reserve and install a defined edge (e.g. bollards or a simple 'pegged' boundary) between mown land and riparian vegetation along the foreshore to reduce unnecessary impacts and to protect existing and newly planted or regenerating foreshore vegetation (refer also to Plate 3.1 above). If a future path is constructed along the foreshore, the pathway could become the defined edge. Consideration should be given to water edge access at key locations to compensate for any restrictions imposed by the revegetation works. Provide low key site support and infrastructure (e.g. paths, boardwalks, steps, viewing platforms) if necessary to minimise site impacts and to enhance user experience.
- Actively re-establish riparian vegetation along the foreshore with due regard to the amenity of adjoining residents.
- Monitor the foreshore area for environmental weed regrowth and control as necessary to facilitate more rapid regeneration of native riparian plants.

Responsible Agencies	*Timeframe*	*Cost*	*Potential Funding Sources*	*Monitoring*
Lead Agency: ▪ CHCC Related Agencies: ▪ DoI – Crown Lands & Water	Years 1 - 2	▪ Establishment of defined edge and initial re-establishment of riparian vegetation: $5,000 (not including infrastructure assoc. with water edge access at key locations) ▪ Management of work and public consultation: CHCC staff time; ▪ Landscape Plan: CHCC staff time	▪ Caring for Our Country ▪ CHCC Environmental Levy	▪ A benchmark for achievement of this action is the establishment of a defined edge. ▪ Routinely check mowing practices and planting establishment
Strategy Action 3.2 Improve the extent of riparian vegetation along the southern foreshore of Woolgoolga Lake adjacent to Sunset Lakes Estate.				
Specific Tasks ▪ Given the complex nature of land ownership in the area, further investigation regarding infrastructure, land ownership and management arrangements / land status is required. ▪ Where works are proposed on Crown Lands, not under Council management, appropriate authorisation from DoI – Crown Lands & Water will be required prior to the works commencing. ▪ Seek any required relevant approvals / licenses. ▪ Actively re-establish vegetation along sections of the foreshore reserve with due regard to the amenity of adjoining residents. Extend riparian vegetation where appropriate along footpath connections and install new or replace existing street trees with locally indigenous street trees along road reserves throughout the residential community. ▪ Encourage residents to incorporate locally indigenous vegetation in private gardens and to recognise and avoid installing invasive or inappropriate plants.				
Responsible Agencies	*Timeframe*	*Cost*	*Potential Funding Sources*	*Monitoring*
Lead Agency: ▪ CHCC Related Agencies: ▪ DoI – Crown Lands & Water	Years 3 – 5	▪ Planting works: $5,000 ▪ Management of public consultation: CHCC staff time;	▪ CHCC Environmental Levy	The benchmark for achievement of this action is the installation of locally indigenous street trees along road reserves throughout Sunset Lakes Estate.

Strategy Action 3.3

Modify the existing landscape plan for the Woolgoolga Lakeside Reserve Picnic Area

Background:

The popularity of the Woolgoolga Lakeside Reserve has led to disturbance to sections of the foreshore and the need to amend the existing landscape plan for the picnic area and extend it to include the wider foreshore area including the Woolgoolga Lakeside Reserve Picnic Area and Woolgoolga Lakeside Caravan Park.

Specific Tasks

- Modify the existing landscape plan for the Reserve to incorporate and integrate the recommendations set out in the following Strategy Actions (3.4 to 3.6) as a basis for future implementation of capital works and improved maintenance practices.

Responsible Agencies	*Timeframe*	*Cost*	*Potential Funding Sources*	*Monitoring*
CHCC as Reserve Trust Manager	Year 1	Landscape Plan: no cost - CHCC and CCSPT staff time.	Not applicable	The benchmark for achievement of this action is the completion and adoption of a revised Landscape Plan

Strategy Action 3.4

Establish a defined edge between mown land and riparian vegetation along the foreshore of Woolgoolga Lakeside Reserve Picnic Area and Woolgoolga Lakeside Caravan Park and revegetate riparian areas

Background:

This strategy relates to Crown Reserve No. 63076 for Public Recreation, Resting Place and communication facilities –under the care, control and management of the Coffs Coast State Park Trust (CCSPT) with CHCC as the appointed Trust Manager, handed over from the Woolgoolga Beach Reserve Trust (now redundant).

A Plan of Management (PoM) was adopted on 29 November 2013 which covers the northern, Lakeside section of Woolgoolga Beach Reserve and details the land status of the area.

Grass mowing close to the foreshore both within the picnic area and along the pedestrian link to the lake entrance / beach has caused unnecessary environmental damage. Excessive mowing and the gradual spread of exotic grass into the foreshore environment create a significant and increasing threat to the sustainability of remnant vegetation.

Efforts to restore and regenerate the riparian vegetation in this area while maintaining recreational amenity would greatly benefit the estuarine / riparian habitat of the Reserve and fulfil a key objective of this CZMP.

Specific Tasks

- Seek any required relevant approvals / licenses.
- Install a defined border around all mown grass areas particularly along the lake foreshores to establish a permanent and visible demarcation line for ease of grass maintenance and to prevent unnecessary incursions into surrounding natural vegetation. Ensure that new walking tracks where proposed are carefully aligned adjacent to the riparian vegetation to reinforce boundary definition.
- Identify sections of foreshore where water edge access should be discouraged and natural values predominate. Set protection zones back from the lakeside embankment to create wider, more sustainable vegetation areas and supplement with additional riparian planting as required.

- Liaise with park management to generate a greater understanding of the site's natural values and to establish maintenance practices that will complement and help sustain this environment.
- Install new or replacement locally indigenous trees throughout the Reserve as necessary to ensure that the visual character and dominance of existing trees is maintained.

Responsible Agencies	*Timeframe*	*Cost*	*Potential Funding Sources*	*Monitoring*
CCSPT; CHCC as appointed Trust Manager	Years 1 - 2	▪ Establishment of defined edge and initial re-establishment of riparian vegetation: $5,000	▪ CHCC Environmental Levy	▪ A benchmark for achievement of this action is the establishment of a defined edge. ▪ Routinely check mowing practices and planting establishment as part of park maintenance

Strategy Action 3.5

Construct a foreshore platform to enhance water edge recreational use and address bank erosion at the central and most popular section of the Lakeside Reserve Picnic Area

Background:

This strategy potentially relates to Crown Reserve No. 63076 (for Public Recreation, Resting Place and communication facilities) and Reserve No. 70416 (for Public Recreation and extraction of sand) – both under the care, control and management of the CCSPT with CHCC as the appointed Trust Manager, handed over from the Woolgoolga Beach Reserve Trust (now redundant).

A Plan of Management (PoM) was adopted on 29 November 2013 which covers the northern, Lakeside section of Woolgoolga Beach Reserve and details the land status of the area.

The popularity of the Woolgoolga Lakeside Reserve particularly for water based recreation has led to unsustainable disturbance to sections of the foreshore highlighted by vegetation loss and erosion of the unprotected embankment.

Concentrated pedestrian access onto a small sandy cove at the Lakeside Reserve has detrimentally affected foreshore vegetation and exacerbated bank erosion.

Specific Tasks

- Seek any required relevant approvals / licenses
- Formalise access to the central and most popular section of the lake foreshore with steps, ramps and platforms to maintain and enhance water edge recreational use while preventing further damage to the embankment. The structure will include bank erosion protection works beneath the platform to prevent further erosion from wave actions. To facilitate the implementation of this action, a design for a new formalised water edge structure has been prepared - refer Appendix B.

Responsible Agencies	*Timeframe*	*Cost*	*Potential Funding Sources*	*Monitoring*
CHCC as appointed Trust Manager	Years 1 - 5	▪ Foreshore structure[1]: $50,000 ▪ General site upgrades: new edging, paths, plants and signage: $20,000	▪ CHCC Environmental Levy ▪ Caring for Our Country	▪ A benchmark for achievement of this action is the establishment of the foreshore structure and picnic area upgrades. ▪ Routinely check mowing practices and planting establishment as part of park maintenance

Note: 1. Foreshore structure cost includes design and construction of jetty structure including ramp and seating and erosion protection measures to embankment beneath jetty – refer to drawing in Appendix B

Strategy Action 3.6

Maintain and enhance other water edge access points at Lakeside Reserve Picnic Area.

Background:

This strategy potentially relates to Crown Reserve No. 63076 (for Public Recreation, Resting Place and communication facilities) and Reserve No. 70416 (for Public Recreation and extraction of sand) – both managed under the care, control and management of the CCSPT with CHCC as the appointed Trust Manager, handed over from the Woolgoolga Beach Reserve Trust (now redundant).

A Plan of Management (PoM) was adopted on 29 November 2013 which covers the northern, Lakeside section of Woolgoolga Beach Reserve and details the land status of the area.

Aside from the central water access location addressed in Strategy Action 3.5, there are a number of low key water edge access points at Lakeside Reserve Picnic Area.

Specific Tasks

- Seek any required relevant approvals / licenses.
- Identify other attractive water edge access points and provide low key site support and infrastructure if necessary to reduce site vulnerability.
- Maintain the existing kayak and canoe soft launching location. Monitor potential foreshore impacts particularly bank erosion and vegetation loss caused by unsustainable use levels. Undertake corrective measures including site reconfiguration if necessary to address impacts.

Responsible Agencies	*Timeframe*	*Cost*	*Potential Funding Sources*	*Monitoring*
CHCC as appointed Trust Manager	Years 1 - 5	▪ $2,000 for any general site upgrades	▪ CHCC Environmental Levy	Routinely check embankment stability and access breaches along foreshore as part of park maintenance

Information shown is for illustrative purposes only

Drawn by: RE Checked by: MVE Reviewed by: TIM Date: August 2012
Source of base data: Coffs Harbour City Council

Strategy Action 3.3:
Modify the existing landscape plan for the Woolgoolga Lakeside Reserve Picnic Area.

Strategy Action 3.4:
Establish a defined edge between mown land and riparian vegetation along the foreshore of Woolgoolga Lakeside Reserve Picnic Area and Woolgoolga Lakeside Caravan Park and revegetate riparian areas.

Strategy Action 3.5:
Construct a foreshore platform to enhance water edge recreational use and address bank erosion at the central and most popular section of the Lakeside Reserve Picnic Area.

Strategy Action 3.6:
Maintain and enhance other water edge access points at Lakeside Reserve Picnic Area.

Strategy Action 3.1:
Establish a defined edge between mown land and riparian vegetation along the southern foreshore of Woolgoolga Lake adjacent to Sunset Lakes Estate and actively re-establish riparian vegetation along the foreshore with due regard to the amenity of adjoining residents

Strategy Action 3.2:
Install new / supplementary street trees using locally indigenous species within the residential communities fronting the lake to mitigate the existing dominance of built form across the skyline.

Strategy Action 3.1:
Rationalise water edge access along the southern foreshores to key locations and provide low key site support and infrastructure such as viewing platforms to optimise the attractive outlook across the lake at key vantage points.

LEGEND

Crown land reserves

0 150

NORTH

Strategy 3 - Foreshores and Riparian Areas

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4

Strategy 4 - Water Quality

It is common practice to compare water quality measurements with guideline values in order to determine the status of water quality in an aquatic system. For the protection of aquatic ecosystems in coastal waterways such as Woolgoolga Lake the most commonly applied guideline values are described by ANZECC (2000) and for the assessment of estuary condition DECCW (now OEH) released a set of guideline values based upon the salinity range in the waterway.

Comparison of existing water quality against guideline values revealed that turbidity, total nitrogen and chlorophyll-a measurements are all slightly elevated in Woolgoolga Lake, based upon a limited set of samples and the available guidelines (GeoLINK 2011a).

4.1 Summary of Proposed Actions

Elevated levels of turbidity, nitrogen and chlorophyll-a are most likely to be a result of inputs of these pollutants from urban and non-urban areas in the catchment. As there are no point source inputs of sediments and nutrients into Woolgoolga Lake the only tools available to reduce the loads of sediments and nutrients into the waterways are associated with reducing the concentrations of sediments and nutrients in diffuse runoff from the catchment in general and in stormwater from urban areas. This is addressed in Strategy 2 of this document. The only additional action proposed is:

- minimise the input of domestic animal faecal materials into the waterway.

4.1.1 Related Strategies

- Strategy 1 Entrance Management.
- Strategy 2 Stormwater Management and Catchment Pollutant.
- Strategy 6 Fish Stocks.
- Strategy 7 Aquatic Habitats.
- Strategy 9 Climate Change and Sea Level Rise Impacts on Water Quality.
- Strategy 10 Water Quality Monitoring.

4.1.2 Objectives Addressed

- Improve the Condition and Extent of Aquatic Habitats.
- Make Provisions for the Ecological Effects of Climate Change and Sea Level Rise.
- Improved Water Quality.

4.2 Details of Proposed Actions

Strategy Action 4.1 Minimise the input of domestic animal faecal materials into the waterway.				
Background: Animal faecal material washed into waterways can contribute significantly to nutrient loads (as well as faecal indicator organism concentrations). Whilst the contribution from native animals such as wading birds and mammals that inhabit the riparian zone cannot be controlled a reduction in nutrient contributions from domestic pets can be achieved by responsible pet ownership. *Specific Tasks* ▪ Provide waste collection bags at the heads of walking trails. ▪ Educate pet owners about the effects of pet faecal materials on waterways in ratepayer newsletters and council newspaper advertisements. ▪ Police council policies with respect to pet ownership.				
Responsible Agencies	*Timeframe*	*Cost*	*Potential Funding Sources*	*Monitoring*
CHCC	Years 2 – 3	▪ Staff time ▪ Installation of units $1,500 p/unit ▪ Maintenance of units $1000 per unit p/annum	Caring for Our Country	Release of educational materials and installation of waste collection bag units.

Strategy 5 - Climate Change Impacts on Estuary Ecology

Under current projections for climate change and associated sea level rise there are likely to be a number of impacts upon estuary ecology. These may include direct impacts upon mangroves and saltmarsh and direct impacts upon fish diversity and abundance.

The ecology of ICOLLs is dependent on a number of physical and chemical processes, including waterway hydrodynamics. The most significant change to hydrodynamics as a result of climate change will be an increase in sea level and a corresponding similar increase in average lake water levels. This will also have significant repercussions for estuarine ecology, most notably fringing wetlands and saltmarsh communities (Haines, 2006).

It is expected that mangroves communities will typically migrate landward in response to higher lake water levels. The distribution and species of mangroves may change due to higher water temperatures (Walsh, 2004a cited in Haines, 2006). Saltmarsh communities are considered to be particularly vulnerable to increases in average lake water levels, as they occupy relatively flat ground near the waters edge. Small changes in sea level will therefore result in extensive inundation (Walsh, 2004a). Further, landward migration of saltmarsh, mangroves, and other wetland communities in response to rising lake water levels may be restricted by existing development or barriers (e.g. embankments associated with residential lands raised above flood levels, natural elevated banks adjoining the lake) resulting in a loss of habitat (Pittock, 2003; Walsh, 2004b, Gilman, 2004 cited in Haines, 2006). This is the case in some, but not all, of the estuarine foreshores of Woolgoolga Lake. It would be prudent to ensure that, where possible, buffers remain protected from future development to allow for the upslope migration of mangroves and saltmarsh.

There may also be indirect impacts upon estuary ecology related to climate change impacts upon water quality. Strategies that will reduce the impacts of forecast climate change scenarios upon water quality are discussed under Strategy 9.

5.1 Summary of Proposed Actions

- Implement development control provisions to facilitate upslope migration of mangroves and saltmarsh in response to sea level rise.

5.1.1 Related Strategies

- Strategy 7 Aquatic Habitats.
- Strategy 9 Climate Change and Sea Level Rise Impacts on Water Quality.

5.1.2 Objectives Addressed

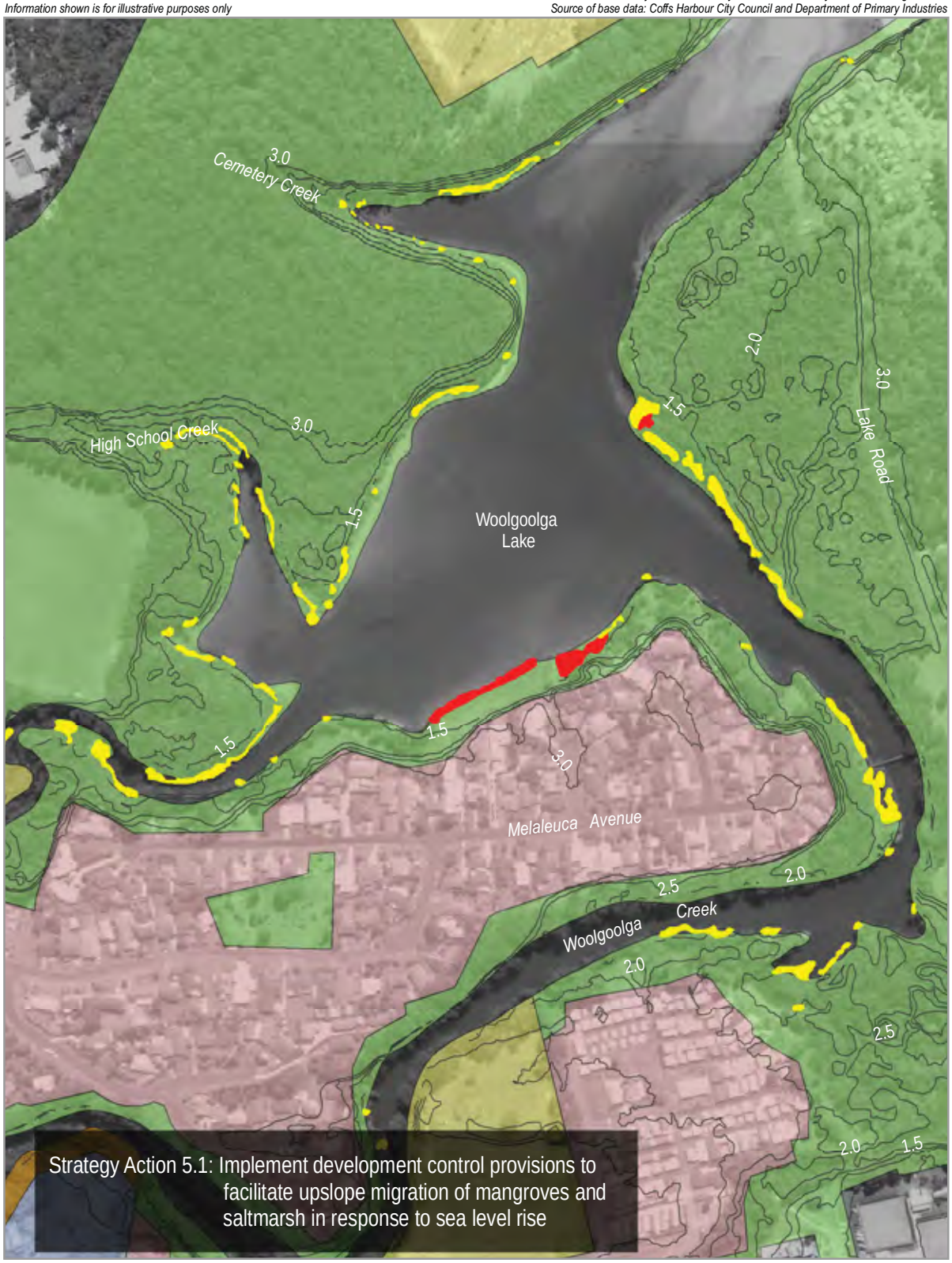
- Improve the Condition and Extent of Aquatic Habitats.
- Increase Fish Stocks.
- Make Provisions for the Ecological Effects of Climate Change and Sea Level Rise.
- Improved Water Quality.

5.2 Details of Proposed Actions

Strategy Action 5.1 Implement development control provisions to facilitate upslope migration of mangroves and saltmarsh in response to sea level rise				
Background: Currently, mangroves and saltmarsh in Woolgoolga Lake are mostly located below the 1.5 m.AHD contour line and all located below the 2 m AHD contour line. The response of mangroves and saltmarsh colonies to sea level rise forecasts is likely to be a mixture of sediment accretion (i.e. no migration) and upslope migration. The exact balance will be dependent upon a variety of geomorphic, biogeographic and development factors that will vary significantly by location. However, it can be safely assumed that the future total vertical migration of mangroves and saltmarsh is likely to be closely aligned with future total sea level rise (i.e. approx. 0.9 m by 2100) as the distribution of saltmarsh and mangroves is strongly defined by tidal heights. In areas where upslope migration is made possible by low sloping land, low development pressure and compatible current landuse careful planning for the future may result in improved outcomes. In addition to buffers allowing the upslope migration of mangroves and saltmarsh it is important to allow horizontal buffers for landward migration of riparian vegetation so that a suitable riparian strip is maintained under sea level rise scenarios. Current best practice suggests that a 40m riparian buffer is suitable for maintaining the environmental integrity of estuaries (see Strategy Action 2.6 and NSW Office of Water, 2011). The majority of the Woolgoolga Lake foreshore is currently zoned 6A – Open Space and Public Recreation. This is considered an adequate zoning for the protection of vertical and horizontal buffers for the upslope migration of saltmarsh and mangroves resulting from sea level rise over the near future. However, in the case that changes to the current zoning of foreshore land around Woolgoolga Lake be proposed or the Coffs Harbour LEP is reviewed, appropriate horizontal and vertical buffers must be protected to ensure the future integrity of mangrove and saltmarsh habitat in addition to a riparian buffer zone. A vertical buffer incorporating the 3 m AHD contour line and a horizontal buffer of 40 m landward from the 3 m AHD contour line will be adequate to preserve the ecological integrity of the system. *Specific Tasks* ▪ Map a buffer zone around Woolgoolga Lake incorporating all lands currently zoned 5A, 6A and 7A falling within 40 m landward of the 3 m AHD contour line. ▪ Develop Development Control Plan (DCP) provisions for the above buffer zone that controls or limits development within the buffer zone such that potential upslope migration of mangroves and saltmarsh is not impeded.				
Responsible Agencies	*Timeframe*	*Cost*	*Potential Funding Sources*	*Monitoring*
CHCC	Years 1 – 2	Staff time	CHCC operating budget	Preparation of a report which describes priority potential areas for future colonisation

Information shown is for illustrative purposes only

Drawn by: RE Checked by: MVE Reviewed by: TIM Date: August 2012
Source of base data: Coffs Harbour City Council and Department of Primary Industries



LEGEND

- Contours between 1.5 and 3.5 m AHD inclusive
- 2A Residential Low Density
- 3D Business Tourist Service Centre
- 5A Special Uses
- 6A Open Space and Public Recreation
- 7A Environmental Protection Habitat and Catchment
- Saltmarsh (Department of Primary Industries - 2011)
- Mangrove (Department of Primary Industries - 2011)

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North

Strategy 5 - Climate Change Impacts on Estuary Ecology

GeoLINK environmental management and design

Coastal Zone Management Plan - Woolgoolga Lake Estuary
1616816

Illustration 5.1

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6

Strategy 6 - Fish Stocks

Recreational fishing is a common use of the Woolgoolga Lake estuary. Diminished fish stock was raised as a potential issue during the community consultation phase of preparing this CZMP.

Fish sampling undertaken as part of this CZMP development and a review of previous studies concludes that fish and macroinvertebrate populations are scarce and lack diversity in Woolgoolga Lake. However, it is noted that ICOLL's generally exhibit lower fish species diversity when compared to permanently open estuaries (Pollard, 1994a; Roy *et al.*, 2001; Williams *et al.*, 2004; Dye and Barros, 2005 cited in Haines, 2008).

Improving fish stocks in Woolgoolga Lake is intricately linked with improving the extent and condition of aquatic habitat, maintaining a natural opening / closing regime for the lake entrance, improving the condition and continuity of riparian vegetation, and improving water quality.

6.1 Summary of Proposed Actions

No direct fish stock improvement actions are proposed such as artificially stocking the lake. Other strategies and actions proposed in this CZMP will adequately address the issue of fish stocks. These strategies include: improve the extent and condition of aquatic habitat (Strategy 7 actions); improve the condition and continuity of riparian vegetation (Strategy 3 and Strategy 8 actions) and improve water quality (Strategy 2 actions).

6.1.1 Related Strategies

- Strategy 1 Entrance Management.
- Strategy 2 Stormwater Management and Catchment Pollutants.
- Strategy 3 Foreshores and Riparian Areas.
- Strategy 4 Water Quality.
- Strategy 5 Climate Change Impacts on Estuary Ecology.
- Strategy 7 Aquatic Habitats.
- Strategy 9 Climate Change and Sea Level Rise Impacts on Water Quality.
- Strategy 15 Residues from the 1989 Dieldrin/Aldrin Spill.

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7

Strategy 7 – Aquatic Habitats

The Northern Rivers Catchment Management Authority (NRCMA) Catchment Action Plan (CAP) lists rehabilitation of aquatic habitats among its goals. A decline in the extent and condition of seagrass beds, mangroves, saltmarsh and sedge heath communities was identified by Council's Coastal Estuary Management Advisory Committee (CEMAC) as possible issues concerning Woolgoolga Lake.

Young mangroves adjoining residential land on Woolgoolga Lake

Detailed mapping analysis of aquatic habitats shows that seagrass has disappeared from Woolgoolga Lake in recent years and it is clear from site visits that some saltmarsh and mangrove habitats show signs of disturbance. The factors causing the decline in the area of seagrass are uncertain, though factors commonly associated with seagrass loss that may be present in Woolgoolga Lake include:

- high suspended sediment loads in catchment runoff;
- natural fluctuations in the area of seagrass common to ICOLLs; and
- natural fluctuations in the position of the marine tidal delta.

7.1 Summary of Proposed Actions

- Liaise with landholders around the foreshore of Woolgoolga Lake to address impact to aquatic habitats.

Elevated sediment delivery from the catchment has been identified as a potential contributor (in addition to natural variables) to fluctuations in seagrass cover in Woolgoolga Lake. Follow strategies to reduce the inputs of sediment from the catchment (see Strategy 2 actions) to maximise the opportunities for the recruitment of seagrass to the system.

7.1.1 Related Strategies

- Strategy 1 Entrance Management to Address Water Quality, Sedimentation and Flooding.
- Strategy 2 Stormwater Management and Pollutant Inputs from the Catchment.
- Strategy 3 Foreshores and Riparian Areas.
- Strategy 4 Elevated Turbidity, Total Nitrogen and Chlorophyll-a Values.
- Strategy 5 Impacts of Climate Change on Estuary Ecology.
- Strategy 6 Diminishing Fish Stocks.
- Strategy 9 Water Quality Impacts Associated with Climate Change and Sea Level Rise.

7.1.2 Objectives Addressed

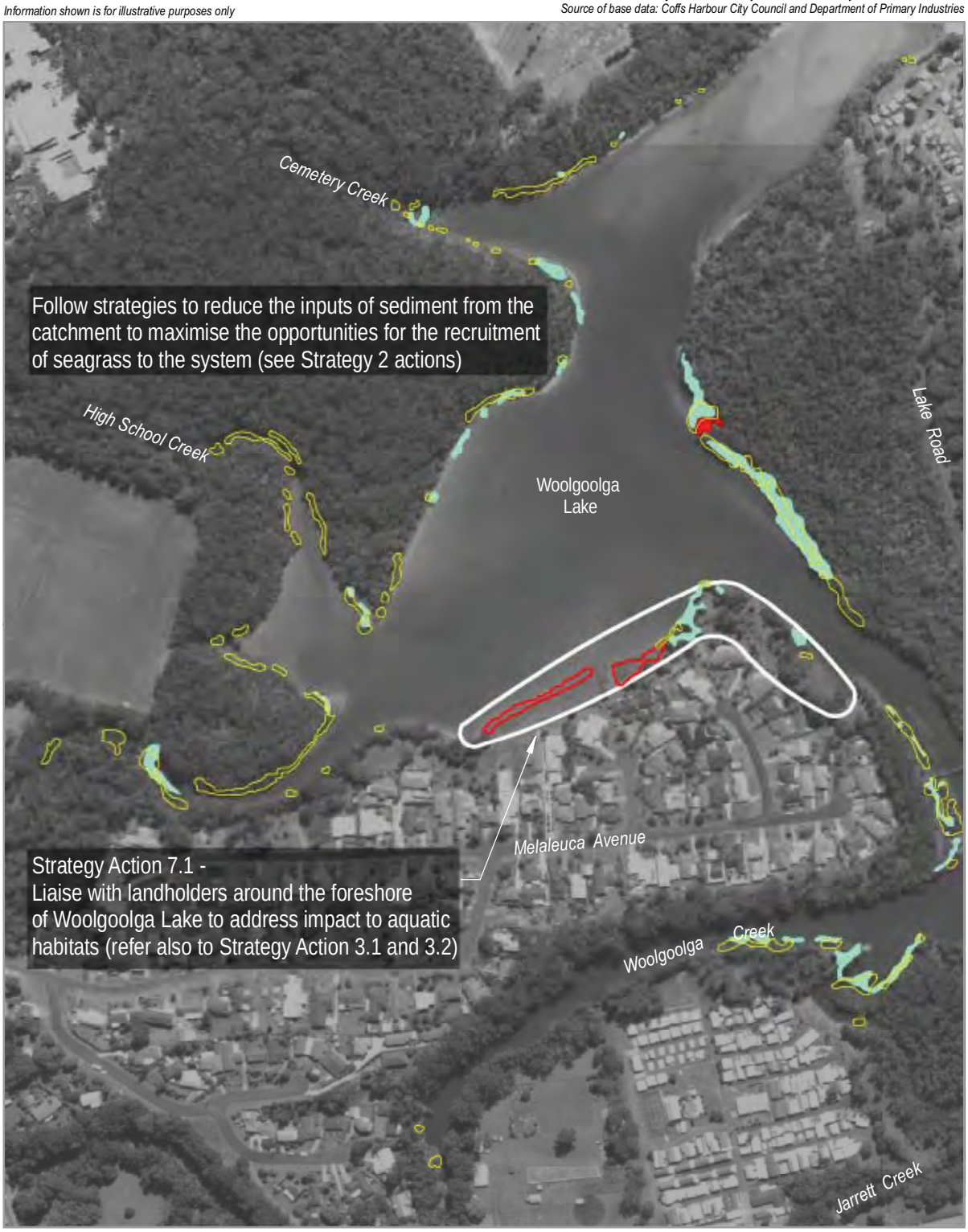
- Improve the Condition and Extent of Aquatic Habitats.
- Make Provisions for the Ecological Effects of Climate Change and Sea Level Rise.

7.2 Details of Proposed Actions

Strategy Action 7.1 Liaise with landholders around the foreshore of Woolgoolga Lake to address impact to aquatic habitats				
Background: There are some residential areas that back onto the Woolgoolga Lake foreshore, particularly in the south eastern corner of the lake and around the confluence with Woolgoolga Creek. Landholder actions that may disturb sensitive saltmarsh and mangrove colonies in these areas include mowing, watering, vegetation removal and pruning, creating pathways for access and drainage activities. *Specific Tasks* ▪ Develop a liaison strategy in consultation with NSW Primary Industries (Fisheries) and Solitary Islands Marine Park to address the issue of land maintenance impacts (e.g. mowing) on aquatic habitats at key locations around the estuary such as the southern foreshores of the lake. This liaison strategy would include an educational component and may form part of Strategy Action 3.1 and 3.2.				
Responsible Agencies	*Timeframe*	*Cost*	*Potential Funding Sources*	*Monitoring*
CHCC	Years 1 - 5	Staff time	▪ CHCC operating budget. ▪ MPA - SIMP operating budget	Routinely check mowing practices, embankment stability and access breaches along foreshore as part of park maintenance

Information shown is for illustrative purposes only

Drawn by: RE Checked by: MVE Reviewed by: TIM Date: June 2012
Source of base data: Coffs Harbour City Council and Department of Primary Industries



LEGEND

- Saltmarsh (Department of Primary Industries - 2011)
- Saltmarsh (Comprehensive Coastal Analysis - 2004)
- Mangrove (Department of Primary Industries - 2011)
- Mangrove (Comprehensive Coastal Analysis - 2004)

North

0 100

Strategy 7 - Aquatic Habitats

GeoLINK

Coastal Zone Management Plan - Woolgoolga Lake Estuary
1616818

Illustration 7.1

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8

Strategy 8 - Environmental Weeds

A variety of terrestrial habitats of high conservation value have been identified within riparian zones of Woolgoolga and Poundyard Creek. However, riparian weed mapping in the two creeks undertaken in January 2011 identified the presence of four environmental weed species listed as priority weeds in the *Northern Rivers Invasive Plants Action Strategy 2009-2013* (*NRIPAS*: Oakwood, 2009). Environmental weeds degrade the native riparian vegetation, reducing its ecological value and in some cases potentially impacting upon bank stability and other estuary values including recreational amenity and aesthetics.

The restoration of riparian vegetation is listed among the goals of the North Coast LLS Catchment Action Plan. Additionally, the Coffs Harbour Settlement Strategy lists the enhancement of riparian corridors as a key strategy for the Woolgoolga area to provide ecological links between coast and hinterland (Coffs Harbour City Council, 2011a).

This strategy is aimed at the protection and rehabilitation of native riparian vegetation communities with high ecological or conservation value where degradation through weed infestation has occurred. The strategy focuses on environmental weeds species identified in the NRIPAS as being Priority C or above.

8.1 Summary of Proposed Actions

- Develop a weed management strategy which prioritises areas of riparian foreshore to be treated and priority weeds to be targeted.
- Utilise specialist bush regeneration contractors to undertake primary weed control in priority areas.
- Foster a local *Bushcare* group to undertake the secondary control or follow-up maintenance of areas treated by contractors.

8.1.1 Related Strategies

- Strategy 3 Foreshores and Riparian Areas.
- Strategy 13 Visual Amenity.

8.1.2 Objectives Addressed

- Restore terrestrial habitats of high ecological or conservation value.
- Enhance, protect and restore natural values to foreshore areas.
- Preserve and enhance the natural appearance of the lake particularly along the foreshores.

8.2 Details of Proposed Actions

Strategy Action 8.1 Develop a weed management strategy which prioritises areas of riparian foreshore to be treated and priority weeds to be targeted.				
Background: Weed mapping undertaken in January 2011 identified the presence of environmental weeds in the upper reaches of Woolgoolga and Poundyard Creeks (GeoLINK *et al*., 2011a). The main species identified included groundsel bush, winter cassia, camphor laurel, and pink lantana. According to the *Northern Rivers Invasive Plants Action Strategy 2009-2013* (*NRIPAS*: Oakwood, 2009), groundsel bush is the highest priority (Priority B) invasive weed species identified during the field assessment. The Strategy also identifies lantana (Priority C) and camphor laurel (Priority D) as priority weeds in riparian landscapes, and winter cassia (Priority C) in coastal landscapes. Weed control is a long-term and costly management action and so it is recommended that areas with important estuary values be targeted as a priority. Illustration 8.1 identifies reaches where the riparian vegetation has been mapped as being in good to very good condition but where environmental weeds identified as either Priority B or C under the *NRIPAS* were also identified (i.e. in this catchment: groundsel bush, senna/winter cassia, or lantana). These reaches are considered to be the highest priority for weed control for the next 5 years under this CZMP and should be the focus of the Weed Management strategy for Woolgoolga Creek/Lake and Poundyard Creek. *Specific Tasks* It is recommended to develop a strategy based on existing mapping which: ▪ sets clear objectives for weed management along the estuary over a 5 year timeline; ▪ identifies priority areas for control efforts; ▪ defines responsibilities for control works; ▪ outlines appropriate methods for control works in estuarine environments; ▪ estimates the number of hours required for primary control works and estimates hours required for maintenance over the 5 year time period; ▪ outlines a strategy for raising community awareness of actions which can contribute to the spread of environmental weeds along the estuary; ▪ identifies funding sources; and ▪ sets monitoring and evaluation criteria.				
Responsible Agencies	*Timeframe*	*Cost*	*Potential Funding Sources*	*Monitoring*
Lead Agency: ▪ CHCC Related Agencies: ▪ North Coast LLS; ▪ Landcare.	Years 1 - 2	Strategy development: $5,000 if done external to CHCC.	North Coast LLS - relevant programs.	The benchmark for this Action is the development of a recognised NRM Plan for the Management of priority weed species in areas of Woolgoolga and Poundyard Creeks.

Strategy Action 8.2 Utilise specialist bush regeneration contractors to undertake primary weed control in priority areas.				
Background: Estuarine and riparian areas are highly sensitive environments. As such, weed control work in these environments needs to be undertaken by specialist bush regenerators with skills in plant identification and knowledge of appropriate methods of control of weeds near waterways (especially where chemical control methods are to be used). In addition, such areas can be hazardous to workers, so it is essential that appropriate OHS strategies are implemented to ensure control works are undertaken in a safe manner. *Specific Tasks* ▪ Priority areas for weed control, species to be targeted, appropriate methods to be used, total available contract hours, and monitoring and evaluation actions/maintenance are to be defined in the Weed Management Strategy developed in Strategy Action 8.1 above. ▪ Priority works should where possible be scheduled into the operations/works plan of Council's Bush Regeneration team, alternatively specialist contractors could be engaged where funding is available.				
Responsible Agencies	*Timeframe*	*Cost*	*Potential Funding Sources*	*Monitoring*
Lead Agency: ▪ CHCC - Weeds Officer to provide oversight. Related Agencies: ▪ North Coast LLS; ▪ Landcare.	Years 2 – 5	Subject to development of the Weeds Management Strategy under Strategy Action 8.1 above. If external contractors are to be used, funds required is subject to the Weed Management Strategy but initially estimated at 400 hours per year @ $35/hr ($14,000/yr) over 5 years.	▪ North Coast LLS Relevant programs. ▪ Environmental Trust Restoration and Rehabilitation grants. ▪ Grants through NSW Government for weed control works on Crown Lands. ▪ CHCC Environmental Levy.	The benchmark for this Action is the engagement of specialist contractors to control priority weeds in areas identified in the Weed Management Strategy developed in Strategy Action 8.1

Strategy Action 8.3

Foster a local Bushcare group to undertake the secondary control or follow-up maintenance of areas treated by contractors.

Background:

The effective control of environmental weeds requires a long-term and consistent approach. To be successful, the initial control works undertaken by the CHCC team or specialist contractors needs to be followed by periodic maintenance to ensure areas cleared of weeds do not become re-infested by regrowth or new weed seedlings. A model that has worked in many parts of the North Coast region has been to support local care groups operating under the Landcare umbrella. Small scale funding and support in the form of insurance coverage and tools is often available through the Landcare network. Group activities are also often part funded via North Coast LLS small grants (where a recognised NRM Plan exists), via CHCC Environmental levies, Environmental Trust grants, etc.

Specific Tasks

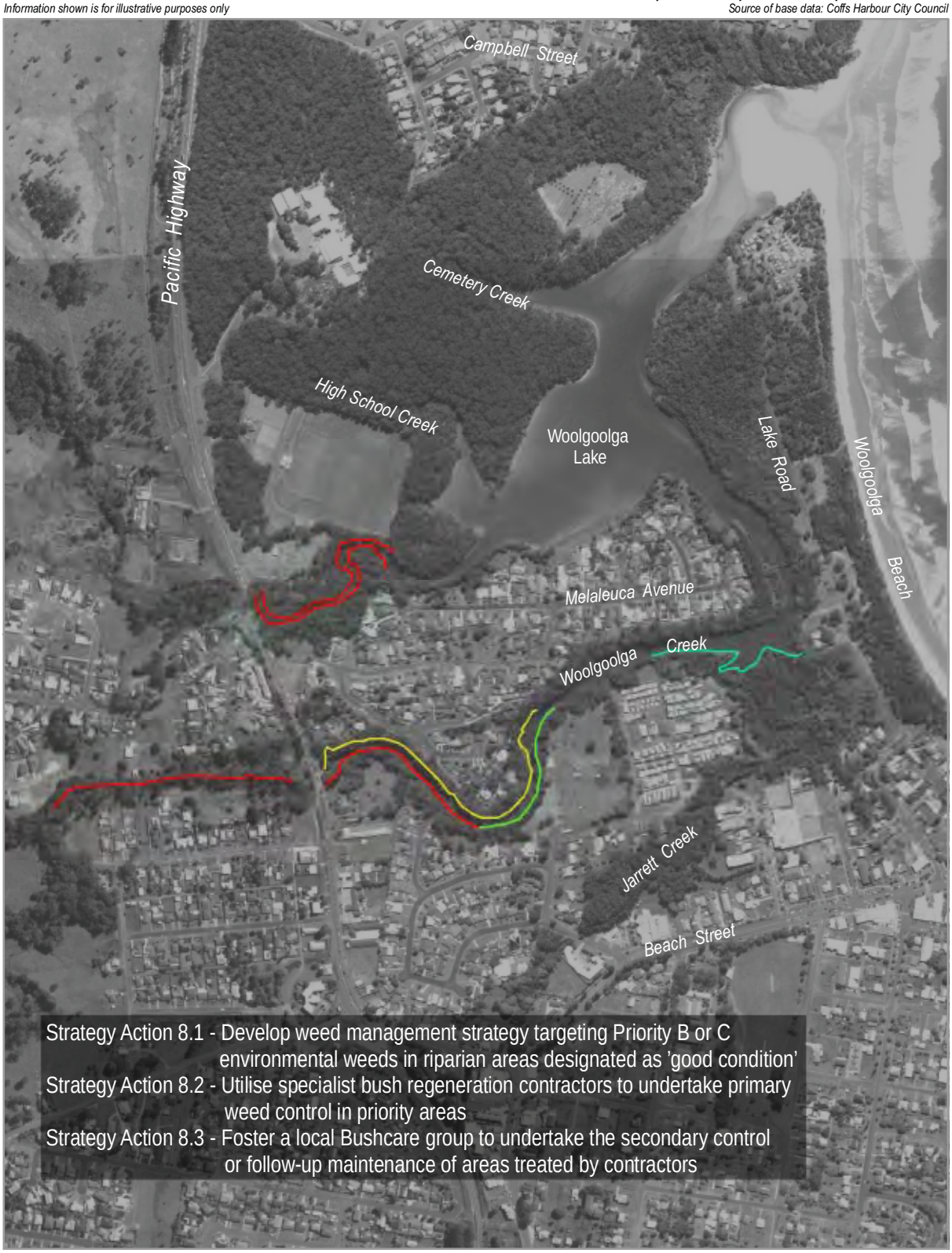
Liaise with Coffs Harbour Landcare to determine the appropriate actions for establishing a Woolgoolga Creek/Woolgoolga Lake Care group.

Responsible Agencies	*Timeframe*	*Cost*	*Potential Funding Sources*	*Monitoring*
Lead Agency: ▪ CHCC. Related Agencies: ▪ North Coast LLS; ▪ Landcare.	Long term commitment required to support community groups	Dependent on activities, but generally limited to provision of tools, consumables, and support.	Support available through Coffs Landcare Network. Potential funding available through North Coast LLS Any other grants available from time to time such as Environmental Trust Community Bush Regeneration and/or Restoration and Rehabilitation Grants. CHCC Environmental Levy	The benchmark for this action is the successful formation of a Woolgoolga Creek Care group which includes as its activities the long term maintenance of high conservation value riparian vegetation communities.

Drawn by: RE Checked by: MVE Reviewed by: TIM Date: June 2012

Information shown is for illustrative purposes only

Source of base data: Coffs Harbour City Council



LEGEND

- Riparian vegetation in good condition but with groundsel, winter cassia and lantana present
- Riparian vegetation in good condition but with lantana present
- Riparian vegetation in good condition with mangrove community but with lantana present
- Riparian vegetation in good condition with winter cassia and lantana present

0 200

North

Strategy 8 - Environmental Weeds

GeoLINK

Coastal Zone Management Plan - Woolgoolga Lake Estuary
1616818

Illustration 8.1

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9

Strategy 9 - Climate Change Impacts on Water Quality

Forecast climate change and sea level rise scenarios are likely to result in a number of changes to water quality processes in ICOLLs such as Woolgoolga Lake. Some of the impacts will be direct, such as changes to average water temperature, whilst some will be indirect, following on from changes to physical processes such as hydrodynamics (Haines 2006). Climate change scenarios may also result in an intensification of existing issues with water quality.

9.1 Summary of Proposed Actions

Addressing current issues in accordance with Strategy Action 1.2 and Strategy 2 actions will be the best preparation for the impacts of climate change on water quality. No further actions are proposed to address this issue.

9.1.1 Related Strategies

- Strategy 1 Entrance Management.
- Strategy 2 Stormwater Management and Catchment Pollutants.
- Strategy 4 Water Quality.
- Strategy 5 Climate Change Impacts on Estuary Ecology.
- Strategy 7 Aquatic Habitats.

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Strategy 10 - Water Quality Monitoring

The collection of water quality data is an important aspect of overall estuary management. When collected in a suitable fashion, water quality data informs managers of:

- typical and abnormal processes occurring in the waterway;
- risks to public safety associated with recreational uses of the estuary;
- risks to public safety associated with the consumption of aquatic foods;
- potential risks to aquatic ecosystems;
- trends with respect to the 'health' of the aquatic system; and
- the impacts of soil, water and other water quality related management strategies implemented throughout the catchment.

The long term dataset available for Woolgoolga Lake is not detailed or consistent enough to provide clear information about a number of the above listed items.

10.1 Summary of Proposed Actions

Continue to implement the Ecohealth water quality monitoring program for Woolgoolga Lake.

10.1.1 Related Strategies

- Strategy 2 Stormwater Management and Catchment Pollutants.
- Strategy 4 Water Quality.
- Strategy 9 Water Climate Change and Sea Level Rise Impacts on Water Quality.
- Strategy 15 Residues from the 1989 Dieldrin/Aldrin Spill.

10.1.2 Objectives Addressed

- Improved water quality.
- Improve the monitoring of water quality.

10.2 Details of Proposed Actions

Strategy Action 10.1 Continue to implement the Ecohealth water quality monitoring program for Woolgoolga Lake.				
Background: The Ecohealth program outlines a framework for the development of a catchment-based aquatic health monitoring program in the Northern Rivers CMA region to provide consistency in monitoring and reporting, and establish the partnerships required for local and regional participation in the sampling program, identification of appropriate management actions and communication of outcomes. The Ecohealth program integrates information from the NSW Monitoring, Evaluation and Reporting (MER) Program, NSW State of Environment (SoE) reports, and a range of other reporting programs. Woolgoolga Lake is currently included in the Ecohealth water quality monitoring program. However, the combined water quality dataset for Woolgoolga Lake has been identified as lacking in continuity and detail. Continuation of the Ecohealth water quality monitoring program for Woolgoolga Lake will assist in supplementing the current water quality dataset. *Specific Tasks* ▪ Continue to implement the Ecohealth water quality monitoring program for Woolgoolga Lake with a review of: - appropriate temporal and spatial scales for sampling; and - a comprehensive list of parameters that will add to the understanding of the health of Woolgoolga Lake; - the issue of pesticides and herbicides used in the catchment and the 1989 spill of Dieldrin and Aldrin (refer to Strategy 15).				
Responsible Agencies	*Timeframe*	*Cost*	*Potential Funding Sources*	*Monitoring*
Lead Agency: ▪ CHCC Related Agencies: ▪ North Coast LLS; ▪ OEH; ▪ MPA - SIMP	Ongoing	$20,000 every 4 years	▪ CHCC operating budget. ▪ MPA – SIMP: in kind assistance	Reporting every 4 years in line with SoE reporting

Strategy 11 - Recreational Facilities and Opportunities

This strategy complements the objectives and proposed actions of Strategy 3 – Foreshores and Riparian Areas which aim to enhance and protect the natural values of the lake.

Woolgoolga Lake offers a range of desirable assets including high scenic amenity, close proximity to the town centre and a range of passive land and water based recreational opportunities. These attributes have in the past provided an incentive for tourist development which has raised concern for the potential impact on the natural values and visual character of the area.

A public picnic area along the southern foreshores of the lake adjacent to the Woolgoolga Lakeside Caravan Park offers a highly attractive and popular recreation destination for the local and wider community. Given the importance of the picnic area as an important community asset, a key objective of this strategy is to maintain and consolidate its existing function and capacity as the main focus for family, water and land based recreational activity around the lake.

Recreational activity elsewhere around the lake attracts quieter, individual activities such as walking, jogging and cycling. While tracks provide access to significant parts of the foreshore area, they are poorly connected and fail to offer a continuous network around the lake periphery and its tributaries. There is also a lack of a legible signage system to provide adequate guidance and information.

There is some concern amongst the community that littering around the foreshore area is a problem. Lack of responsibility with rubbish reflects poorly on community pride and impacts on the visual amenity and recreational experience for visitors.

11.1 Summary of Proposed Actions

In order to address the above issues the following actions are proposed:

- Woolgoolga Lakeside Reserve and Lakeside Caravan Park:
  - support non-motorised water craft use such as kayaks by providing easier access and a dedicated soft launching area along the foreshore of the lakeside picnic area;
  - continue to prohibit the use of recreational motorised watercraft in the lake; and
  - replace car tyres used to protect the southern bank near the entrance (adjoining the caravan park) with a more visually sympathetic, natural treatment; and
  - install an interpretive centre at the picnic area to enhance appreciation of the visual, cultural and environmental values of the lake and install low key signage at path junctions and at the start of walking tracks to facilitate site orientation and legibility.
- Walking Trails:
  - remove and revegetate unnecessary or duplicated path routes;
  - upgrade tracks to generate visual continuity with a consistent standard;
  - ensure that path routes are clearly defined and continuous between destinations;
  - replace and rationalise the existing signage system and highlight starting points with signs or maps to ensure legibility;
  - provide a continuous, universally accessible walking track along the southern shore of the lake and along one or both sides of Jarrett and Woolgoolga Creeks; and

- investigate opportunities to install a footpath through land belonging to Woolgoolga High School along the eastern foreshores of Woolgoolga Creek to provide a continuous public access route.

- Prevent unnecessary car movement into the western side of Lake Road;
- Replace and enhance existing park furniture over the longer term by adopting a consistent theme and suite of new fixtures and materials that are robust, attractive and complementary with the natural visual character of the setting
- Rubbish around the foreshores:
  - continue to provide appropriate rubbish disposal and removal facilities in high use foreshore areas; and
  - organise foreshore clean-up activities for the local community.

11.1.1 Related Strategies

- Strategy 3 Foreshores and Riparian Areas
- Strategy 13 Visual Amenity

11.1.2 Objectives Addressed

- Maintain and enhance the existing passive water and land based recreational experiences and opportunities in a manner that complements and sustains the natural values of the lake and its tributaries.
- Encourage low key recreational activities that are compatible with each other and the natural environment.
- Enhance, protect and restore natural values to foreshore areas.
- Preserve and enhance the natural appearance of the lake particularly along the southern foreshores adjacent to existing residential development.
- Optimise the attractive outlook across the lake and creeks from path routes, recreation areas and other destinations for public enjoyment.

Information shown is for illustrative purposes only

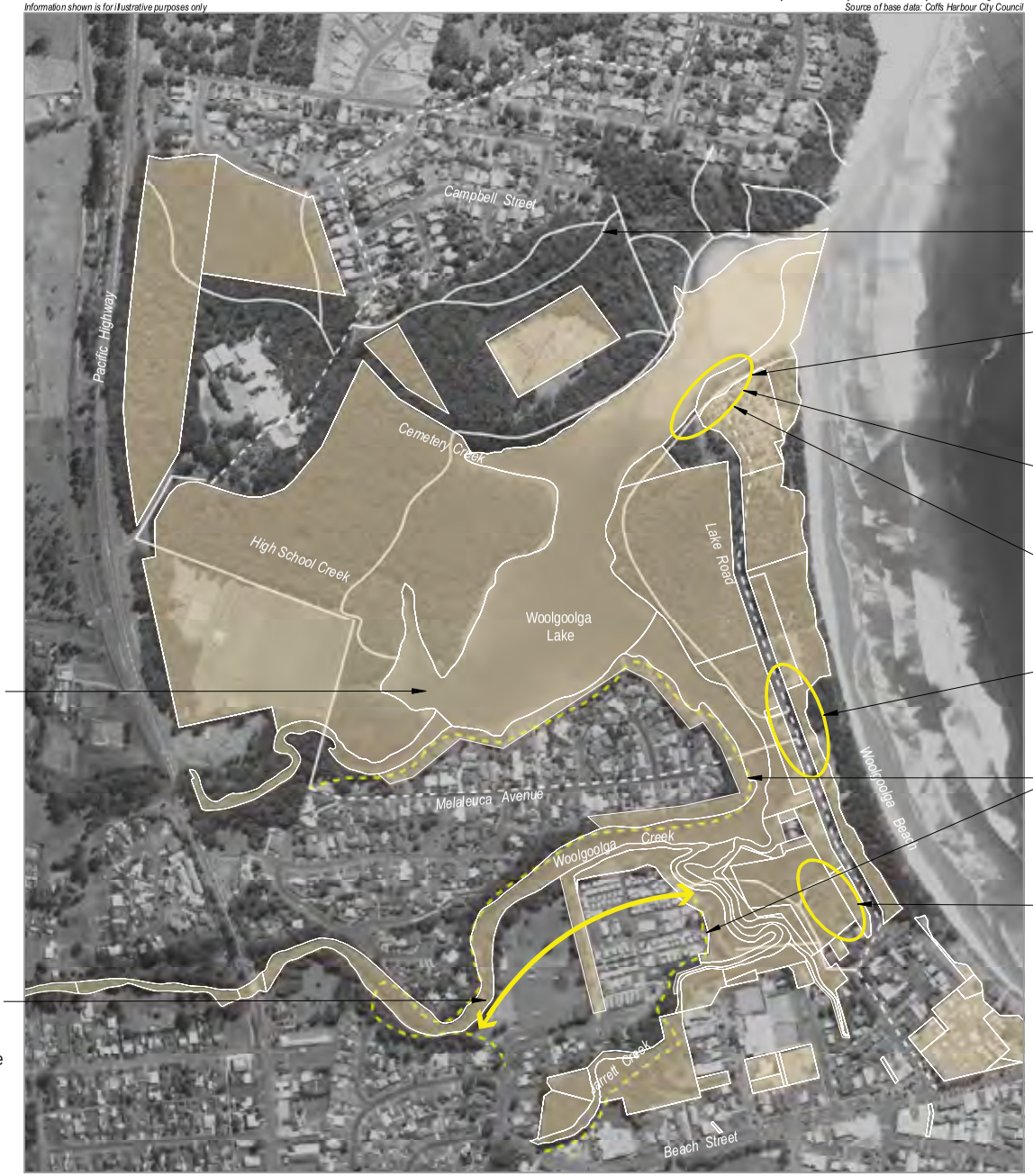
Drawn by: RE Checked by: MVE Reviewed by: TIM Date: August 2011
Source of base data: Coffs Harbour City Council

Strategy Action 11.2:
Walking Trails
- Upgrade tracks to generate visual continuity with a consistent standard
- Ensure path routes are clearly defined and continuous between destinations
- Replace and rationalise the existing signage system with appropriate and consistent directional, identification and informational signs and maps at key locations to improve pedestrian legibility, orientation, site interpretation and enjoyment of the lake environment generally. Highlight starting points of tracks with signs or maps for optimal legibility

Strategy Action 11.4:
Organise foreshore clean-up activities for the local community

Strategy Action 11.1:
Continue to prohibit the use of recreational motorised watercraft in the lake

Strategy Action 11.2:
Investigate opportunities for a footpath through land belonging to Woolgoolga High School along the eastern foreshores of Woolgoolga Creek to provide a continuous public access route



Strategy Action 11.2:
Remove and revegetate unnecessary or duplicated path routes

Strategy Action 11.1:
Replace and enhance existing park furniture over the longer term by adopting a consistent theme and suite of fixtures and materials complementary with the natural setting

Strategy Action 11.1:
Support non-motorised water craft use such as kayaks by providing easier access and a dedicated soft launching area

Strategy Action 11.4:
Continue to provide appropriate rubbish disposal and removal facilities in high use foreshore areas

Strategy Action 11.3:
Prevent unnecessary car movement into the western side of Lake Road

Strategy Action 11.2:
Provide a continuous, universally accessible walking track along the southern shore of the lake and along one or both sides of Jarrett and Woolgoolga Creeks

Strategy Action 11.3:
Abandon proposals for tourism accommodation development specified in previous Plan of Management

LEGEND

Crown land reserves

0 150

NORTH

GeoLINK environmental management and design

Coastal Zone Management Plan - Woolgoolga Lake Estuary
1616819

Strategy 11 - Recreational Facilities and Opportunities

Illustration 11.1

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11.2 Details of Proposed Actions

Strategy Action 11.1

Maintain and improve facilities that support existing passive recreational activities at Woolgoolga Lakeside Reserve and along the foreshores of the Lakeside Caravan Park.

Background:

The Woolgoolga Lakeside Reserve occupies a prime location on the southern foreshores of the lake and offers a well-developed and highly popular recreation destination for the local and wider community. The site enjoys a large grassed open space with remnant shade trees and a protected northerly / westerly view over the lake. It also offers a long open foreshore with easy access for swimming and soft launching for canoes and kayaks. Use of motorised watercraft on the lake is prohibited ensuring that potential conflicts with other passive water based recreational users are avoided. Picnic facilities, barbeques, toilets, a playground, easy car access, parking and maintained open spaces cater to high number of visitors and family groups. The facilities and park furniture, while providing a good if basic level of comfort, have a tired appearance and do not follow a consistent theme.

Given the role and value of the picnic area as a community asset, a key objective of this strategy is to maintain and consolidate the existing function and capacity of the site as the main focus for family, water and land based recreational activity around the lake. Opportunities should also be explored to enhance the comfort and visual appeal of the site with higher standard facilities.

The following range of tasks is recommended to address the issues identified at the Woolgoolga Lakeside Reserve Area. Some of the tasks may relate to Crown Reserve No. 63076 for Public Recreation, Resting Place and communication facilities – managed by Council as the Trust Manager for the CCSPT. To facilitate the implementation of these tasks, a design for a new formalised water edge structure has been prepared (refer Appendix B).

Specific Tasks

The following generic and site specific tasks are recommended:

- Seek any required relevant approvals/licenses.
- Maintain and support existing passive recreational uses within the reserve with a focus on family oriented water and land-based activities. Replace and enhance existing park furniture over the longer term by adopting a consistent theme and suite of new fixtures and materials that are robust, attractive and complementary with the natural visual character of the setting.
- Formalise access to the central and most popular section of the lake foreshore (as described and costed under Strategy Action 3.5. Refer to design proposal Appendix B).
- Maintain easy access and a dedicated soft launching area along the foreshore for non-motorised watercraft such as canoes and kayaks. Monitor use levels and formalise water access if necessary if use levels become unsustainable and damage to foreshore vegetation occurs. Continue to prohibit the use of motorised watercraft.
- Undertake periodic surveys to record and monitor use levels and satisfaction with recreational facilities and opportunities.
- Install an interpretive centre at the picnic area to enhance appreciation of the visual, cultural and environmental values of the lake and install low key signage at path junctions and at the start of walking tracks to facilitate site orientation and legibility.
- Install new planting and a defined border around all mown grass areas (as described and costed under Strategy Action 3.4).
- Modify the existing landscape plan for the reserve to incorporate the above actions (as described and costed under Strategy Action 3.3).

Responsible Agencies	*Timeframe*	*Cost*	*Potential Funding Sources*	*Monitoring*
CHCC; CCSPT	Years 1 - 5	▪ Upgrade park furniture and signage: $20,000 ▪ Visitor surveys: CHCC staff time	▪ Caring for Our Country ▪ Sport and Recreation Facility Grant program	▪ Visitor survey on a 2-yearly basis ▪ Routine checks by park management to ensure watercraft compliance

Strategy Action 11.2

Improve the path network around the foreshores and tributaries of the lake

Background:

Recreational walking, jogging and cycling are key activities around the lake. These activities are facilitated by a network of boardwalks, bridges and formed and unformed bush tracks of varying standard and surface finish (refer to Illustration 11.1).

Across the northern slopes of the lake, a haphazard array of simple tracks, paths and steps provide access to the northern shoreline and to various destinations to the west.

In the south, paths and bridges across Woolgoolga and Jarrett creeks provide important linkages to surrounding areas for nearby residents who have limited access options because of an absence of through streets. A bush track extending from the Lakeside Reserve to the Woolgoolga Creek pedestrian bridge to the west provides an attractive walking route through riparian vegetation and past a significant flying-fox colony and an attractive lakeside vantage point. Another unformed route from the reserve provides pedestrian access to the lake entrance and beach to the east. A cycle route formed by line marking provides a connection along Lake Road between the reserve and the town centre.

Sections of sealed paths create linkages with streets to create a continuous pedestrian / cycle route around the western edge of the lake. This important route links residential communities with key destinations such as the high school, sports ground, lakeside picnic area and the town centre in the south.

While there are numerous tracks within the reserve, they generally lack continuity and legibility. Some are difficult to find particularly where they begin some distance from nearby streets. A key objective of this strategy is to build on the existing path network to optimise the valuable recreational contribution it makes and to complement other recommendations to improve the visual and environmental attributes of the lake.

Specific Tasks

The following generic and site specific tasks are recommended:

- Prepare an overall plan that sets out the path network including existing and proposed new sections. Development of the plan should include the identification of a consistent design theme involving a palette of surface treatments and street furniture and construction standards. The system should aim to be universally accessible and integrate with existing cycle / footpath routes that surround or pass through the area.
- Seek any required relevant approvals / licenses.
- Replace and rationalise the existing signage system with appropriate and consistent directional, identification and informational signs and maps at key locations to improve pedestrian legibility, orientation, site interpretation and enjoyment of the lake environment generally. Highlight starting points of tracks with signs or maps for optimal legibility.
- Consolidate walking trails around the northern side of the lake and remove and revegetate unnecessary or duplicated routes. Upgrade, extend or replace tracks to create the most efficient, accessible system.

- Provide a continuous series of universally accessible walking tracks along the southern shore of the lake and along one or both sides of Jarrett and Woolgoolga Creeks. The defined edge proposed between mown land and riparian vegetation along the southern foreshore of Woolgoolga Lake adjacent to Sunset Lakes Estate (refer to Strategy Action 3.1) would ideally be replaced by a path in the future. The path would then act as the boundary between mown land and riparian vegetation along this section of foreshore.
  Incorporate boardwalks and low key surface treatments that respond appropriately to site conditions. Provide viewing platforms and rest stops with seating to optimise site attributes and to enhance the recreational experience of users. Connect tracks to existing access routes and streets while ensuring route selection has due regard for privacy into surrounding residences. Seek to establish new paths as a defined maintenance boundary between mown grass and riparian vegetation where applicable.
- Investigate opportunities to install a footpath through land belonging to Woolgoolga High School to provide a continuous public access route along the eastern foreshores of Woolgoolga Creek.
- Upgrade the pedestrian connection between the Woolgoolga Lakeside Reserve and the lake mouth to create a more legible public access route. Seek to establish new paths as a defined maintenance boundary between mown grass and riparian vegetation.

Responsible Agencies	*Timeframe*	*Cost*	*Potential Funding Sources*	*Monitoring*
Lead Agency: ▪ CHCC Related Agencies: ▪ DoI – Crown Lands & Water; ▪ CCSPT.	Years 5 – 10	▪ Cycle path plan: CHCC staff. ▪ New signage system: $15,000. ▪ Upgraded tracks - north side $5,000. ▪ Upgraded tracks – south side: $20,000. ▪ High school path: $2,000. ▪ Lake mouth path: $2,000.	▪ Caring for Our Country. ▪ Sport and Recreation Facility Grant program. ▪ CHCC Environmental Levy.	Check for preventative and corrective maintenance requirements on an ongoing basis once path and sign systems are completed.

Strategy Action 11.3

Modify existing and proposed uses along Lake Road to ensure that environmental values are protected.

Background:

This strategy relates primarily to Crown Reserve No. 83057 for Future Public Requirements – managed by NSW Department of Industry – Crown Lands & Water and to a lesser extent Crown Reserve No. 63076 for Public Recreation, Resting Place and communication facilities – managed by Council for the CCSPT handed over from the Woolgoolga Beach Reserve Trust (now redundant).

The area bound by Lake Road and the eastern foreshores of Woolgoolga Lake consist of fragmented remnant vegetation, weed growth and grassed open space. It is readily accessed by vehicles and is used for supplementary car parking for the picnic areas on the eastern side of the road. This has caused minor damage to the grass surface giving the area an unkempt appearance. It is also understood that the Rainbow Bee-Eater has established roosting sites with the grassed areas despite a lack of protection from public and maintenance vehicles.

In reviewing previous and current uses of the area, it is now the preferred strategy to restore the natural values as a primary objective in order to enhance the environmental attributes of the reserve as a whole.

Specific Tasks

- Seek any required relevant approvals / licenses.
- Create a barrier along Lake Road to prevent unnecessary car movement across the open spaces. Provide 90 degree car parking on grassed sections adjacent to Lake Road where necessary as an overflow for the formal car parks on the eastern side of the road.
- Remove weed and undertake a revegetation program to restore cleared areas. Identify and undertake appropriate management of existing grassed areas to maintain and protect nesting locations for the Rainbow Bee-Eater. Engage a local Bushcare group for follow-up maintenance of revegetated areas (refer to Strategy Action 8.3).

Responsible Agencies	*Timeframe*	*Cost*	*Potential Funding Sources*	*Monitoring*
Lead Agency: ▪ CCSPT; CHCC as appointed Trust Manager for works relating to Reserve 83057 and Reserve 63076 Related Agencies: ▪ CHCC; ▪ DoI – Crown Lands & Water; ▪ Landcare with respect to weed removal / revegetation program.	▪ Years 1 – 5: create a barrier along Lake Road to prevent unnecessary car movement ▪ Years 1 – 5: restore cleared areas / manage Rainbow Bee-Eater nesting locations	▪ $5,000 ▪ Included in above cost	▪ Caring for Our Country. ▪ CHCC Environmental Levy. ▪ North Coast LLS.	The benchmark for this action is implementation of the barriers. Council to routinely check revegetated areas for weeds

Strategy Action 11.4

Address Rubbish Around the Foreshores

Background:

The community consultation phase identified rubbish around the foreshore areas as an issue impacting on the recreational experience offered by Woolgoolga Lake.

Woolgoolga Lake and Woolgoolga Creek are already registered 'clean up' sites on the Clean Up Australia website. Woolgoolga High School Student Environment Council is also involved in cleaning up around Woolgoolga Lake on Clean Up Australia day as part of their ongoing environmental projects.

Specific Tasks

- Continue to provide appropriate rubbish disposal and removal facilities in high use foreshore areas.
- Undertake targeted removal when rubbish is encountered during routine park maintenance.
- Liaise with Clean Up Australia site coordinators to ensure that the area is a focus of their activities and provide support as necessary to facilitate the best outcome from their annual event.
- Raise public awareness of the need for litter prevention by including discrete messages on signage systems.

Responsible Agencies	*Timeframe*	*Cost*	*Potential Funding Sources*	*Monitoring*
CHCC	Ongoing	CHCC staff time for liaison, maintenance and Clean Up Australia support	NSW Government Litter Prevention Program – grants managed by the Sustainability Programs Division of OEH	Liaise annually with Clean Up Australia site coordinators following Clean Up Australia day

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Strategy 12 - Flying-Fox Camp

A Grey-headed Flying-fox (*Pteropus poliocephalus*) maternity camp referred to as the 'camp') occurs along the banks of Woolgoolga Lake. This species is listed as vulnerable under both the Australian Commonwealth Environment Protection and Biodiversity Conservation Act 1999 and the NSW Threatened Species Conservation Act 1995. The extent of the reserve area covers 6.8 ha, however the effective roost area has been reduced due to weed encroachment and degradation to approximately 1 ha (Our Living Coast 2010).

The camp is located on Crown Land and managed by Coffs Harbour City Council under the Woolgoolga Lake Park Reserve. The area containing the camp is located between the eastern bank of Woolgoolga Lake and Lake Road. The camp and surrounds are currently zoned Open Space 6a with a Low Density Residential 2a to the south and south west.

Concern has been expressed about the camp during the project consultation phase. Concerns have related to impacts of excrement on water quality, odours, and impacts on vegetation in the roosting area. Community comments also included support for maintaining the camp.

Council plans to develop a management strategy with the objective of maintaining the camp over the long-term while achieving an equitable balance between conservation and the social, cultural, aesthetic and environmental values shared by the community (Our Living Coast 2010).

Other objectives of the management strategy include restoring the area's value as Secondary Koala Habitat, increase the area's value as a wildlife corridor and link to the Regional Park, enhance the Woolgoolga Lake riparian and coastal values and providing for community's needs in terms of recreation, education and interpretation of these values to ensure the long-term management of the camp.

12.1 Summary of Proposed Actions

It is considered the objectives of Council proposed management strategy for the flying-fox camp are consistent with the objectives developed for the Woolgoolga Lake estuary. Therefore the CZMP supports Council's development of the Flying-fox management strategy. The only proposed action regarding the flying-fox camp is:

- ensuring consistency between the Flying-fox management strategy and any related CZMP actions.

12.1.1 Related Strategies

- Strategy 3 Foreshores and Riparian Areas.
- Strategy 8 Environmental Weeds.
- Strategy 11 Recreational Facilities and Opportunities.

12.1.2 Objectives Addressed

- Restore terrestrial habitats of high ecological or conservation value.
- Maintain the flying-fox camp over the long-term while achieving an equitable balance between conservation and the social, cultural, aesthetic and environmental values shared by the community.
- Enhance, protect and restore natural values to foreshore areas.

12.2 Details of Proposed Actions

Strategy Action 12.1

Ensure consistency between the Flying-fox management strategy and any related CZMP actions

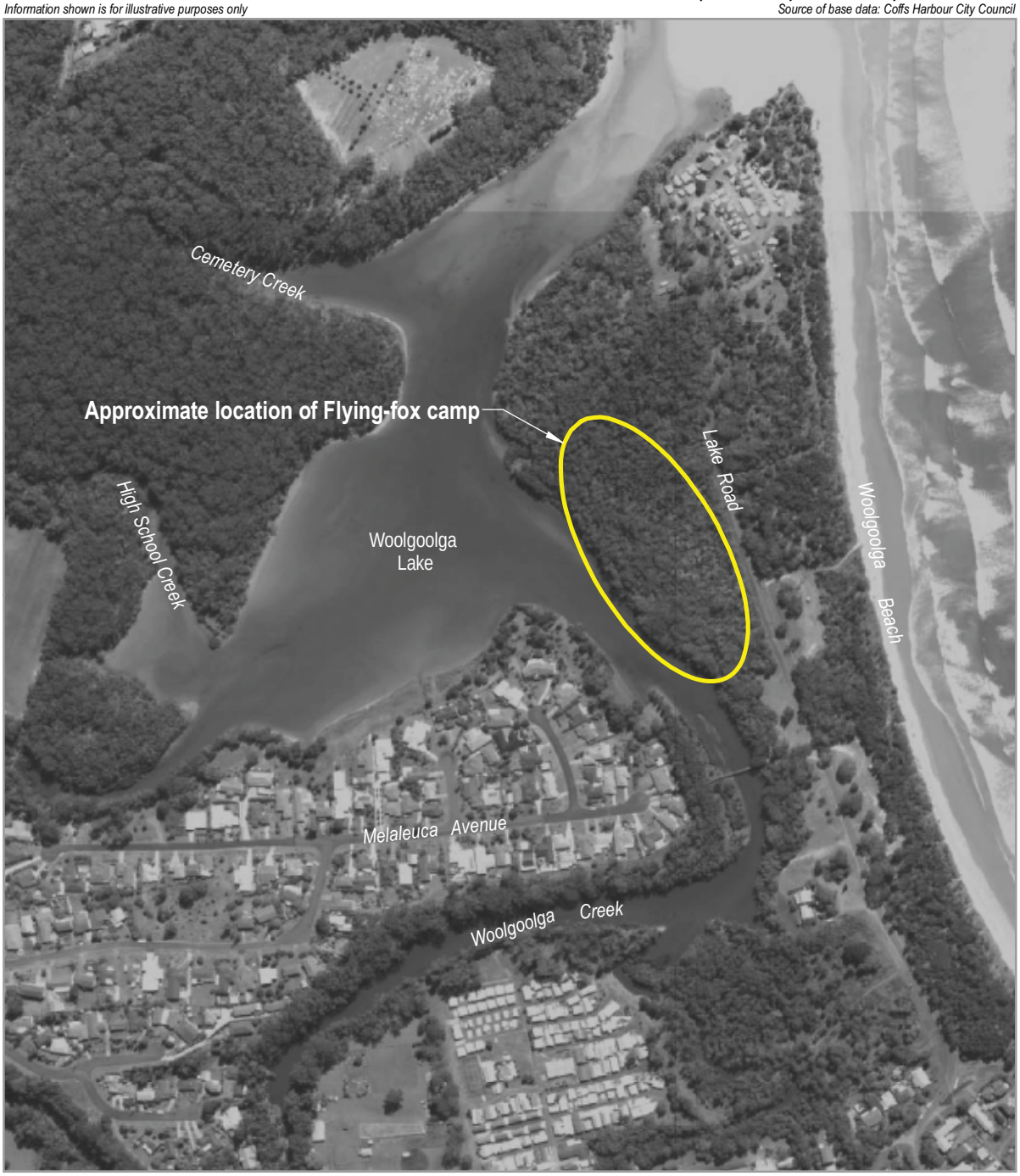
Background:

Council plans to develop a management strategy for the Flying-fox camp at Woolgoolga Lake. The objective of the management strategy is to maintain the camp over the long-term while achieving an equitable balance with the values shared by the community. Other objectives of the management strategy include restoring the area's value as Secondary Koala Habitat, increase the area's value as a wildlife corridor and link to the Regional Park, enhance the Woolgoolga Lake riparian and coastal values and providing for community's needs in terms of recreation, education and interpretation of these values to ensure the long-term management of the camp.

Specific Tasks

- Ensure development of the Flying-fox management strategy considers any related CZMP actions (e.g. actions for Strategy 3, 8 and 11). Amend CZMP actions where appropriate to ensure consistency between the CZMP and Flying-fox management strategy.

Responsible Agencies	*Timeframe*	*Cost*	*Potential Funding Sources*	*Monitoring*
CHCC	1 – 2 years	CHCC staff time for internal liaison.	Nil	Review draft document of Flying-fox management strategy to ensure consistency between the CZMP and Flying-fox management strategy



Strategy Action 12.1 - Ensure consistency between the Flying-fox management strategy and any related CZMP actions

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13

Strategy 13 - Visual Amenity

Woolgoolga Lake Reserve is recognised for its high scenic amenity and as a key natural asset to the local community. The scenic values of Woolgoolga Lake include:

- a continuous edge of natural vegetation around the majority of the lake foreshores, often extending well back and rising up adjoining slopes to produce an attractive natural skyline and backdrop to views across the lake;
- the surrounding ridges enclose and help to protect the lake, further enhancing the microclimate and visual experience to visitors; and
- the popular Woolgoolga Lakeside Reserve area beside the Lakeside Caravan Park provides open grassed spaces beneath remnant trees producing a highly attractive recreation area with panoramic views across the lake to the north and west.

This strategy aims to highlight the importance of the natural environment in achieving this amenity and in identifying ways to mitigate the visual impacts of surrounding residential development, infrastructure provision and maintenance practices to achieve a more sympathetic balance with the natural values.

13.1 Summary of Proposed Actions

Preserve and enhance the natural values of Woolgoolga Lake to maintain its high level of visual amenity by:

- removing car tyres along the southern bank adjoining the Lakeside Caravan Park and protect / reinstate riparian vegetation;
- review the method and type of edge reinforcement / erosion protection required along the northern shoreline and consider a more visually sympathetic solution when the existing timber wall requires replacement or upgrading
- investigate simple ways to mitigate the visual impact of the existing timber revetment wall along the northern shoreline (such as pocket planting of riparian vegetation immediately behind the wall or in front of the wall); and
- preserve the extent of continuous natural vegetation across the surrounding slopes and skyline of the lake to maintain the visual buffer to adjoining land uses such as the playing fields, RMS depot, cemetery and the southern residential fringe of Safety Beach. Restore native vegetation to impacted areas that have been unnecessarily cleared.

Previous strategy actions also contribute to preserving and enhancing the visual amenity of Woolgoolga Lake including:

- undertaking better management practices and restoring natural vegetation in poorly or inappropriately maintained areas within the Reserve (Strategy 3 actions);
- installing new planting to mitigate the visual impact of built form in adjoining residential areas (Strategy 3 actions);
- providing infrastructure and facilities that complement the natural appearance and values of the setting (Strategy 11 actions);
- installing a consistent signage system (Strategy Action 11.2); and
- undertaking a more proactive litter prevention and removal program (Strategy Action 11.4).

13.1.1 Related Strategies

- Strategy 3 Foreshores and Riparian Areas.
- Strategy 11 Recreation Facilities and Opportunities.

13.1.2 Objectives Addressed

- Implement bank stabilisation and rehabilitation works in areas with important estuary values.
- Maintain and enhance existing passive water and land based recreational experiences and opportunities in a manner that complements and sustains the natural values of the estuary.
- Enhance, protect and restore natural values to foreshore areas.
- Optimise the attractive outlook across the lake and creeks from path routes, recreation areas and other destinations for public enjoyment.
- Undertake management practices and provide infrastructure and facilities that complement the natural appearance and values of the setting.

13.2 Details of Proposed Actions

Strategy Action 13.1

Preserve and enhance the natural values of Woolgoolga Lake to maintain its high level of visual amenity.

Background:

The natural environment of Woolgoolga Lake and its setting produce a high level of visual amenity that is enjoyed by a large number of visitors and the local residents. A key reason for the attractiveness of the setting is the continuity and dominance of the natural features. On the southern foreshores of the lake, however, there is a lack of natural vegetation to mitigate the visual impact of built form associated with the nearby residential neighbourhood. Elsewhere, weed growth, poor maintenance practices, rubbish deposition and provision of unattractive and poorly located infrastructure have also contributed to the loss of visual amenity. The objective of this management strategy is to maintain the dominance of the natural environment throughout the reserve and to restore or enhance areas where these values have been degraded.

Specific Tasks

- Seek any required relevant approvals / licenses
- Remove car tyres along the southern bank adjoining the Lakeside Caravan Park and protect / reinstate riparian vegetation to strengthen the banks and accept the effects of dynamic natural processes that may result in fluctuations in erosion and accretion of the foreshore banks. This action is to be undertaken in combination with Strategy Action 3.4 involving establishing a defined edge between mown land and riparian vegetation along the embankment and re-establishing riparian vegetation This strategy relates to Crown Reserve No. 63076 for Public Recreation, Resting Place and communication facilities and 70416 for Public Recreation and extraction of sand – under the care, control and management of the CCSPT with CHCC as the appointed Trust Manager, handed over from the Woolgoolga Beach Reserve Trust (now redundant).
- A Plan of Management (PoM) was adopted on 29 November 2013 which covers the northern, Lakeside section of Woolgoolga Beach Reserve and details the land status of the area.
- Review the method and type of edge reinforcement required along the northern shoreline and consider a more visually sympathetic solution when the existing timber wall requires replacement or upgrading.

Investigate simple ways to mitigate the visual impact of this treatment such as pocket planting of riparian vegetation over the interim period.

- Install new / supplementary street trees using locally indigenous species within the residential communities fronting the lake to mitigate the existing dominance of built form across the skyline (as described and costed under Strategy Action 3.2).
- Using locally indigenous species install new foreshore vegetation in carefully considered locations along the foreshores and surrounding residential areas adjacent to the southern edge of the lake (as described and costed under Strategy Action 3.1 and 3.2). Also provide low key site support and infrastructure where appropriate such as water-edge platforms to optimise views across the lake (as described and costed under Strategy Action 3.1).
- Preserve the extent of continuous natural vegetation across the surrounding slopes and skyline of the lake to maintain the visual buffer to adjoining land uses such as the playing fields, RTA depot, cemetery and the southern residential fringe of Safety Beach. Restore native vegetation to impacted or areas that have been unnecessarily cleared.
- Enhance the visual, cultural and environmental appreciation of the lake and its surrounding area by installing a coordinated system of interpretive signs at key locations along pedestrian access routes and at existing foreshore destinations and vantage points (as described and costed under Strategy Action 11.2).
- Replace and enhance existing park furniture within Woolgoolga Lakeside Reserve over the longer term by adopting a consistent theme and suite of new fixtures and materials (as described and costed under Strategy Action 11.1).
- Install new or replacement locally indigenous trees throughout the Lakeside Reserve picnic area as necessary to ensure that the visual character and dominance of existing trees is maintained (as described and costed under Strategy Action 3.4).
- Undertake measures to improve litter prevention and removal (as described under Strategy Action 11.4)

Responsible Agencies	*Timeframe*	*Cost*	*Potential Funding Sources*	*Monitoring*
CCSPT; CHCC (as Trust Manager for car tyre removal)	1 - 2 years	▪ Car tyre removal: $2,000 assuming CHCC staff time ▪ Replace / modify timber wall: $5,000 assuming CHCC staff time	CHCC operating budget	Implementation of this action

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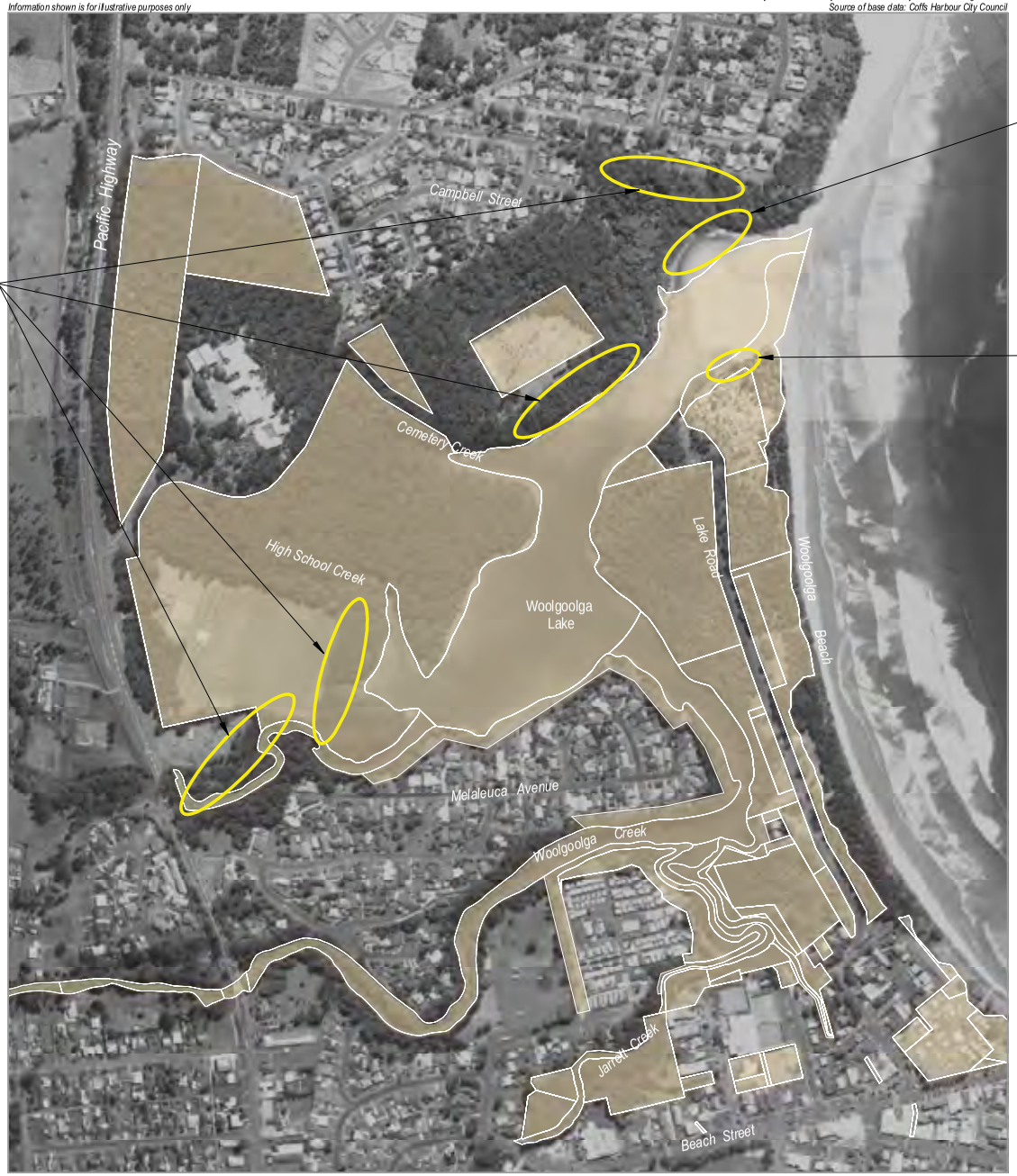
Information shown is for illustrative purposes only

Drawn by: RE Checked by: MVE Reviewed by: TIM Date: August 2012
Source of base data: Coffs Harbour City Council



Strategy Action 13.1:
Preserve the extent of continuous natural vegetation across the surrounding slopes and skyline of the lake to maintain the visual buffer to adjoining land uses such as the playing fields, RTA depot, cemetery and the southern residential fringe of Safety Beach

Strategy Action 13.1:
Investigate simple ways to mitigate the visual impact of the existing treatment such as pocket planting of riparian vegetation over the interim period. Review the method of erosion protection when the existing timber wall requires replacement or upgrading and consider a more visually sympathetic solution

Strategy Action 13.1:
Remove car tyres and protect / reinstate riparian vegetation to strengthen the banks (undertaken in combination with Action 3.4)

LEGEND

Crown land reserves

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NORTH

GeoLINK environmental management and design

Coastal Zone Management Plan - Woolgoolga Lake Estuary
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Strategy 13 - Visual Amenity

Illustration 13.1

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Strategy 14 - Dredging

Anecdotal evidence suggests Woolgoolga Lake was deeper in some locations in the past (around the 1970's), particularly in the mid to lower reaches. Community consultation has highlighted a perceived loss of recreational opportunity due to decreased waterway depth relative to this period.

Historical aerial photography indicates that water depths in 1943 were similar to the period from the 1990's to present. The aerial photography indicates deeper water depths in the 1960's and 1970's. This is considered to be due to very large flooding events in the 1960's and 1970's in combination with large ocean swell events which had the effect of removing a significant amount of marine derived sediment in the lower reaches of the lake. Aerial photographs in subsequent years show the gradual build-up / replenishment of this marine sand and subsequent reduced water depths in the vicinity of the lake picnic area / lake entrance.

Fluctuations in the amount of marine sediment in the estuary and consequent fluctuations in water depths are a natural trend. The major source of sedimentation in the estuary is from marine derived sands which are naturally pushed into the estuary through the entrance by tidal flows assisted by ocean currents and waves. Secondary sources include inputs from the broader catchment from erosion.

Infilling of the estuary by marine derived sands is a natural long-term process that is not easily reversed. Intervention works such as dredging are expensive and generally only achieve short-term benefits in respect to removal of sediment. In addition, dredging can have significant impacts on estuary processes, health, ecology and water quality, for example:

- dredging of marine delta shoals creates an increased sediment demand for infilling of the entrance which would result in a net depletion of sand on Woolgoolga Beach; and
- dredging of the deep mud basin in the lake can modify natural sediment processes and associated benthic metabolism and chemical processes thus degrading water quality and exacerbating eutrophication (Haines, 2006).

Therefore, this estuary management study does not recommend dredging on the basis of the following considerations:

- long-term fluctuations in water depths associated with infilling of the estuary by marine derived sands is a natural process that has occurred prior to the 1970's (water depths in 1943 were similar to present water depths based on aerial photography);
- dredging is expensive and generally only achieves short-term benefits in respect to removal of sediment;
- dredging can have significant impacts on water quality, estuary processes, health, and ecology;
- the lake is part of the Solitary Islands Marine Park and is listed as ''Habitat Protection Zone' which has the objective of protecting habitats and reducing high impact activities (e.g. dredging); and
- an approval process involving NSW government agencies is required before dredging is undertaken and it is considered unlikely that dredging would be approved for Woolgoolga Lake for the primary purpose of increasing water depths for improved swimming amenity.

14.1 Summary of Proposed Actions

For reasons described above, no dredging activities are proposed under this Coastal Zone Management Plan for the Woolgoolga Lake estuary.

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Strategy 15 - Residues from the 1989 Dieldrin/Aldrin Spill

After a fish kill in Woolgoolga Lake in 1989 samples of dead fish revealed high levels of Dieldrin and Aldrin. Sediment samples indicated that a quantity of Dieldrin and Aldrin had been carried into the lake down a drain and the findings of follow up sampling resulted in the prosecution of a local pest control operator. Further sampling, 2 months later showed that Dieldrin levels had not dropped significantly. High levels of Dieldrin and Aldrin were also found in an oyster and a water bird from Woolgoolga Lake.

Water quality and sediment sampling undertaken in 1991 found only trace levels of Dieldrin and Aldrin in sediment and no detectable levels in water (Allen & Fidge 1992). Fish and oysters collected and analysed at the same time also had low levels.

15.1 Summary of Proposed Actions

In consideration of the 1991 findings, the elapsed period of over 20 years, the half-life of Dieldrin / Aldrin being about 2 – 8 years in soil, and the dispersal of sediment from flooding events in the elapsed period, it is considered there is potentially no remaining issue associated with the 1989 Dieldrin / Aldrin spill. However, as a precautionary measure it has been recommended that this issue is considered in the development of a water quality sampling program under Strategy 10. No further actions are proposed.

15.1.1 Related Strategies

- Strategy 2 Stormwater Management and Catchment Pollutants
- Strategy 10 Water Quality Monitoring

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Acronyms

AHD	Australian Height Datum
ANZECC	Australia and New Zealand Environment Conservation Council
APZ	Asset Protection Zone
ASS	Acid sulfate soils
CAP	Catchment Action Plan
CCA	Comprehensive Coastal Assessment
CCSPT	Coffs Coast State Park Trust
CEMAC	Coffs Harbour City Council Coastal Estuary Management Advisory Committee
CHCC	Coffs Harbour City Council
CMSS	Catchment Management Support System
DO	Dissolved Oxygen
DoI	NSW Department of Industries
DPI	NSW Department of Primary Industries
EMS	Estuary Management Study
FCNSW	Forestry Corporation of New South Wales
ICOLL	Intermittently Closed and Open Lake and Lagoon
LGA	Local Government Area
LLS	North Coast Local Land Services
MER	Monitoring Evaluating and Reporting
MHL	Manly Hydraulics Laboratory
MPA	Marine Parks Authority
NRCMA	Northern Rivers Catchment Management Authority (now North Coast Local Land Services)
NRIPAS	Northern Rivers Invasive Plants Action Strategy 2009-2013
OEH	Office of Environment and Heritage, NSW Department of Premier & Cabinet
OEH – PWG	Office of Environment & Heritage – Parks & Wildlife Group
SIMP	Solitary Islands Marine Park
TN	Total Nitrogen
TP	Total Phosphorus
TSS	Total Suspended Solids
WSUD	Water Sensitive Urban Design

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Appendix A

Entrance Management Policy
Woolgoolga Lake Estuary

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Entrance Management Policy

Woolgoolga Lake Estuary

Prepared for: Coffs Harbour City Council

Amended January 2018 for Certification

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1616-1001	Draft for Public Exhibition	22/10/2012	Tim Ruge	Cate Walsh
1616-1007	FINAL	31/01/2013	Tim Ruge	Kim Casson

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Tables

1 Introduction

1.1 Reason for this Policy

The entrance to the Woolgoolga Lake estuary naturally alternates between being open or closed to the ocean. These types of estuaries are known as an ICOLL's - Intermittently Closed and Open Lakes and Lagoons.

Many ICOLL's are manually or artificially opened to the ocean by authorities to 'drain' the estuary for a range of reasons, often to reduce the impacts of flooding around the estuary foreshores. However, artificially opening ICOLL's can impact on estuary health. Therefore a Policy is required to outline to Council if and when the entrance to Woolgoolga Lake estuary should be artificially opened.

1.2 The Purpose of this Policy

The purpose of this Policy is to provide Council with criteria for initiating an artificial opening event and a procedure for artificial opening of the entrance of Woolgoolga Lake estuary.

1.3 Policy Statement

The Woolgoolga Lake Entrance Management Policy aims to:

- minimise interference with the natural opening and closing regime for Woolgoolga Lake estuary;
- minimise flooding of properties from elevated water levels in the estuary;
- minimise flooding of the local sewerage system from elevated water levels in the estuary;
- provide a procedure to address extreme water quality issues in the estuary;
- detail trigger levels for artificial opening of the estuary entrance;
- detail procedures and responsibilities for artificial opening of the estuary entrance; and
- detail procedures for monitoring following an artificial opening event.

This Policy will be implemented by Coffs Harbour City Council in consultation with the appropriate NSW Government agencies.

1.4 Area to Which this Policy Applies

The area covered by this Policy is shown in **Illustration 1.1**. This Policy applies to the catchment of the estuary which comprises the waterway, foreshores and land adjacent to the estuary up to the tidal limit of the tributary creeks and the extent of the drainage catchment directly contributing to the estuary waterways. The area relevant to this Policy also includes the proposed access route along Woolgoolga Beach for excavator access to the estuary entrance.

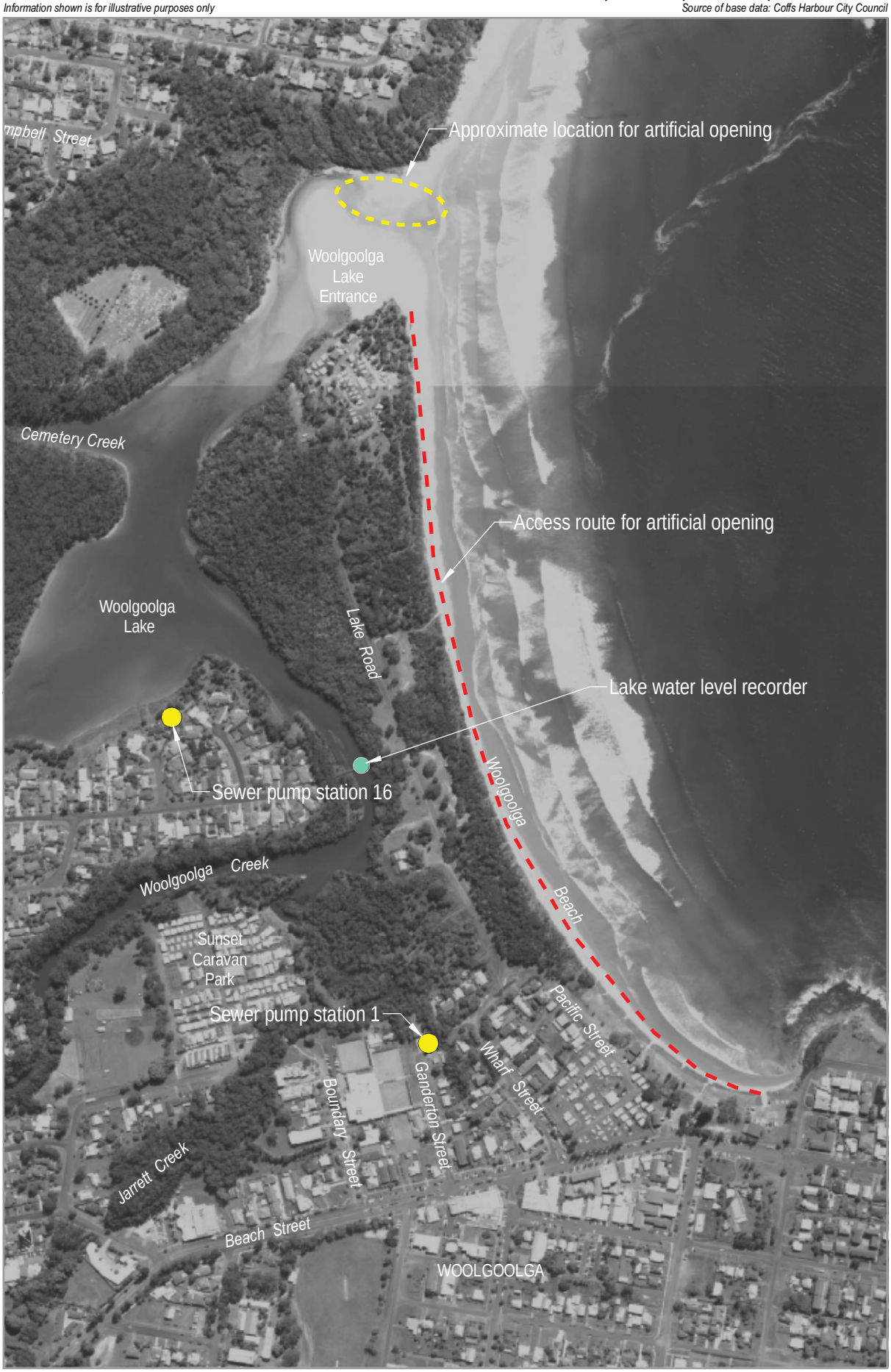
1.5 Policy Context

This Policy has been prepared as part of the Coastal Zone Management Plan (CZMP) for Woolgoolga Lake estuary. CZMP's for estuaries are prepared in accordance with Part 4A of the *Coastal Protection Act 1979* and the *Guidelines for Preparing Coastal Zone Management Plans* (DECCW, 2010). These guidelines require CZMP's for ICOLL's to include an Entrance Management Policy.

A range of NSW legislation and policies are relevant to estuary management and the establishment of any Entrance Management Policy and subsequent artificial opening procedures.

There may be a range of statutory approvals / licensing requirements that need to be sought in order to undertake entrance management activities, for example artificial opening. A range of approvals may be required due to potentially different land tenures, zonings and statutory provisions. These provisions may include DoI - Crown Lands and Water licence under the NSW Crown Lands Act 1989, concurrence from NSW Fisheries for dredge and reclamation work on defined water land under the NSW Fisheries Management Act 1994, or other approvals and licences under the National Parks and Wildlife Act 1974 or the Marine Parks Act 1997.

In addition, the Environmental Planning and Assessment Act 1979 established the framework for development control and assessment in NSW. Certain activities may require approval under this Act and associated State Environmental Planning Policies (SEPP) (e.g. SEPP (Infrastructure) 2007). Certain works or activities may either require development consent or be exempt from requiring consent. In the case where works or activities may be exempt from requiring consent, a Review of Environmental Factors (along with all other relevant approvals / licences) would be required under Part 5 of the EP&A Act before works / activities can be carried out. This is addressed more fully in **Section 3** of this Policy.



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Area to Which Policy Applies

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Woolgoolga Lake Entrance Management Policy
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Illustration 1.1

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2 Background

2.1 Entrance Management Issues

The key issues for entrance management are:

- flooding of low-lying properties; and
- flooding of the local sewerage system.

Secondary issues relate to some community desire for artificial opening of the entrance to 'flush' the lake to improve water quality and reduce sedimentation in the lake. These secondary issues are discussed further in **Section 2.1.4**.

2.1.1 Flood Levels

The highest recorded flood level in Woolgoolga Lake was reported as 2.1 m AHD in 1974 (Bewsher Consulting, 1989).

Flood levels for Woolgoolga Lake are dependent on the flood storage capacity of the lake, outlet conditions and ocean water levels. A 2012 flood study for Woolgoolga Lake (BMT, WBM, 2012) estimated the following peak 1% Annual Exceedance Probability (AEP) event flood levels (i.e. 1 in 100 year event) based on a peak ocean level of 2.4 m AHD and a berm height of 1.5 m AHD:

- 2.6 m AHD for the lake entrance; and
- 2.7 m AHD at the upstream end of the lake.

The entrance berm geometry has the most significant impact on the modelled flood levels in Woolgoolga Lake and the surrounding floodplain. A catchment derived flood event occurring when the entrance is closed will provide a much higher flood level in the lake than a similar one occurring with an open entrance (BMT, WBM, 2012:81-83). The impact of adopting a 1.5m berm over a 1.0m berm is around a 0.4m increase in flood level within Woolgoolga Lake and a 0.3m increase at the Jarrett Creek confluence. The impact of adopting a 1.5m berm over an open entrance condition is around a 1.0m increase in flood level within Woolgoolga Lake and a 0.6m increase at the Jarrett Creek confluence (BMT, WBM, 2012:92).

The 2012 flood study for Woolgoolga Lake considered potential impacts of future climate change for the 1% AEP design event. The most significant impact for Woolgoolga Lake will be from the impact of the predicted increase in berm height, which is in line with the 0.4m and 0.9m sea level rise for the 2050 and 2100 planning horizons (BMT WBM, 2012:89).

Table 2.1 Flood Level Estimates – Woolgoolga Lake

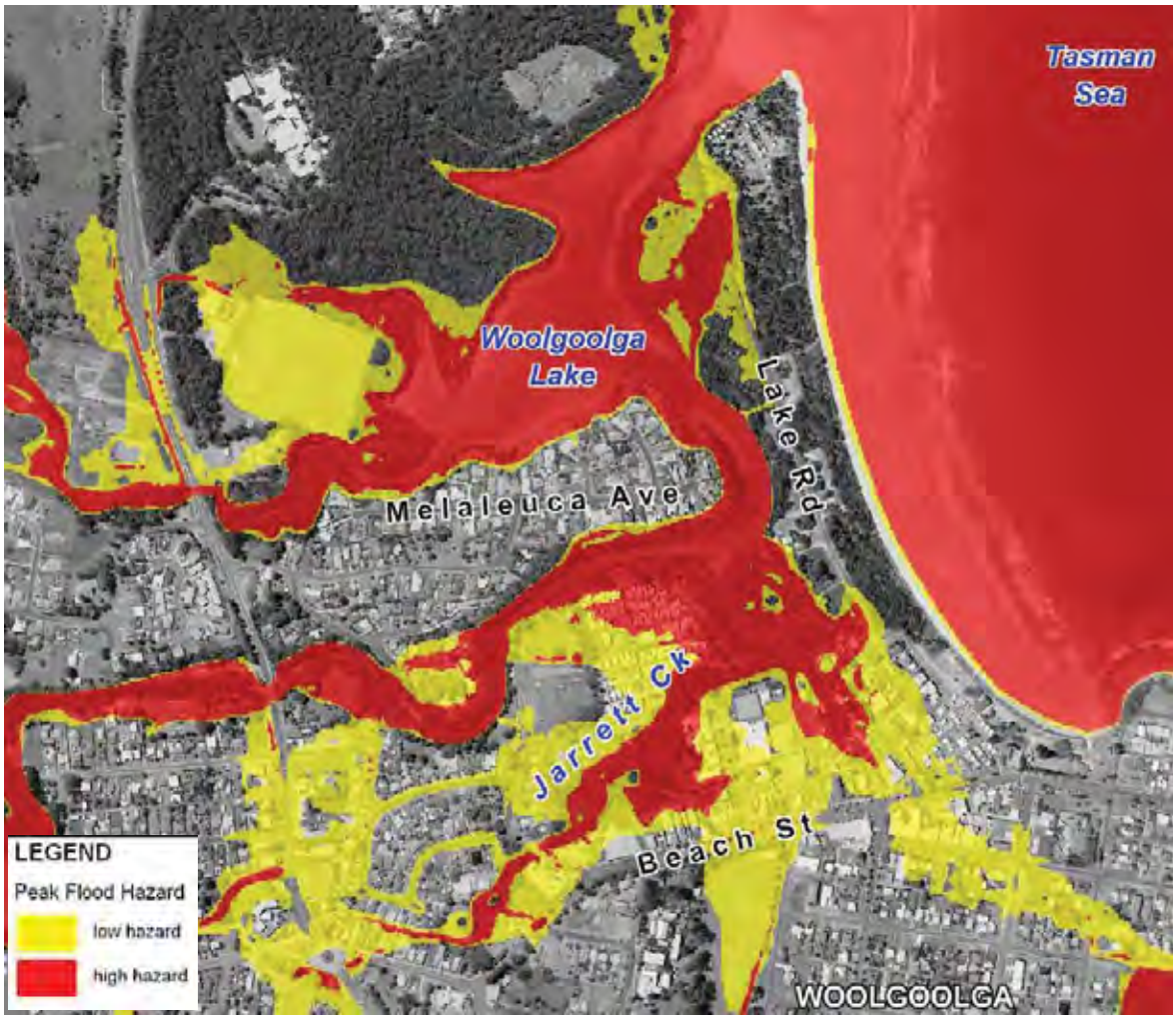
	Flood Levels for the Lake Gauge at the Upstream End of the Lake (m AHD) [1]		
	Immediate[2]	***2050***[3]	***2100***[4]
1% AEP design event	2.9	3.2	3.7

Source: Table 8-6 in BMT, WBM, 2012

2.1.2 Flooding of Properties

Contour information indicates the ground level of low-lying properties adjoining the estuary is generally in the range of 2.0 - 2.5 m AHD. Flooding events in 2011 and 2012 have highlighted at-risk properties in Sunset Caravan Park with ground levels in the range of 1.5 – 2.0 m AHD and some floor levels of permanent sites in the range of 2.13 – 2.23 m AHD. The flood study for Woolgoolga Lake (BMT WBM, 2012) indicates these properties would flood with a 5 year ARI flood event with an entrance berm height of 1.5 m AHD. There are also at-risk properties in Pacific Street, Wharf Street, Boundary Street and Haines Close that were affected by floods in 2011 and 2012.

The flood level estimates in **Table 2.1** indicate other properties are at risk of flooding in the present 1% AEP event. There will be an increased number of properties at risk of flooding as a result of sea level rise. The lower contour levels around the lake are shown in **Illustration 2.1** to provide an indication of properties at risk of flooding in major events. The modelled flood hazards for the 1%AEP event from the 2012 flood study are shown in **Plate2.1**.



Source: Figure A-12 in BMT, WBM, 2012

Plate 2.1 Woolgoolga Flood Study – 1% AEP Modelled Peak Flood Hazards

2.1.3 Flooding of the Sewerage System

Council's previous informal Policy of opening the lake entrance was based on preventing flooding of the adjoining sewerage system. Council's Policy was to open the entrance when lake water levels reached an established flood mark of 1.8 m AHD. This is the level of the overflow pipe from Sewage Pump Station No.1 (PS 1) in Ganderton Street. At lake water levels greater than 1.8 m AHD, water will flood PS 1 causing water to enter the sewerage system causing excess pumping and potentially leading to sewage

entering the lake system via Jarrett Creek. There is another low-lying sewage pump station (PS 16) on the southern foreshore of the lake, however this pump station is higher than PS 1 and does not currently dictate artificial opening of the entrance. Refer to **Illustration 2.2** in regard to the location of these pump stations.

2.1.4 Artificial Opening for Flushing the Estuary

A proportion of community participants in the consultation phase of the CZMP for Woolgoolga Lake estuary indicated a desire for an entrance opening Policy for the purpose of:

- 'flushing' the lake to improve water quality; and
- reducing sediment in the lake.

2.1.4.1 Flushing to Improve Water Quality

Artificially opening estuary entrances is often carried out as a 'quick fix' to redress water quality problems stemming from other causes such as inadequate stormwater treatment from urban areas or inadequate erosion control measures in the catchment. Best practice for estuary management is based on addressing the source of the water quality issues rather than treating the symptoms by artificially opening entrances to 'flush' an estuary. The CZMP for Woolgoolga Lake estuary includes strategies to address the source of current water quality issues.

Water quality data examined in the Estuary Processes Study for Woolgoolga Lake (GeoLINK *et al*., 2011) indicates the water quality of Woolgoolga Lake is generally in good condition with a high natural variance which is characteristic of ICOLLs. Therefore, there is no need for flushing of the estuary to improve water quality under 'normal' conditions. Nevertheless, there may be instances where artificial opening is justified to address extreme water quality issues such as a spill of contaminants into the waterway. This is addressed in **Section 2.5**.

2.1.4.2 Flushing to Reduce Sediment Levels

The major source of sedimentation in the estuary is from marine sands which are naturally pushed into the estuary through the entrance by tidal flows assisted by tidal and ocean currents and waves. Fluctuations in the amount of marine sediment in the estuary and consequent fluctuations in water depths are a natural trend. Secondary sediment sources include inputs from the broader catchment including from bank erosion and erosion associated with catchment land management practices.

The Estuary Processes Study for Woolgoolga Lake (GeoLINK *et al*., 2011) indicates artificial opening of the lake entrance will not have any significant impact on reducing sedimentation in the lake or removing the shoals of marine sand from the entrance. Data indicates that only very large flooding events (eg. the 1974 event), potentially in combination with large ocean swell events, will remove significant quantities of marine sand from the entrance. Artificial opening will only result in minor scouring near the entrance. The effect of this would be short-lived with relatively quick in-filling with marine derived sands. Therefore, this Policy does not recommend artificial opening of the entrance for the purpose of reducing sediment levels in the lake.

2.2 Water Level Monitoring

Water levels in the estuary are automatically monitored and recorded by Manly Hydraulics Laboratory (MHL) ("Woolgoolga Lake" station) and reported online. The water level recorder is located near the footbridge in Woolgoolga Creek, approximately 250 m upstream of the confluence of the creek and the lake as shown in **Illustration 1.1**. The instrument records the water level every 15 minutes.

0 100

North

Lower Contour Levels Around Woolgoolga Lake

GeoLINK

Woolgoolga Lake Entrance Management Policy
1616536

Illustration 2.1

Information shown is for illustrative purposes only

Drawn by: RE Checked by: TIM Reviewed by: TIM Date: October 2012
Source of base data: Coffs Harbour City Council

0 100

North

Location of Sewage Pump Stations

GeoLINK

Woolgoolga Lake Entrance Management Policy
1616535

Illustration 2.2

2.3 Natural Breakout Water Levels

Under natural conditions, ICOLL entrances open over a relatively wide range of water levels termed the 'natural breakout range'.

An occasional artificial opening of the entrance within the natural breakout range is not likely to have a significant environmental impact since it falls within the expected natural variation. However, over the longer term, numerous artificial openings especially at a comparatively low water level are likely to have a significant environmental impact since the natural frequency and duration of opening and closing to the ocean will be significantly altered.

Lake water level records for Woolgoolga Lake for the period of 1982 to 1988 indicate a natural breakout range of 1.2 to 1.8 m AHD. This was a period with varying rainfall years from very dry to very wet with some average years. Lake water level records for the period of 2007 to 2011 (a high rainfall period) indicate a similar 'natural breakout range' of 1.2 to 1.6 m AHD.

Table 2.2 summaries the water levels experienced in the lake during non-flood periods and for major flood events. The table includes estimates of future water levels based on the simple addition of predicted sea level rise.

Table 2.2 Lake Water Levels for Non-Flood and Flood Periods – Existing and Future

	Existing[1] (2011)	***2050[2]***	***2100[3]***
Non-Flood Periods			
Average water level (m AHD)	0.7	1.1	1.6
Maximum water level (m AHD)	1.8	2.2	2.7
Minimum water level (m AHD)	0.2	0.6	1.1
90th percentile water level[4] (m AHD)	1.1	1.5	2.0
Natural breakout range[5] (m AHD)	1.2 – 1.8	1.6 – 2.2[6]	2.1 – 2.7[6]
Flood Events			
1 in 100 Year Flood (at upstream end of lake)	2.9[7]	3.2[7]	3.7[7]

Notes: 1. Based on 1982 – 1988 data, 2004 data and 2007 – 2011 data in Estuary Processes Study (GeoLINK *et al*, 2011);
2. Existing water level plus 0.4m sea level rise;
3. Existing water level plus 0.9m sea level rise
4. The water level greater than 90 percent of all recorded water levels
5. Water levels at which a closed entrance naturally opens
6. Estimates only – based on the assumption that opening mechanism remains unchanged and water levels will increase by the same amount as sea level rise
7. Source: Table 8-6 in BMT, WBM, 2012

2.3.1 Rate of Water Level Rise During Flooding

The maximum rate of water level rise in the lake following a rainfall event has been estimated from an analysis of hourly water level records for the period of 2007 to 2011 (a high rainfall period). The analysis provided the following generalisations or indication of maximum rate of water level rise:

- 0.3 m rise in water level over 12 hours associated with approximately 120 mm of rainfall; and
- 0.6 m rise in water level over 24 hours associated with approximately 100 mm of rainfall; and
- 0.9 m rise in water level over 48 hours associated with approximately 100 mm of rainfall.

2.4 Trigger Water Levels

2.4.1 Opening Trigger Level

Based on the details in **Sections 2.1.2** and **2.1.3**, the lower desired water level in the lake to avoid flooding of properties and the sewerage system is approximately 1.6 m AHD. This level is near the upper limit of the natural breakout range (1.2 – 1.8 m AHD). Artificially opening the entrance at this level will be generally infrequent and will not have any significant impact on the natural opening and closing regime of Woolgoolga Lake and therefore unlikely to have a significant environmental impact on the estuary. Therefore, a lake water level of **1.6 m AHD** is recommended as an artificial opening trigger water level.

The opening trigger water level may need to be adjusted in the future in response to:

- sea level rise;
- implementation of flood mitigation measures;
- augmentation of the sewerage system;
- or other factors.

2.4.2 Alert Trigger Level

In consideration of the rate of rise of water levels in the lake (**Section 2.3.1**) it is recommended that an alert trigger level of **1.30 m AHD** (with a closed entrance) is used to initially alert Council to monitor the potential for significant increases in water levels. This should provide between 12 and 24 hours of warning prior to the lake reaching a level of 1.6 m AHD in the event of significant rainfall.

The alert trigger water level may need to be adjusted in the future in response to sea level rise or other factors.

2.5 Other Triggers for Artificial Opening

Artificial opening may be required to address extreme water quality issues such as contaminant spills where it may be desirable to provide some 'draining' of the lake. However, it is not considered practical to include triggers to address a broad range of potential water quality scenarios. A range of factors would need to be considered during a water quality crisis, such as:

- environmental and public health risks posed by the water quality issue;
- the extent to which artificial opening will mitigate the water quality issue; and
- consequent environmental and public health risks along the adjoining coastline following artificial opening of the lake.

This Policy does not include triggers for water quality issues due to the broad range of potential water quality scenarios and the associated uncertainties. It is recommended that any water quality crisis is assessed on an individual basis. If artificial opening is considered an appropriate option to address a water quality crisis, then this Policy should be referred to in undertaking the opening procedure.

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3

Approvals

3.1 Statutory Provisions

The area of Woolgoolga Lake and any proposed entrance management works would be located within the Coffs Harbour LGA. The actual water body of Woolgoolga Lake is not zoned, but identified as "Creeks" under the Coffs Harbour Local Environmental Plan (CHLEP) 2000. Land immediately adjacent to and surrounding the defined water body of Woolgoolga Lake is zoned as 6A Open Space and Public Recreation under the CHLEP 2000.

Specifically, for the purpose of flooding mitigation works, Clause 50 of the State Environmental Planning Policy (Infrastructure), 2007 (ISEPP) applies, allowing such works to be carried out on any land and precludes them from requiring development consent. Clause 50 of ISEPP 2007 states the following:

Development permitted without consent

(1) Development for the purpose of flood mitigation work may be carried out by or on behalf of a public authority without consent on any land.

(2) A reference in this clause to development for the purpose of flood mitigation work includes a reference to development for any of the following purposes if the development is in connection with flood mitigation work:

(a) construction works,

(b) routine maintenance works,

(c) environmental management works.

Although flood mitigation works would be permitted without consent on any land, the requirements of Part 5 of the EP&A Act 1979 must be fulfilled and Council would be required to prepare a REF for proposed artificial opening of Woolgoolga Lake. The REF would outline the nature and extent of the proposal, what would be the trigger and determining factors for proceeding with artificial opening and identify and address any potential environmental effects which may result from such works. Hence the REF would also include mitigation measures and safeguards for the protection of the environment during artificial opening works. The REF would need to be consistent with the adopted CZMP and Entrance Management Policy for Woolgoolga Lake.

In conjunction with preparation of the REF, Council would be required to consult with and seek any relevant licences and or concurrence from other state government agencies. These would include:

- DoI - Crown Lands & Water under the Crown Lands Act 1989;
- Department of Primary Industries - Fisheries under the Fisheries Management Act 1994;
- Marine Parks Authority under the Marine Parks Act 1997;
- WaterNSW under the Water Management Act 2000; and
- Office of Environment and Heritage (National Parks and Wildlife) under the National Parks and Wildlife Act 1974.

3.1.1 Crown Lands Act 1989

Due to the artificial opening works affecting the waterway of Woolgoolga Lake and the coastline, it is likely that such works would affect Crown Land. Artificial opening of the entrance will require authority by way of licences from the Crown under Part 4, Division1 of the Crown Lands Act 1989.

3.1.2 Fisheries Management Act 1994

The objectives of the Fisheries Management Act 1994 *are to conserve, develop and share the fishery resources of the State for the benefit of present and future generations.* The provisions of Division 3, Part 7 of the Act are likely to be relevant to any works associated with the artificial opening of Woolgoolga Lake. The provisions relate to the protection of aquatic habitat. Although flood mitigation works would be precluded from requiring consent under ISEPP, the provisions of the Fisheries Management Act 1994 are still applicable and as part of the REF process concurrence from the Department of Primary Industries Fisheries would be required for certain activities. **Table 3.1** outlines the relevant provisions of the Act that would apply to the artificial opening of Woolgoolga Lake.

Table 3.1 Activities requiring concurrence under the Fisheries Management Act 1994

Fisheries Management Act 1994	Sections 198-202	Concurrence is required from the Minister, Department of Primary Industries (Fisheries) for dredge and reclamation works on defined water land. The nature of artificial opening would constitute dredge works and also potentially reclamation works in watered land. Hence a permit and concurrence from s required prior to commencement of any works.
	Sections 219-220	Concurrence is required when barriers to the movement of fish including water course crossings are to be constructed or modified. Any proposed artificial opening is unlikely to create a barrier to the movement of fish. However such specifics would need to be confirmed within the REF.
	Sections 204-205	Any artificial opening works would likely be restricted to the sand berm. Any works must not affect mangroves or other protected marine vegetation. If marine vegetation would be harmed by flood mitigation works a permit must be sought from the Minister before works commence. Clause 205 (2) states that *A person must not harm any such marine vegetation in a protected area, except under the authority of a permit issued by the Minister under this Part.* It is unlikely that any such vegetation would be affected by works associated with the artificial opening of Woolgoolga Lake, however the REF must confirm this.
	Schedules 4, 4A, 5 and 6	The REF prepared for works associated with artificial opening would need to consider any presence of local threatened aquatic habitat for flora or fauna. Thus Key Threatening Processes (KTPs) would need to be considered in preparation of the REF. The following KTPs may be relevant and required consideration: ▪ *Degradation of native riparian vegetation along NSW water courses*. ▪ *Installation and operation of instream structures and other mechanisms that alter natural flow regimes of rivers and streams.*

3.1.3 Marine Parks Act 1997

As Woolgoolga Lake forms park of the Solitary Islands Marine Park, Council would be required to obtain a permit / concurrence from the Marine Park Authority / the Minister under the Marine Parks Act 1997 in order to undertake any works on land affected by the Marine Park and any associated zoning. Preparation of the REF would need to consider these factors and seek the relevant concurrence / permit.

3.1.4 Water Management Act 2000

A controlled activity approval under the Water Management Act 2000 (WM Act) is required for certain types of developments and activities that are carried out in or near a river, lake or estuary (water land). Under the WM Act, a controlled activity means:

- the erection of a building or the carrying out of a work (within the meaning of the Environmental Planning and Assessment Act 1979), or
- the removal of material (whether or not extractive material) or vegetation from land, whether by way of excavation or otherwise, or
- the deposition of material (whether or not extractive material) on land, whether by way of landfill operations or otherwise, or
- the carrying out of any other activity that affects the quantity or flow of water in a water source.

Artificial opening of Woolgoolga Lake would constitute a controlled activity under the WM Act. However under the Water Management (General) Regulation 2011, Clause 38 Controlled activities—public authorities, states: *A public authority is exempt from section 91E (1) of the Act in relation to all controlled activities that it carries out in, on or under waterfront land.*

Although Coffs Harbour City Council would be exempt from requiring a Controlled Activity Approval, Clause *37, Condition applying to all exemptions under this Subdivision,* of the Regulations states:
An exemption conferred under this Subdivision is subject to the condition that the person by whom the relevant controlled activity is carried out must comply with applicable requirements (if any) of the Minister that are published in the Gazette, or notified in writing to the person, for the purposes of this clause and that are for the protection of:
(a) the waterfront land on which the activity is carried out, or
(b) any river, lake or estuary to which that land has frontage.

3.1.5 National Parks and Wildlife Act 1974

The Woolgoolga Lake system falls within the Coffs Coast Regional Park. The park was created through a partnership of Council and the National Parks and Wildlife Service (now within OEH). The National Parks and Wildlife Act 1974 applies if the park is a reserve made under the Act. The Park's management is guided by a Trust Board. Preparation of an REF for artificial opening works would need to determine whether or not the park is a reserve under the Act and hence consultation / concurrence are required with OEH / National Parks and Wildlife Service. Consultation with the Trust Board would be required whether or not the park is affected by the Act. The REF would also need to consider any management plan that has been prepared for the park.

3.2 Summary of Potential Approvals

Artificial opening of the entrance for the purpose of flood mitigation is permitted without consent under Clause 50 of the State Environmental Planning Policy (Infrastructure), 2007. However the requirements of Part 5 of the EP&A Act 1979 must be fulfilled and Council is required to prepare a REF for proposed artificial opening of the entrance to Woolgoolga Lake estuary. The REF needs to be consistent with the adopted CZMP and Entrance Management Policy for Woolgoolga Lake estuary.

Preparation of the REF will involve consultation with relevant state government agencies. This will confirm the necessary approvals and licences required for artificial opening of the entrance. Preliminary assessment indicates the following approvals and licences may be necessary:

- a license from the DoI - Crown Lands & Water under the Crown Lands Act 1989;
- a permit and concurrence from the Minister, Department of Department of Primary Industries (Fisheries) under the Fisheries Management Act 1994 pursuant to Sections 198-202 for dredge and reclamation works on defined water land (the nature of artificial opening would constitute dredge works and also potentially reclamation works); and
- a permit / concurrence from the Marine Park Authority / the Minister under the Marine Parks Act 1997 as Woolgoolga Lake forms park of the Solitary Islands Marine Park.

The Woolgoolga Lake system falls within the Coffs Coast Regional Park, which was created through a partnership of Council and the National Parks and Wildlife Service. Consultation with the National Parks and Wildlife Service and Trust Board is required to determine if any approvals are required under the National Parks and Wildlife Act 1974.

It is noted that a Controlled Activity Approval under the Water Management Act 2000 is not required due to the Water Management (General) Regulation 2011, Clause 38 Controlled activities - public authorities, which states: *A public authority is exempt from section 91E (1) of the Act in relation to all controlled activities that it carries out in, on or under waterfront land.* However, Council is still required to follow any applicable guidelines of WaterNSW under the Water Management Act 2000.

4

Artificial Opening Procedure

4.1 Decision Making Process

The logic of the decision making process relates to avoiding flooding of low-lying properties and the local sewerage system. Nuisance flooding of low-lying properties occurs at lake water levels of approximately 1.6 m AHD. At higher levels of approximately 1.8 m AHD, water will flood Sewage Pump Station No.1 in Ganderton Street causing excess pumping and potentially leading to sewage entering the lake system via Jarrett Creek.

The general decision making process is shown in the flow chart in **Illustration 4.1 and 4.2** and involves:

- An alert is issued when the entrance is closed and lake water level reaches 1.3m AHD. These conditions are to be considered in association with BOM weather forecasts.
- The process proceeds into a 'standby' phase during which the entrance conditions are assessed, sand berm height and rain forecasts are monitored.
- The process proceeds into the 'deployment' phase when the entrance sand berm is higher than 1.6m AHD, and significant rainfall* is forecast that is likely to raise lake levels above 1.6m AHD. At this point Council will lower the entrance sand berm height to 1.6m AHD to allow the lake to 'overtop' naturally if it reaches this level.

4.1.1 Alert Phase

The alert level of 1.30 m AHD will be based on water level data automatically monitored at 15 minute intervals by Manly Hydraulics Laboratory (MHL) at Woolgoolga Lake station at the footbridge in Woolgoolga Creek (refer to **Illustration 1.1**). An alert will be automatically sent to Council if the level of 1.30 m AHD is reached and the water level records indicate the entrance condition is closed.

Following the 1.30 m AHD alert, Council will monitor rainfall forecasts to predict if water levels are likely to rise significantly. If significant rainfall / water level rise is considered likely then Council will initiate "standby" phase.

4.1.2 Standby Phase

The "standby" phase will involve:

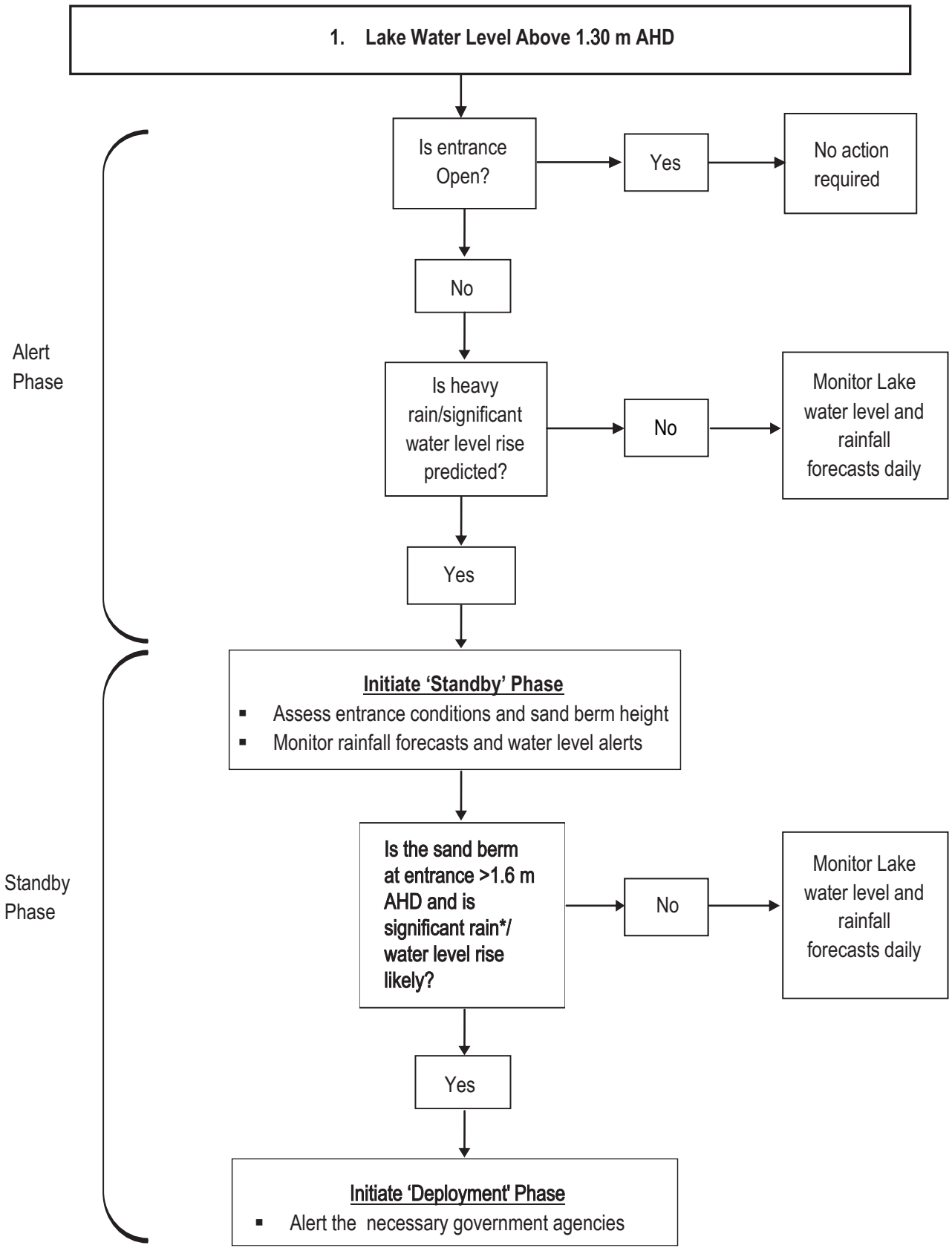
- Council assessing entrance conditions and measures the sand berm height at the entrance
- Council monitoring rainfall forecasts and water level alerts.

If the sand berm is higher than 1.6m AHD, and significant rainfall* is forecast or water levels rise is likely to raise lake levels above 1.6m AHD, then Council:

- alerts relevant state government agencies; and
- proceeds to 'deployment phase.

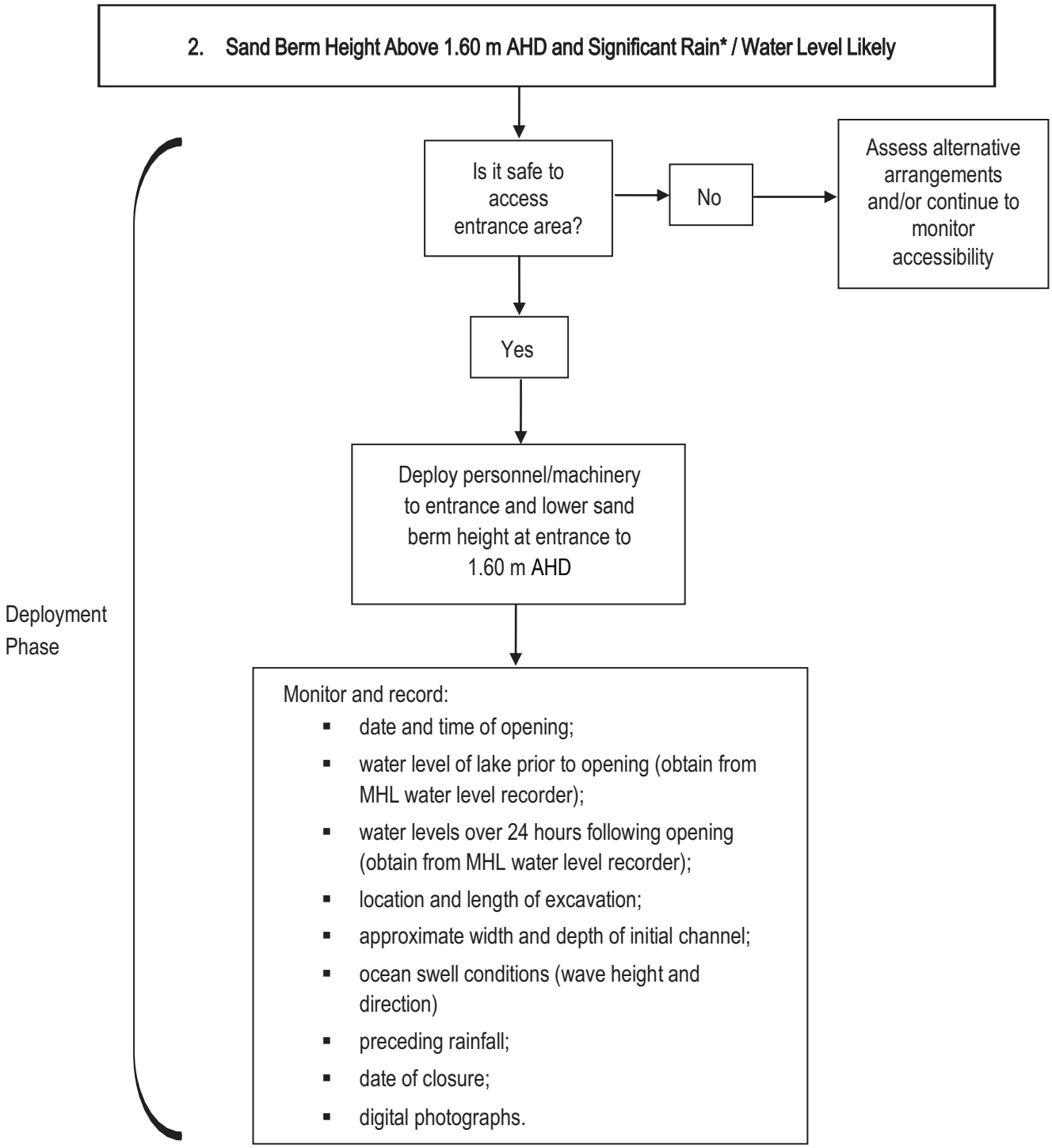
Note: *Significant rainfall is deemed to be a forecast of more than 100mm rainfall over a 24 hour period.

Illustration 4.1 Artificial Opening Decision Making Flowchart – Alert Phase and Standby Phase



Note: * Significant rain is a forecast of more than 100mm over 24 hours

Illustration 4.2 Artificial Opening Decision Making Flowchart – Deployment Phase



Note: * Significant rain is a forecast of more than 100mm over 24 hours

4.1.3 Deployment Phase

During this phase Council's personnel and machinery will be deployed to the entrance if the site assessment considers it appropriate and safe. The recommended access route will be used unless the site assessment indicates an alternative route.

Council will lower the entrance sand berm height to 1.6m AHD to allow the lake to 'overtop' naturally if it reaches this level.

The location and distance of the crest of the sand berm will vary. It is expected that the excavated channel will be a maximum of 4.8m wide (two bucket widths) stretching from the lake shoreline and excavated down to a level no lower than 1.6m AHD at the crest and sloping towards the ocean.

Following the excavation works, monitor and record the following:

- date and time of excavation works;
- location, length and width of excavation;
- water level of lake prior to works (obtain from MHL water level recorder);
- water levels over 24 hours following works
- tide and ocean swell conditions (wave height and direction)
- rainfall;
- digital photographs.

4.2 Responsibilities for Artificial Opening

Coffs Harbour City Council is responsible for artificial opening of the entrance.

5 Policy Updates

5.1 Review and Update of this Policy

This Policy and the associated REF should be reviewed every five years or in response to:

- outcomes of a future Floodplain Risk Management Study and Plan for Woolgoolga Lake;
- augmentations to components of the local sewerage system that are impacted by flood levels;
- legislation changes; and
- any other significant factors relevant to artificial opening of the entrance of Woolgoolga Lake estuary.

Review of the Policy will include analysis of all monitoring data collected over that period to ensure that predictions, assumptions and trigger levels outlined in the current Policy and REF are correct or appropriate. This will include a review of changes to climate change and sea level rise predictions and consequent impacts to this Policy.

Note: Any updates to this Policy will be presented on the CHCC Environment page under 'Our Coast' 'Estuary Management Plans' in the Woolgoolga Lake page.

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Acronyms

AHD	Australian Height Datum
CEMAC	Coffs Harbour City Council Coastal Estuary Management Advisory Committee
CHCC	Coffs Harbour City Council
CHLEP	Coffs Harbour Local Environmental Plan
CZMP	Coastal Zone Management Plan
ICOLL	Intermittently Closed and Open Lake and Lagoon
ISEPP	State Environmental Planning Policy (Infrastructure), 2007
LGA	Local Government Area
MHL	Manly Hydraulics Laboratory
PS	Pump Station
REF	Review of Environmental Factors
SEPP	State Environmental Planning Policy

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Appendix B

Woolgoolga Lake Reserve Foreshores Upgrade - Design Development

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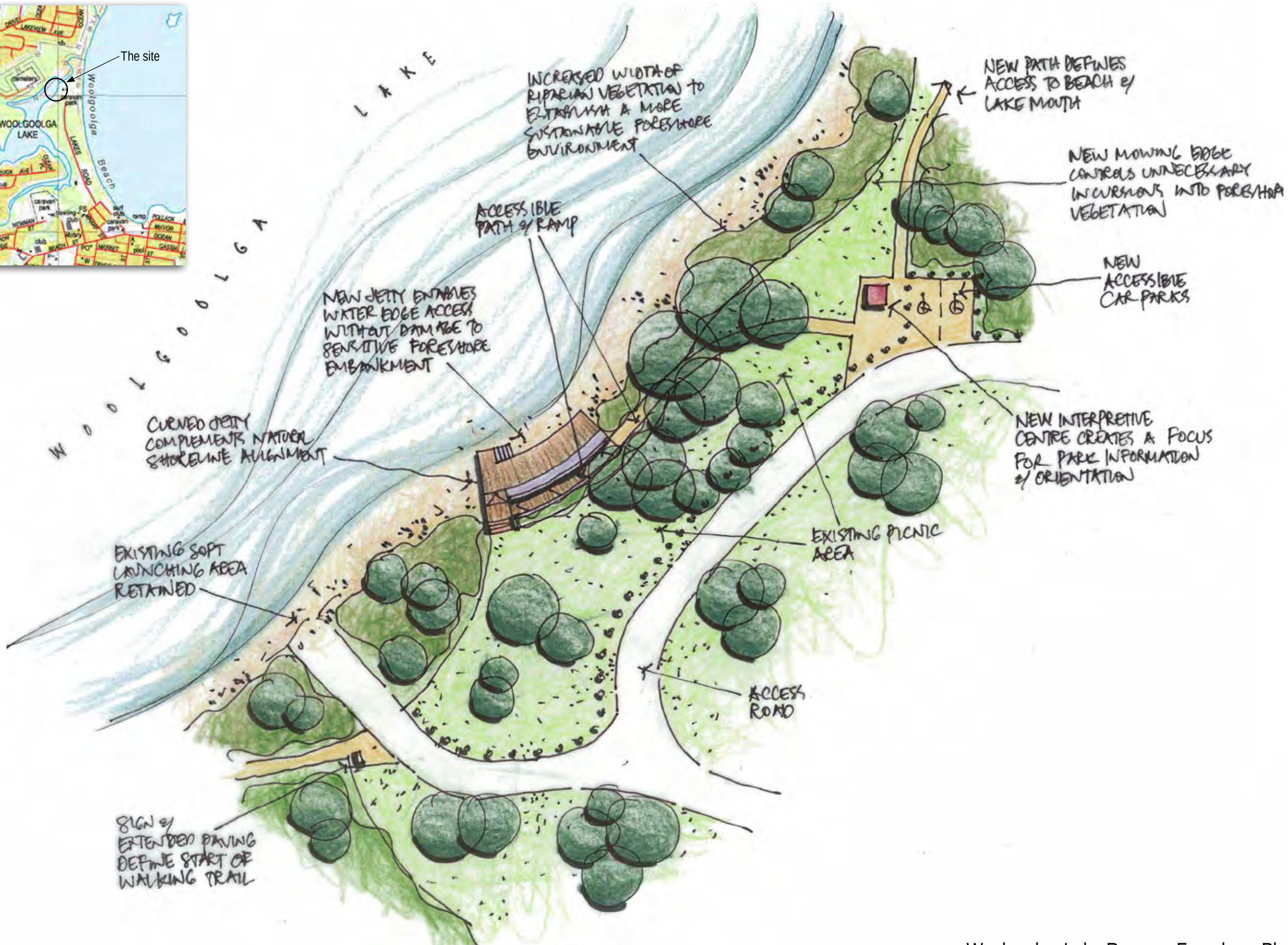
Information shown is for illustrative purposes only

Drawn by: RE Checked by: GAM Reviewed by: TIM Date: April 2012
Source of base data: Topographic Map NSW



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Appendix C

Funding Sources

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Fund Name	*Funding Body(ies)*	*Objectives and Priorities*	*Web Address*
Various – jointly administered by North Coast LLS	▪ Various – jointly administered by North Coast LLS	▪ Community capacity targets. These include targets with respect to the awareness, knowledge and skills of the community in relation to Natural Resource Management, and the levels of engagement of the community. These are specifically: - CCB1, Awareness knowledge and skills; - CCB2, Community engagement; and - CCB3, Community support. ▪ Land use planning targets. The relevant land use planning targets relate to aboriginal cultural integration in the planning process, environmental assets and significant farmland protection, landuse conflict within and adjacent to key environmental and farming assets and the integration of natural resource assets into planning. They are specifically; - LUP1, Aboriginal cultural integration; - LUP2, Environmental assets/rural production areas; - LUP3, Land use conflict and key natural resources; and - LUP4, Natural resource integration. ▪ Biodiversity targets. These targets relate to the area of land under secure conservation management, habitat connectivity, the mitigation of threats to biodiversity, threatened species management, sustainable management of terrestrial and aquatic ecosystems and habitat rehabilitation and revegetation. The targets are; - B1, Secure conservation management; - B2, Habitat connectivity; - B3, Biodiverstiy threat mitigation; - B4, Threatened species; - B5, Biodiversity management and enhancement; and - B6, Habitat rehabilitation and revegetation.	Funding (General): http://www.northern.cma.nsw.gov.au/get-involved/funding Current Funding Opportunities: http://www.northern.cma.nsw.gov.au/get-involved/funding

Fund Name	*Funding Body(ies)*	*Objectives and Priorities*	*Web Address*
		▪ Water targets. These targets relate to the integrated management of urban water cycles and community education about and monitoring of water resources. The targets are: - W1, River structure riparian vegetation and fish passage; - W2, Urban water cycle management; - W3, Water information and education; and - W4, Aquifer health and river flow. ▪ Coastal targets. The relevant coastal targets relate to the management and assessment of coastal lakes and estuaries. The targets are: - C1, Coastline; and - C2, Estuaries and coastal lakes. ▪ Marine targets. The relevant marine targets relate to management practices that reduce threats to and impacts on the marine environment. The targets are: - M1, Marine research and planning; - M2, Best practice; - M3, Marine protected areas; and - M4, Improved marine environement management practices. ▪ Soil and land resource targets. The most relevant of the soil and land targets relates to the area of high risk acid sulfate soils under active management. The complete list of targets is: - L1, Soil health; - L2, Acid sulphate soils; and - L3, Soil conservation/remediation.	

Fund Name	*Funding Body(ies)*	*Objectives and Priorities*	*Web Address*
Caring for Our Country	Jointly administered by the Australian Government: ▪ Department of Agriculture, Fisheries and Forestry; and ▪ Department of Sustainability, Environment, Water, Population and Communities	*Objectives:* ▪ to achieve an environment that is healthy, better protected, well-managed, resilient and provides essential ecosystem services in a changing climate.	http://www.nrm.gov.au/index.html
		Priorities: ▪ the National Reserve System; ▪ biodiversity and natural icons; ▪ coastal environments and critical aquatic habitats; ▪ sustainable farm practices; ▪ natural resource management in northern and remote Australia; and ▪ community skills, knowledge and engagement.	
Estuary Management Program	NSW Department of Environment and Heritage	*Objectives:* ▪ to provide support to councils to improve the health of NSW estuaries; and ▪ understand the potential risks from climate change. Support provided to councils under these programs includes financial assistance to: ▪ prepare estuary management plans and supporting studies; and ▪ carry out projects to improve estuary health.	http://www.environment.nsw.gov.au/coasts/InfoCoastEstFloodGrants.htm
		Priorities: ▪ updating estuary plans to consider climate change impacts, including sea level rise; ▪ estuary health monitoring and improvement; and ▪ focusing on high-hazard coastal areas and stressed estuaries. Grant offers are subject to availability of funds for each financial year and State-wide priorities. Funding of up to 50% of a project's costs will normally be offered for successful grant applications.	

Fund Name	*Funding Body(ies)*	*Objectives and Priorities*	*Web Address*
Coastal Management Program	NSW Department of Environment and Heritage	*Objectives:* ▪ to provide support to local councils to manage the risks from coastal hazards such as coastal erosion; and ▪ and to restore degraded coastal habitats. Support provided to councils under these programs includes financial assistance to: ▪ prepare coastline, and coastal zone management plans and supporting studies; ▪ carry out projects to reduce risks associated with coastal hazards and improve coastal environments.	http://www.environment.nsw.gov.au/coasts/InfoCoastEstFloodGrants.htm
		Priorities: ▪ updating coastal hazard studies to incorporate sea-level rise benchmarks; and ▪ focusing on high-hazard coastal areas and stressed estuaries. Grant offers are subject to availability of funds for each financial year and State-wide priorities. Funding of up to 50% of a project's costs will normally be offered for successful grant applications.	
Floodplain Management Program	NSW Department of Environment and Heritage	*Objectives:* ▪ to reduce the impacts of flooding and flood liability on communities; and ▪ to reduce private and public losses resulting from floods, utilising ecologically positive methods wherever possible.	http://www.environment.nsw.gov.au/coasts/InfoCoastEstFloodGrants.htm
		Priorities: Provides financial support to councils and eligible public land managers to: ▪ make informed decisions on managing flood risk by preparing floodplain risk management plans (and associated background studies) under the floodplain risk management process; ▪ implement floodplain risk management plans to reduce flood risk to both existing and future development, and reduce losses through a range of property, flood and response modification measures as outlined in the manual; and	

Fund Name	*Funding Body(ies)*	*Objectives and Priorities*	*Web Address*
		▪ provide essential information to the State Emergency Service to enable the effective preparation and implementation of local flood plans to deal with flood emergency response. Assistance under the program is normally offered by the State Government providing $2 for every $1 provided by the council.	
Environmental Trust Grants	NSW Department of Environment and Heritage	*Objectives:* ▪ to encourage and support restoration and rehabilitation projects; ▪ to promote research into environmental problems of any kind; ▪ to promote environmental education in both the public and private sectors; ▪ to fund the acquisition of land for the national parks estate; ▪ to fund the declaration of areas for marine parks and for related purposes; ▪ to promote waste avoidance, resource recovery and waste management (including funding enforcement and regulation and local government programs); ▪ to fund environmental community groups; and ▪ to fund the purchase of water entitlements for the purpose of increasing environmental flows for the State's rivers and restoring or rehabilitating major wetlands.	http://www.environment.nsw.gov.au/grants/envtrust.htm
		Relevant Programs: ▪ the urban sustainability program funds projects carried out by local councils in partnership with the community that protect and restore the urban environment; ▪ the lead environmental community groups program provides administrative funds for environmental organisations that work with their communities to conserve the environment; ▪ the environmental restoration and rehabilitation program funds projects that restore or rehabilitate degraded areas, or protect important ecosystems and habitats, prevent or minimise future environmental damage and enhance the quality of specific environmental resources; ▪ the environmental education program supports projects that increase commitment to protecting the environment and promoting sustainable behaviour; ▪ the environmental research program funds projects managed by educational	

Fund Name	*Funding Body(ies)*	*Objectives and Priorities*	*Web Address*
		institutions and government agencies that research local solutions to environmental problems and ways of operating that are less harmful to the environment; ▪ the eco schools program funds schools so they can involve their students and the community in developing and implementing environmental management projects; and ▪ the protecting our places program supports projects that restore or rehabilitate Aboriginal land or land that is culturally significant to Aboriginal people, or that educate Aboriginal and other communities about the environment.	
Grants to Voluntary Environment Heritage Organisations (GVEHO)	Australian Government: Department of Sustainability, Environment, Water, Population and Communities	*Objectives:* ▪ help eligible community based environment and heritage organisations to value, conserve and protect Australia's natural environment and historic heritage by assisting with their administrative funding. *Priorities:* ▪ funds provided may be used to assist with salaries and salary on-costs for executive and administrative staff; office accommodation rental; electricity, gas, phone and other similar charges; essential office supplies and equipment; staff and volunteer training; photocopying and printing costs; and travel costs incurred on behalf of the organisation.	http://www.environment.gov.au/about/programs/gveho/index.html
NSW Recreational Fishing Trusts	NSW Department of Primary Industries	*Objectives:* ▪ projects that improve recreational fishing in NSW; ▪ anyone can apply for funding from the Recreational Fishing Trusts, including fishing clubs and organisations, universities, councils, community groups, individuals and so on. Joint applications are also encouraged; and ▪ funding applications must relate to the improvement of recreational fishing. *Priorities:* ▪ recreational fisheries enhancement; ▪ angler education and information; ▪ research on recreational fishing; ▪ recreational fisheries access and facilities; and ▪ recreational fisheries sustainability.	http://www.dpi.nsw.gov.au/fisheries/recreational/licence-fee/apply-for-funds

Fund Name	*Funding Body(ies)*	*Objectives and Priorities*	*Web Address*
NSW Maritime Infrastructure Program: Better Boating Program Regional Infrastructure Grants	NSW Transport Maritime	*Objectives:* ▪ the Better Boating Program provides waterways infrastructure for the benefit of the boating community and the marine sector on New South Wales waterways; and ▪ the BBP provides individual grant contributions to proponents such as Local Government, State agencies, boating organisations and community groups for the development of public boating infrastructure.	http://www.maritime.nsw.gov.au/mpd/infra_program.html
		Priorities: Consideration for BBP funding will only be given to those projects that are: ▪ principally infrastructure works of a lasting nature; ▪ intended to greatly improve current amenities (or addresss the lack thereof); ▪ located in a readily accessible public area with unrestricted public access; ▪ for use of or available to, a broad cross-section of the public boating community; ▪ situated either on public land or land owned by the Local Council, the Crown or NSW Maritime; ▪ able to be commenced within 6 months of the approval of the grant and be completed within 18 months from this approval date. It should be noted that any funding grants not utilised within that period may be withdrawn; ▪ supported in writing by key stakeholders, including the Local Council; and ▪ able to meet the Program's criteria for assessment and are submitted by the nominated closing date.	
Raising National Water Standards Program	Australian Government: National Water Commission	*Objectives:* ▪ support for projects that are improving Australia's national capacity to measure, monitor and manage our water resources.	http://www.nwc.gov.au/www/html/347-introduction-to-rnws.asp
		Priorities: ▪ funds are directed at activities across three strategic investment areas: - advancing the implementation of the National Water Initiative; - improving integrated water management across Australia; and - improving knowledge and understanding of our water resources. ▪ more than 175 Raising National Water Standards projects have been funded under the	

Fund Name	*Funding Body(ies)*	*Objectives and Priorities*	*Web Address*
		following themes: - water accounting; - emerging water markets; - water planning and management; - knowledge and capacity building; - irrigation and other rural water; - water-dependent ecosystems; - integrated urban water management; - groundwater; - northern rivers; - national assessment of water resources; and - Northern Australia water futures assessment.	
Country Towns Water Supply and Sewage Program	NSW Department of Primary Industries Office of Water	*Objectives:* ▪ a major government reform program that provides management, technical and financial support to local water utilities (LWUs) in the provision of water supply and sewerage services to country towns in NSW.	http://www.water.nsw.gov.au/Urban-water/Country-town-water/default.aspx
		Priorities: ▪ management assistance through the Best-Practice Management of Water Supply and Sewerage Guidelines; ▪ technical assistance through: - regular inspections and advice on water and sewage treatment works operational problems; - conducting water supply and sewerage operator training seminars/ courses; - pre commissioning inspections of Fluoridation Plants and technical assistance to NSW Health to enable councils to comply with requirements under the Fluoridation of Public Water Supplies Act 1957 and in certification of fluoridation officers;. - ongoing LWUs dam safety inspections and mentoring/ training of operators; - ongoing LWUs liquid trade waste discharge approvals;	

Fund Name	*Funding Body(ies)*	*Objectives and Priorities*	*Web Address*
		- conducting regional trade waste regulation courses; and - providing help desk services. ▪ financial assistance through grants to local water utilities towards the capital cost of works to address the backlog in water supply and sewerage infrastructure.	
Job Services Australia – New Enterprise Incentive Scheme (NEIS)	Australian Government: Department of Education, Employment and Workplace Relations	*Objectives:* ▪ to give young people, aged 17 to 20 years, quality training and experience through structured and supervised projects that focus on areas where natural environmental conservation work and cultural heritage restoration is required; ▪ to contribute to high priority conservation projects, to promote environmental, conservation and natural heritage outcomes and through this benefit the community and the environment and; ▪ to contribute to NEIS participants: - personal development, including teamwork and leadership skills; - skill development and training through activities that are structured and sequential in their learning outcomes; - strengthened connections with the community through relationships, participation and contribution to the community; and - improved career and employment prospects through accredited training and on-the-project training.	http://www.deewr.gov.au/Employment/JSA/EmploymentServices/Pages/NEIS.aspx
		Priorities: ▪ DEEWR provides funding for NEIS teams to work on projects which focus on areas where environmental and heritage restoration and conservation are needed; ▪ participants in the NEIS programme work in teams from a central or regional location and may undertake projects in remote locations; ▪ each project has a community focus and is developed in consultation with community representatives; and ▪ participants undertake accredited training which enable them to complete project tasks, and increases their capacity to move into employment or further training at the end of their placement.	

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Appendix D

Summary of Estuary Processes Study

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Woolgoolga Lake is an Intermittently Closed and Open Lakes and Lagoon (ICOLL). The estuary has areas of high environmental, recreational and aesthetic value. A key focus of recreational activity occurs at the public picnic area adjacent to the Woolgoolga Lakeside Holiday Park near the estuary entrance.

The estuary catchment area to the tidal limit is 343 ha, and the water body area is 37.6 ha. The total catchment (including drainage catchment upstream of the tidal limit) covers an area of 2,185 ha. State Forest area encompasses a large proportion of the upper limits of the catchment. Banana plantations and blueberry farms cover a significant proportion of the upper slopes in the mid-catchment.

The main creeks flowing to the estuary are Woolgoolga Creek and Poundyard Creek. Other tributaries include South Woolgoolga Creek, Cemetery Creek and High School Creek.

The estuary is part of the Solitary Islands Marine Park and zoned as a Habitat Protection Zone up to the tidal limit of the tributary creeks. A portion of the vegetated area adjoining the northern shore of the lake is located in the Coffs Coast Regional Park.

The key findings and recommendations of the *Data Compilation and Estuary Processes Study – Darkum Creek, Woolgoolga Lake and Willis Creek* (GeoLINK et al., 2011) is summarised below for Woolgoolga Lake.

D.1 Hydrodynamics

D.1.1 Hydrodynamic States and Entrance Behaviour

Woolgoolga Lake is generally classified as an 'intermittently open' system. Water level data for the period of 2007 to 2011 indicates the lake is predominantly open during high rainfall years. During this period the entrance was open for approximately 66% of the time. The number of entrance openings over a 5 year period from 1982 to 1988 was 17 (an average of 3 to 4 entrance openings per year) of which Council initiated nine. This latter period included a range of varying rainfall years from very dry to very wet with some average rainfall years.

Opening of the entrance has been initiated by Council in the past as a flood control measure. Council's informal policy is to open the lake entrance when the lake water level reaches an established flood mark of 1.8 m AHD at the Council depot in Ganderton Street, Woolgoolga. The last opening initiated by Council was in 2007.

When the entrance is open, water levels in the lake can vary by 0.5 to 0.8 m over a full tidal cycle which will promote vertical and horizontal mixing between marine and estuary waters. A closed entrance results in perched water levels in the lake with water levels approximately 0.25 to 0.5 m higher than when the entrance is open. The maximum water level in the lake is typically in the range of 1.1 to 1.5 m AHD immediately prior to the entrance opening 'naturally'. Water levels in the lake are likely to increase by the same amount as sea level rise increases as a result of climate change. A summary of existing and future water levels for the lake is shown overleaf in Table D.1.

Reference to deeper water levels in the lake in the 1970's is discussed in Section D.2.2.

Table D.1 Lake Water Levels for Non-Flood Periods – Existing and Future

	Existing[1] (2011)	*2050*	*2100*
Average water level (m AHD)	0.7	1.1	1.6
Maximum water level (m AHD)	1.5	1.9	2.4
Minimum water level (m AHD)	0.2	0.6	1.1
90th percentile water level[2] (m AHD)	1.1	1.5	2.0

Notes: 1. Averaged from 2004 data and 2007 – 2011 data in Estuary Processes Study (GeoLINK et al, 2011);
2. The water level greater than 90 percent of all recorded water levels;

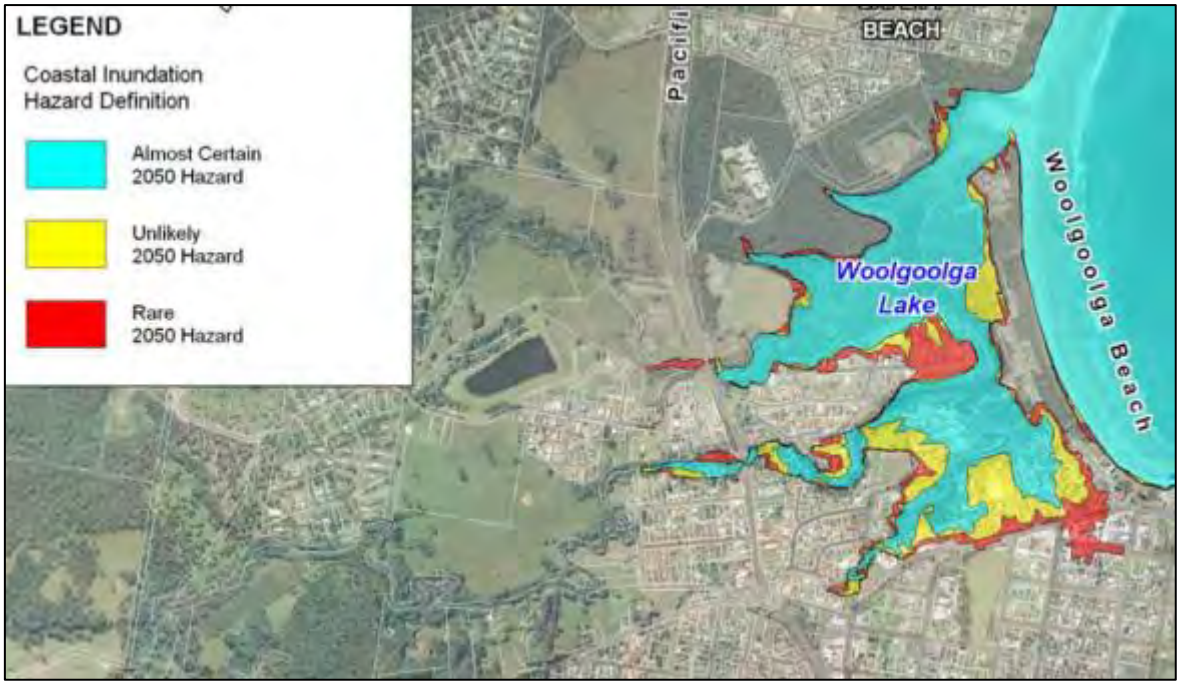
D.1.2 Coastal Processes and Inundation

The long term shoreline recession on Woolgoolga Beach from coastal processes will result in some erosion of the north-eastern section of Lakeside Caravan Park and erosion of the reserve in the vicinity of the existing timber walls/rock revetment wall opposite the Woolgoolga Lake entrance – refer to Plate D.1.

Source: BMT WBM (2010b)

Plate D.1 Beach Erosion and Shoreline Recession Mapping for the Year 2050

Flooding along the margins of the lake as a result of elevated ocean levels during storms will be exacerbated by sea level rise – refer to Plate D.2. Modelling indicates increased inundation of Sunset Lakes Estate along the southern shores of the lake, increased inundation of Woolgoolga Sunset Caravan Park and areas adjoining Woolgoolga Creek, and inundation north of Beach Street in Woolgoolga.



Source: BMT WBM (2010b)

Plate D.2 Coastal Inundation Mapping for the Year 2050

Increased inundation of developed areas surrounding Woolgoolga Lake as a result of sea level rise will limit the effectiveness of existing low-lying stormwater treatment measures.

D.2 Geomorphology and Sediment Dynamics

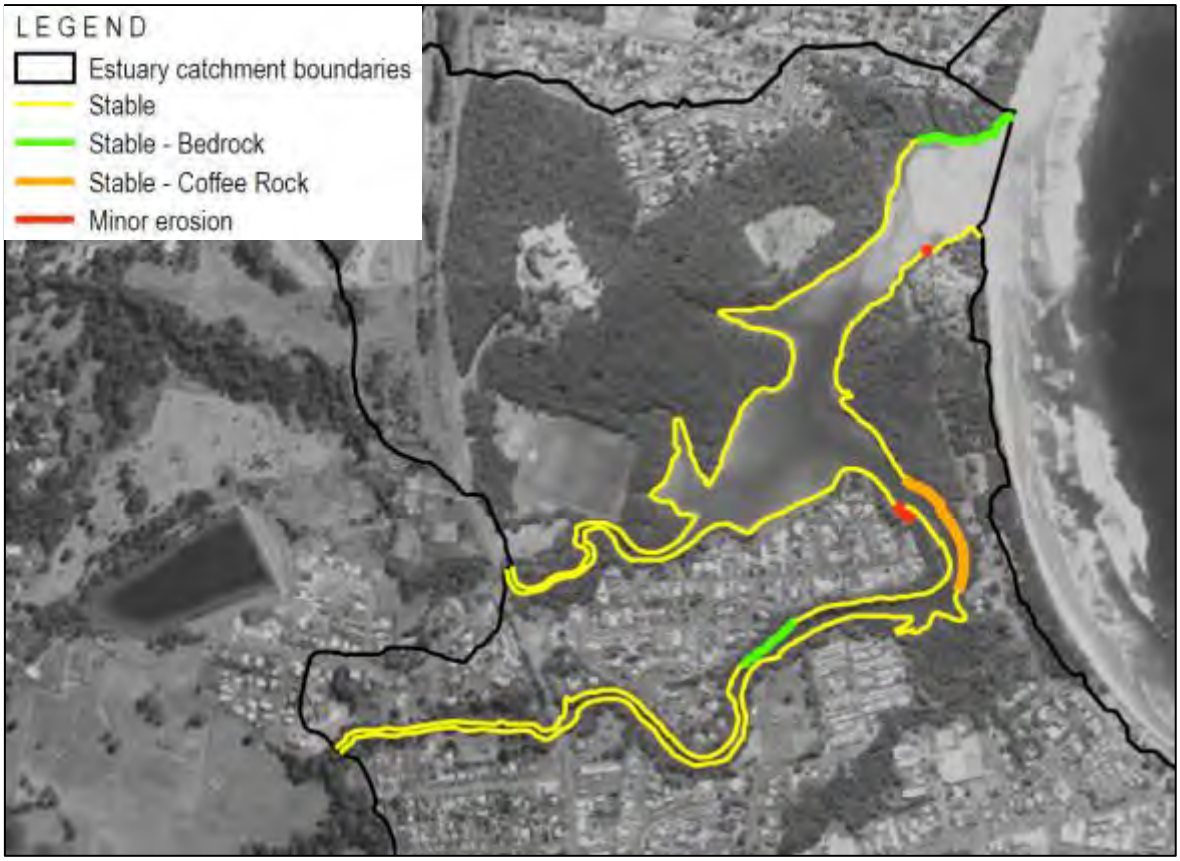
D.2.1 Bank Erosion

Bank erosion is not a significant issue in the Woolgoolga Lake estuary with only 5% of estuary banks subject to minor erosion and no moderate or severe erosion reaches identified – refer to Plate D.3. Several areas of past erosion have been remediated using predominantly rock revetment or mixed timber walls/rock revetment (e.g. north bank near Woolgoolga Creek entrance), or tyre walls.

D.2.2 Sedimentation

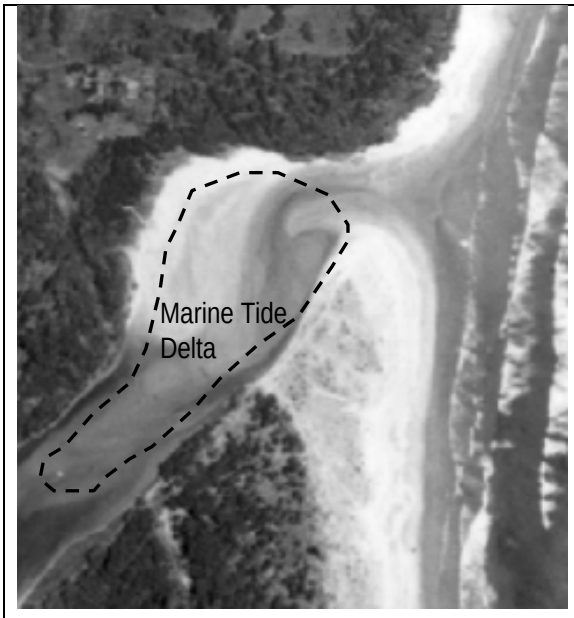
Aerial photography indicates the marine tide delta near the estuary entrance varies significantly in association with major flooding / rainfall events. Community experience of deeper water levels in Woolgoolga Lake in the 1970's relates to natural variations in the accumulation of marine sediment in the estuary. Erosion and transport of marine sediments out of an estuary is related to flood size and duration. The years 1964 and 1974 show a distinct reduction in the extent of the marine tide delta and a relatively deep estuary entrance area in comparison to other years (refer to Plate D.4 to Plate D.5). This is attributed to: the exceptionally large rainfall events experienced prior to the photographs; the generally 'wet' years during this period; and potentially the large wave conditions and severe coastal erosion experienced in 1974. The rainfall events experienced during this period include:

- A flood in April 1962 - the second largest flood on record for Woolgoolga Lake;
- 305 mm of rainfall in one day in April 1963 (the third largest daily rainfall total on record for Woolgoolga);
- 196 mm of rainfall in one day in March 1964 (the 14th largest daily rainfall total on record); and
- A flood in March 1974 - the largest flood on record for Woolgoolga Lake. The rainfall during this flood included 146 mm, 306 mm and 138 mm on three successive days.



Source: GeoLINK et al. (2011)

Plate D.3 Bank Erosion Severity (mapped January 2011)



1943 (12 March): General El Niño Southern Oscillation phase in preceding years: El Niño

1974 (18 August): General El Niño Southern Oscillation phase in preceding years: La Niña

Plate D.4 Entrance Conditions – Aerial Photographs –1943 and 1974

1994 (17 May): General El Niño Southern Oscillation phase in preceding years: El Niño

2009 (May): General El Niño Southern Oscillation phase in preceding years: La Niña

Plate D.5 Entrance Conditions – Aerial Photographs – 1994 and 2009

D.3 Water Quality Processes

Physico-chemical water quality data for Woolgoolga Lake shows a high degree of variability, a common and defining feature of ICOLLs.

Median turbidity readings exceed ANZECC (2000) guidelines and OEH MER guidelines, however the default guidelines may not be readily applicable to shallow ICOLLs such as Woolgoolga Lake where re-suspension of sediment occurs as a result tidal fluctuations and wind-driven currents.

Limited chemical water quality data indicates Woolgoolga Lake is slightly nitrogen enriched but is not phosphorus enriched. Nutrient and sediment modelling of the estuary catchment indicates that:

- forestry operations in the upper catchment area are the main contributor of nitrogen and sediment;
- horticultural land uses contribute most of the phosphorus; and
- residential land-use is also a significant contributor of sediments and nutrients.

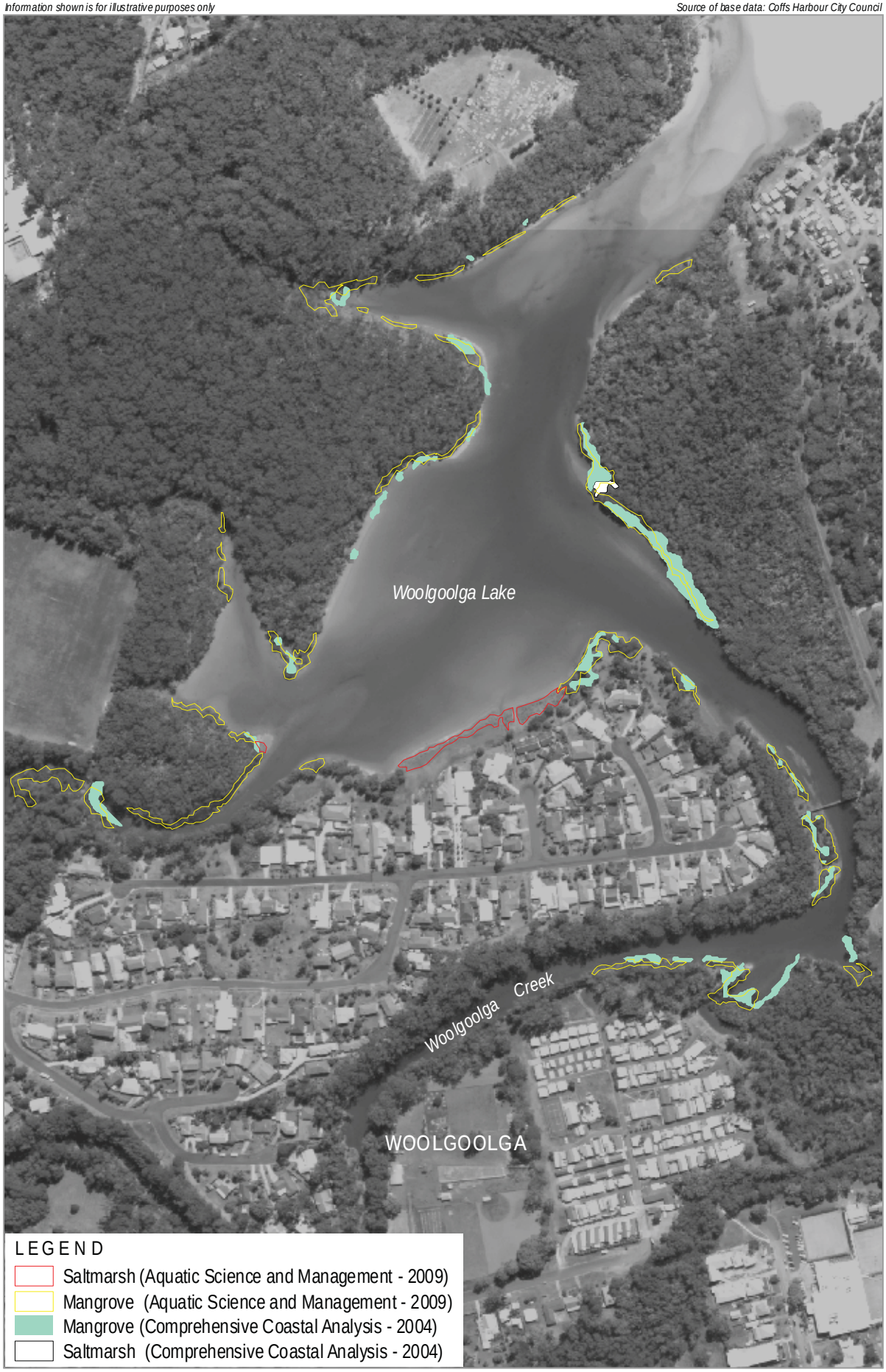
Faecal indicator organism samples indicate the waters of Woolgoolga Lake (for the period sampled) are generally safe for primary contact recreation. Chlorophyll-a concentrations indicate that Woolgoolga Lake has a slightly elevated trophic status.

D.4 Ecological Processes

D.4.1 Estuarine Habitat

Benthic habitat is a mixture of sand, mud and gravel bars. Mangroves are the dominant vegetative habitat type in Woolgoolga Lake, and the extent of mangroves has increased – refer to Illustration D.1.

The area of saltmarsh at Woolgoolga Lake between the southern shores and Sunset Lakes Estate is likely to be 'squeezed' and potentially lost with higher water levels resulting from sea level rise as there is nowhere for the salt marsh to retreat / re-establish.



0 100

North

Estuarine Habitat Mapping Undertaken as part of this Study
Compared with Williams *et al* (2006) - Woolgoolga Lake

GeoLINK environmental management and design

Data Compilation and Estuary Processes Study
1616534

Illustration 7.6

D.4.2 Aquatic Fauna

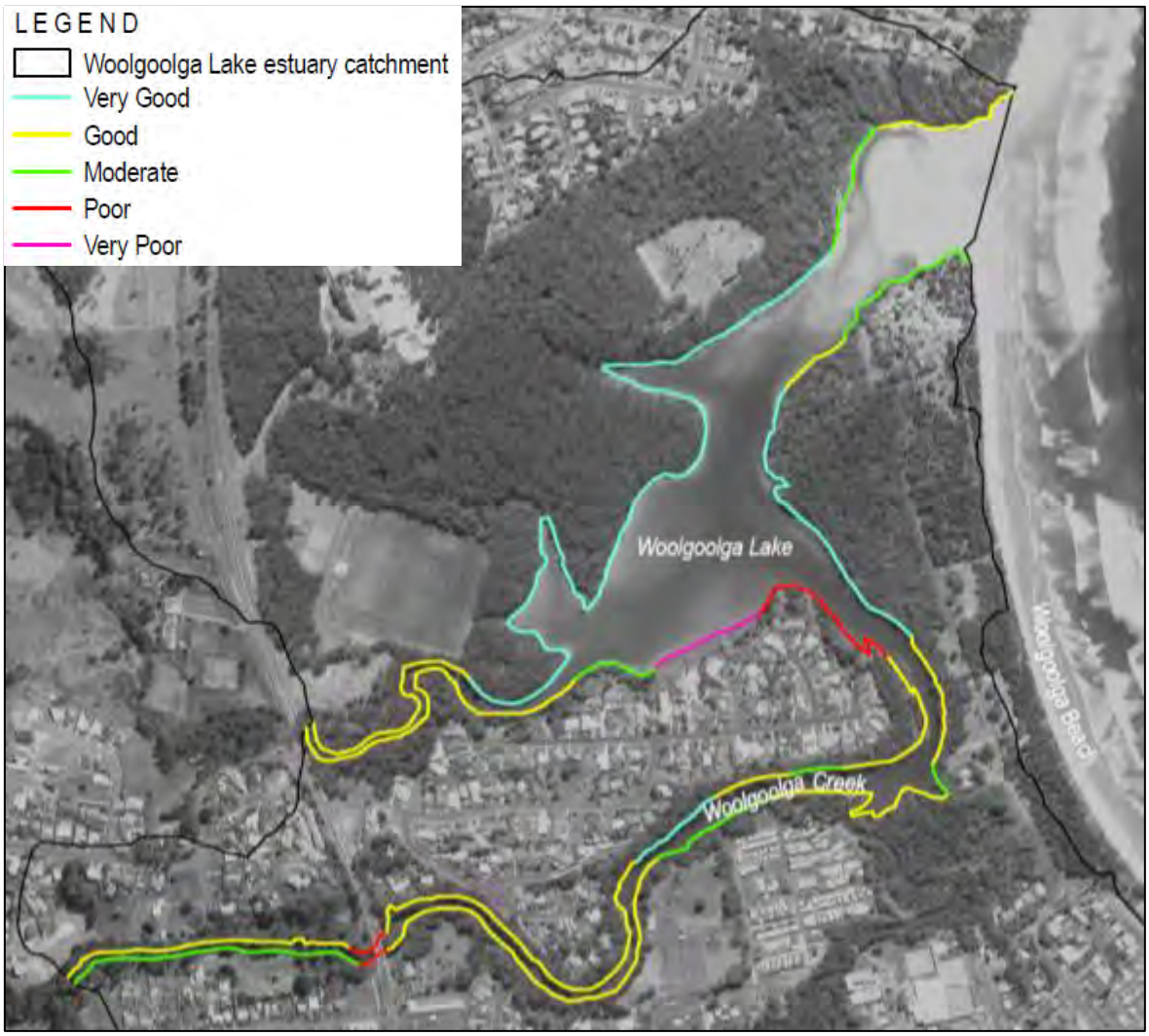
Macroinvertebrate fauna were sampled and analysed. The results indicated that the central regions of the waterway contain the most diverse and abundant benthic macroinvertebrate fauna. A survey of fish species was undertaken with relatively few animals from a small number of taxa collected. No threatened aquatic species have been individually reported from Woolgoolga Lake.

D.4.3 Woolgoolga Lake Flying Fox Camp

A Grey-headed Flying-fox maternity camp occurs along the eastern banks of Woolgoolga Lake. This species is listed as vulnerable. Council plans on developing a long-term Flying-fox Management Strategy for the camp.

D.4.4 Riparian Vegetation

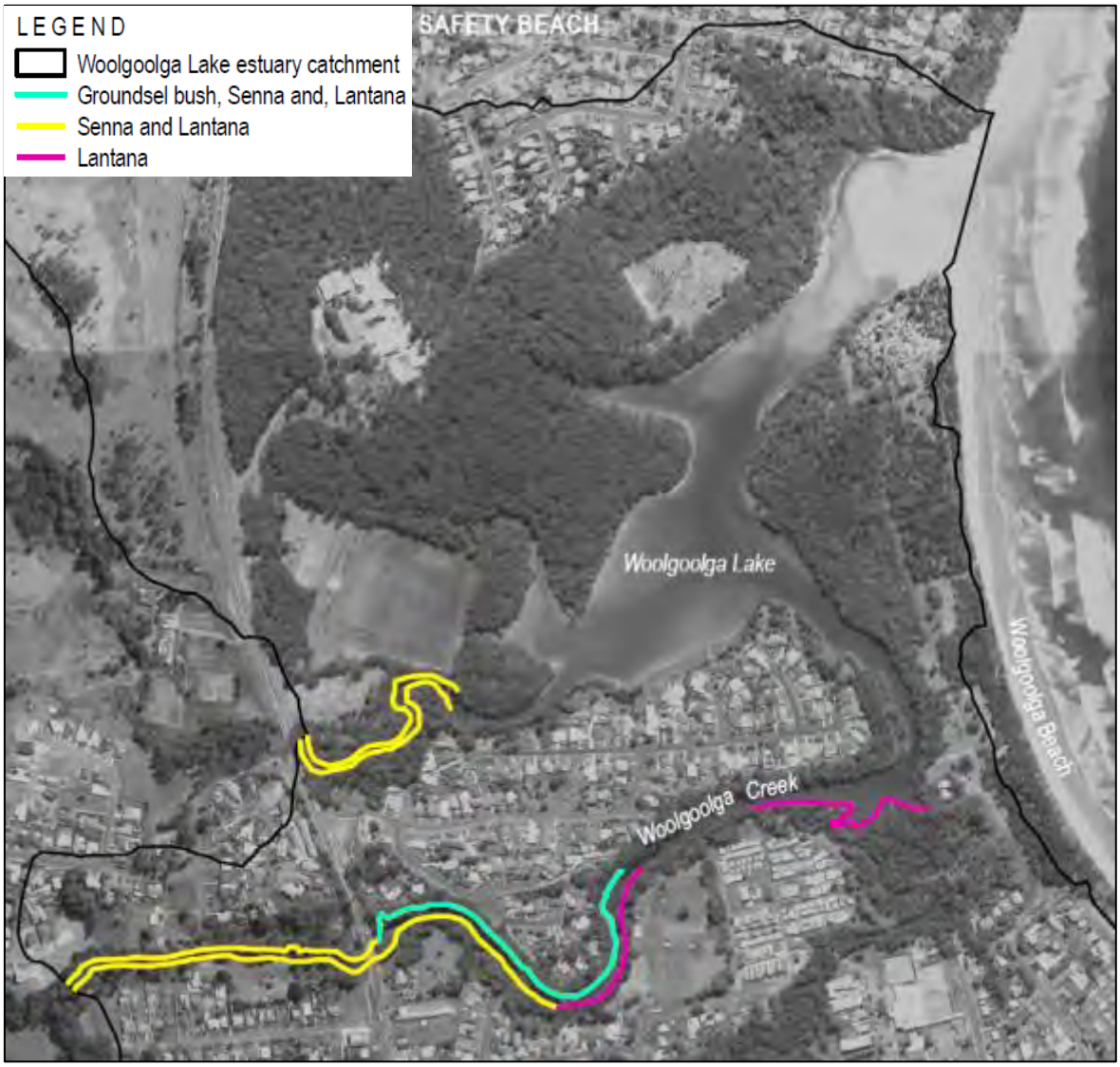
Riparian vegetation in the study area is predominately in moderate to good condition (96% of mapped estuary banks) – refer to Plate D.6. Only 3% of banks had riparian vegetation in poor to very poor condition and these reaches were confined to the southern bank of Woolgoolga Lake where it is clear of riparian vegetation with the exception of fringing saltmarsh which is impacted by mowing practices. An analysis of aerial photography shows the site was cleared prior to the 1940's. However, since the 1980's when residential development accelerated the native vegetation has not been allowed to regenerate as a result of mowing practices.



Source: GeoLINK et al. (2011)

Plate D.6 Riparian Vegetation Condition (mapped January 2011)

The distributions of major weeds along the estuary have been mapped – refer to Plate D.7. Four of the mapped invasive weed species are listed as Priority B or C in coastal or riparian landscapes under the Northern Rivers Invasive Weed Strategy 2009-2013.



Source: GeoLINK et al. (2011)

Plate D.7 Distribution of Priority B and Priority C Invasive Weed Species (mapped January 2011)

D.4.5 Estuary Health

In general, the health of Woolgoolga Lake is average:

- water quality is generally acceptable for recreational use and for the protection of aquatic ecosystems;
- saltmarsh is scarce and poorly managed. Mangroves appear to be recruiting to the system, a positive indication. Seagrass appears to have disappeared from the system in the past decade, though the original extent is unknown. Weeds and other disturbances to riparian vegetation are common;
- fish and macroinvertebrate populations are scarce and lack diversity;
- fish kills have been related to pesticide spills; and
- algal blooms and pest invasions do not appear to be an issue.

D.5 Climate Change and Sea Level Rise

Climate change is projected to include an increased frequency of hot days, increased intensity and frequency of extreme daily rainfall events and droughts, changes to sea levels and changes in the occurrence of intense storm events. Climate change projections at the local scale for the Coffs Harbour area are described in a report by BMT WBM (2010a). The climate change projections for the Coffs Harbour area (relative to the 1977 to 2007 period) include the following:

- evaporation: decreases in summer and spring and increases in autumn and winter;
- temperature: decreases in average temperatures for summer, autumn and spring and increases in winter;
- Extreme Hot Days: significant increases in the annual number of extreme hot days;
- Average Rainfall: increases in annual totals and seasonal totals except for decreases in autumn totals for the Coffs Harbour area;
- High Rainfall Events: increases in frequency of high rainfall events in summer and autumn;
- Sea Level Rise: 0.4 m increase in mean sea level by 2050 and 0.9 m increase by 2100 (relative to 1990 mean sea levels); and
- Wave Climate: future wave climate will be similar to the present or within the variability of the existing wave climate. However, the Coffs Harbour Coastal Processes and Hazards Definition Study (BMT WBM, 2010b) investigated the possibility of a permanent shift from the existing south easterly wave climate to a more easterly wave climate with average wave height remaining the same.

D.5.1 Climate Change and Sea Level Rise Impacts on Estuary Processes

General estuary processes that will be impacted by climate change include (after Haines, 2006 and 2008; Mackenzie et al., 2009):

- coastal processes and interactions with estuary entrances: e.g. a landward and upward shift in entrance channels in response to sea level rise;
- hydrodynamics: changes in water level and altered tidal prisms due to changes to entrance conditions; impacts of altered rainfall and evaporation patterns. Predicted sea level rise may result in higher water levels within the estuary and potentially an increase in typical water depths;
- sediment dynamics: changes to ingress of marine sediment due to changes to entrance conditions and changes to sediment derived from catchment runoff in response to an increase in high rainfall events;
- water quality: changes to water temperature and sediment dynamics and subsequent changes to chemical and physical processes in the estuary; and
- ecology: the impacts of increased water levels and altered hydrodynamics, sediment dynamics and water quality on ecological processes.

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Appendix E

Summary of Community Uses Assessment

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Community consultation aims to discover community aspirations and gain stakeholder input to the Project to ensure that the Estuary Management Plan is accepted by the community as a coherent, practical and achievable plan.

E.1 Previous Consultation

The outcomes from the public participation for the 1991 Woolgoolga Lake Plan of Management reflect the issues of concern that have arisen under the current project. The 1991 main issues of concern include: erosion at the mouth of the lake; dredging of marine sand deposits near the mouth; removal of sediments within the lake near Sunset Lakes Estate to improve recreational use of the lake; reduction in bushfire hazard; restoration and protection of the eroding northern bank near the lake entrance; formalisation of walking tracks in bushland areas; water quality monitoring; stormwater treatment; increased signage for public access points; and rehabilitation of eroded and weed infested areas.

E.2 Initial Community Workshop

A community workshop was held at Woolgoolga Community Centre on 14 September 2010. The purpose of the Initial Community Workshop was to gain input on community values, issues and objectives for the three estuaries. Approximately 30 people attended the workshop.

Council and the consultant team (GeoLINK / GECO Environmental / Aquatic Science and Management) provided an introduction on the Estuary Management Plan process. The attendees then formed five groups to discuss and compile a list of key issues and goals for the estuaries. Following the group work a representative from each group summarised their key issues and goals. A final question time was undertaken before the workshop concluded.

The key focus of the attendees was generally Woolgoolga Lake, however some specific comments relating to Darkum Creek were provided. The main issues arising from the workshop related to the need for improved water quality and reduced sedimentation in Woolgoolga Lake and an entrance management protocol to assist these two issues.

The various goals and issues developed by the group work are summarised below. The comments below refer to Woolgoolga Lake except where noted otherwise.

E.2.1 Goals:

- improved water quality for Woolgoolga Lake;
- increased water depths in Woolgoolga Lake for improved recreation (swimming and boating);
- a protocol for opening the entrance to Woolgoolga Lake to improve water quality and assist with preventing sedimentation in the lake;
- maintenance of a stable sand spit on the south side of the Woolgoolga Lake entrance;
- dredging was recommended by some groups to address the sedimentation issues in Woolgoolga Lake;
- a return to a past condition of Woolgoolga Lake when it was considered deep and clean and allowed a range of recreational activities – swimming, boating;
- removal of the training wall on the north side of the Woolgoolga Lake entrance was suggested by one group to establish a 'more natural' amenity and function;
- foreshore management;
- water quality monitoring;
- improved fish breeding;
- improved signage and walkway access to the lake foreshore;
- improved passive recreation facilities e.g. picnic facilities; and
- a telephone 'hotline' to advise Council of problems associated with Woolgoolga Lake.

E.2.2 Issues:

- sedimentation in Woolgoolga Lake resulting in reduced water depth and thereby impacting on recreational use of the lake;
- poor water quality in Woolgoolga Lake;
- erosion of the sand spit on the south side of the Woolgoolga Lake entrance was a concern for a number of groups;
- diminishing fish stock in Woolgoolga Lake;
- urban drainage systems causing flooding issues;
- damage to existing walkways and lake of maintenance of the walkways;
- previous channel works to Poundyard Creek having a negative impact on Woolgoolga Lake;
- address water quality issues associated with runoff from rural lands and urban areas (nutrients, herbicides, pesticides, sediment and organic matter);
- fire management was expressed as a concern by one group;
- seepage into Woolgoolga Lake from the cemetery on the northern foreshore; and
- concern was expressed by some attendees regarding pollution from Flying-fox excrement.

Some concerns were also expressed in relation to the estuary management planning process in regard to:

- public availability (and ease of access) of documentation; and
- scepticism as to whether management plan actions will be undertaken and the timeframe of actions.

E.3 Community Survey

A community survey was undertaken over a two month period from April to May 2011, encompassing a school holiday period to provide opportunity to capture input from the widest possible catchment of users. The surveys were located at Council offices, local outlets in the estuary catchments such caravan parks, newsagents and post offices. In addition, a web survey was made available through the website.

The survey data is summarised below. The total number of completed surveys received was 50.

1. Where are respondents from?

Sixty percent of respondents were from the Woolgoolga area, 22 % from Safety Beach and 16 % from elsewhere in the Coffs Harbour Council area. One respondent was from outside the Coffs Harbour Council area at the time of completing the survey.

2. How often do you visit use Woolgoolga Estuary?

All respondents indicated they visit or use Woolgoolga Lake. Respondents visiting the Woolgoolga Lake on a daily basis made up 38% of the total respondents, with a few times a week and a few times a year the next highest responses at 18% and 20% respectively. 4% of respondents rarely or never visit the Woolgoolga Lake.

3. Indicate how you use the estuary:

Survey results indicate the main use of the Woolgoolga Lake is walking, with 86% of total respondents identifying this use. Respondents identifying swimming, picnicking, dog walking, fishing and bird-watching were similar in number, from 36-46%. Boating was listed by 14% of respondents as a use. 8% of respondents listed other uses including kayaking.

4. Indicate your level of concern for the following estuary-related issues:

The estuary issues of most concern, identified by 66 to 68% of respondents were:

- water quality issues associated with runoff from agricultural lands and urban areas;
- increasing levels of sedimentation in Woolgoolga Lake; and
- sand build-up in the entrance to Woolgoolga Lake causing blocking of outflows and high flood levels.

The estuary issue of least concern, identified by 38% of respondents, was inadequate public access around Woolgoolga Lake foreshores / creeks.

5. Indicate the importance you place on the following estuary related goals:

The estuary goals of most importance, identified by 76-82% of respondents were:

- improved water quality;
- improved aquatic habitat within the lake and creeks to support fish stocks, crustaceans, etc; and
- improved runoff control in urban areas of the catchment.

6. Artificial opening of the Woolgoolga Lake Entrance:

Sixty-four percent of respondents indicated they would support artificial opening of the Woolgoolga Lake entrance. 18% of respondents do not support artificial opening with a further 16% undecided.

7. Use of motor boats in the estuary:

76% of respondents indicated they do not support the use of motor boats. 26% of respondents indicated that they would support the use of motor boats in Woolgoolga Lake estuary, with canoes with a mini outboard motor considered the most suitable.

8. Flying Fox colony at Woolgoolga Lake

52% indicated that they were not concerned about the flying fox colony at Woolgoolga Lake.

E.4 Stakeholder Consultation

The organisations listed below were consulted to obtain initial input to the study:

- NSW Department of Environment, Climate Change and Water
- NSW Department of Environment, Climate Change and Water – Environmental Protection Authority
- NSW Department of Environment, Climate Change and Water – Parks and Wildlife Group
- Solitary Islands Marine Park Authority
- Primary Industries (Fisheries) – Industry and Investment NSW
- Northern Rivers Catchment Management Authority - Coffs Harbour
- Department of Planning - Grafton
- NSW Department of Water
- Land and Property Management Authority
- NSW Maritime
- Roads and Traffic Authority
- Coffs Coast Tourism Association
- Local Aboriginal Land Council – Coffs Harbour
- Gumbular-Julipi Elders Council, c/o Coffs Harbour Local Aboriginal Land Council
- Woolgoolga Surf Life Saving Club
- Coffs Harbour Historical Society and Museum Inc.
- Landcare
- Woolgoolga Chamber of Commerce Industry & Tourism Inc
- Let's Save Woolgoolga Lake

- Coffs Harbour City Council
- Garby Elders
- Jim Stevens
- Woolgoolga Returned Services Golf Club

Input received from various organisations has been incorporated into the assessment of the relevant issues in the EMS. The issues are summarised below.

Table E.1 Consultation Correspondence

Stakeholder
Department of Planning (DoP)
The DoP refers to the following documents for consideration in preparing the CZMP: ▪ Mid North Coast Regional Strategy; and ▪ SEPP 71 – Coastal Protection.
The DoP raises the issue of future sea level changes and its consideration in planning for coastal areas. The DoP refers to the following documents and guidelines for consideration in preparing the CZMP: ▪ NSW Coastal Planning Guideline: Adapting to Sea Level Rise; ▪ Coastal Risk Management; and ▪ Flood Risk Management.

E.5 Final Community Workshop – Development of Strategies

A community workshop was held at Woolgoolga Community Centre on 13 October 2011 for the three estuaries (Darkum Creek, Woolgoolga Lake, and Willis Creek). The purpose of the workshop was to gain community input into the development of management strategies to ensure appropriate strategies have been developed, and to assist with identifying priorities. Approximately 30 people attended the workshop.

Council and the consultant team (GeoLINK / GECO Environmental / Aquatic Science and Management) provided an introduction on the key issues for the estuaries. The attendees then formed six groups to develop a list of key management strategies targeting the key issues for the estuaries. The output of the six groups are summarised in the following table. Following the group work a representative from each group summarised their strategies and reasoning. A final question time was undertaken before the workshop concluded.

The key focus of the attendees was generally Woolgoolga Lake, however some strategies such as catchment pollutant strategies related to all three estuaries. The main strategies generally aligned and supported the strategies that were being developed by the consultant team. The main strategies developed by the six groups are included:

- catchment pollutant strategies particularly with respect to rural runoff;
- management of environmental weeds and protection of riparian areas;
- urban stormwater management;
- sewerage overflows;
- dredging of the entrance;
- maintaining and enhancing existing walking trails; and
- prevent new development in areas affected by increased water / flood levels from sea level rise.

Table E.2 Management Strategies Developed in Community Workshop on 13 October 2011

ISSUES	*Group 1*	*Group 2*	*Group 3*	*Group 4*	*Group 5*	*Group 6*
Stormwater and Catchment Inputs	▪ Education and address policing / fining ▪ Erosion due to building and bad farming practices (eg. Blueberry / bananas) ▪ Sewerage inspections ▪ Dog excrement: place "poo bags" at head of walking tracks and police this / fines ▪ Council and NPWS to enforce "Animals Act".	▪ Eliminate or reduce top soil erosion / runoff from entering Poundyard Creek from construction and rural activities eg. blueberries	▪ Ongoing monitoring of water quality from all waterways and action taken to correct any silt or chemical imbalances ▪ In rural areas ensure a minimum buffer zone of 22 m along all waterways to trap sediment runoff	▪ Address the issue of erosion from orchards ▪ Campaign awareness for residents in the catchment (rural and urban)	▪ Buffer zones to 30 m along waterways ▪ Construct nitrogen traps / filter zones ▪ Address litter from children ▪ Inspection of sewerage especially Poundyard Ck	▪ Stormwater treatment devices implemented on all outlets and regularly serviced ▪ Water quality monitoring ▪ Audit agricultural practices ▪ Fish sampling for water quality monitoring
Impacts to foreshores	▪ Seek funding for protection of riparian areas ▪ Support for volunteer groups for removal of rubbish and regeneration activities ▪ Council implement / supplies facilities (eg. common green skip bins) for landowners / caravan parks to remove green waste to prevent illegal dumping ▪ Wooden barriers / bollards and planting to define boundary to prevent mowing encroachment to native bushland	▪ Removal of noxious weeds eg. mile-a - minute and morning glory	▪ Educate residents and council workers on detrimental effects of mowing and other foreshore gardening activities on native riparian vegetation ▪ Develop and implement a management plan to keep lantana and other environmental weeds out of the foreshore areas ▪ Develop and implement an erosion management strategy	▪ Bollard the western end of the Woolgoolga Lake picnic area to eliminate vehicle access and a sign erected to prohibit cars, bikes onto the lake foreshores ▪ Campaign to control noxious weeds on the edges of Woolgoolga Lake ▪ A campaign to eliminate the camphor laurel problem that is developing along these creeks in the upper reaches	▪ Address illegal mowing, tree removal, and use of fertilisers ▪ Requires more landcare, neighbourhood and weed management groups ▪ Bush regeneration at TAFE ▪ Re-establish buffer zones ▪ Council get rid of green bins and place mulch around trees ▪ Promote / educate community regarding composting / worm	▪ Address weeds – lantana, asparagus fern (CMA, School, Community) – continue spraying; ▪ Mangroves – implement colonisation study (CMA, schools).

ISSUES	*Group 1*	*Group 2*	*Group 3*	*Group 4*	*Group 5*	*Group 6*
				▪ Keep natural, no rock walls, no retaining walls, no sandbags	farms	
Flooding	Council to revise: ▪ stormwater planning ▪ level of outlets for sewerage or relocating outlets ▪ relocation of housing at risk from flooding	▪ Address sewerage pumping stations overflow in heavy rains ▪ Keep stormwater drains cleared	▪ Rebuild and vegetate southern dune peninsula (near Caravan Park) by pumping sand from sedimentation area. This should improve any flooding problems in Woolgoolga Lake	▪ Have to maintain vegetation corridors within the catchment to slow run-off and reduce intensity of flooding, particularly when setting up new developments ▪ To alleviate the flooding of foreshore, removing the silt from the estuary mouth (dredging and sand pumping) Council should setup regular maintenance of clearing sand build-up by way of earth moving equipment after dune erosion. Push the sand back onto the southern dune entrance and beachfront ▪ Stop removing branches and tree trunks from waterways	▪ Odour issues from pump station at end of Young Street ▪ Convert kerb and guttering to dish drains and local grasses and plants ▪ Install retention basin and sedimentation traps ▪ Promote stormwater infiltration devices on properties	▪ Manually open Woolgoolga Lake mouth in storm events ▪ Public notification (paper) of water quality following flood events.

ISSUES	*Group 1*	*Group 2*	*Group 3*	*Group 4*	*Group 5*	*Group 6*
Sedimentation	▪ Holding ponds higher up the catchment ▪ Do not remove or install large logs (natural damming) to slow water flow, catch sediment and provide fish / aquatic habitat.	▪ Dredging to remove sediment from bottom of lake	Refer to Flooding comments.	▪ Reinstate the natural northern lake entrance by removing the retaining wall ▪ Bulldoze the sand; ▪ Dredge the entrance to remove sand ▪ Return to contour planting in agriculture on the catchment hills (eg. blueberry farms)	▪ Re-establish riparian vegetation using neighbourhood group eg Sunset Lakes ▪ Utilise sediment traps and biological solutions to address sediment runoff ▪ Increase riparian buffer near sports oval by reclaiming 10 – 20 m on east of oval ▪ Increase riparian buffer along Darkum Creek within Golf Course	▪ Runoff and marine silts are considered the issue ▪ Water depth varies depending on mouth status ▪ Dredging is considered to be temporary relief (optic cable maybe impacted by dredging
Recreation	▪ Prevent 4WD entry / damage to environment ▪ No new walking tracks to be put in ▪ Maintain and enhance existing walking tracks so that public stay on tracks ▪ NPWS to prevent and police / fine 4WD's on beach	▪ No further trail networks are needed ▪ Bank erosion at the picnic area of the lake needs to be addressed	▪ Existing trail networks which are retained should be converted to boardwalks to prevent erosion ▪ Where trail (where boardwalks) are set back from waterways, then the land between can be developed as a catchment / erosion control zone for runoffs to ease siltation and erosion	▪ Walking trails on the cemetery side of the lake need fixing as it is washed out and dangerous ▪ Very important to keep and expand the walking trails so residents and visitors can enjoy the waterways	▪ Close off unnecessary trails ▪ Make clear signage – interpretation ▪ Retain only necessary well-walked trails ▪ Stop 4WDs / motorbikes on trails	▪ Pathways – adequate quantity but quality poor (fix steps / drainage – north shore, Safety Beach) ▪ Upgrade to "in-ground", permanent well-constructed eg Port Macquarie Headland Walk.

ISSUES	*Group 1*	*Group 2*	*Group 3*	*Group 4*	*Group 5*	*Group 6*
			▪ Educational signage at key points of each waterway on the importance of these as a natural environment.			
Climate Change and sea level rise	▪ No new developments in flood prone areas as designated by Coffs Coastal Zone Management Plan ▪ Protection (by zoning) of existing native riparian habitat	▪ No comment	▪ Council to identify and publicise those properties which will be affected by climate change and flooding events and develop and implement property prevention measures	▪ No comment	▪ Make retreat areas for animals and plants ▪ Households to use water retention strategies ▪ No new development in river / lake / sea level rise areas.	▪ No comment
Other	▪ More active policing / fining of regulations by NPWS and Council ▪ Use signs and education avenues eg. in schools, social media, tv and papers ▪ Container legislation – 10c for return of bottles and cans to prevent litter	▪ The poor condition of Woolgoolga Lake Bridge is considered an eyesore	▪ No comment	▪ Community Dune Care Groups should have to seek approval from Council and community before performing strategies and so-called improvements to the lake and foreshores, in particular pruning has been done which leaves a lot to be desired ▪ Ugly shade-cloth fences on beach front etc unnecessary and for long periods.	▪ Teach people to look at rivers for health, deterioration and regeneration, street education ▪ All new development to be required to be 40% under indigenous vegetation	No superfluous signage – if a must, eco-friendly and reduce (maintain) education signs to a minimum

Appendix F

Summary of Development of Management Objectives and Issues

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F.1 Values

F.1.1 Local and Regional

The natural settings of the estuaries and coast within the Mid North Coast area are a feature that attracts visitors and locals to the area. Woolgoolga Lake and its tributaries are in keeping with this natural setting, form part of the network of bushland settings along the coast and estuaries and are of local and broader significance due to their proximity to residential communities of Woolgoolga and Safety Beach.

Key values of the estuary include its natural setting and recreational opportunities including the public picnic area adjacent to the Woolgoolga Lakeside Holiday Park and the walking and cycling track network. The sites attributes create a highly attractive and popular recreation destination for the local and wider community.

F.1.2 Cultural Heritage

Aboriginal, European and Sikh cultural heritage values are significant for the Woolgoolga area.

The Woolgoolga area was (and continues to be) inhabited by the Gumbayngirr people prior to European Settlement. Records show that artefact finds and earth mound / shell middens, a possible burial site and a camp site are located within the within the Woolgoolga Lake catchment.

Europeans moved into the area from the 1870s. Records indicate that there are cultural items of significance within the study area associated with the timber harvest industry that established in the early days of European settlement.

The cultural values of these Aboriginal and European sites within the Woolgoolga Lake catchment area require sensitive consideration and preservation.

F.1.3 Recreational Values

The close proximity of residential communities and the variety of natural settings around Woolgoolga Lake combine to create a broad range of passive land and water based recreational opportunities that optimise the scenic potential of the area.

A key focus of recreational activity occurs at the public picnic area adjacent to the Woolgoolga Lakeside Holiday Park. The sites attributes create a highly attractive and popular recreation destination for the local and wider community. The area has a long open foreshore that allows easy, soft water entry for swimming and canoe / kayak launching. Picnic facilities, barbeques, toilets, a playground and maintained open spaces cater to high number of visitors and family groups. Some minor damage to the foreshore environment is evident around the edge of the lake where access for water-based recreation has exposed or compacted the ground and inhibited vegetation recovery.

The predominant activity elsewhere around the lake is recreational walking, jogging and cycling which are facilitated by a network of boardwalks, bridges and bush tracks of varying standard that extend around the lake periphery and provide access to key destinations at the water's edge.

F.1.4 Scenic Values

There are a number of scenic values of Woolgoolga Lake and its tributaries:

- the majority of the foreshores around the lake comprise a continuous edge of natural vegetation, often extending well back from the foreshores and rising up adjoining slopes producing an attractive natural skyline and backdrop to views across the lake;
- the surrounding ridges enclose and help to protect the lake, further enhancing the microclimate and visual experience to visitors; and
- one of the most popular public reserves occupies the southern edge of the lake near the Woolgoolga Lakeside Holiday Park. Here, open grassed spaces beneath remnant trees produce a highly attractive recreation area with panoramic views across the lake to the north and west.

F.1.5 Hydrodynamic Values

A key issue raised through community consultation relates to the depth of Woolgoolga Lake and its subsequent impact on recreational use of the estuary.

Consultation indicated that the community aspirations for Woolgoolga Lake include.

- improved water quality for Woolgoolga Lake;
- increased water depths in Woolgoolga Lake for improved recreation (swimming and boating);
- a protocol for opening the entrance to Woolgoolga Lake to improve water quality and assist with preventing sedimentation in the lake (an opening strategy for Darkum Creek was also suggested by one group);
- a return to a past condition of Woolgoolga Lake when it was considered deep and clean and allowed a range of recreational activities.

F.1.6 Water Quality Values

Despite showing high levels of variability common to ICOLLs, when assessed against the ANZECC (2000) guidelines the water of Woolgoolga Lake is generally acceptable for the protection of aquatic ecosystems. The main exception to this pattern is that the TN concentration is generally above the ANZECC (2000) guideline trigger value. In addition to this, the waters of Woolgoolga Lake in the area around the caravan park have been shown to be suitable for primary contact recreation such as swimming for 9 of the 13 months that sampling was undertaken.

The entrance to Woolgoolga Lake is frequently open to tidal exchange. As a result of this, flushing times are likely to be relatively low throughout the system, maintaining good water quality.

To the knowledge of the author there have been no algal blooms recorded from Woolgoolga Lake and the only reported fish kill was associated with an isolated chemical spill.

F.1.7 Ecological Values

There are a number of ecological characteristics of the Woolgoolga Lake estuary that can be considered values. These include the following:

- approximately 1ha of mangrove habitat distributed around the lake that is largely in good condition and actively recruiting in many areas. Mangroves are an important primary producer driving the overall productivity of the system, provide structural habitat for fish and invertebrates and stabilise banks and sediment;
- a mostly intact and healthy riparian vegetation, that filters overland flows, stabilises banks, provides structural habitat for fish and contributes to the overall productivity of the estuary;
- fish and invertebrates that provide a resource for recreational fishers. Commonly targeted species include flathead, bream and mudcrabs;
- a large population of saddle tree oyster (Isognomon ephippium) that provides structural habitat, stabilises bottom sediments and filter the water;
- snags in the ecological zones referred to as the upper and lower creeks that provide habitat for fish, help to slow flows and reduce erosion;
- intertidal sand and mud banks that provide foraging habitat for wading birds (some of which are protected under international treaties and Australian legislation) and a substrate for primary producers that drive the food webs of the estuary;
- a pleasant and attractive environment created by the combination of the above features; and
- a maternity camp of the vulnerable species Grey-headed Flying-fox occurs along the banks of Woolgoolga Lake. In order to protect, restore and manage the camp CHCC as part of the Our Living Coast program, plan on developing a Flying-fox Management Strategy to achieve an equitable balance between conservation and the social, cultural, aesthetic and environmental values shared by the community (Our Living Coast 2010).

F.2 Management Objectives

F.2.1 Entrance Conditions and Hydrodynamics Objectives

F.2.1.1 Develop a Formal Entrance Management Policy

Woolgoolga Lake is an 'intermittently open' system. The entrance opens and closes to the ocean naturally in a constant but irregular cycle depending on fluvial, tidal and wave processes. Artificial opening of the entrance has been initiated by Council in the past as a flood control measure. Council has an informal policy of opening the lake entrance when the lake water level reaches an established flood mark indicating the adjoining sewerage system is at risk of being flooded. The last opening initiated by Council was in 2007.

CEMAC identified the need for a formal entrance management policy for Woolgoolga Lake which is to include matter such as criteria for artificial opening. Additionally, the OEH Guidelines for Preparing Coastal Zone Management Plans (DECCW, 2010) requires Estuary Management Plans for ICOLL's to include an entrance management policy.

F.2.1.2 Minimise Interference with Natural Entrance Opening / Closing Processes

Artificial opening of ICOLL's can have significant negative impacts on water quality, fish and other ecological communities. Under natural conditions, ICOLL entrances open over a relatively wide range of water levels termed the 'natural breakout range'. Lake water level records for the period of 1982 to 1988 (a period with varying rainfall years from very dry to very wet with some average years) indicate a 'natural breakout range' of 1.2 to 1.8 m AHD – the lake water levels at which a closed entrance naturally opens. Lake water level records for the period of 2007 to 2011 (a high rainfall period) indicate a similar 'natural breakout range' of 1.2 to 1.6 m AHD.

An occasional artificial opening of the entrance within the 'natural breakout range' is not likely to have a significant environmental impact since it falls within the expected natural variation. However, over the longer term, numerous artificial openings especially at a comparatively low water level are likely to have a significant environmental impact since the natural frequency and duration of opening and closing to the ocean will be significantly altered. In the short term, more frequent openings can lead to increased exposure and death of aquatic vegetation and increased risk of low dissolved oxygen and incidence of fish kills. Over the long term, more frequent openings will lead to shifts in the structure and distribution of fringing riparian vegetation communities and public health considerations including smells / odours and poor water quality.

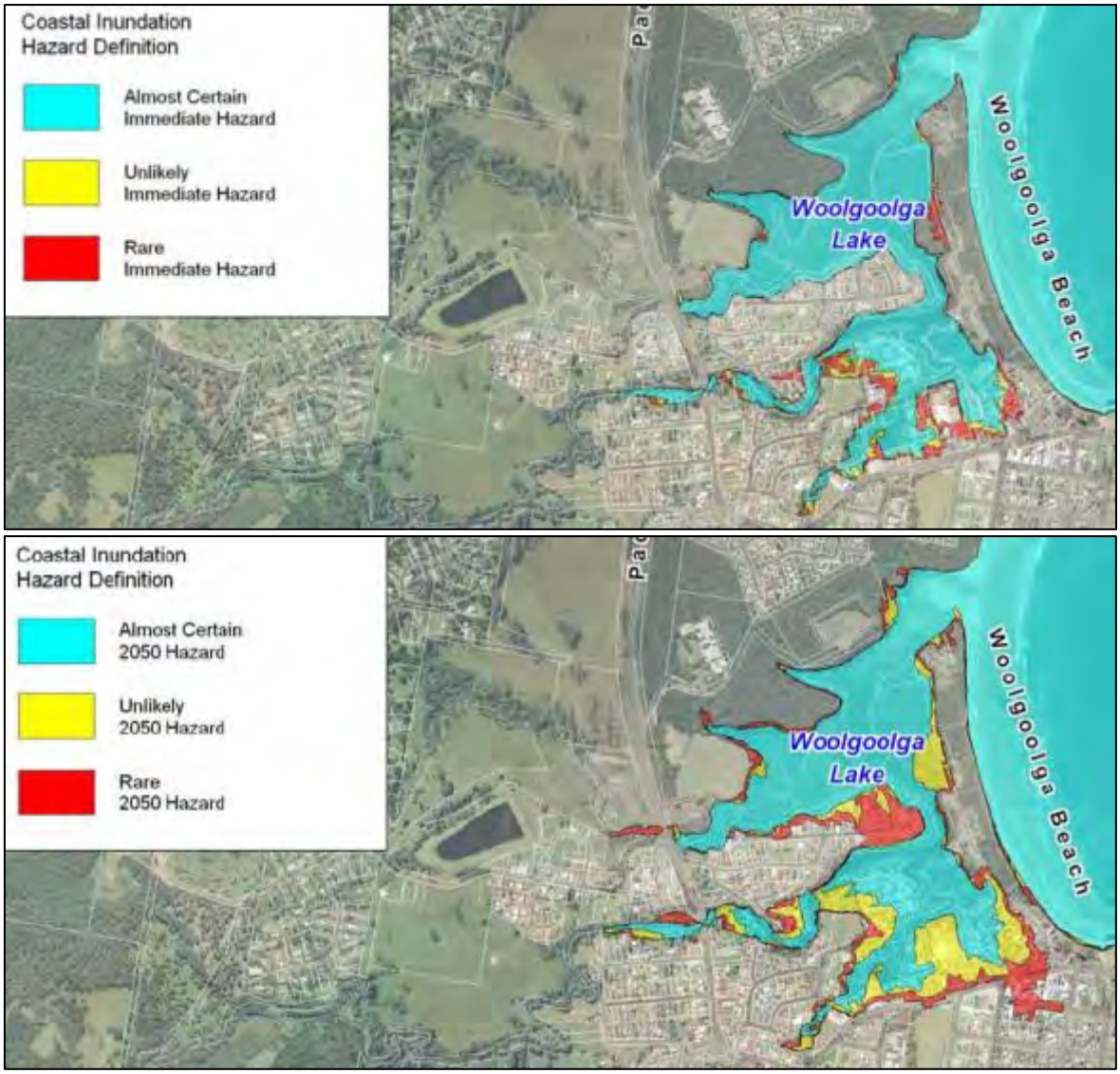
Therefore the objective is to maintain a natural opening / closing regime for the lake entrance. Interference (artificial opening of the entrance) would only be employed for critical situations such as to mitigate and reduce the impacts of flooding on properties and infrastructure adjoining the lake. Artificial opening would ideally be initiated within the 'natural breakout range'.

F.2.1.3 Minimise Flooding of Properties and Infrastructure

Some properties and infrastructure adjoining Woolgoolga Lake are at risk of flooding including residential areas of Sunset Lakes Estate along the southern shores of the lake, Woolgoolga Sunset Caravan Park and areas adjoining Woolgoolga Creek and Jarrett Creek – refer to the upper map of Plate F.1. Sewage pump stations adjoining the lake and its creek are also impacted by flooding with water entering the pump stations and potentially leading to sewage entering the lake system – refer to Section F.2.1.1 for further details.

Flooding of properties and infrastructure along the margins of the lake will be exacerbated by sea level rise for flood events influence by elevated ocean levels - refer to the lower map of Plate F.1. Artificial opening of the lake entrance has the potential to reduce flood levels in the lake for certain flood events. It is important to note that for large flood events, flood levels in the lake have been shown to be independent of any artificial entrance opening works. This is due to the effect of the elevated ocean water levels which would 'over-ride' any impact of an open entrance.

There are a variety of strategies to minimise or avoid flooding of properties and infrastructure around the lake including: appropriate development controls for future development in flood prone areas; artificial opening of the lake entrance where appropriate; flood-proofing infrastructure; etc.



Source: BMT WBM (2010b)

Plate F.1 Coastal Inundation Mapping for the Immediate and 2050 Planning Horizons

F.2.2 Bank Stability and Sedimentation Objectives

F.2.2.1 Determine priorities for the implementation of appropriately designed bank stabilisation and rehabilitation works in areas with important estuary values.

Bank erosion is not a significant issue in the Woolgoolga Lake estuary (GeoLINK et al., 2011). Only 1% of banks surveyed (approximately 80 m total) had minor erosion and there was no moderate or severe erosion recorded. The relatively stable nature of this system is primarily due to the low energy environment of the estuary, the cohesive nature of the bank materials, and the mostly well-vegetated estuary banks. Nevertheless, the presence of remedial bank protection works on the north bank of the lake entrance and on the southern bank picnic area foreshore demonstrate that active management is required to maintain bank stability in the lower reaches of Woolgoolga Lake. The intention of this objective is to develop bank remediation plans for areas of minor bank erosion that intersect with areas of importance from a recreational, estuarine health, or estuarine ecology perspective.

F.2.3 Ecological, Habitat and Biodiversity Objectives

F.2.3.1 Improve the Condition and Extent of Aquatic Habitats

The Northern Rivers Catchment Management Authority (NRCMA) Catchment Action Plan (CAP) lists rehabilitation of aquatic habitats among its goals. Analysis of estuarine habitat extent in Woolgoolga Lake indicates that seagrass has disappeared in recent years and that some saltmarsh and mangrove habitats show signs of disturbance.

F.2.3.2 Restore terrestrial habitats of high ecological or conservation value by removing threats and through targeted rehabilitation (e.g. riparian vegetation, endangered ecological communities such as Coastal Saltmarsh, Freshwater Wetlands, etc)

Restoration of riparian vegetation is also listed among the goals of the NRCMA CAP. A variety of terrestrial habitats of high conservation value have been identified within the Woolgoolga Lake estuary. A major threat to the integrity and viability of these habitats is weed invasion, and to a lesser extent clearing or suppression of natural regeneration. This management objective is aimed at the rehabilitation of sites with high ecological or conservation value where degradation through weed infestation or other impacts has occurred.

F.2.3.3 Flying-Fox Camp

In regard to the Grey-headed Flying-fox maternity camp on the eastern bank of Woolgoolga Lake, Council plans to develop a management strategy with the objective of maintaining the camp over the long-term while ameliorating concerns within the community. Other objectives of the management strategy include restoring the area's value as Secondary Koala Habitat, enhance the Woolgoolga Lake riparian and coastal values and providing for community's needs in terms of recreation, education and interpretation of these values to ensure the long-term management of the camp.

F.2.3.4 Increase Fish Stocks

Recreational fishing is a common use of the Woolgoolga Lake estuary. Increasing fish stocks was raised as a goal during community consultation.

F.2.3.5 Monitor and Improve the Health of the Woolgoolga Lake Estuary

The Estuary Processes Study (GeoLINK et al., 2011) describes the overall health of the Woolgoolga Lake estuary system as average. Improvements in the health of the estuary could be achieved by better management of water quality, removal of weeds from the riparian zone and improvement of the condition and extent of saltmarsh vegetation. This management objective generally relates to achieving all other specific management objectives for the estuary.

F.2.3.6 Make Provisions for the Ecological Effects of Climate Change and Sea Level Rise

Some negative ecological impacts are likely to result under current climate change and sea level rise scenarios. These may include changes in the distribution and extent of mangrove and saltmarsh colonies and reductions in the overall productivity of the estuary. Effective planning for future changes to help to mitigate negative impacts may include strategies such as establishment of buffer areas between development and the lake edge to enable 'retreat' of riparian vegetation as lake levels rise over the longer term.

F.2.4 Water Quality Objectives

F.2.4.1 Improved Water Quality

The NRCMA CAP lists an improvement in the condition of coastal zone natural resources as one of its targets. This was also identified as a goal during community consultation. Whilst analyses of water quality data against existing guidelines have not uncovered major issues there are a number of ways in which the water quality of Woolgoolga Lake could be improved. These include:

- reduce nutrient and sediment inputs from the catchment through better land, stormwater and wastewater management; and
- reduce the risk of sewage entering the waterway as a result of flooding of sewerage infrastructure.

F.2.4.2 Improve the monitoring of water quality

This is one of the goals identified during community consultation and is also a wish of the Coastal Estuary Management Advisory Committee (CEMAC). A suggested water quality monitoring program that meets NSW government reporting obligations will be delivered as part of the Estuary Management Plan.

F.2.5 Recreational Use and Access Objectives

Woolgoolga Lake occupies a predominantly natural setting although urban development has encroached around the southern foreshores and dominates the catchment areas of Woolgoolga and Jarrett creeks. The close proximity of residential communities and the variety of natural settings combine to create a broad range of passive land and water based recreational opportunities that optimise the scenic potential of the area. The following objectives are aimed at maintaining and enhancing the natural setting and existing recreational opportunities.

F.2.5.1 Maintain and enhance the existing passive water and land based recreational experiences and opportunities in a manner that complements and sustains the natural values of the lake and its tributaries.

F.2.5.2 Encourage low key recreational activities that are compatible with each other and the natural environment.

F.2.5.3 Enhance, protect and restore natural values to foreshore areas.

This latter objective is aimed at restoring the natural amenity of foreshore areas that have been degraded or prevented from regenerating through poor or conflicting maintenance practices such as mowing of riparian habitats.

F.2.6 Views and Visual Character Objectives

The majority of the foreshores around the lake comprise a continuous edge of natural vegetation. This often extends well back from the foreshores and rise up adjoining slopes to produce an attractive natural skyline and backdrop to views across the lake. The surrounding ridges also enclose and help to protect the lake, further enhancing the microclimate and visual experience to visitors. The following objectives are aimed at maintaining and enhancing these characteristics.

F.2.6.1 Preserve and enhance the natural appearance of the lake particularly along the southern foreshores adjacent to existing residential development.

This objective relates to a previous objective in Section F.1.5.3.

F.2.6.2 Optimise the attractive outlook across the lake and creeks from path routes, recreation areas and other destinations for public enjoyment.

F.2.6.3 Undertake management practices and provide infrastructure and facilities that complement the natural appearance and values of the setting.

F.3 Management Issues

F.3.1 Entrance Conditions and Hydrodynamics Issues

F.3.1.1 Entrance Management to Address Water Quality, Sedimentation and Flooding

Effect of Closed Entrance on Water Quality

A significant proportion of community participants in the consultation phase have indicated a desire for an entrance opening protocol for the purpose of 'flushing' the lake to improve water quality. An entrance opening protocol will be developed as part of the Estuary Management Plan. However, the protocol will need to take account of the potential negative impacts of artificially opening the entrance, as described in Section F.1.1.2, including negative impacts on water quality, fish and other ecological communities. Artificially opening estuary entrances is often carried out as a 'quick fix' to redress water quality problems stemming from other causes such as inadequate stormwater treatment from urban areas or inadequate erosion control measures in the catchment (refer to Section F.1.4.1). Best practice for estuary management is based on addressing the source of the water quality issues rather than treating the symptoms by artificially opening entrances to 'flush' an estuary. It should also be noted that water quality data indicates that Woolgoolga Lake is generally in good condition with a high natural variance which is characteristic of ICOLLs. Nevertheless, in addition to flood mitigation purposes, there may be instances where artificial opening is justified to address extreme water quality issues.

Effect of Closed Entrance on Sedimentation in the Lake

A significant proportion of community participants in the consultation phase have also indicated a desire for an entrance opening protocol to minimise sedimentation in the lake. The Processes Study (GeoLINK et al, 2011) indicates artificial opening of the lake entrance will not have any significant impact on reducing sedimentation in the lake or removing the shoals of marine sand from the entrance. Data indicates that only very large flooding events (e.g. 1974 event), potentially in combination with large ocean swell events, will remove significant quantities of marine sand from the entrance. Artificial opening will only result in minor scouring near the entrance. The effect of this would be short-lived with relatively quick in-filling with marine derived sands. This is addressed further in to Section F.2.2.2.

Flooding of Properties and Infrastructure

Artificial opening of the entrance has been initiated by Council in the past as a flood control measure. The initiation of entrance opening involves direct excavation of a narrow 'starter' channel. Council's informal policy is to open the lake entrance when the lake water level reaches an established flood mark which is set at 1.8 m AHD. This is the level of the overflow pipe from Sewage Pump Station No.1 (PS 1) in Ganderton Street. At lake water levels greater than 1.8 m AHD, water will flood PS 1 causing water to enter the sewerage system (and cause excess pumping) and potentially lead to sewage entering the lake system via Jarrett Creek. There is another low-lying sewage pump station (PS 16) on the southern foreshore of the lake, however this pump station is higher than PS 1 and does not currently dictate artificial opening of the entrance.

The highest recorded flood level in Woolgoolga Lake was reported as 2.1 m AHD in 1974 (Bewsher Consulting, 1989). Table F.1 summaries the water levels experienced in the lake during non-flood periods and for major flood events.

Table F.1 Lake Water Levels for Non-Flood and Flood Periods – Existing and Future

	Existing[1] (2011)	*2050[2]*	*2100[3]*
Non-Flood Periods			
Average water level (m AHD)	0.7	1.1	1.6
Maximum water level (m AHD)	1.5	1.9	2.4
Minimum water level (m AHD)	0.2	0.6	1.1
90th percentile water level[4] (m AHD)	1.1	1.5	2.0
Natural breakout range[5] (m AHD)	1.2 – 1.8	1.6 – 2.2	2.1 – 2.7

	Existing[1] (2011)	*2050[2]*	*2100[3]*
Flood Events			
1 in 100 Year Flood	2.6	3.0	3.5
Probable Maximum Flood	2.7	3.1	3.6

Notes: 1. Averaged from 2004 data and 2007 – 2011 data in Estuary Processes Study (GeoLINK *et al*, 2011);
2. Existing water level plus 0.4m sea level rise;
3. Existing water level plus 0.9m sea level rise
4. The water level greater than 90 percent of all recorded water levels
5. Water levels at which a closed entrance naturally opens

Water levels in the lake are likely to increase by the same amount as sea level rise increases caused by climate change. Future water levels and flood levels considering the impact of sea level rise are summarised in Table F.1.

It is important to note the above flood levels for major events are independent of any artificial entrance opening works. This is due to the effect of the elevated ocean water levels which would 'over-ride' any impact of an open entrance. However, floods which occur at low ocean water levels would be limited by artificial opening of the lake entrance.

F.3.2 Bank Stability and Sedimentation Issues

F.3.2.1 Bank Erosion of Picnic Area Foreshores

Mapping of bank erosion has been completed. No severely eroding or moderately eroding sites were identified. However, minor erosion was recorded in the vicinity of the Lakeside Picnic Area foreshore. The site is adjacent to an area of high recreational use, which in part would be contributing to the issue. As such any remedial actions planned would need to consider the recreational values of the site. An assessment of this site and a determination as to whether remedial action is required will be undertaken as part of the Estuary Management Plan. This issue is addressed in combination with Section F.2.5.2 regarding upgrading and management of existing recreational facilities.

F.3.2.2 Dredging – the need to address effects of sedimentation including a perceived loss of recreational opportunity due to decreased waterway depth

Anecdotal evidence suggests that the estuary was deeper in some locations in the past (around the 1970's), particularly in the mid to lower reaches. Community consultation has highlighted a perceived loss of recreational opportunity due to decreased waterway depth relative to this period.

Due to a lack of historical bathymetric data, changes in the depth of the estuary and lake cannot be quantified. However, historical aerial photography indicates that water depths in 1943 were similar to the period from the 1990's to present. The aerial photography indicates deeper water depths in the 1960's and 1970's. This is considered to be due to very large flooding events in combination with large ocean swell events during this period which had the effect of removing a significant amount of marine derived sediment near the entrance. Aerial photographs in subsequent years show the gradual build-up / replenishment of this marine sand and subsequent reduced water depths in the vicinity of the lake picnic area / lake entrance.

Fluctuations in the amount of marine sediment in the estuary and consequent fluctuations in water depths are a natural trend. The major source of sedimentation in the estuary is from marine derived sands which are naturally pushed into the estuary through the entrance by tidal flows assisted by tidal and ocean currents and wind and ocean waves. Secondary sources include inputs from the broader catchment including from bank erosion and as a result of sheet, rill and gully erosion associated with catchment land management practices.

Infilling of the estuary by marine derived sands is a natural long-term process that is not easily reversed. Intervention works such as dredging are expensive and generally only achieve short-term benefits in respect to removal of sediment. In addition, dredging can have significant impacts on estuary processes, health, ecology and water quality, for example:

- dredging of marine delta shoals creates an increased sediment demand for infilling of the entrance which would result in a net depletion of sand on Woolgoolga Beach; and

- dredging of the deep mud basin in the lake can modify natural sediment processes and associated benthic metabolism and chemical processes thus degrading water quality and exacerbating eutrophication (Haines, 2006).

Therefore, this estuary management study does not recommend dredging on the basis of the following considerations:

- long-term fluctuations in water depths associated with infilling of the estuary by marine derived sands is a natural process that has occurred prior to the 1970's (water depths in 1943 were similar to present water depths based on aerial photography);
- dredging is expensive and generally only achieves short-term benefits in respect to removal of sediment;
- dredging can have significant impacts on water quality, estuary processes, health, and ecology;
- the lake is part of the Solitary Islands Marine Park and is listed as 'Habitat Protection Zone' which has the objective of protecting habitats and reducing high impact activities (e.g. dredging); and
- an approval process involving NSW government agencies is required before dredging is undertaken and it is considered unlikely that dredging would be approved for Woolgoolga Lake for the primary purpose of increasing water depths for improved swimming amenity.

F.3.3 Ecological, Habitat and Biodiversity Issues

F.3.3.1 Loss of Aquatic Habitats

A decline in the area and condition of seagrass beds, mangroves, saltmarsh and sedge heath communities was identified by CEMAC as possible issues concerning Woolgoolga Lake. Detailed mapping analysis of aquatic habitats shows that seagrass has disappeared from Woolgoolga Lake in recent years. The factors causing the decline in the area of seagrass are uncertain, though factors commonly associated with seagrass loss that may be present in Woolgoolga Lake include:

- high suspended sediment loads in catchment runoff;
- natural fluctuations in the area of seagrass common to ICOLLs; and
- natural fluctuations in the position of the marine tidal delta.

F.3.3.2 Loss of riparian vegetation on the southern lake foreshore.

The riparian vegetation of the Woolgoolga Creek and Lake estuary is predominantly in moderate to very good condition (GeoLINK et al, 2011). Only a small area of vegetation in very poor condition was identified, occurring on the southern foreshore of Woolgoolga Lake, immediately adjacent to the residential area of Sunset Lakes Estate. Although the site has the appearance of having been cleared to facilitate resident's views, an analysis of air photography dating back to 1943 shows that the site was cleared prior to the 1940's. However, the native vegetation has been allowed to regenerate along most of the reach, except in this area, since the 1980's when residential development accelerated. Generally, it is an objective of estuary management to maintain a continuous swathe of native vegetation along the foreshore and banks to maintain the estuary health, ecology, bank stability and aesthetics. Encouraging native riparian vegetation including saltmarsh habitats to regenerate at this site would further this objective. This issue is addressed under Section F.2.5.1.

Plate F.2 Southern Foreshore of Woolgoolga Lake

F.3.3.3 Environmental weeds degrading native riparian vegetation communities in mid to upper reaches of Woolgoolga and Poundyard Creeks.

Weed mapping undertaken in January 2011 identified the presence of environmental weeds in the upper reaches of Woolgoolga and Poundyard Creeks (GeoLINK et al., 2011). The main species identified included groundsel bush, senna, camphor laurel, and pink lantana. Environmental weeds degrade the native riparian vegetation, reducing its ecological value and in some cases potentially impacting upon bank stability and other estuary values including recreational amenity and aesthetics. Weed control is a long-term and costly management action and so it is recommended that areas with important estuary values be targeted as a priority. Reaches of high priority for weed control will be determined as part of the Estuary Management Plan.

F.3.3.4 Diminishing Fish Stocks

At the community meeting diminishing fish stocks were raised as an issue. Fish sampling undertaken as part of the Estuary Management Study (EMS) detected a lower diversity of fish species than previous studies, though the methods used and timing of the study may not have been comparable.

F.3.3.5 Flying-Fox Camp

Concern has been expressed about the flying-fox camp along the banks of Woolgoolga Lake during the project consultation phase. Concerns have related to impacts of excrement on water quality, odours, and impacts on vegetation in the roosting area. Community comments also included support for retaining the camp. Council plans on developing a management strategy for the long-term management of the camp which will include vegetation management and direct amelioration of concerns within the community.

F.3.3.6 Impacts of Climate Change on Estuary Ecology

Some negative ecological impacts are likely to result under current climate change and sea level rise scenarios. These may include changes in the distribution and extent of mangrove and saltmarsh colonies, reductions in the overall productivity of the estuary and a reduction in feeding and nesting areas for wading birds.

F.3.4 Water Quality Issues

F.3.4.1 Elevated Turbidity, Total Nitrogen and Chlorophyll-a Values

Poor water quality was identified during community meetings as a perceived issue and also by CEMAC as a potential issue. However, analysis of existing water quality data indicates that for the majority of the time, (9 out of 13 months of Beachwatch data collection) the waters of Woolgoolga Lake are suitable for primary contact recreation. Analysis of other water quality data indicates that the waters of Woolgoolga Lake are within ANZECC (2000) guidelines for the protection of aquatic ecosystems by all measures except turbidity and total nitrogen concentration, but that they exceed OEH guideline values for chlorophyll-a concentration and turbidity in lagoons. In summary, whilst the water quality is generally acceptable for current uses, careful management of land use and runoff in the catchment could result in improvements. Additional motivation for improvements in water quality lies in the stated goals of the North Coast LLS CAP, and the fact that the waters of Woolgoolga Lake are part of the Solitary Islands Marine Park.

Turbidity
Poor water quality was identified during community meetings as a perceived issue and also by CEMAC as a potential issue. However, analysis of existing water quality data indicates that for the majority of the time, (9 out of 13 months of Beachwatch data collection) the waters of Woolgoolga Lake are suitable for primary contact recreation. Analysis of other water quality data indicates that the waters of Woolgoolga Lake are within ANZECC (2000) guidelines for the protection of aquatic ecosystems by all measures except turbidity and total nitrogen concentration, but that they exceed OEH guideline values for chlorophyll-a concentration and turbidity in lagoons. In summary, whilst the water quality is generally acceptable for current uses, careful management of land use and runoff in the catchment could result in improvements. Additional motivation for improvements in water quality lies in the stated goals of the NRCMA CAP, and the fact that the waters of Woolgoolga Lake are part of the Solitary Islands Marine Park.

The assembled water quality data for Woolgoolga Lake triggers ANZECC (2000) and OEH interim guidelines for the protection of aquatic ecosystems for turbidity. The specific cause of elevated turbidity levels in Woolgoolga Lake is uncertain, though the following factors may be contributing:

- wind re-suspension of fine sediments on the bottom – this is considered likely, due to the wide shallow nature of the main body of the lake, though a single water quality profiling undertaken in 2004 showed limited mixing during closed conditions (see GeoLINK 2011a);
- re-suspension of fine sediments on the bottom due to tidal flow; and
- elevated suspended sediment loads in catchment runoff.

The median turbidity value is only slightly above the ANZECC (2000) guideline value for estuaries.

Nitrogen
Analysis of the existing water quality data against ANZECC (2000) guidelines indicates that Woolgoolga Lake is also nitrogen enriched on a regular basis. Whilst he ANZECC (2000) guidelines are the best currently available measuring stick for water quality they have not been developed specifically for ICOLLs like Woolgoolga Lake and can result in misleading conclusions.

Chlorophyll-a
Elevated nitrogen concentrations are an indirect threat to an ecosystem. The main problem associated with elevated nitrogen concentrations is that under specific conditions they may lead to algal blooms. Chlorophyll-a concentrations are measured as an indicator of the status of algal populations. Whilst the median chlorophyll-a concentration for Woolgoolga Lake is within ANZECC (2000) guideline values, it is greater than the OEH guideline value for lagoons. The authors have not been made aware of a history of algal blooms in Woolgoolga Lake but the combination of slightly elevated total nitrogen and chlorophyll-a concentrations constitutes an issue.

F.3.4.2 Stormwater Management and Pollutant Inputs from the Catchment
During community consultation water quality issues associated with runoff from rural and urban lands were raised as a perceived issue. Nutrients, sediments, pesticides and herbicides, and organic matter were all seen as potential contaminants in runoff. A basic modeling exercise was undertaken as part of the Estuary Processes Study using the Catchment Management Support System (CMSS). The CMSS is a method of calculating nutrient and sediment budgets based upon landuse types and their distribution within a catchment

Forestry Operations
The CMSS indicated that the greatest contribution of sediments and nitrogen potentially comes from forestry operations in the upper catchment due to the large proportion (approximately one third) of the catchment under this landuse. This highlights the importance of erosion and sediment controls during forestry operations.

Rural Landuse
The CMSS indicated phosphorus input to the lake was largely attributed horticultural land uses. This highlights the importance of erosion and sediment controls for the main agricultural practices in the catchment

(e.g. banana and blueberry cultivation) and wastewater controls for intensive horticultural practices such as excess fertigation from greenhouse cucumber production.

Urban Development
Urban development comprises over half of the immediate estuary catchment area of Woolgoolga Lake. There is also a potential long-term urban expansion area west of the existing highway should population targets be achieved sooner than currently predicted.

New development areas have the potential to reduce the quality of catchment runoff during and after the construction phase. It is important that controls placed on new developments are sufficient and enforced to ensure no negative net impact upon water quality. It is equally important that stormwater management (treatment and detention) improvements are pursued in existing urban areas. This may include retrofitting of existing drainage systems to improve treatment and detention as opportunities arise in association with redevelopment. However, it is noted that some older drainage systems based on grassed swales as opposed to kerb and gutter, such as older areas of Safety Beach, provide effective treatment of runoff.

Old on-site sewage management systems (septic systems) on rural and rural-residential properties also have potential to deliver excess nutrients and pathogens to the estuary system.

Pacific Highway Upgrade
An additional and immediate development within the greater catchment area is the construction of the Woolgoolga bypass. It is important that water quality runoff from the construction of this major development is subject to strict controls and does not result in adverse impacts to water quality.

F.3.4.3 Sewage Input During Times of High Water Levels
During times of very high water levels in Woolgoolga Lake (>1.8m AHD) there have been pollution events associated with overflows from sewage pump stations that have led to sewage entering the water. This matter is addressed in a previous issue relating to flooding of infrastructure – refer to Section F.2.1.1.

F.3.4.4 Water Quality Impacts Associated with Climate Change and Sea Level Rise
It is difficult to predict precisely how forecast climate change and sea level rise may impact upon water quality in Woolgoolga Lake. It is likely, however, that some existing issues might become more pronounced under climate change and sea level rise scenarios, particularly issues relating to catchment inputs.

In respect to the impacts of sea level rise on stormwater management, there are a number of low-lying stormwater treatment systems that will be impacted along the southern foreshore of the lake adjoining Sunset Lakes Estate. These are mini-wetland treatment systems which will be impacted as a result of being largely submersed with higher lake levels resulting from sea level rise. These mini-wetland treatment systems are estimated to have an invert level of approximately 1.5 m AHD. Based on the lake water levels shown previously in Table F.1, these systems will be frequently submerged in the future during high tide events when the lake entrance is open. This will render the systems ineffective for treatment during these submerged periods. It may also result in entrapped pollutants being released into the lake system. Therefore, to maintain effective stormwater treatment of the respective drainage catchments, retrofitting of the systems or installation of replacement systems at more appropriate locations requires consideration.

F.3.4.5 Residues from the 1989 Dieldrin/Aldrin Spill
To date, no follow up information has been gathered to describe the status of sediment, water or biota with respect to the pollution event in 1989.

F.3.4.6 Water Quality Impacts from the Flying Fox Camp
This was raised as a potential issue during community consultation. This matter will be addressed under a previous issue addressing the camp – refer to Section F.2.3.5.

F.3.4.7 Lack of Continuity and Detail in Existing Water Quality Data

The conclusions that have been drawn about nutrient and sediment concentrations and trophic status are based upon a limited dataset. In general the available water quality data for Woolgoolga Lake could be described as lacking in continuity and detail.

F.3.5 Recreational Use and Access Issues

F.3.5.1 Poorly managed recreational activities and other practices have the potential to impact on riparian vegetation and thereby degrade the recreational experience of the lake

As indicated in Section F.2.3.2, a small area of vegetation in very poor condition occurs on the southern foreshore of Woolgoolga Lake, immediately adjacent to a residential area. Management practices such as mowing continues to impact on the regeneration of native riparian vegetation in areas previously cleared. Modifying current management practices to encourage native riparian vegetation to regenerate at this site would further objectives associated with improving estuarine habitat and improving the natural amenity of the lake for recreational purposes.

Similarly, understorey vegetation has been cleared to create / maintain a fire buffer along a strip of the bushland reserve in the north of the lake adjacent to the residential area of Safety Beach. The ground cover of grass is routinely mown or slashed with potential encroachment beyond the necessary fire buffer into natural vegetation.

At the Lakeside Picnic Area and Caravan Park there are a number of factors impacting on riparian vegetation and bank erosion that could be significantly improved with appropriate measures:

- concentrated pedestrian access onto a 'sandy beach area' at the main picnic area has impacted on vegetation cover on the banks and exacerbated bank erosion. Strategies are required to mitigate the impact of pedestrian access across the bank in specific locations (compatible with the recreational use of the picnic area) and preventing access across the bank in other more sensitive location to enable reestablishment of riparian vegetation and thereby reinforcing against bank erosion; and
- unmanaged mowing practices adjacent to the caravan park along the bank between the picnic area and the lake entrance is impacting on the riparian vegetation. Installation of a defined edge is required between riparian vegetation and mowed areas to help protect and reestablishment a sufficient riparian border while defining a walkway along this section. This will then assist in reinforcing the bank against erosion.

Uncontrolled and inappropriate pedestrian access through other riparian areas also has the potential to damage natural values and degrade the recreational experience to visitors.

F.3.5.2 Existing recreational facilities and opportunities require upgrading and management to enhance and protect the recreational experience offered by Woolgoolga Lake

The desirable assets of Woolgoolga Lake (high scenic amenity, close proximity to the township, and the range of passive land and water based recreational opportunities) provide an incentive and pressure for expanded tourism development of the foreshores. However inappropriate development has the potential to detract from the assets and amenity of the lake. This issue relates to the objectives of protecting the natural values of the lake.

Recreational walking, jogging and cycling are key activities around the lake. These activities are facilitated by a network of boardwalks, bridges and bush tracks of varying standard around the lake periphery. There is a lack of a continuous walking trail network that is clearly defined and provides optimal access into and through the area such as around the southern / western periphery of the lake and Woolgoolga Creek. The paths are particularly important for the residential community in the remote southern neighbourhoods of the lake where the restricted street layout offers minimal access options.

Similarly, there is a lack of appropriate directional and interpretive signage to complement the network of boardwalks, bridges and bush tracks around the lake periphery.

Rubbish around the foreshore areas was identified as an issue during community consultation that also relates to maintaining the recreational experience offered by Woolgoolga Lake.

F.3.6 Views and Visual Character Issues

Woolgoolga Lake is a relatively large water body that includes creeks and water courses that extend into a variety of catchments including urban, natural, and highly modified rural environments. Issues pertaining to views and visual character include:

F.3.6.1 Maintenance of existing views and solar access by residents along the southern foreshores of the lake conflicts with the retention of foreshore vegetation

This issue relates to the issues described in Section F.2.3.2 and F.2.5.1 - regarding modifying current management practices to encourage native riparian vegetation to regenerate along the southern foreshores of the lake. The design and/or management of revegetation will require careful consideration and consultation to mitigate conflicts with regard to shading of winter sun and impacts on views for landholders adjoining the southern foreshores of the lake. This issue is addressed under Section F.2.5.1.

F.3.6.2 Loss of visual amenity resulting from weed growth, poor maintenance practices, rubbish deposition and provision of unattractive and poorly located infrastructure

The above matters have the potential to impact on the visual amenity experienced around Woolgoolga Lake foreshores. This issue requires a range of strategies which are partly dealt with in previous issues relating to weed growth (Section F.2.3.2), undesirable impacts on existing riparian vegetation (Section F.2.5.1), and rubbish (Section F.2.5.2).

The issue of unattractive and poorly located infrastructure refers to issues such as past practices of bank erosion protection that are visually unsympathetic to the setting.

F.2.6.3 Limited opportunity to appreciate the intimate visual character of the tributaries in the upper catchment areas of the lake.

This issue is associated with limited public access along the foreshores of Woolgoolga Creek, South Woolgoolga Creek, Jarrett Creek. This issue relates to a lack of a continuous walking trail network (Section F.2.5.2) to provide optimal access around the periphery of the lake and creeks. Accordingly, this issue is addressed under Section F.2.5.2.

F.4 Ranked List of Issues

Table F.2 shows the ranked management issues in terms of their priority for management over the next five years. Five years is the expected planning timeframe for the Estuary Management Plan before it undergoes review and adjustment. The ranking has been based on the scoring system below. The scoring attributed to each management option is shown in Table F.2.

Priorities have been allocated to management objectives based on a matrix assessment that considers:

- the degree to which the management objectives will impact on estuary issues:
  (scoring: low = 1, moderate = 3, high = 5);
- timeframe over which the impacts are likely to occur:
  (scoring: short (< 3 years) = 1, medium (5-8 years) = 3, long (>10 years) = 5);
- extent of the estuary addressed by the management objective:
  (scoring: lower estuary = 1, middle estuary = 1, upper estuary = 1, whole estuary = 3); and
- community rating of the issues addressed by the management objectives based finding from the community survey detailed in Section 3): (scoring: not important = 0, important = 3, very important = 5).

Table F.2 Ranked List of Key Estuary Management Issues

Priority	*Key Estuary Management Issue*	*Potential for Impact on Estuary Objectives*	*Timeframe over which Impacts Occur*	*Extent of Estuary Addressed*	*Community Rating*	*Priority Score*
1	Entrance Management to Address Water Quality, Sedimentation and Flooding	5	5	2	5	17
2	Stormwater Management and Pollutant Inputs from the Catchment	3	5	3	5	16
3	Poorly managed recreational activities and other practices have the potential to impact on riparian vegetation and thereby degrade the recreational experience of the lake	4	5	2	4	15
4	Elevated Turbidity, Total Nitrogen and Chlorophyll-a Values	3	5	2	5	15
5	Impacts of Climate Change on Estuary Ecology	4	5	3	2	14
6	Diminishing Fish Stocks	3	5	2	4	14
7	Loss of Aquatic Habitats	3	5	2	3	13
8	Environmental weeds degrading native riparian vegetation in mid to upper reaches of Woolgoolga and Poundyard Creeks	2	5	2	4	13
9	Water Quality Impacts Associated with Climate Change / Sea Level Rise	3	5	2	3	13
10	Lack of Continuity and Detail in Existing Water Quality Data	2	5	2	3	12
11	Existing recreational facilities and opportunities require upgrading and management to enhance and protect the recreational experience offered by Woolgoolga Lake	3	3	2	3	11
12	Flying-Fox Camp	3	3	1	3	10
13	Loss of visual amenity resulting from weed growth, poor maintenance practices, rubbish deposition and provision of unattractive and poorly located infrastructure	2	3	2	2	9
14	Dredging – the need to address effects of sedimentation including a perceived loss of recreational opportunity due to decreased waterway depth	1	1	1	5	8
15	Residues from the 1989 Dieldrin/Aldrin Spill	1	3	2	1	7

Appendix G

Letters of Support from Agencies for Relevant Actions

DOC18/000676

Steve McGrath
General Manager
Coffs Harbour City Council
Locked Bag 155
Coffs Harbour NSW 2450

Attn: Marten Bouma

By email: council@chcc.nsw.gov.au
CC: marten.bouma@chcc.nsw.gov.au

Dear Mr McGrath

Re: Draft Woolgoolga Lake, Boambee / Newports Creek and Coffs Creek Coastal Zone Management Plans as amended 14 December 2017 (draft CZMPs)

The Department of Industry – Lands & Water (DoI Crown Lands) has reviewed the draft Woolgoolga Lake, Boambee / Newports Creek and Coffs Creek Coastal Zone Management Plans (as amended 14 December 2017) where relevant to the NSW *Crown Lands Act 1989.*

The review has considered technical, planning and financial aspects of the draft CZMPs as relevant to Crown land management. The review has not considered the adequacy of the draft CZMPs in relation to other legislation or the 'Guidelines for Preparing a Coastal Zone Management Plans', produced by the NSW Office of Environment & Heritage (2013).

DoI Crown Lands agrees 'in principle' to the amended draft CZMPs under section 55C(2)(b) of the *Coastal Protection Act*. This agreement does not exclude or replace the need for authorities to undertake the various planning, regulatory and approval processes that may be required as per the *Crown Lands Act 1989* and as part of implementing the CZMPs.

Should you wish to discuss this matter further, please do not hesitate to contact Ms Catherine Knight, Coastal Management Specialist, on 0428 967 997 or by email at catherine.knight@crownland.nsw.gov.au.

Yours sincerely

Glenn Bunny
Director Infrastructure and Land Management
10 January 2018

437 Hunter Street Newcastle NSW 2300
PO Box 2185 Dangar NSW 2309
Tel: 1300 886 235 www.crownland.nsw.gov.au ABN: 72 189 919 072

OUT17/16446

27 April 2107

Coffs Harbour City Council
Locked Bag 155
COFFS HARBOUR, NSW 2450

Attn: Marten Bouma
Email address marten.bouma@chcc.nsw.gov.au

Dear Mr Bouma

Support for actions required to be undertaken by DPI Agriculture under Council's adopted Estuary Coastal Zone Management Plans (EMPs)

Thank you for the opportunity to provide comment for the above proposal as per your correspondence dated 23 March 2017.

DPI Agriculture has reviewed the commitments included in the EMPs and agrees to undertake the actions outlined. To assist Council to plan to undertake these actions DPI Agriculture encourages Council in the first instance to contact Mr Mark Hickey Leader Northern Horticulture, Primary Industries Horticulture on telephone (02 6626 1277) or email mark.hickey@dpi.nsw.gov.au to ensure that the relevant industry development officers will be available.

Yours sincerely

E Rogers

Liz Rogers
Manager
Agriculture Landuse Planning

NSW Department of Primary Industries - Agriculture
Locked Bag 21, Orange NSW 2800 | 161 Kite St, Orange NSW 2800
Tel: 02 6391 3391 | Email: landuse.ag@dpi.nsw.gov.au | www.dpi.nsw.gov.au | ABN: 72 189 919 072

From: Jason Bailey
To: Sally Whitelaw
Cc: Jackson Pfister
Subject: RE: ccspt draft email
Date: Wednesday, 3 January 2018 11:50:40 AM
Attachments: image002.png
image003.jpg

Hi Jackson

The Coffs Coast State Park Trust supports the amended actions proposed for Woolgoolga Lake and Coffs Creek as detailed in the email below.
Please contact me if you have any further questions.

Kind Regards
Jason

Jason Bailey
Manager Holiday Parks & Reserves | Coffs Harbour City Council
P: 02 6648 4443 | F: 02 6648 4446 | M: 0417 270 296
E: jason.bailey@chcc.nsw.gov.au | W: www.coffsharbour.nsw.gov.au
Follow Us: on Twitter

From: Sally Whitelaw
Sent: Friday, 15 December 2017 11:06 AM
To: Jason Bailey
Cc: Jackson Pfister
Subject: FW: ccspt draft email

Hi Jason,

Support for actions required to be undertaken by Coffs Coast State Park Trust under Council's Woolgoolga Lake, and Coffs Creek Coastal Zone Management Plans (CZMPs).

I refer to Council's adopted Coastal Zone Management Plans (CZMPs) undertaken for Woolgoolga Lake and Coffs Creek. Council has recently submitted all CZMPs to the Minister of Environment for Certification under Section 55G of the Coastal Protection Act 1979. Prior to finalizing certification, the Minister requires confirmation of written support from various agencies for nominated actions that they are responsible for under those plans.

Following consultation with DoI – Crown Lands and Water, Council has identified that Coffs Coast State Park Trust is in control and management of a number Reserves pertaining to Strategies within the Woolgoolga Lake and Coffs Creek CZMPs. The strategies pertaining to CCSPT for each respective CZMP have been detailed in the table attached.

The updated CZMPs (showing changes via highlights for additions and ~~strikethrough~~ for deletions) can be found in Q:\Common\SALLY WHITELAW\CZMPs with the original plans available on the Council website at http://www.coffsharbour.nsw.gov.au/environment/our-coast/Pages/Estuary-Management-Plans.aspx

Accordingly, Council is seeking written support from CCSPT for the listed Strategies for each CZMP. Currently, Council has received written support from CCSPT for Strategy 11.3 in the Woolgoolga Lake CZMP (received 18 April 2017).

It should also be noted that the CZMP was endorsed for adoption by the Coffs Harbour Coastal Estuary Management Advisory Committee. This committee included members from various State Government and community agencies, including - NSW OEH (Coasts and Catchments), Marine Parks Authority, OEH (National Parks and Wildlife Authority), Roads and Maritime Services, Local land Services, Marine Park Authority, State Emergency Service, Coffs Harbour Regional Landcare and DoI – Crown Lands & Water.

In order to help expedite the Ministerial certification process for the CZMPs can you now provide a written response as soon as possible ie. within 30 days, that you are in support, or have no objection, to the certification of the Woolgoolga Lake and Coffs Creek CZMPs.

Should you require any further information please contact Jackson Pfister on 6648 4662, or email jackson.pfister@chcc.nsw.gov.au

Regards,

Sally Whitelaw
Senior Biodiversity Officer| Coffs Harbour City Council
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17/07/2017
Ref No.: D00236087

Marten Bouma
Planner/Urban Designer
Coffs Harbour City Council
Locked Bag 155
Coffs Harbour
NSW 2450

Support for actions required to be undertaken by Forestry Corporation under Council's adopted Woolgoolga Lake Coastal Zone Management Plan

Dear Marten
Thank you for the opportunity to review the Estuary Management Plan (EMP) for the Woolgoolga Lake Estuary in particular the actions assigned to Forestry Corporation NSW under Strategy Action 2.3.

As agreed FCNSW endorses the EMP on the condition that the changes agreed to between FCNSW and CHCC on the 9th June 2017 are written into the amended EMP prior to certification. The changes to the EMP included rewording of the 2nd paragraph on page 15 under the heading Strategy 2-Stormwater Management and Catchment Pollutants, and rewording of the section tilted Strategy Action 2.3 on page 19.

These changes were requested as the original draft EMP significantly overstated the potential for forestry operations to have an impact on water quality and health of the estuary, and were not supported by the published research. FCNSW were also not consulted about the specific tasks it had been assigned in Strategy Action 2.3.

Regards,

Peter Walsh
Soil and Water Specialist

From:	Tony Broderick
To:	Sally Whitelaw; Jackson Pfister
Subject:	Fwd: Agency support for actions under Estuary Coastal Zone Management Plans
Date:	Monday, 4 December 2017 9:50:13 AM
Attachments:	image001.jpg image001.jpg Attachment 1 - BoambeeNewports CZMP LLS Relevant Strategy Updates.docx Attachment 2 - Darkum Willis Woolgoolga CZMP LLS Relevant Strategy Updates.docx LLS Letter Agency Support for Actions. Follow-up- Local Land Services.pdf

Hi Sally and Jackson,

Thankyou for the opportunity to comment on the revised strategy and actions outlined in the CZMP's for Darkum, Willis and Woolgoolga creeks.

North Coast LLS supports the listed Strategy actions 1.2 and 1.5 for Darkum and Willis Creek CZMP's and the responsibilities attributed to NCLLS as outlined in the attached. Please note that in 171/8 NCLLS will update the "Soil and Water Management Practices for Blueberry growers in Northern NSW, 2008" as part of its current Ecological Sustainable Development: blueberry engagement project.

North Coast LLS also supports Strategy actions 2.2 and 2.6 fo5r Woolgoolga Creek CZMP's and the responsibilities attributed to NCLLS as outlined in the attached.

kind regards
Tony Broderick

Tony Broderick | Team Leader Land Services
North Coast Local Land Services
24-26 Mulgi Drive, South Grafton NSW 2460.
t: 02 6604 1114 | m: 0409 225 798
w: www.lls.nsw.gov.au/northcoast

---------- Forwarded message ----------
From: **Sally Whitelaw** <sally.whitelaw@chcc.nsw.gov.au>
Date: 30 November 2017 at 12:08
Subject: Agency support for actions under Estuary Coastal Zone Management Plans
To: "tony.broderick@lls.nsw.gov.au" <tony.broderick@lls.nsw.gov.au>
Cc: Jackson Pfister <jackson.pfister@chcc.nsw.gov.au>

Hi Tony,

As discussed the other day we are seeking comments from LLS in regards to a number of CZMPs so that we can get them certified and available for grant funds.

A letter is attached explaining this further.

Please give me a call if you have any questions. It would be great to get this sorted before xmas if possible. If not I am on leave for most of January however Jackson is available in

January if you have any questions. He can be reached on 6648 4462.

Regards,

Sally Whitelaw

Senior Biodiversity Officer| Coffs Harbour City Council

P: | 02 6648 4673

E: sally.whitelaw@chcc.nsw.gov.au | W: www.coffsharbour.nsw.gov.au |

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