

ESTUARY MANAGEMENT PLAN

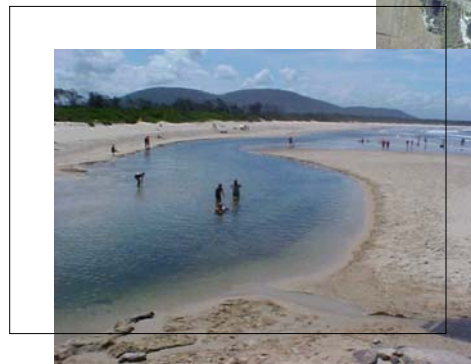
ESTUARY MANAGEMENT STUDY & PLAN

Killick Creek Crescent Head

Final Report



April 2006



NSW Government
DEPARTMENT OF NATURAL RESOURCES



Killick Creek Estuary Management Study and Plan

Prepared For: Kempsey Shire Council

Prepared By: WBM Oceanics Australia

Offices

*Brisbane
Denver
Karratha
Melbourne
Morwell
Newcastle
Sydney
Vancouver*

DOCUMENT CONTROL SHEET

WBM Oceanics Australia Newcastle Office: 126 Belford Street BROADMEADOW NSW 2292 Australia PO Box 266 Broadmeadow NSW 2292 Telephone (02) 4940 8882 Facsimile (02) 4940 8887 www.wbmpl.com.au ACN 010 830 421	Document: R.N0874.001.03.KillickEMS&P_final
	Title: Killick Creek Estuary Management Study and Plan
	Project Manager: Philip Haines
	Author: Philip Haines
	Client: Kempsey Shire Council Client Contact: Ron Kemsley Client Reference:
Synopsis: This document has been prepared under the provisions of the NSW Estuary Policy and NSW Coastal Policy, and in accordance with the Estuary Management Manual. It outlines the management process that is to be followed in order to achieve long term sustainability of the creek with regard to ecological, economic and social values. The Plan is intended to be used by Council to guide future works programs and policy changes.	

REVISION/CHECKING HISTORY

REVISION NUMBER	REVISION DESCRIPTION	DATE	CHECKED BY		ISSUED BY	
0	Preliminary draft	10/5/05	PEH		PEH	
2	Draft for exhibition	29/11/05	PEH		PEH	
3	Final	3/4/06	PEH		PEH	

DISTRIBUTION

DESTINATION	REVISION										
	0	1	2	3	4	5	6	7	8	9	10
Kempsey Shire Council	1		1	5							
WBM File	1		1	1							
WBM Library											

FOREWORD

Killick Creek Estuary Management Plan

The estuaries of NSW represent a priceless natural resource. Collectively, they are immensely valuable from an ecological, social and economic perspective.

NSW has over 130 estuaries that vary in size from small coastal creeks and lagoons to large lakes and rivers. Estuaries contain diverse ecosystems that form the foundation of the coastal food chain. They provide important habitats for a variety of marine and terrestrial plants and animals.

Estuaries have a special place in the lives of most Australians. Many people want to live near estuaries and if they can't, they want to take their holidays there. Over 75% of the NSW population live and work in towns and cities near estuaries. A high proportion of the State's commercial activity occurs near estuaries as they provide an important focus for industry, tourism and recreational activities. This high level of development pressure means that estuaries are subject to a range of direct and indirect impacts due to land use in the catchment, changes to hydrology and tidal processes, and the direct use of the estuary waterway. In recognition of the need for future sustainable use of high value public assets, the NSW Government is implementing a number of key strategic initiatives, one of which is the Estuary Management Program. The Estuary Management Program commenced in 1992 to assist local government to better manage estuaries through a strategic process outlined in the NSW 'Estuary Management Manual'.

An Estuary Management Plan for Killick Creek is being prepared on behalf of Kempsey Shire Council and the Department of Natural Resources (DNR), to fulfil the requirements of the NSW Estuary Management Policy (1992) and the NSW Coastal Policy (1997). The Plan will provide a program of strategic actions to assist government authorities and other stakeholder groups to sustain a healthy estuary through appropriate waterway, foreshore and catchment management. The Plan presents an integrated suite of management strategies, giving due consideration to the complex interactions between many estuarine processes and functions.

The Killick Creek Estuary Management Plan is designed to provide clear direction regarding responsibilities for actions, which will help achieve the overall goal of a sustainable waterway. The Plan also provides information on who will be responsible for implementation of these actions and how they can be funded. The Plan is designed to be a dynamic document. That is, as the needs or conditions of the estuary change in the future, the options and strategies being implemented as part of this Plan can be adjusted to suit through an on-going review process.

Signed
Mayor,	Regional Director, North Coast
Kempsey Shire Council	DNR

EXECUTIVE SUMMARY

Killick Creek is a small estuary on the mid north coast of NSW connected to the ocean adjacent to the township of Crescent Head.



Killick Creek and Crescent Head township

Killick Creek is the principal natural waterway through the township and consequently is used by residents for a variety of recreational activities. Located immediately adjacent to the southern foreshore of Killick Creek is the Crescent Head Caravan Park. During the holiday season (early October to late April), the caravan park and other holiday accommodation within the town attracts a large number of tourists to Crescent Head, who also utilise Killick Creek, especially swimming within the entrance channel.



Recreational activities within Killick Creek Entrance, January 2002

In addition to the recreational demands, Killick Creek serves a major role in the Macleay River Flood Mitigation Scheme. When the floodplains of the Upper Belmore River are inundated, floodwaters discharge into Killick Creek in order to mitigate flood risks and minimise inundation of pasture lands. Flood mitigation works in the 1950s resulted in the Killick drain cutting (connecting the estuary with the floodplains of the Upper Belmore and Upper Maria Rivers), and rock training works at the entrance, along with general widening and deepening of the estuary in some of the upper reaches.

Kempsey Shire Council, in collaboration with the Department of Natural Resources (DNR) has prepared an Estuary Management Plan for Killick Creek, under the NSW Government's Estuary Management Program. The aim of the Estuary Management Plan is to ensure ecological sustainability of the estuary, whilst balancing the demands on the system by human uses. Essentially, the Plan strives to protect aspects of the estuary that are valued, and remedy those aspects that degrade the system.

A combination of scientific investigations and community consultation was adopted in preparing the Plan. First, an Estuary Processes Study (MHL, 2002) was conducted, which investigated and described the physical, chemical and biological processes occurring within the estuary. Consultation was then carried out with the relevant stakeholders of Killick Creek (including the upstream landholders) as well as local community. The consultation was designed to identify a range of issues that needed to be addressed by future management actions.

Based on a detailed understanding of the environmental processes and the concerns and aspirations of the community and stakeholders, a series of strategies were developed to meet long term objectives for the Killick Creek estuary. The strategies, which were assessed and short-listed based on likely costs and effectiveness, cover a range of management issues, including Water Quality, Entrance Works, Sedimentation, Ecology and Floodplain / Agricultural Management.

Strategies were designed and customised to address 18 separate objectives, each aiming to ensure long term sustainability of the estuary. Many strategies were able to address multiple objectives, meaning that these strategies represent the best opportunities for future conservation and environmental restoration.

The Estuary Management Plan provides a "user manual" for future environmental sustainability of Killick Creek. It provides details of what strategies should be adopted to achieve the greatest benefits to Killick Creek, whilst also balancing existing and future human demands on the system. For each strategy, sufficient detail is given in the Plan to commence implementation, including costs, responsibilities and timeframes.

The management strategies for Killick Creek estuary are presented below, in priority order.

Ref.	Strategy Description
<u>To commence implementation immediately (within 6 – 12 months, i.e. before Dec 2006)</u>	
A	Prepare and implement a formal Entrance Management Policy to guide Council on when, how and where to artificially dredge the entrance (see Appendix A for interim protocols)
B	Prepare and implement a formal Floodgate Management Plan to guide Council on when to allow floodwaters into the estuary to minimise impacts on the environment and users (see Appendix B for interim protocols)
C	Critically assess the actual threat to the coastal dunes to determine if Council's periodic "meander correction" dredging in the entrance is justified
D	Install 'leaky pits' in the caravan park to reduce low-flow stormwater discharge into the lower reaches of Killick Creek (especially the area used for swimming)
E	Continue to monitor for bacteria (eg enterococci) for human health purposes
F	Continue to implement the Crescent Head Stormwater Management Plan (GHD, 2003)
G	Install permanent signage at the entrance advising of strong currents in the channel
<u>To commence implementation in the short term (within 1 – 3 years, i.e. before Dec 2008)</u>	
H	Remove sediment shoals in Killick Creek which inhibit tidal flushing and flood discharge
I	Upgrade existing Killick Creek floodgates to ensure they operate effectively
J	Prepare a DCP for all new urban development around the estuary requiring adoption of improved watercycle management and on-site runoff management (eg rainwater tanks)
K	Continue trials of improved backswamp management with targeted education of agricultural landholders regarding improved land management practices
L	Conduct an agricultural and economic assessment of land practices within the Belmore River floodplain to determine ways of possibly improving discharge to Killick Creek
M	Carry out a water quality monitoring program for Killick Creek with a number of sites throughout the estuary to help determine ecosystem health and impacts of inputs
N	Restore entrance training wall to current engineering standards, including a consistent and larger rock size, a geotextile filter, and appropriate provision for stormwater outlets
O	Undertake re-vegetation of the riparian zone around the estuary, particularly the public lands behind the southern bank between the entrance and Muddy Arm
<u>To commence implementation in the medium term (within 3 – 5 years, i.e. before Dec 2010)</u>	
P	Carry out an environmental flows assessment to determine the maximum amount of discharge that can be accommodated by the estuary without significant degradation
Q	Hydrologic and hydraulic modelling study of the Belmore Swamp area to identify efficiency of existing flood mitigation scheme and to assess possible alternatives
R	Construct a block in the drain u/s of the floodgates to help control water levels in the drain and to induce sedimentation before agricultural sediment reaches the estuary
S	Assess wetland and estuarine habitat to identify critical habitat areas and Endangered Ecological Communities, and protect these areas through appropriate landuse zonings
T	Rezone the Killick Creek waterway to 'Environmental Protection' as part of the Kempsey LEP review to reflect the environmental significance of the estuary
U	Conduct flora and fauna surveys of the waterway and the foreshore to provide better information on ecological values, and threats to these values, including weed invasion
V	Encourage on-site stormwater management for existing development within Crescent Head, including retrofitting rainwater tanks and using grass swales, where appropriate

CONTENTS

Foreword	i
Executive Summary	ii
Contents	iv
List of Figures	ix
List of Tables	ix
1 INTRODUCTION AND LEGISLATIVE FRAMEWORK	1-1
1.1 Background	1-1
1.2 The Need for a Long Term Management Plan	1-3
1.3 Estuary Management Process	1-4
1.3.1 NSW Government's Estuary Management Program	1-4
1.3.2 Estuary Management Policy 1992	1-6
1.3.3 NSW Coastal Policy 1997	1-6
1.3.3.1 <i>Ecologically Sustainable Development</i>	1-7
1.3.3.2 <i>Integrated Coastal Zone Management</i>	1-8
1.4 Other Government Initiatives for Natural Resource Management	1-8
1.4.1 Environmental Planning and Assessment Act 1979 (EP&A Act)	1-9
1.4.2 State Environmental Planning Policies (SEPPs)	1-9
1.4.2.1 <i>SEPP 14 – Coastal Wetlands</i>	1-9
1.4.2.2 <i>SEPP 35 – Maintenance Dredging of Tidal Waterways</i>	1-10
1.4.2.3 <i>SEPP 71 – Coastal Protection</i>	1-11
1.4.2.4 <i>Other SEPPs</i>	1-11
1.4.3 River and Foreshores Improvement Act, 1948	1-12
1.4.4 Threatened Species Conservation Act, 1995	1-12
1.4.5 National Parks and Wildlife Act 1974	1-12
1.4.6 Fisheries Management Act 1994	1-13
1.4.7 Policy and Guidelines – Aquatic Habitat Management and Fish Conservation, 1999	1-14
1.4.8 Protection of the Environment Operation Act 1997	1-15
1.4.9 Catchment Management Authorities Act 2003	1-16
1.4.10 Natural Resource Management Act 2003	1-16
1.4.11 Coastal Protection Act 1979	1-17
1.4.12 Local Government Act 1993	1-17

1.4.13	Crown Lands Act 1989	1-18
1.4.14	Environment Protection and Biodiversity Conservation (Cth) Act 1999	1-18
1.4.15	North Coast Regional Environmental Plan 1988	1-19
1.4.16	Stormwater Management Planning	1-19
1.4.17	Kempsey Integrated Water Cycle Management Study	1-20
1.4.18	Independent Inquiry into Coastal Lakes	1-20
	1.4.18.1 Response to HRC Independent Inquiry by NSW Government	1-21
1.4.19	Northern Rivers Catchment Management Authority	1-22
	1.4.19.1 Mid North Coast Catchment Blueprint	1-22
	1.4.19.2 Northern Rivers Catchment Action Plan	1-23
1.5	Planning Reforms by State Government	1-24
1.6	Existing Council Planning Framework	1-25
1.6.1	Kempsey LEP 1987	1-25
1.6.2	Development Control Plans	1-25
1.6.3	Other Council Planning Policies and Instruments	1-26
1.7	Lower Macleay River Flood Mitigation Scheme	1-27
1.8	Structure of this Report	1-27
2	SUMMARY OF ESTUARY PROCESSES	2-1
2.1	Location and Geographic Context of the Creek	2-1
2.2	Past Usage of the Creek	2-1
2.2.1	Pre-European Conditions	2-1
2.2.2	Contemporary development	2-1
2.3	Current Environmental Condition of the Creek	2-4
2.3.1	Tidal Movement and Flushing	2-4
2.3.2	Impacts of Flooding	2-4
2.3.3	Water Quality	2-4
2.3.4	Sediments and Acid Sulfate Soils	2-5
2.3.5	Ecological Processes	2-6
2.4	Interactions between the processes	2-6
2.4.1	Major Externalities Influencing Estuary Condition	2-7
	2.4.1.1 Catchment Inputs	2-7
	2.4.1.2 Entrance Conditions	2-7
2.4.2	Human Impacts on the Estuary	2-7
2.5	Management Recommendations based on Processes Understanding	2-8
3	COMMUNITY AND STAKEHOLDER CONSULTATION	3-1

3.1	Scope of Consultation Undertaken	3-1
3.2	Issues raised through formal community and stakeholder input	3-1
3.3	Outcomes of Community and stakeholder Workshops	3-3
3.4	Outcomes of Public Exhibition of the draft Estuary Management Study and Plan	3-3
4	ESTUARY VALUES, USES AND ISSUES OF CONCERN	4-1
4.1	Estuary Values	4-1
4.2	Uses of the Estuary	4-1
4.3	General Issues of Concern	4-1
4.4	Specific Issues Requiring Attention	4-2
4.4.1	Water quality	4-2
4.4.1.1	<i>Issue A: Urban stormwater inputs</i>	4-2
4.4.1.2	<i>Issue B: Degradation of water quality when entrance is shoaled</i>	4-3
4.4.1.3	<i>Issue C: Water Quality Impacts of Agricultural Drainage</i>	4-3
4.4.1.4	<i>Issue D: Red weed</i>	4-3
4.4.2	Entrance Management	4-4
4.4.2.1	<i>Issue E: Dangerous tidal currents in the entrance channel</i>	4-4
4.4.2.2	<i>Issue F: Meander Correction and Artificial Entrance Opening</i>	4-4
4.4.3	Sedimentation	4-5
4.4.3.1	<i>Issue G: Sand accumulation in entrance channel</i>	4-5
4.4.3.2	<i>Issue H: Boatramp in Entrance Channel</i>	4-5
4.4.3.3	<i>Issue I: Accumulation of organic sediments (ooze)</i>	4-6
4.4.4	Ecology	4-6
4.4.4.1	<i>Issue J: Marinisation of estuarine vegetation</i>	4-6
4.4.4.2	<i>Issue K: Preservation of aquatic and terrestrial habitats and communities</i>	4-6
4.4.4.3	<i>Issue L: Fish kills in the estuary</i>	4-7
4.4.5	Upper Floodplain Management	4-7
4.4.5.1	<i>Issue M: Need for continued drainage of water from Belmore Swamp</i>	4-7
4.4.5.2	<i>Issue N: Performance of the existing Killick Creek floodgates.</i>	4-8
4.4.5.3	<i>Issue O: Partial infilling and other modifications to drains</i>	4-8
4.4.5.4	<i>Issue P: Generation of acid runoff in the upper Belmore Swamp area</i>	4-8
4.4.5.5	<i>Issue Q: Flood mitigation for the Kempsey-Crescent Head main road</i>	4-9
4.4.5.6	<i>Issue R: Rehabilitation of agricultural lands</i>	4-9
4.4.5.7	<i>Issue S: Poor condition of the entrance rock training wall</i>	4-9
5	OBJECTIVES FOR FUTURE MANAGEMENT	5-1
5.1	Water Quality Objectives	5-1
5.2	Entrance Management Objectives	5-2

5.3	Sedimentation Objectives	5-3
5.4	Ecology Objectives	5-4
5.5	Upper Floodplain Management Objectives	5-5
5.6	Summary of Objectives	5-6
5.7	Ranking of Objectives	5-8
6	DEVELOPMENT AND ASSESSMENT OF POSSIBLE FUTURE MANAGEMENT OPTIONS / STRATEGIES	6-1
6.1	Formulation of Options / Strategies	6-1
6.1.1	Options Addressing Water Quality Objectives (Objectives 1 – 4)	6-1
6.1.2	Options Addressing Entrance Management Objectives (Objectives 5 – 6)	6-2
6.1.3	Options Addressing Sedimentation Objectives (Objectives 7 – 9)	6-2
6.1.4	Options Addressing Ecology Objectives (Objectives 10 – 12)	6-3
6.1.5	Options Addressing Floodplain and Agricultural Management (Objectives 13 – 18)	6-3
6.1.6	Options Addressing Multiple Objectives	6-4
6.2	Assessment of Possible Options / Strategies	6-4
6.2.1	Results of Multi-Criteria Assessment	6-5
6.2.2	Short-List of Preferred Management Options	6-6
6.2.3	Proposed Implementation Order	6-8
6.3	Descriptions of Preferred Options / Strategies	6-9
6.3.1	Strategies to be implemented IMMEDIATELY (6 – 12 months)	6-9
6.3.1.1	<i>EM-2: Prepare & implement a formal Entrance Management Policy</i>	6-9
6.3.1.2	<i>FM-1: Prepare & implement a formal Floodgate Management Plan</i>	6-11
6.3.1.3	<i>EM-1: Critically assess the actual threat to the coastal dunes</i>	6-13
6.3.1.4	<i>WQ-3: Install 'leaky pits' in the caravan park</i>	6-15
6.3.1.5	<i>WQ-12: Continue to monitor for bacteria (eg faecal coliforms and enterococci)</i>	6-17
6.3.1.6	<i>WQ-1: Implement Crescent Head Stormwater Management Plan</i>	6-18
6.3.1.7	<i>EM-3: Install signage outlining the hazards of the entrance</i>	6-19
6.3.2	Strategies to be implemented in the SHORT TERM (1 – 3 years)	6-20
6.3.2.1	<i>Sed-3: Remove sediment shoals in Killick Creek which inhibit tidal flushing and flood discharge</i>	6-20
6.3.2.2	<i>FM-2: Upgrade floodgates to ensure they operate effectively</i>	6-22
6.3.2.3	<i>WQ-14: Prepare a DCP for future development within Crescent Head</i>	6-23
6.3.2.4	<i>FM-6: Continue trials of improved backswamp management with targeted education of agricultural landholders</i>	6-24
6.3.2.5	<i>FM-4: Agricultural and economic assessment of land practices</i>	6-25
6.3.2.6	<i>WQ-13: Water quality monitoring program for Killick Creek</i>	6-26

6.3.2.7	<i>FM-7: Restore the entrance training rock wall to an acceptable engineering standard</i>	6-29
6.3.2.8	<i>Ecol-3: Undertake riparian re-vegetation along the foreshores</i>	6-30
6.3.3	Strategies to be implemented in the MEDIUM TERM (3 – 5 years)	6-32
6.3.3.1	<i>Multi-1: Carry out an environmental flows assessment for Killick Creek</i>	6-32
6.3.3.2	<i>FM-3: Hydrological and hydraulic study of the Belmore Swamp area</i>	6-33
6.3.3.3	<i>Sed-2: Construct a block in the drain upstream of the floodgates</i>	6-34
6.3.3.4	<i>Ecol-2: Assess wetlands and existing endangered ecological communities, such as saltmarsh, and protect through LEP revision and/or SEPP-14 amendments</i>	6-36
6.3.3.5	<i>Ecol-1: Rezone the estuary to 'Environmental Protection'</i>	6-37
6.3.3.6	<i>Ecol-5: Flora / fauna surveys of the waterway and the foreshore</i>	6-38
6.3.3.7	<i>WQ-5: Encourage on-site stormwater management</i>	6-39
7	ESTUARY MANAGEMENT PLAN	7-1
7.1	The Purpose and Context of This Plan	7-1
7.2	Community Consultation Process	7-1
7.3	Objectives of the Plan	7-2
7.4	Proposed Management Strategies	7-3
7.5	Implementation Details	7-5
7.6	Program for Implementation	7-28
7.7	Funding Requirements and Opportunities	7-29
7.8	Performance Measures, Targets and Contingencies	7-31
7.8.1	Primary Performance Measures	7-32
7.8.2	Secondary Performance Measures	7-32
7.8.3	Tertiary Performance Measures	7-33
7.9	Factors for Success	7-33
7.10	Future Reviews and Modifications or Amendments to the Plan	7-34
8	REFERENCES	8-1
APPENDIX A: INTERIM ENTRANCE MANAGEMENT PROTOCOLS		A-1
APPENDIX B: INTERIM FLOODGATE MANAGEMENT PROTOCOLS FOR KILLICK FLOODGATES		B-1
APPENDIX C: CONSULTATION WITH STAKEHOLDERS		C-1
APPENDIX D: KILLICK CREEK HYDROSURVEY (JULY 2001)		D-1

APPENDIX E: MULTI-CRITERIA ASSESSMENT OF POSSIBLE MANAGEMENT OPTIONS

E-1

LIST OF FIGURES

Figure 1-1	Killick Creek General Locality	1-2
Figure 1-2	Killick Creek Estuary Details and Features	1-3
Figure 1-3	NSW Government's Estuary Management Process	1-5
Figure 1-4	SEPP 14 Wetlands in the vicinity of Killick Creek	1-10
Figure 1-5	LEP Zonings for the Killick Creek Area	1-26
Figure 1-6	Connection between Killick Creek and the Lower Macleay River and Hastings-Maria Catchment Flood Mitigation Schemes (Source: MHL, 2002)	1-28
Figure 1-7	Process of developing Management Strategies for the EMP	1-30
Figure 2-1	Clearing of Belmore Swamp (Source: KSC archives)	2-2
Figure 2-2	Schematic representation of Killick Creek floodgates	2-3
Figure 3-1	Public meeting at Crescent Head Surf Club, 14 February 2006	3-4
Figure 4-1	Red weed at entrance to Killick Creek (source: KSC)	4-4
Figure 4-2	Dredging of Killick Creek Entrance (October 2000, courtesy of Kempsey Shire Council)	4-5
Figure 4-3	Excavation to create Killick Drain in the 1950s (photo courtesy KSC)	4-7
Figure 4-4	Killick Creek Floodgates and dropboards (submerged)	4-8
Figure 4-5	Existing rock wall at Killick Creek entrance	4-10
Figure 4-6	Rock apron formed from dislodged wall material	4-10
Figure 6-1	Relative Scores for Possible Management Options	6-5
Figure 6-2	Entrance channel meander and resulting erosion scarp	6-14
Figure 6-3	Conceptual drawing of 'leaky pit' for caravan park	6-16
Figure 6-4	Example of signage for Killick Creek regarding swimming hazards	6-20
Figure 6-5	Possible dredging and disposal locations in lower reaches of Killick Creek	6-21
Figure 6-6	Suggested Water Quality Monitoring Sites for Pilot Program	6-28
Figure 6-7	Areas for Riparian Revegetation around Killick Creek	6-31
Figure 6-8	Crown road access to Killick Drain	6-35
Figure 6-9	Existing landuse zonings within and around Killick Creek	6-37

LIST OF TABLES

Table 5.1	Prioritised list of Management Objectives	5-8
Table 6.1	Short-List of Preferred Management Options	6-6
Table 6.2	Short-listed Management Options and Objectives Matrix	6-7
Table 6.3	Implementation Order for Preferred Management Options	6-8
Table 7.1	Implementation Program for All Strategies	7-28

Table 7.2	Financial Requirements for Implementation of Strategies	7-29
Table 7.3	Framework for Future Estuary Management Plan Review	7-34