### Macleay Estuary Information Register

**APPENDIX A - MACLEAY RIVER ESTUARY INFORMATION AND DATA REGISTER**

<table>
<thead>
<tr>
<th>Reference No.</th>
<th>Subject</th>
<th>Full Title</th>
<th>Year</th>
<th>Author/s</th>
<th>Journal</th>
<th>Format</th>
<th>Abstract</th>
<th>Statement of Use to Estuary Management Planning Process</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Erosion studies</td>
<td>Report by Departmental Committee on Macleay River Erosion</td>
<td>1934</td>
<td>Departmental Committee on Erosion, Lands Department</td>
<td>Report - Hardcopy</td>
<td>This report presents an overview by the Departmental Committee on Erosion on the major causes of bank erosion in the Macleay River downstream of Kempsey. Floods, wave action and tidal currents were identified as the major causes of bank erosion in 1934. Other contributing factors identified include river traffic, shoaling of straight reaches, removal of natural protective cover and cultivation of banks and cattle grazing. Dredging of the channel (increase of channeling the river - riffles) was identified as having negligible influence on extent and severity of bank erosion.</td>
<td>John Schmidt, DIPNR Kempsey</td>
<td>(02) 6563 1212</td>
<td><a href="mailto:john.schmidt@dipnr.nsw.gov.au">john.schmidt@dipnr.nsw.gov.au</a></td>
</tr>
<tr>
<td>2</td>
<td>Geology and Geomorphology</td>
<td>A reconnaissance of soils of the Kempsey District</td>
<td>1963</td>
<td>P.H. Walker</td>
<td>Journal</td>
<td>A comprehensive investigation of soil characteristics for the lower Macleay River assessing residual and depositional landscapes, their pedological attributes and their agricultural potential.</td>
<td></td>
<td>University of Wollongong Library</td>
<td>CSIRO Soils and Land Use Series No. 44</td>
</tr>
<tr>
<td>3</td>
<td>Geology and Geomorphology</td>
<td>Weathering and soil development on a sequence of river terraces</td>
<td>1969</td>
<td>R. Brewer and P.H. Walker</td>
<td>Journal</td>
<td>This study outlines the process of soil development on five alluvial terraces in the Macleay valley at Belgrave Falls. It investigates the degree of weathering and the extent of clay illuviation with soil profiles of differing ages.</td>
<td></td>
<td>University of Wollongong Library</td>
<td>Australian Journal of Soil Research, 20, 293-305</td>
</tr>
</tbody>
</table>
5. Geology and Geomorphology

Underfit analysis of the Lower Macleay River Basin: Preference of the application of a model

A.K. Milne

University of Wollongong

Journal

The paper provides an assessment of riffle-pool spacing for the Macleay River around Bellbrook examining the relationship between bankfull discharge, meander wavelength and riffle-pool spacing.

Does not directly relate to any Section 10 issues.

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6. Floods and Flood Studies

New South Wales Coastal Rivers Floodplain Management Studies - Macleay Valley Volume 2

Laurie, Montgomery & Pettit Pty Ltd

Hardcopy

This report is a compilation of cost/benefit analyses and hydrological data in the form of two primary appendices.

John Schmidt, DIPNR Kempsey

(02) 6563 1212

john.schmidt@dipnr.nsw.gov.au

Does not directly relate to any Section 10 issues but provides a good overview of the hydrological data for rainfall events on the Macleay River. It also provides a good insight into the various economic assessments done on flood mitigation and flood damage.

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7. Floodplain management

New South Wales Coastal Rivers Floodplain Management Studies - Macleay Valley Summary Report

Laurie, Montgomery & Pettit Pty Ltd

Hardcopy

Outlines the physical extent of flooding, the extent of past flood mitigation works and makes recommendations for future drainage improvements.

John Schmidt, DIPNR Kempsey

(02) 6563 1212 john.schmidt@dipnr.nsw.gov.au

This summary document deals directly with issues relating to Land use Planning and Development Control (Section 10.1) providing a useful but dated assessment of previous works stemming from a drainage improvement perspective.

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8. Floods and Flood Studies

Macleay River Flood Study

Public Works

Hardcopy


John Schmidt, DIPNR Kempsey

(02) 6563 1212 john.schmidt@dipnr.nsw.gov.au

Does not directly relate to any Section 10 issues but provides an excellent summary of hydrological accounts for a number of large rainfall and flood events (e.g. 1949, 1963, 1977 and 1980). The desktop hydraulic modeling uses a quasi 2D model but does not incorporate sediment transport and therefore provides little insight into the spatial and temporal dynamics of sedimentation.
5 Management Plans & Studies
Estuary Management Manual
1992
New South Wales Government
Report - Hardcopy
Outlines the NSW government’s approach to estuary management planning. Describes the 8 step estuary management process, factors affecting the administration of estuaries, government financial assistance, a glossary, and 14 appendices dealing with estuary management issues and the physical, chemical and ecological processes occurring in estuaries.

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6 Floodplain management
Lower Macleay Floodplain Management Study
1997
Webb, McKeown & Associates Pty. Ltd.
Report - Hardcopy
This report provides an assessment of the KUBICON flood modelling for the Lower Macleay River while also providing an operational outline of flood control measures. Coordinated analyses for flood protection for rural and urban areas are provided with prize costs assessed for various structural works. Recommendations are made for village floodwater mitigation, structural options, suggested operational changes, drainage modifications, civic collection and legislative systems.

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john.schmidt@dipnr.nsw.gov.au

7 Floodplain management
Lower Macleay Floodplain Management Plan
1999
Webb, McKeown & Associates Pty. Ltd.
Report - Hardcopy
Outlines various recommendations for flood mitigation works for villages on the lower Macleay focusing on flood control for the 1 in 100 flood at Frederickton, Smithtown, Gladstone and Jerseyville. In addition, recommendations are made for issues such as water quality and acid sulphate soils.

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john.schmidt@dipnr.nsw.gov.au

8 Floodplain management
Upper Belmore Floodplain Management Strategy
2000
Webb, McKeown & Associates Pty. Ltd.
Report - Draft
Draft document dealing with issues relating to the Upper Belmore Floodplain including major floodplain strategies that deal with floodwater and flow management, local floodplain and town management groups and acid sulphate soils.

Ron Kemsley, Kempsey Shire Council
(02) 6566 3248
ron.kemsley@kempsey.nsw.gov.au

9 Floodplain management
Upper Belmore Floodplain Management Plan
1999
Webb, McKeown & Associates Pty. Ltd.
Report - Hardcopy
Draft document dealing with issues relating to the Upper Belmore Floodplain including major floodplain strategies that deal with floodwater and flow management, local floodplain and town management groups and acid sulphate soils.

Ron Kemsley, Kempsey Shire Council
(02) 6566 3248
ron.kemsley@kempsey.nsw.gov.au

This report provides a series of recommendations weighted towards improved flood control for the villages of the Upper Belmore. In addition, it deals directly with Sections 10.3, 10.5 and 10.11 but does not answer the critical questions regarding wetland management, and sulphate soils and water quality. Furthermore, this desktop study highlights some of the potential impacts of increased levee construction in the Kinchela and Belmore areas (i.e. reduced inundation of wetlands in small floods < 4.6 - 4.9 m).
This report quantifies heavy metal loadings in the Macleay catchment demonstrating the presence of $3 - 90 \times$ background level of Antimony (Sb) and $1 - 5 \times$ background for Arsenic (As). Sources of heavy metals include sediments and tailings from historical mining operations such as the Hillgrove Mineral Field. Bakers Creek is shown to have exceptionally high loadings of heavy metals with a clear downstream dispersal pattern. Loadings remain beyond ISQC guidelines for Sb right to the Pacific with preferential accumulation on the southern side of the Macleay River.

Ron Kemsley, Kempsey Shire Council
(02) 6566 3248  r.kemsley@kempsey.nsw.gov.au

This report provides an indication of the pH and DO response of floodplain waterbodies to flooding (relevant to Sections 10.4 and 10.11). It also provides basic information on the response of estuarine systems to flooding and implications for fish kills resulting from low DO concentrations (Section 10.10). Based on field testing.

Ron Kemsley, Kempsey Shire Council
(02) 6566 3248  r.kemsley@kempsey.nsw.gov.au

Draft report including maps outlining the geomorphic characteristics of the Macleay River between Nulla Nulla Creek and Sherwood bridge crossing. Quantifies the rates of gravel extraction from 1997/98 to 2001/2002 and addresses the geomorphic impacts of gravel extraction. Emphasises the role of bedrock on determining channel stability and makes recommendations for changes to current gravel extraction practices.

DIPNR Kempsey
(02) 6566 3248  r.kemsley@kempsey.nsw.gov.au

This report provides an indication of the pH and DO response of floodplain waterbodies to flooding (relevant to Sections 10.4 and 10.11). It also provides basic information on the response of estuarine systems to flooding and implications for fish kills resulting from low DO concentrations (Section 10.10). Based on field testing.

Ron Kemsley, Kempsey Shire Council
(02) 6566 3248  r.kemsley@kempsey.nsw.gov.au

Describes the results of tidal gauging data collection undertaken at 39 tidal gauging sites on the Macleay River estuary between 15 April and 23 May 2003. Tidal limits, tidal range, as well as horizontal and vertical current velocities for all major waterways are recorded. In addition, 59 water quality profiles were collected (including coliform and nutrient levels) between 15 April and 16 April 2003.

DIPNR Kempsey
(02) 6566 3248  r.kemsley@kempsey.nsw.gov.au

Provides tidal process information directly relevant to Section 10.5 and a snapshot of estuarine water quality relevant to Section 10.11 (through faecal coliforms and nutrient analysis). This report was commissioned to assist the estuary management process by providing baseline data for hydraulic modeling. Electronic data is available from the Manly Hydraulics Laboratory.
27. Coastal Development and Kempsey Integrated Water Cycle Management Infrastructure

- Kempsey Integrated Water Cycle Management Strategic Plan - Concept Study Final Draft
- Infrastructure: Coastal Development and Acid Sulphate Soils
- Water Quality
- Miscellaneous Technology, Regulatory and Policy Responses

2003

A final draft report dealing with issues related to an integrated Water Cycle Management Strategic Plan for Kempsey Shire. Issues addressed include surface and groundwater supply, water quality of other water supplies and resources, and identification of stormwater systems for urban and village centres. Includes comprehensive background information, a draft plan and resource manual, and urban area audits, and recommendations for potential actions to address identified issues.

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Although only a draft final report was available, the document provides a very comprehensive source of detailed planning information related to town water management in the lower Macleay. The report has many indications for estuary management as it deals with many issues of potential impacts. The report provides valuable information pertaining to urban growth planning relevant to Section 10.1. There is a particular focus on impacts associated with unsewered coastal villages. A useful resource for regional planning and for background information on a variety of biophysical and land capability characteristics. The data are generally of high quality but general in nature. For many management issues more detailed investigations may be necessary but the report provides a very useful context for planning and designing more detailed studies.

28. Acid Sulphate Soils

- Agricultural Drainage in Acid Sulphate Soil Backswamps in New South Wales, Australia - Technical, Regulatory and Policy Responses

2002

A study of soils, geology, geomorphology, vegetation, land uses and land capabilities of the area covered by the Kempsey & Korororo Point 1:100 000 Australian Map grid sheet. Includes descriptions of 46 soil landscapes including their biophysical characteristics and land use qualities and limitations.  Includes 18 appendices describing and interpreting various soil analyses and should be used in conjunction with an accompanying map. Includes a discussion of broader effects (Section 10.13).

Mitch Taka, DIPNR, Kempsey
(02) 6562 5152
mttaka@dpnl.nsw.gov.au

A very comprehensive assessment directly relevant to Section 10.1. Includes many references to other sources. The major references are available on the Kempsey Shire Council website. A useful source of detailed planning information related to future water resource planning and management; and, 10.9 Habitat protection and management; and, 10.10 Coastal protection. Rich in detail and well referenced.  Comprehensive scope of this report makes it relevant to: 10.1 Land Use Planning and development; 10.3Biological land management; 10.4 Agricultural land management; and, 10.5Biological protection.

29. Miscellaneous

- Soil Landscapes of the Kempsey & Korororo Point 1:100 000 Sheets Report

1999

A study of soils, geology, geomorphology, vegetation, land uses and land capabilities of the area covered by the Kempsey & Korororo Point 1:100 000 Australian Map grid sheet. Includes descriptions of 46 soil landscapes including their biophysical characteristics and land use qualities and limitations.  Includes 18 appendices describing and interpreting various soil analyses and should be used in conjunction with an accompanying map. Includes a discussion of broader effects (Section 10.13).

Allinson, G.

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30. Water Quality

- Macleay River Catchment - Assessment of Water Quality Monitoring Program

2000

A very comprehensive assessment directly relevant to Section 10.1. Includes many references to other sources. The major references are available on the Kempsey Shire Council website. A useful source of detailed planning information related to future water resource planning and management; and, 10.9 Habitat protection and management; and, 10.10 Coastal protection. Rich in detail and well referenced.  Comprehensive scope of this report makes it relevant to: 10.1 Land Use Planning and development; 10.3Biological land management; 10.4 Agricultural land management; and, 10.5Biological protection.

2003

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M.J.Tulau

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Allinson, G.

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The comprehensive scope of this report makes it relevant to: 10.1 Land Use Planning and development; 10.3Biological land management; 10.4 Agricultural land management; and, 10.5Biological protection.

Access to this report is through the Kempsey Shire Council's website.
Fisheries & Aquaculture
Scientific reports on the recovery of the Richmond and Macleay Rivers following fish kills in February and March 2001

Editor: Steve Kennelly

Major floods occurred in the Richmond and Macleay River systems in February and March 2001, followed by major fish kills. The rivers were subsequently closed to fishing for 4½ months. Monitoring of the recovery of fish, invertebrates and water quality was undertaken over a 12 month period, the results of which are presented in a series of twelve reports compiled into this document. The surveys dealt with species of commercial and recreational interest. Surveys of day-time recreational fisheries are also included. The data from sampling showed that fish and macroinvertebrate populations recovered to levels sufficient to sustain normal commercial and recreational fishing within 4½ months. Recommendations for a regular monitoring program are made as are suggestions for further development of a robust sampling strategy.

Ron Kerney, Kempsey Shire Council

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The report deals primarily with recovery of fish populations after fish kills and as such is relevant directly to Section 10.10. In particular recommendations for future monitoring relate to the question “what strategies need to be in place to ensure our fisheries continue to be productive?”. Describes several of the factors that lead to fishing closures.

Historical & Cultural
Report on the entrance to, by Sir John Coode, K.C.M.G to the Legislative Assembly of New South Wales 1891

Author: Sir John Coode

Described four options for improving the entrance of the Macleay River based on the prevailing conditions around 1885-1888, also includes an in-depth description of the Macleay River County physical environment, navigability, flooding effects, channeling, and land use in the late 1880s.

Macleay Valley Historical Society

Available for on site viewing by appointment. Maybe available through the State Library.

Provides historical context to the changes in the Macleay estuary’s physical conditions including bank condition and entrance conditions. Provides historical background to Section 10.2 Riparian Land Management and Bank Erosion, and 10.3 Wetland and Floodplain Functioning and Management.

Historical & Cultural
Between Wind and Water – A history of the ports and coastal waterways of New South Wales

Author: Leone Coltheart

Documents the history of public works in NSW estuaries. Valuable reference to the settlement histories of many NSW coastal river systems including shipping, transportation, and land uses.

Available through interlibrary loan

Provides historical context to Section 10.2 Riparian Land Management and Bank Erosion. Information is presented in terms of the contribution of the Public Works Department over 100+ years. Although it presents a good grasp of the issues it does not contribute significantly to how to solve issues of estuary management.

Flood Mitigation
Macleay River County Council Flood Mitigation, 13th Annual Meeting and Study Tour of the Australian National Committee of the International Commission on Irrigation and Drainage

Author: Anon (potentially Macleay River County Council)

Details the history of the Macleay Valley Flood Mitigation Scheme, plus estimates the benefits and associated costs. Work undertaken up until 1991. Green summarizes the various flood control works, with examples including at Pomona, Highfields Creek, Greta, and in the Belmore River Floodway. Includes 22 photos and 3 diagrams.

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Historical context of flood mitigation works both upper and downstream of Kempsey prior to 1996.
<table>
<thead>
<tr>
<th>Page</th>
<th>Category</th>
<th>Title</th>
<th>Date</th>
<th>Author(s)</th>
<th>Source</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>26</td>
<td>Water Quality</td>
<td>Water Quality in the Macleay River - Northern Rivers Study No. 8</td>
<td>1987</td>
<td>State Pollution Control Commission</td>
<td>Report - NSW Environmental Protection Authority</td>
<td>Presents the results of water quality sampling in the Macleay River undertaken between June 1984 and June 1986. 36 sites were sampled including 25 estuarine sites. Includes sewage treatment plant and industrial site sampling. Sampling dates were selected to represent pre-determined flow regimes as opposed to fixed interval sampling. Extensive professional analyses including bacteria. Draws conclusions as to potential sources of poor water quality including an assessment of the effects of flood mitigation.</td>
</tr>
<tr>
<td>27</td>
<td>Water Quality</td>
<td>Water quality and river flow interim environmental objectives</td>
<td>1999</td>
<td>NSW Environmental Protection Authority</td>
<td>Report - NSW Environmental Protection Authority</td>
<td>This document sets out broad goals and guidelines for achieving improved river health outcomes in the Macleay River catchment. Interim water quality objectives with key indicators and numerical criteria are provided. The objectives and guidelines have been tailored to suit the water management committee approach which was discontinued in 2004, however the interim water quality objectives, key indicators and numerical criteria are still relevant to Section 10.11 Water Quality.</td>
</tr>
<tr>
<td>28</td>
<td>Floodplain Management</td>
<td>Sustainable land management of coastal floodplains in northern NSW - Macleay River Catchment Final Report</td>
<td>2002</td>
<td>Marcus Riches and Simon Walsh, NSW Fisheries</td>
<td>Report - NSW Fisheries</td>
<td>180 floodgates have been identified within the Macleay Valley. An assessment was made to prioritise the 180 floodgates to determine flood suitability for active management and reduce negative effects of their operation. 24 gates were selected as high priority for active management. The report outlines a methodology for developing floodgate management plans, giving two examples of implementation in the lower Macleay (Marriot’s floodgates and Clancy’s floodgates). Provides examples of alternative floodgate management which may help restore floodplain and wetland function and reduce the negative effects of over-drainage (e.g. examples in Sections 10.3, 10.4, and 10.5). It also deals with Section 10.11 Water Quality by referring to acid drainage.</td>
</tr>
</tbody>
</table>
This study presents brief interpretations of water quality data collected from the Macleay River (the entrance and Double Island) and Yarrahapinni Wetlands (Middle Island) over the period March 1996 to February 1999. Water level (tidal range), conductivity, pH, temperature, and DO were measured at fixed short-term intervals. The study was undertaken prior to the planned re-opening of one of the Yarrahapinni floodgates and showed characteristic acid sulphate responses to critical rainfall events.

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Gives baseline water quality information relevant to Sections 10.3, 10.4, 10.5, and 10.11 and combined with data collected post opening of the floodgates gives an indication of potential recovery of ecosystem functioning with modified floodgate operation.

The purpose of this monitoring exercise was to capture baseline environmental data which outline the physical, biological and chemical status of the Macleay River in the vicinity of Christmas Creek. The monitoring was undertaken in locations to provide a baseline from which to assess potential impacts of the river of any proposed discharge of effluent discharges. Temperature, salinity, pH, turbidity, DO, velocity, sediment type and size, total phosphorous, total nitrogen, and orthophosphate were sampled on 29 January 1997. Monitoring of E.coli plus a survey of benthos macroinvertebrates, fish, and riparian and instream flora also occurred between 21 and 24 January 1997.

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WQ sampling was limited to a single day and was potentially confounded by heavy rainfall during the second of 2 passes over the 3 sites. As such only limited conclusions can be drawn although the data adds to the general estuarine water quality dataset and therefore is of some use to Section 10.11. A small number of sediment samples were taken and grain size analyses done which are of limited use to Section 10.7 Sedimentation.

Reports the results of community water quality monitoring in the Belmore River area over the period from Spring 1990 to December 1991. Parameters tested were pH, Dissolved Oxygen and salinity and where pH<4 or DO<4mg/L, iron and aluminium levels were tested by Kempsey Shire Council. Attempts are made to link reported fish kills in the Belmore River system and associated drains to pH, oxygen availability and aluminium concentrations. Recommendations for a continued WQ monitoring program are also suggested.

Ron Kemsley
(02) 6566 3248
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Some relevance to Section 10.11 although data quality is an acknowledged issue. Recommendations on floodgate management are relevant to Section 10.5.

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(02) 6566 3248
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33 Air Photography Resources

Air Photo library index abstract
2003 anon.

Photographs
Provides an index by area of available aerial photography resources. Resources can be obtained through Land and Property Information (02) 6332 8123. www.lpi.nsw.gov.au

Not directly relevant but has broad applicability for understanding changes in land use and physical estuary characteristics and may also interpretation of views of change of landscape features and processes (potential relevance to 10.2 and 10.3).

34 Digital Data Resources

North Coast Assessment - Available Digital Data Sets (GIS layers)
2004 anon.

Digital data
Provides a table of current natural resource management related GIS (geographical information systems) digital data sets held mostly by NSW Government Agencies with some datasets from Commonwealth Agencies and Local Government. The list was compiled for the North Coast Assessment Process and contains a keyword identifier, data layer name, capture scale, data currency, custodian, GIS format, storage medium, attributes, conditions and any restrictions on use.

Download PDF for viewing. Contact appropriate agencies for access requirements.

A comprehensive list of available datasets relevant to natural resource management, useful with direct and/or broad relevance to estuary management planning. Availability of datasets is not known with the table indicating some restriction on access and use.

35 Miscellaneous

Stressed Rivers Assessment - Macleay River
1999 DLWC Report - Hardcopy

The stressed rivers approach incorporates the assessment and classification of environmental and hydrological stress and conservation value of rivers. This is then used to determine priorities and policies. This approach will ensure that these actions are taken according to the needs of individual streams and that the impact on the rural communities is focussed where it is likely to make a real difference to river health and user opportunities. This report includes the subcatchment results, in report cards which contain very useful information on geology, tree cover, average for see land capability, nutrient load, biophysical area, fish, streams, rivers and their flows, hydrological stress rating is derived from proportioning current water extraction to the streamflow estimate. The full development stress rating is based on if all existing licences were active. Environmental stress is based on river health factors such as banks and bed erosion, riparian vegetation, land use, fish barriers, water quality, monitoring stations, population density, floodplain, riparian, wetland, flood, lake, estuary, seep, drainage, levee, fish and wetland. The overall stress rating is based on combining the environmental and hydrological stress rating. High conservation values have been identified by Fisheries and NPWS.

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The stressed rivers assessment was undertaken to assist the NSW Water Reforms process. The assessment is catchment focussed with the entire Macleay estuary summarised as a single “Coastal Macleay” subcatchment. The report contains broad statistics in the subcatchment descriptions but is not of direct relevance to any of the identified Section 10 issues with the exception of 10.12 River Health for which the desired outcomes are not clearly defined.

36 Miscellaneous

State of the Rivers and Estuaries Report - Mid North Coast Catchments

A report on waterway health and management for water users and resource managers. The main objectives of the report are to provide information about the status and condition of the Mid North Coast waterway, enhance the accessibility of the information, present a public forum for discussion and improve communication between those concerned with the management of riverine and estuarine resources; present information on land use and trends for assessment of the cumulative effects of management policies and programs; identify uncontrolled or emergent issues; identify substantial gaps in the information; and to provide a basis of current data collection and monitoring programs.

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This report is essentially an audit of the current state of knowledge and issues relevant to North Coast rivers and estuaries. Although the information is some 10 years old it is still of direct relevance to the estuary management planning process. The focus of the assessment is on several systems so the depth of information is somewhat limited. The report provides useful background information relevant to the Macleay estuary including detailed information on sampling (10.7); floodplain management (10.5); freshwater gravel extraction rates (10.7); and commercial fishing (10.10). Other topics discussed in the report are detailed and probably more adequately addressed in other studies/reports.
Fisheries & Aquaculture

Macleay Estuary Information Register

**37** Fisheries & Aquaculture

*Macleay North Coast Sustainable Aquaculture Strategy - land based aquaculture*


Report - final draft

Aquaculture is one of the fastest growing industries in the world. New South Wales is well placed to take advantage of growth opportunities largely because of its climate and relatively clean environment. The strategy contains two components - a best management practice component and an integrated approval process component - which are intended to ensure development is effective and sustainable manner. The strategy contains land based aquaculture only.

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As the strategies stated intention is to streamline approval processes for some types of land-based aquaculture, the chapters relating to planning approval is particularly relevant to Sections 10.1, 10.5 and 10.10 Flood Planning and Development Control. The strategy also has a reference to Section 10.12 Fish and Shellfish Management despite most of the critical questions and identified issues in this section being concerned with water-based aquaculture.

**38** Flood Mitigation

*Macleay River Flood Mitigation Model Investigation - unveils key highlights and flood management to boost sustainability*

NSW North Coast Sustainable Aquaculture Strategy

River Management in NSW - Case study of the Macleay River

The ecological effects of structural flood mitigation works on fish habitats and fish communities in the lower Clarence River system of south-eastern Australia.

Ron Kerensky, Kempsey Shire Council
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Johnstone and Rimmer, I.Baulch.

The report recommends that gates be kept open at all times except immediately prior to and during floods as a mechanism for improving fish habitat and communities.

In many instances, fish abundance in ungated natural tributaries and in drains downstream of floodgates, with intense. Fish assemblages were generally higher (both numbers of species and communities).

vegetation were much less at gated sites and surrounding landuse was generally more restricted above gates. The report recommends that gates be kept open at all times except immediately prior to and during floods as a mechanism for improving fish habitat and communities.

The ecological effects of structural flood mitigation works on fish habitats and fish communities in the lower Clarence River system of south-eastern Australia.

Ron Kerensky, Kempsey Shire Council
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The concepts in this report are still relevant but the data is probably biased. There is probably more recent data available. Nonetheless the report identifies the need for cumulative assessment of development proposals (Section 10.1) provides an assessment of approaches to reducing the effects of flood mitigation including through environment compensation and habitat restoration (10.3); gives a limited overview of damage history suitable for background use (10.5); describes changes to estuarine vegetation over the period 1956-1981 (10.9); and, describes decreases in commercial fish catches between ~ 1970-1985 and suggests a link to flood mitigation structures (10.12).
Fisher & Aquaculture

Provides a review of the current status of the NSW oyster industry including an assessment of the industry's viability on the face of declining production and increasing land and water management issues, institutional and organisational issues, and planning issues. The report draws on community and stakeholder views, the findings of an inquiry into the Wallis Lake incident, a stakeholder workshop, and independent expert advice on the form of the comprehensive "Safeguarding environmental conditions for oyster cultivation in NSW" report by Ian White (included as an appendix). The HRC report provides 5 recommendations which are intended to contribute significantly to the maintenance of a sustainable and viable oyster industry in NSW.

Fisheries & Aquaculture

The HRC report provides a thorough summary of issues, risks, and opportunities for the oyster industry. Specifically, the report recommends actions on identifying through planning processes and industry incentives (DEP933) issues where oyster growing should be deemed the priority land use, in effect mandating the consideration of off the adjacent land use subject to their impact on oyster growing (referred to Section 10.8). Additionally, recommendations related to improving land and water management through assistance programs (incentives, subsidies, etc.) and to improving industry sustainability through organisation and promotion are included (Section 10.13). The report does not address the question of "abandoned" oyster leases.

Geomorphology

Provides a review of the current status of the NSW oyster industry including an assessment of the industry's viability on the face of declining production and increasing land and water management issues, institutional and organisational issues, and planning issues. The report draws on community and stakeholder views, the findings of an inquiry into the Wallis Lake incident, a stakeholder workshop, and independent expert advice on the form of the comprehensive "Safeguarding environmental conditions for oyster cultivation in NSW" report by Ian White (included as an appendix). The HRC report provides 5 recommendations which are intended to contribute significantly to the maintenance of a sustainable and viable oyster industry in NSW.

Geology and Geophysics

Provides a review of the current status of the NSW oyster industry including an assessment of the industry's viability on the face of declining production and increasing land and water management issues, institutional and organisational issues, and planning issues. The report draws on community and stakeholder views, the findings of an inquiry into the Wallis Lake incident, a stakeholder workshop, and independent expert advice on the form of the comprehensive "Safeguarding environmental conditions for oyster cultivation in NSW" report by Ian White (included as an appendix). The HRC report provides 5 recommendations which are intended to contribute significantly to the maintenance of a sustainable and viable oyster industry in NSW.

Miscellaneous

Independent advice on dredging of river entrances and estuaries.

Some 6 primary government agencies, the Coastal Council, and more than a dozen local government authorities are regularly concerned with decision making on dredging of river entrances and lower estuaries. A summary of issues related to the four main types of dredging processes occurring in lower estuaries and entrance areas (including all dredging, pecky open entrance dredging, dredging of ICOLLs, and commercial sand extraction) is provided. The range of available data from primary agencies that may assist more effective decision making processes are outlined. Recommendations for improving the decision making processes are also provided for each of the four types of dredging activities. Information provided includes dredging performance, environmental conditions, water area (km$^2$), mangrove area (km$^2$), and average annual fish catch.

Some 6 primary government agencies, the Coastal Council, and more than a dozen local government authorities are regularly concerned with decision making on dredging of river entrances and lower estuaries. A summary of issues related to the four main types of dredging processes occurring in lower estuaries and entrance areas (including all dredging, pecky open entrance dredging, dredging of ICOLLs, and commercial sand extraction) is provided. The range of available data from primary agencies that may assist more effective decision making processes are outlined. Recommendations for improving the decision making processes are also provided for each of the four types of dredging activities. Information provided includes dredging performance, environmental conditions, water area (km$^2$), mangrove area (km$^2$), and average annual fish catch.

The river styles methodology is a broad-based technique covering the whole of the Macleay catchment. Although limited reference is made to the tidal reaches, this does not detract from the value of the report. The river styles methodology is a broad-based technique covering the whole of the Macleay catchment. Although limited reference is made to the tidal reaches, this does not detract from the value of the report. The river styles methodology is a broad-based technique covering the whole of the Macleay catchment. Although limited reference is made to the tidal reaches, this does not detract from the value of the report. The river styles methodology is a broad-based technique covering the whole of the Macleay catchment. Although limited reference is made to the tidal reaches, this does not detract from the value of the report. The river styles methodology is a broad-based technique covering the whole of the Macleay catchment. Although limited reference is made to the tidal reaches, this does not detract from the value of the report.
46  Management Plans & Studies

Macleay Total Catchment Management Strategy ~1994
Macleay TCM Committee
Report - Hardcopy

The Macleay TCM strategy outlines strategies, actions and outcomes to improve the condition of the Macleay catchment’s land, water and vegetation resources. The focus is on cooperative action by agencies, NGOs and landholders to achieve improved natural resource management outcomes in the valley.

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Although superseded by the Catchment Management Board Blueprints and more recently by Catchment Management Authority Plans, the TCM Strategy provides interesting reading as many of the identified issues and strategies are still current. The more recent CMA Plans are probably of more relevance to Section 20 issues as they have replaced the TCM Strategies.

47  Historical & Cultural

TCM Community Study - Macleay Catchment 1996
Woolcott Research Pty Ltd
Report - Hardcopy

The purpose of the TCM Community Study was to provide actionable and appropriate data which could be used in the development of a detailed marketing strategy aimed at promoting a good understanding of TCM within the community and encouraging participation. Areas of management included awareness of local environmental issues, awareness of environmental programs, perceptions of the state of the environment, attitudinal segmentation, and perceptions of TCM objectives. The findings included that 32% of people were unable to identify any environmental issues in their area, spontaneous awareness of environmental programs was low, community identified issues are similar to TCM committee identified issues, and waterways and water quality are regarded as being in poor condition. The majority of those surveyed support the aims of TCM so it is concluded that there are no concept barriers to adoption.

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The study does not directly relate to any of the issues identified in the Section 10 summary. However, community perceptions and attitudes are fundamental to natural resource management. May form a basis for sample test of future attitudinal surveys although the data is not estuary specific.

48  Water Quality

Guidelines for managing risks in recreational waters - Draft May 2004
National Health and Medical Research Council
Report - Hardcopy

The primary aim of these guidelines is to assist local/State/Territory authorities and other stakeholders to assess and manage recreational water bodies under their jurisdiction. The guidelines focus on local assessment and management of hazards and factors that may lead to hazards. The report considers physical hazards, pathogens (faecal contamination potential), algal and cyanobacterial quality, and chemical contamination. The draft report describes how to apply the guidelines and actions to take if guidelines are exceeded.

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Directly relevant to Section 10.11 Water Quality and 10.8 Tourism Management which both raise issues in relation to faecal contamination. Also relevant to Section 10.6 Boating as boat users often have primary contact with recreational waters.

49  Groundwater

Groundwater characteristics of the Kempsey District, NSW
P.H.Walker, CSIRO Division of Soils.
Report - Hardcopy

A limited survey of groundwater levels and characteristics was carried out between September 1969 and July 1970. The objects of the study were to find out the magnitude of groundwater levels and characteristics in various parts of the landscape and to measure the variation in water table with time and rain. The survey concluded that seasonal variations in groundwater levels were marked in the area, and that highest levels were generally found in the lowlands of the Macleay floodplain adjacent to swamps. Groundwater salinity and acidity can be increased through undue interference by man such as overextraction.

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Relates to Section 10.11 Water Quality although groundwater is not an identified issue. Also relevant to Section 10.4 as the report has a limited discussion on potential acid sulphate soil impacts.
The NSW Groundwater Quality Protection Policy is a component of the State Groundwater Policy Framework. This policy document outlines objectives and principles specifically designed to protect groundwater resources against pollution. The policy includes background information on the functioning of groundwater resources and systems as well as a range of policy implementation strategies.

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Despite the fact that groundwater issues are not specifically acknowledged in the Section 10 summary, the policies, principles and objectives are likely to be relevant to Section 10.11 Water Quality.

The lower Macleay floodplain has been changed physically due to extensive flood mitigation works. Earlier studies have indicated that these works have had potential or actual effects on the aquatic ecology of the floodplain, such as fish kills and reduced estuarine production. The aim of the report is to collate and review existing information with respect to aquatic ecology and fisheries, identify data needs, and contribute to a process of developing management options. Sources of information included published scientific papers, reports prepared by or on behalf of the NSW Government, Kempsey Shire Council, and consultation with stakeholders.

In: Status Report to the Floodplain Management Committee Meeting, 16 February 1996

This report reviews the various alterations to the Macleay River estuary and the state of knowledge of the effects of these alterations on the aquatic ecosystem. Specifically, the review focuses on changes to estuarine habitats, seasonal movements of aquatic organisms, and the effects of salinity, acidification, de-oxygenation and heavy metal toxicities on aquatic organisms. As such the report provides useful information on Sections 10.3, 10.4, 10.5, 10.9, 10.10, 10.11, and 10.12 as well as providing recommendations for areas of future research to fill current knowledge gaps.

The one-dimensional model used is probably very limited in predicting pollution effects due to the confounding effects of tidal processes that operate in the area of study. Additionally, no analysis of pollution from Acid Sulphate Soils or low DO water was undertaken even though drainage is now known to exacerbate these pollution effects.

This report provides useful information on Sections 10.3, 10.4, 10.5, 10.9, 10.10, 10.11, and 10.12 as well as providing recommendations for areas of future research to fill current knowledge gaps.
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**54 Flood Mitigation**

**Flood Mitigation on the Macleay River**

1976

Anonymous (Address given by Councillor D.E. Hopkins)

Report - Hardcopy

The history of flood mitigation works on the Macleay Valley is provided. An overview of programs implemented, their costs, and operation is detailed along with a review of the effects on flood mitigation. The basic intentions of the scheme are also outlined.

John Schmidt,
DIPNR Kempsey
(02) 6563 1212
john.schmidt@dipnr.nsw.gov.au

**Description:** Thorough overview of the flood mitigation program as implemented up until 1975. Provides historical context to the questions contained in Sections 10.2 Riparian Management and Bank Erosion, 10.3 Floodplain Wetland Management, and 10.5 Floodgate and drain management.

**Relates to:** Section 10.11 Water Quality.

**Note:** It is not clear whether the plan is binding on council or not. The copy provided was incomplete, missing the first 28 pages.

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**55 Water Quality**

**Kempsey Shire Urban Stormwater Management Plan 2000-2005**

2000

Kempsey Shire Council

Report - Hardcopy

Outlines issues, strategies and actions for urban stormwater management within Kempsey Shire.

Kempsey Shire Council
(02) 6266 3200

**Description:** Relates to Section 10.11 Water Quality. It is not clear whether the plan is binding on council or not. The copy provided was incomplete, missing the first 28 pages.

**Relates to:** Sections 10.11 Water Quality.

**Note:** The copy provided was incomplete, missing the first 28 pages.

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**56 Water Quality**

**South West Rocks Sewerage - Review of effluent disposal options.**

1980

Department of Public Works

Report - Hardcopy

This report reviews the various effluent disposal options available for the proposed South West Rocks sewerage scheme. The general criteria for each option are presented and each option evaluated on technical, economic, environmental and aesthetic grounds. Disposal in the sand dunes behind Front Beach and Saltwater Creek is recommended.

John Schmidt,
DIPNR Kempsey
(02) 6563 1212 john.schmidt@dipnr.nsw.gov.au

**Description:** The report is interesting reading as it shows the state of knowledge of effluent effects at the time of writing. It is probably too dated to be of direct relevance to the Estuary Management Planning process although it does provide some historical background.

**Relates to:** Sections 10.11 Water Quality.

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**57 Acid Sulphate Soil**

**Acid Sulphate Soil Priority Management Areas on the Lower Macleay Floodplain**

1999

Tulau, M.J. & Naylor, S.D.

Report - Hardcopy

A comprehensive overview of the nature and extent of Acid Sulphate Soil in the Lower Macleay Floodplain. Includes an introduction to acid sulfate soils, a biophysical background to the issue, a discussion of the regional extent of the problem, and examination of this relationship with land use and land management issues in the Lower Macleay Floodplain. Includes maps of each priority area and a useful bibliography.

Mitch Tulau,
DIPNR Kempsey
(02) 6563 1212 mitch.tulau@dipnr.nsw.gov.au

**Description:** A very useful and concise overview of the ASS issue in the Lower Macleay Floodplain. A good quality report that should be used as a starting point in any examination of this issue and which has been cited as a background source in most subsequent reports.

**Relates to:** Sections 10.4 Acid Sulphate Soil management, 10.5 Floodgate & Drain Management, 10.2 Floodplain Wetland Management, 10.1 Land Use Planning & Development Control, and 10.11 Water Quality.
An overview of issues related to the environmental management of coastal floodplains in NSW produced through a review and collation of technical reports, strategic plans, workshop proceedings and consultations with stakeholders. Identifies 35 major issues under four broad categories: water, land, riparian zones, and land use planning and management. Identifies 12 priority areas for further work and 18 recommendations relating to further studies, monitoring, analysis and evaluation, liaison between stakeholders and the formation of working parties.

John Schmidt, DIPNR Kempsey (02) 6563 1212 john.schmidt@dipnr.nsw.gov.au

A very broad, statewide overview that touches on all aspects of floodplain management. It may provide a general guide for placing issues within the Lower Macleay in broader context but its usefulness is limited because of its broad rather than deep coverage of the issues and by the absence of any data or input from Macleay Valley stakeholders.

The ASS issue has implications for a range of floodplain and estuary management issues including: 10.4 Acid Sulphate Soil management; 10.5 Floodgate & Drain Management; 10.2 Floodplain Wetlands Management; 10.1 Land Use Planning & Development Control; and 10.11 Water quality. Much of the material covered here is treated in more detail in subsequent reports (particularly Tulau and Naylor, 2000), however, the map and schematic diagrams presented here may be useful.

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This report is of limited use. It is not concise, contains much that is erroneous and occasionally inaccurate. Its main contribution purports to be the discussion of various market-based instruments for improving the management of ASS but even this analysis is over simplistic, ignores some important social and biophysical constraints and leads to erroneous conclusions.

Some of the original sources cited in this report (e.g. James, D (1997) Environmental Incentives – Australian experience with Economic Instruments for Environmental Management, Drop Consultants, Sydney and Terreiros, Cairns, Australia) would be useful if market-based management solutions are being considered.

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This study covers the nature and significance of ASS, the biophysical characteristics of ASS in the Lower Macleay, and a discussion of the regulatory and market-based policy instruments available for their management.

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The ASS issue has implications for a range of floodplain and estuary management issues including: 10.4 Acid Sulphate Soil management; 10.5 Floodgate & Drain Management; 10.2 Floodplain Wetlands Management; 10.1 Land Use Planning & Development Control; and 10.11 Water quality.

While the results presented here are positive and are likely to have broader applicability throughout the lower Macleay, they are based on data from a very short time period and follow-up evaluations would be advisable before firm conclusions are drawn.

Ron Kemsley, Kempsey Shire Council (02) 6566 3348 ron.kennedy@kempsey.nsw.gov.au
Evaluates the nature of the commercial fishing industry in the Macleay District and provides information on the location of the different fishing facilities. The size of the fishery is limited by the condition of the entrance bars at the Macleay River and South West Rocks Creek (Black Creek). Given these limitations, and the existence of long-term good effective measures for improving the entrance, the industry is commercially at a current level and the size of the fishery is not likely to change in the foreseeable future. A new facility supporting the co-operative, marine services and slipway extension of the eastern training wall at the New Entrance would be of benefit to the commercial fishing and tourism industries.

Includes maps of existing facilities and concept plan for proposed new facility.

This report relates directly to 10.6 – Boating Use as and proposes new berthing and associated facilities near the Macleay River Estuary for commercial and recreational use. It is also of some relevance to 10.4 – Tourism Management as the proposed facilities are intended to cater to the needs of the tourism sector (particularly fishing charter operators and recreational fishing). It is of only limited relevance to 10.10 – Fish & Shellfish Management because the proposed facilities are intended to cater primarily to those operating offshore.

Examines the factors responsible for a large fish kill in the Belmore River following high rainfall and inundation of Belmore Swamp in March 1978. Water quality parameters investigated included water temperature, total suspended solids, chemical oxygen demand, salinity and pH. While the data showed noticeable increases in suspended solids and salinities in pH, the fish kill was primarily attributed to a very rapid and severe decrease in dissolved oxygen. The deoxygenation was in turn attributed to the decay of water sensitive pasture plants that have replaced the indigenous and water vegetation in Belmore Swamp as a result of drainage and flood mitigation works.

A useful resource for regional planning and the background information on a variety of biophysical and land capability characteristics. The data are generally of high quality but general in nature. For many management issues more detailed investigations may be necessary but the report provides a very useful context for planning and designing more detailed studies.

The comprehensive scope of this report makes it relevant to: 10.1 – Land Use Planning & Development; 10.3 Floodplain landscapes management; 10.4 ASS investigations may be necessary but the report provides a very useful context for planning and designing more detailed studies.

The issues examined affect the current use and possible future developments of the South West Rocks Creek port for both commercial and recreational users. It is therefore already relevant to 10.6 – Boating Use and 10.7 Sedimentation but indirectly relevant to 10.8 Tourism Management.

Embankment of the entrance and expansion of the racing wall could also adversely affect sand delivery to Black Beach.

A study of soils, geology, geomorphology, vegetation, landuse and land capabilities of the area covered by the Macksville & Nambucca 1:100 000 Australian Map grid sheet. Includes descriptions of approximately 50 soil landscapes including their biophysical characteristics and land use qualities and limitations. Includes all appendices, including text and interpreting various soil analyses and should be used in conjunction with an accompanying map.

Includes descriptions of approximately 50 soil landscapes including their biophysical characteristics and land use qualities and limitations. Includes all appendices, including text and interpreting various soil analyses and should be used in conjunction with an accompanying map.

A brief but important study that has implications for the management of the Macksville & Nambucca 1:100 000 Australian Map grid sheet. Includes all appendices, including text and interpreting various soil analyses and should be used in conjunction with an accompanying map.
65 Marine, Beach & Dune Systems
Coastal Zone Management: A Manual of Coastal Dune Management and Rehabilitation Techniques

A review of the present structure plan for South West Rocks with recommendations for the development of a new structure plan. It identifies further information that is required for effective planning and identifies that should form the development of a future plan.

The review identifies many issues raised during consultation with the local community (workshops) and government agencies and authorities. It reviews the regulatory and planning frameworks relevant to SWR (summarised in Table 1.5). It evaluates environmental considerations and constraints (summarised in Table 4.2.1). It includes a list of key concern and habitat sites.

John Schmidt, Kempsey Shire Council
(92) 6552 3322 john.schmidt@kempsey.nsw.gov.au

This review was limited to issues relevant to the immediate area of SWR, specifically the area bounded by Jerseyville (S), Arakoon (E), the Macleay River (W)& Trial Bay (N). It resolves a large for issues which are not community or government agency concerns of direct relevance to 10.1 – Land Use Planning 

and Development Control.

Several recommendations are made as to how these recommendations should be included in the future structure plan.

66 Marine, Beach & Dune Systems
Stuarts Point Coastal Hazard Advice

This document deals exclusively with coastal and dune environments. It is of limited relevance to floodplains and estuaries except in so far as dunes form a barrier protecting estuarine environments and therefore the degradation of the dunes may have flow on effects to the health of estuarine ecosystems.

67 Coastal Development & Infrastructure
South West Rocks Structure Plan Review

A review of the coastal dune system in the vicinity of Stuarts Point with respect to the planning and management of the area. It discusses the current state of knowledge and presents recommendations for future planning.

John Schmidt, Kempsey Shire Council
(92) 6552 3322 john.schmidt@kempsey.nsw.gov.au

This report is best used in conjunction with Tulau & Naylor 1999 (which provides a better overview of the ASS issue in the area), a description of the processes of plan development, and a management plan to develop and maintain coastal and dune environments.

68 Marine, Beach & Dune Systems
Stuarts Point Coastal Zone Hazard Advice

This management plan was commissioned to provide detail on proposed management strategies for the Stuarts Point Coastal Zone Area Project. It includes a brief overview of the processes of plan development, and a description of the processes of plan development and the management plan.

John Schmidt, Kempsey Shire Council
(92) 6552 3322 john.schmidt@kempsey.nsw.gov.au

This report is best used in conjunction with Tulau & Naylor 1999 (which provides a better overview of the ASS issue in the area), a description of the processes of plan development, and a management plan to develop and maintain coastal and dune environments.

69 Acid Sulphate Soil
Collombatti Clypura Acid Sulphate Soil Hot Spot Area Management Plan – Final Report

This report is best used in conjunction with Tulau & Naylor 1999 (which provides a better overview of the ASS issue in the area), a description of the processes of plan development, and a management plan to develop and maintain coastal and dune environments.

Ron Kerany, Kempsey Shire Council
(92) 6552 3322 ron.kerany@kempsey.nsw.gov.au

This report is best used in conjunction with Tulau & Naylor 1999 (which provides a better overview of the ASS issue in the area), a description of the processes of plan development, and a management plan to develop and maintain coastal and dune environments.

This report is best used in conjunction with Tulau & Naylor 1999 (which provides a better overview of the ASS issue in the area), a description of the processes of plan development, and a management plan to develop and maintain coastal and dune environments.
This document has significant historical relevance to Section 10.4 Acid Sulfate Soil Management in that it was the first survey to identify and describe ASS (cat-clays) in the Lower Macleay and discuss their management implications. However, the mapping and descriptions of the soils and their properties have been superseded by the Soil Landscape maps and reports of the area (Atkinson 1999, Eddie 2000) while a better discussion of the nature, distribution and management of ASS in the Lower Macleay can be found in Tulau and Naylor 1999.

Hydrographic, Tidal & Navigation Surveys

Title: Marine Seismic Reflection survey off South West Rocks, Trial Bay near Kempsey

Year: 1973

Authors: Lean, J.

This is an offshore survey and so is of limited relevance except in so far as the presence of the bedrock ridge may enhance accumulation of sediment at the mouth of South West Rocks Creek and thereby limit its usefulness as a port (Section 10.6 – Boating Use).

Management Plans & Studies

Title: Estuary Management Manual

Year: 1992

Authors: New South Wales Government

This outlines the 8 step estuary planning process. Does not directly relate to any of the Section 10 issues.

Estuarine Habitats

Title: Water Habitats of the Nambucca, Macleay and Hastings Catchments - North Coast Water Habitats Study Report #3.

Year: 2001

Authors: NSW National Parks and Wildlife Service Northern Directorate

This identifies 6 water habitat types and their water requirements and sensitivity to management activities from the perspective of water extraction. Relates to the protected areas and rare and threatened flora and fauna species known to the Water Management Committees. Identifies issues with legislation concerning threatened species and the need for a more comprehensive definition of KEY Habitats than identified in Section 10.9 (Habitat Protection). Does not address the status/condition of the habitats listed.

Instream habitats are not addressed in this Report. Raises issue of seagrass beds and relationship to freshwater discharge from adjoining unconfined aquifers – needs more investigation.

Does not specifically address management of riparian areas or beach nourishment.
Wetlands

Environmental impact statement for the proposed restoration of Yarrahapinni Wetland, Mid-North Coast, NSW. Prepared for Yarrahapinni Wetlands Reserve Trust

2007

SVC Consultancy - a division of Shortland Wetlands Centre

Report - Hayclay

Complex information relevant to the impacts of permanently opening the floodgates to restore tidal inundation to SEPP 14 Wetland #409 of Yarrahapinni - identifies flora and fauna habitat issues which are non-sensational in real data. Includes flora, fauna and Threatened Species likely to occur. Investigates impacts on neighbours, landuse patterns, soil and erosion, hydrology, estuary function, water quality, flora and fauna habitat, aboriginal heritage and socio-economic impacts.

Ron Kemsley, Kempsey Shire Council

(02) 6566 3200

Relevant to 12.2 (Floodplain Wetlands Management), 12.3 (Floodplain Wetlands Management), 12.4 (Acid Sulphate Soils Management), 12.5 (Floodgate and Drain Management), 12.6 (Vegetation Corridors) and 12.11 (Water Quality).

Background document.

Recreation and Tourism

A proposal to build a boardwalk at the Yarrahapinni Wetland - Environmental Impact Statement.

2000

Yarrahapinni Wetlands Reserve Trust

Report - Hardcopy

Assesses proposal for a Boardwalk as part of a community awareness and education program for the rehabilitation of the wetland and wetlands in general. Includes biological checks for species listed under the Threatened Species Conservation Act (1995).

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Relevant to 10.3 (Floodplain Wetlands Management) and 10.8 (Tourism Management). Briefly discusses some issues and potential long and short term impacts from proposal. Includes some information on Aboriginal heritage which has not been listed as a Section 10 issues. Documentation is confined to the Yarrahapinni Wetland.

Management Plans and Studies

Yarrahapinni Wetlands Reserve Plan of Management 2001

2000

Yarrahapinni Wetlands Reserve Trust

Report - Hartclay

Legal and working framework which guides the Wetlands Reserve Trust's management of the wetland in accordance with the Crown Lands Act. Documents natural resources and describes 5 Management Units and identifies Management Objectives, Key Actions and Performance Targets under 9 categories of Management Guidelines. Lists plant species and significant fauna (TSC Act 1995 and CAMBA/JAMBA).

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(02) 6566 3248

ron.kemsley@kempsey.nsw.gov.au

Relevant to 10.2 (Riparian Land Management), 10.3 (Floodplain Wetlands Management), 10.4 (Acid Sulphate Soils Management), 10.5 (Floodgate and Drain Management), 10.9 (Habitat Protection) and 10.11 (Water Quality).

Demonstrates the level of documentation required for Management Plans. Relevant to 12.2 (Floodplain Wetlands Management), 12.3 (Floodplain Wetlands Management), 12.4 (Acid Sulphate Soils Management), 12.5 (Floodgate and Drain Management), 12.6 (Vegetation Corridors) and 12.11 (Water Quality). Failure discussion on long term role of the Wetlands Trust and the need to develop appropriate income opportunities. Includes some information on Aboriginal heritage which has not been listed as a Section 10 issues. Documentation is confined to the Yarrahapinni Wetland.

To what degree has the Plan been implemented? 1 floodgate opened on a trial basis for 12 months. Issues with impact on neighbouring properties unresolved. Need to purchase more land to resolve neighbour impacts. Need to deal with impacts on Oyster/Fishing Industry. Funding stream opportunities have changed (previously NHT and DLWC) issues with funding availability? Who opportunities through CMA. No timeframes evident for implementation. Are Annual Reports addressing Performance Measures on Management Actions. Trust currently without funds for works.

Wetlands

Yarrahapinni Wetland Vegetation Monitoring - Final Report to Yarrahapinni Reserve Trust

2004

Justine Graham and John Duggin, Ecosystem Management, University of New England

Report - Hardcopy

16 field trips between March 2000 and December 2003 monitoring 7 vegetation communities, soil and water quality. Action plan for Yarrahapinni Wetland. Graphs and raw data presented covering few intervals of fire, flood, tidal inundation (opening gates), flood and floodgate closure. Photographic records presented. No clear summary of findings or conclusions included.

Ron Kemsley, Kempsey Shire Council

(02) 6566 3248

ron.kemsley@kempsey.nsw.gov.au

Relevant to 10.3 (Floodplain Wetlands Management), 10.4 (Acid Sulphate Soils Management), 10.5 (Floodgate and Drain Management) and 10.11 (Water Quality). If findings drawn out and/or monitoring extended as changes in vegetation cover and species composition may take longer to be apparent.

Appendix 1 Conference Presentation CD not included.
**Estuarine Habitats**

The Importance of groundwater to seagrass habitats at Stuarts Point

2002

Dr Pia Laegdsgaard NSW Dept. of Land & Water Conservation

This Report investigates the relationships between Seagrass in the Macleay River and its relationship with aquifer discharges (quantity and quality) from the Stuarts Point aquifer. Higher levels of nutrients in the discharged water causes stress to Seagrass by the increase in growth of algae, epiphytes and phytoplankton on the Sea grass leaves. Document the function, environmental requirements Seagrass distribution has been mapped from 1956 - 1997 and an increase in area noted. Recommendation for ongoing monitoring and investigation are made.

John Schmidt, DPIPWE Kempsey (02) 6562 1212

Useful background information for 10.1.5. Erosion and sedimentation Control as it highlights the need to consider groundwater (quantity and quality) implications on lands above aquifers on aquatic habitats within adjacent rivers. Health of seagrass also has implications for control of sediment loads in runs. Relevant to 10.7 (Sedimentation), 10.9 (Habitat Protection), 10.11 (Water Quality) and 10.12 (River Health).

**Wetlands**

A Survey of Wetlands of Coastal New South Wales - Technical Memorandum NO.5 CSIRO Division of Wildlife Research

1970

G N Goodrick

This Report was prepared by CSIRO Division of Wildlife Research and the NSW NPWS in 1970 and documents survey works undertaken on the wetlands of coastal NSW as the basis for a freshwater conservation program by NSW NPWS. 14 ecological types of wetland defined and the distribution and extent of each type listed geographic districts. The report draws attention to the impact of flood mitigation on wildlife and stresses the need to preserve areas for wildlife.

Ron Kemsley, Kempsey Shire Council (02) 6566 3248

Provides an historical perspective to the issues we trying to address in this Estuary Management Plan process (10.3 Floodplain Wetlands Management, 10.9 Habitat Protection). Map not attached to the Report.

Interesting historical perspective. Map not attached - may be of historical interest and useful for comparative purposes.

**Wetlands**

NSW Wetlands Management Policy ACTION PLAN

1998/99

Dept. of Land and Water Conservation

Sets priorities for wetland management in NSW in accordance with NSW Wetlands Management Policy. 9 Principles, 15 Strategies and 33 Actions are listed for implementation through a co-operative process requiring participation of community, all State Govt agencies, local government and industry.

Ron Kemsley, Kempsey Shire Council (02) 6566 3248

Does not specifically relate to any Section 10 issues. Sets a legislative framework for taking actions.

Specialist Advisory Groups such as NSW Wetland Action Group (WAG) were disbanded in 2003 and replaced by the over-arching Natural Resources Commission which administers the Natural Resources Commission Act 2003.

**Wetlands**

Wetlands of the Lower Macleay Floodplain, Northern Coastal New South Wales - Proceedings of the Linnean Society NSW 111(3) 1989

1989

R L Pressey

432 wetlands on the lower Macleay floodplain were mapped and an inventory of species made. Wetlands were grouped according to their size and the number of plant taxa within.

John Schmidt, DPIPWE Kempsey (02) 6562 1212

Does not specifically relate to any Section 10 issues apart from looking at the use of wetlands as a means for flood mitigation. Specialist Advisory Groups such as NSW Wetland Action Group (WAG) were disbanded in 2003 and replaced by the over-arching Natural Resources Commission which administers the Natural Resources Commission Act 2003.
Estuarine Habitat

Mapping of Bass Habitat in the Macleay, Hawkesbury and Shoalhaven Rivers - Interim Report for the Recreational Freshwater Trust Expenditure Committee (NSW Fisheries, Port Stephens Fisheries Centre)

2004

G West, R Laird, RJ Williams

Report - Hardcopy (DRAFT)

This Interim Report maps aquatic habitat elements (Bightgrove, Saltmarsh, Zostera and Other) for the 3 rivers. Ortho-rectified aerial photographs were processed and digital images were extracted and studied with data collected in the field. Features of particular relevance such as snags, eroded banks and cover of vegetation were classified in terms of their extent as either point, line or polygon features. Digital data may also be available on finalisation of the documentation during 2005.

Greg West
Scientific Officer - Habitat Mapping
NSW Dept of Primary Industries (incorporating NSW Fisheries)
Taylors Beach Rd, Taylors Beach 2316
(02) 49821232

Important baseline information relevant to Section 10.1 (Landuse Planning and Development Control), 10.2 (Riparian Land Management) and Bank Erosion), 10.6 (Boating Use), 10.7 (Sedimentation), 10.9 (Habitat Protection) and 10.10 (Fish and Shellfish Management). An important starting point for monitoring and evaluating changes and prioritising remedial bank stabilisation and revegetation activities. The Macleay Arm was not included in this project but will be included in the more comprehensive 2005 mapping.

In addition, NSW Fisheries has provided a digital data layer of Aquatic Habitat / Macrophyte mapping (Mangroves, Saltmarsh, Zostera and Others) based on 1985 aerial photography. An updated survey as part of the Comprehensive Coastal Assessment is being undertaken in February 2005 and this will be a more definitive survey noting weed species distribution such as Elodea sp. and Egeria sp.

Baseline information on changes over time and useful to current investigations by DIPNR. Relevant to Section 10.1 (Landuse Planning and Development Control), 10.2 (Riparian Land Management & Bank Erosion) and 10.9 (Habitat Protection)

Whole document unavailable when compiling database.

Riparian and Floodplain Vegetation

Saltwater Creek Catchment - Flora and Fauna Study, South West Rocks - prepared for Kempsey Shire Council Coastal and Estuary Management Committee

2003

Kendall & Kendall Pty Ltd

Report - Hardcopy

Outlines the flora and fauna communities and species within the catchment of Saltwater Creek. This study conserves or enhances existing or new surface water wetland regimes. Conservation values of flora and fauna species and communities on a Regional, State and National basis are included and Management Recommendations on habitat conservation, weeds and buffers to adjoining development areas are made for this sensitive intermittently open coastal / lagoon system.

John Schmidt,
DIPNR Kempsey
(02) 6523 1212
john.schmidt@dipnr.nsw.gov.au

This report focuses on a small target area but provides good relatively up-to-date information on the conservation status of a diversity of species for the Macleay coastal / estuary zone. Management recommendations have some relevance to the need for development controls adjoining significant remnant areas therefore addresses Section 10.1 (Landuse Planning and Development Control), 10.2 (Riparian Land Management & Bank Erosion) and 10.9 (Habitat Protection)

Whole document unavailable when compiling database.

Riparian and Floodplain Vegetation

Vegetation Survey of Saltwater Creek, Arakoon State Recreation Area, NSW

1995

Laura Dwyer

Report - Hardcopy

This report documents vegetation communities along a transect from Saltwater Creek through to the back dune.

Ron Kendall,
Kempsey Shire Council
(02) 6523 1212
ron.kendall@kempsey.nsw.gov.au

This report focuses on a small target area but does not relate directly to any Section 10 issues. It may be of interest when for a specific monitoring project on weed invasion or disturbance in this particular locality.
### Miscellaneous

<table>
<thead>
<tr>
<th>Title</th>
<th>Date</th>
<th>Author/Contact Information</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Threatened Species of the Lower North Coast of New South Wales</td>
<td>2000</td>
<td>NSW National Parks and Wildlife Service, Sydney</td>
<td>This booklet provides Threatened Species profiles for the lower north coast and includes fishes.</td>
</tr>
</tbody>
</table>

### Riparian and Floodplain Vegetation

<table>
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<tr>
<th>Title</th>
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<th>Notes</th>
</tr>
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<tbody>
<tr>
<td>Riverbank Restoration for the Hunter Estuary - A Decision Making Guide</td>
<td>2000</td>
<td>Nambucca Valley Landcare Inc./Coastcare</td>
<td>This booklet provides valuable information for revegetation activities in the Nambucca estuary and addresses the significance of mangroves and estuarine-dependent fish. Species for use in revegetation are listed according to zones through the estuary.</td>
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</tbody>
</table>

### Fisheries and Aquaculture

<table>
<thead>
<tr>
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<th>Date</th>
<th>Author/Contact Information</th>
<th>Notes</th>
</tr>
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<tbody>
<tr>
<td>NSW Fisheries: Policies and Guidelines - Aquatic Habitat Management and Fish Conservation</td>
<td>1998/1999</td>
<td>NSW Fisheries</td>
<td>This document defines and describes aquatic habitats, fish and fish resources. It details the Legislative framework, provides guidelines on a wide range of activities and defines biodiversity conservation and habitat rehabilitation activities.</td>
</tr>
</tbody>
</table>

### Indigenous Fisheries Strategy and Implementation Plan

<table>
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</table>

Relevant reference information when considering Section 10.1 (Land Use Planning and Development Control), 10.2 (Riparian Land Management and Bank Erosion) and 10.9 (Habitat Protection). Updates to the threatened species lists need to be checked for on a regular basis.
This booklet provides valuable information for revegetation activities in the Bellinger estuary and describes erosion processes and the values of vegetation. Species for use in revegetation are listed according to zones through the estuary.

Provides important flora listings for comparison with current situation and current legislation. Relevant to Section 10.1 (Land Use Planning and Development Control), 10.2 (Riparian Land Management and Bank Erosion) and 10.9 (Habitat Protection).

Provides interesting historical context to status of these remnants. New listings under Threatened Species Conservation Act set a framework to assist conservation. Relevant to Section 10.1 (Land Use Planning and Development Control) and 10.9 (Habitat Protection).

Weed control works have been undertaken as part of a Coastcare Grant provided to South-west Rocks Dune Care and Kempsey Council. Works undertaken between February 2002 and February 2004. Need for continuity of works and integration with Aboriginal community. Status of ownership and implementation of long-term conservation management.
The purpose of this interim report is to evaluate the flooding impacts associated with alternative main options for the proposed freeway to Kempsey in the lower Macleay floodplain. Hydrologic and hydraulic model was calibrated to evaluate the 2 options, the eastern option with the western option, a range of different bridge and floodway designs were tested. The report delineates the effects on flood levels in areas adjacent to, upstream of, and downstream of the proposed route. No recommendation is made of which route to choose, however, the report does recommend that more detailed investigations be carried out to resolve the model accuracy once a preferred route is selected and further flood investigations are carried out.

The potential impacts of the Eastern Option for the lower Macleay - Kempsey Highway Upgrade on flooding has been identified as a major concern. In order to investigate this issue, more detailed flood modelling of the whole range of design events was undertaken using a calibrated and dimensionless RMA-2 hydraulic model was used. Such an approach provides a better spatial representation of results to more accurately determine the likely size and location of any impacts. A property survey was also conducted so that the social and economic value of any flood impacts could be calculated and the number of properties affected determined. These options were remodelled for the full range of design events to determine the changes in flood behaviour, the number of properties affected, and increases in potential flood damage. A summary of the results obtained is presented along with a discussion of the potential flood mitigation measures considered. The report concludes that the eastern route has substantial bridge and floodway openings that there would be substantial impacts.

Hydrologic and hydraulic modelling was undertaken to evaluate the 2 options, the eastern option with the western option, a range of different bridge and floodway designs were tested. The report delineates the effects on flood levels in areas adjacent to, upstream of, and downstream of the proposed route. No recommendation is made of which route to choose, however, the report does recommend that more detailed investigations be carried out to resolve the model accuracy once a preferred route is selected and further flood investigations are carried out.

The report assesses the progress in addressing the issues and identifies additional issues related to land and water management in the lower Macleay. The report focusses on technical issues, equity issues, fisheries impacts and implementation problems. Recommendations are suggested for how to address these issues to improve the model accuracy. A range of different sized bridge and floodway designs were trialled. The report details the effects on flood levels in areas adjacent to, upstream of, and downstream of the proposed route. No recommendation is made of which route to choose, however, the report does recommend that more detailed investigations be carried out to resolve the model accuracy once a preferred route is selected and further flood investigations are carried out.

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This report goes into more detail than the previous related study, and uses more accurate modelling techniques to determine flood effects. A detailed floodplain survey and 2003 bathymetry of the river bed were used to refine the model. The findings have important ramifications for floodplain management and may have as yet unacknowledged effects on advocacy and resource processes.
<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Year</th>
<th>Source</th>
<th>Authors</th>
<th>Abstract/Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>98</td>
<td>Miscellaneous</td>
<td>2005</td>
<td>M.Tighe, P.Ashley, P.Lockwood, S.Wilson</td>
<td>Article in press</td>
<td>This study builds on previous work by Ashley and Graham (2001), and sets out to determine the spatial and vertical distribution of Arsenic (As) and Antimony (Sb) contamination across the Macleay Coastal floodplain and to investigate possible uptake of these contaminants into selected pasture species.</td>
</tr>
<tr>
<td>99</td>
<td>Acid Sulphate Soil</td>
<td>2001</td>
<td>anon.</td>
<td>Report - hardcopy</td>
<td>This report is a summary of presentations provided to the Macleay River Catchment ASS Remediation Projects Review, 29 May 2001. A comprehensive overview of projects underway at the time is provided. Presentations include “Seven Oaks Drain Projects and the Upper Belmore Floodplain Management Strategy”, “Harrison Estuaries Rehabilitation”, “Yarrahapinni Creek Active Habitat Management Trial”, “Campbell Creek Community Water Quality Monitoring”, “Macleay Floodplain Water Quality Monitoring Program”, “Tidal Freshwater and Marine Rehabilitation Programs”, and “Macleay Floodplain Rehabilitation Program”.</td>
</tr>
<tr>
<td>100</td>
<td>Geology and Geomorphology</td>
<td>1998</td>
<td>Bradley Eyre</td>
<td>Journal</td>
<td>Episodes of freshwater flow control the transport, retention and transformation of material in most Australian estuaries, and for only a small part of the year during high flow events do most Australian rivers and estuaries contribute a significant amount of material to the continental shelf. Research and monitoring efforts need to be directed towards evaluating the role episodic freshwater discharges play in the functioning of Australian estuaries.</td>
</tr>
<tr>
<td>101</td>
<td>Management Plans and Studies</td>
<td>2002</td>
<td>DIPNR Kempsey</td>
<td>Report - hardcopy</td>
<td>The integrated catchment management plan or Catchment Blueprint is an advisory plan intended to guide the development of the draft integrated catchment management plan. The plan contains “Principles of management actions, Measurable improvements on catchment health and sustainable and productive land use are the intended outcomes.”</td>
</tr>
</tbody>
</table>
Floods and Flood Studies

Recent studies have included:

1. **Macleay Estuary Information Register**
   - Provides historical context to the Macleay Valley Flood Mitigation Committee.
   - Relevant to Sections 10.7 and 10.8.
   - Contains some information of relevance to the Estuary Management Planning process.

2. **Kempsey evaluation of options for flood protection**
   - Kempsey Shire Council
   - Relevant to Section 10.2 Riparian management and bank erosion but is limited in its application as it deals specifically with erosion occurring at the caravan park.

3. **Macleay Flood Mitigation**
   - Kempsey Shire Council
   - Relevant to Section 10.2 Floodplain management and bank erosion but is limited in its application as it deals specifically with erosion occurring at the caravan park.

The report deals with the erosion as if it is a fluvial (freshwater system) despite the fact that the site is in the estuary. Opinions are given for treatment but the geomorphological investigations supporting the options is limited.

The report sets out a proposal for a valley-wide scheme which involved extensive drain enlargement, river bank protection, ocean cuts training walls, and dredging at a total estimated cost of $1,090,000 pounds. Contains several maps and appendices outlining the significant and commercial uses of the estuary.

The report investigates the causes and options for the treatment of bank erosion occurring at the caravan park. The report deals with the erosion as if it is a fluvial (freshwater system) despite the fact that the site is in the estuary. Opinions are given for treatment but the geomorphological investigations supporting the options is limited.

Relevant to Section 10.2 Floodplain management and bank erosion but is limited in its application as it deals specifically with erosion occurring at the caravan park.

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| 206 | Flood Mitigation | Macleay River County Council Report - Flood Mitigation Plan of Flood Mitigation for the Lower Valley. Report by the Council's Civil Engineer reviewing the 1953 proposals of the Macleay Valley Flood Mitigation Committee. | 1962 | Hardcopy | Following the release of the 1953 Jacka Report and the subsequent decision in 1954 to delegate to the Macleay Valley County Council the powers and duties relating to flood mitigation, works proceeded on the then Macleay River Flood Mitigation Scheme. This report reviews the recommendations of the Jacka Report and the progress to date and proposes a detailed program of further works to be undertaken. The main focus is on improving flood efficiency and to construct works which prevent water below Kempsey from being flooded. The report recommends to reduce periods of inundation to between 5-10 days, the construction of new drains and improvements in the capacity of existing drains. Further extension areas requiring flood protection works are identified and techniques for stabilisation proposed along with approximate scale of works and costings. The 1953 scheme of works estimated to cost $1,090,000 pounds is replaced by a far more detailed and comprehensive scheme costing $1,660,000 pounds. Priorities are allocated for 67 planned works. 8 maps and 2 figures are included. | 106 | 107 | 108 | 109 | Macleay Estuary Information Register |
| 207 | Management Plans and Studies | Saltwater Creek and Lagoon, South West Rocks Estuary Management Study and Plan. | 2005 | Hardcopy (DRAFT) | Outlines a management process in accordance with the provisions of the NSW Estuary and Coastal Policies that is intended to be followed in order to achieve long-term sustainability of Saltwater Creek and Lagoon with regard to ecological, economic and social values. The plan (now being drafted from the draft form and updated) is intended to be used by Council to guide future works programs and policy changes. | 107 | 109 | | | |
| 208 | Hydrographic, Tidal and Navigation Surveys | South West Rocks Creek - Review of hydrographic surveys. | 1986 | Hardcopy | Reviews 25 years of hydrographic surveys on South West Rocks Creek and comments on changes in creek and entrance conditions over the period. | 108 | | | | |
| 209 | Coastal Development and Infrastructure | Draft assessment of crown lands at Fisherman's Reach | 2001 | DLWC unpublished | The assessment applies to a part of the Macleay Arm and was undertaken to rationalise lease allocation of licences for waterfront structures over Crown Land. The assessment recommends a strategy to public consultation and advice that conditions requiring sharing of facilities be incorporated into existing occupations or new occupation licences. The number of permitted jetties is limited to a maximum of 15 between Auld Street and Perrett Lane, with a maximum of 5 between Auld Street and Perrett Lane, with an existing concrete boat ramp be transferred to Kempsey Council and dedicated a public boat ramp facility. | 109 | | | |
110 Flood Mitigation
Lower Macleay Valley Flood Mitigation - Review of Kinchela Creek and Belmore River Floodway capacities.
1994
NSW Public Works Report - hardcopy
Assesses the actual floodway capacity of Kinchela Creek and Belmore River against the design capacity and finds that both floodways are operating below their design levels.
Kinchela Creek is limited by the size of the two floodway structures while Belmore River is restricted by the channel size.
Kempsey Shire Council (02) 6566 3200
Indirect relevance to Section 10.5 Floodgate and drain management although not pertinent to any of the identified issues. Is mostly concerned with the efficiency of existing works compared to their designed capacities.

111 Flood Mitigation
Raising of Kinchela Creek levees and associated works - Review of environmental factors
1997
Kempsey Shire Council Report - Hardcopy
A proposal to raise Kinchela Creek and Belmore River levees to provide increased flood protection to local landholders is assessed for its environmental effects.
John Schmidt, DIPNR Kempsey (02) 6563 1212 john.schmidt@dipnr.nsw.gov.au
The modelling for the proposal relies on the RUBICON model developed for earlier flood modelling exercises (although new data has been put into the model increasing its accuracy). Although the document is a review of environmental factors it focuses heavily on the benefits for landholders and the "improved equity" scenario for sharing flooding problems. The information is broadly relevant to Sections 10.3, 10.4, 10.9 and 10.11 but is of most relevance to 10.5 Floodgate and drain management.

112 Flood Mitigation
Hat Head Levee hydraulic review
1994
Webb McKeown and Associates Pty Ltd Report - Hardcopy
This report determines the 1 in 100 year flood levels in Korogoro Creek near Hat Head and assesses the adequacy of existing infrastructure (e.g. levees, roads) to deal with floods of this magnitude and above. Korogoro Creek drains the Swan Pool and is part of the Belmore/Kinchela flood mitigation and drainage scheme.
Kempsey Shire Council (02) 6566 3200
Indirectly relevant to Section 10.5. Contains new cross-section data for Korogoro Creek which may be of future monitoring use. Adds new data to the existing RUBICON flood model of the lower Macleay Valley.

113 Management Plans and Studies
Saltwater Creek Estuary Processes Study
2002
Manly Hydraulics Report 1126 Report - hardcopy (CD)
The estuary processes study for Saltwater Creek has been undertaken as part of a process to develop an Estuary Management Plan (EMP) for the Creek. The study found that Saltwater Creek suffers from a lack of environmental information with issues such as artificial entrance opening, seaweed development and nutrient loading likely to affect the creek ecology and condition. The height of the entrance berm is significant as it regulates the water quality, water level and flooding, and ecological processes in the creek. The study recommends an area of further investigation that would assist in the preparation of the EMP.
John Schmidt, DIPNR Kempsey (02) 6563 1212 john.schmidt@dipnr.nsw.gov.au
Saltwater Creek is a discrete catchment within the broader Macleay River catchment and is being addressed by a separate process from an Estuary Management Plan perspective. There is no direct relevance to the Naylor EMP process although the process has been well researched and acted on and provides some broad guidelines for what might be included in the Macleay EMP (although the scale in both geographical and in terms of breadth of issues is vastly different).
The estuary processes study for Killick Creek has been undertaken as part of a process to develop an Estuary Management Plan (EMP) for the Creek. The study found that Killick Creek estuary has been impacted by a number of human induced changes to the system including flood mitigation works, channelisation and permanent opening of the creek entrance, and catchment development. The major concerns for the system include water quality and level problems, flooding management, vegetation management, ecological health and environmental variety. The study recommends it areas of further investigation that would assist in the preparation of the EMP.

Report on an exploration of used aquifers along the coastal strip between Hat Head and South West Rocks using vertical electric soundings (VES). While used sand aquifers were identified along the entire coastal strip there was only one area with potential for potable water use. This area was identified in Hat Head and is based on an earlier (1987) unsuccessful submission which forms the bulk of the sections, conceptual borefield diagram and results of VES survey. Accompanying map notes that the VES survey needs to be confirmed by drilling and that there would be some likely impact on the adjacent reserve. Includes interpreted geological cross-sections, conceptual borefield diagrams and results of VES surveys. Accompanying map folder containing GIS and locality plan, aquifer thickness isopachs and aquifer resistivity trends appear to be missing.

Public Works Department Kempsey, Kempsey Shire Water Supply Augmentation Stage 2 Geophysical Mapping of Sand Aquifers

Report on an exploration of used aquifers along the coastal strip between Hat Head and South West Rocks using vertical electric soundings (VES). While used sand aquifers were identified along the entire coastal strip there was only one area with potential for potable water use. This area was identified in Hat Head and is based on an earlier (1987) unsuccessful submission which forms the bulk of the sections, conceptual borefield diagram and results of VES survey. Accompanying map folder containing GIS and locality plan, aquifer thickness isopachs and aquifer resistivity trends appear to be missing.

Macleay Estuary Information Register
Macleay Estuary Information Register

118 Groundwater
Lower Macleay River supply Sherwood borefield recharge investigations

REZ677 Australian Groundwater Consultants Pty Ltd Report - Hardcopy

Study showing that recharge of the Sherwood Borefield by the Macleay River is impeded by areas of low permeability but there is a clear path of recharge from an abandoned channel. It recommends an artificial recharge scheme consisting of a diversion weir across the main channel of the Macleay to divert water to the abandoned channel. This would increase yield from less than 1200 cubic metres per day to approximately 3500 cubic metres per day. Includes locality plan, geophysical exploration results including map (Appendix B), borefield management program (Appendix C) and method for checking hydraulic status of bores (Appendix D).

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Relates directly to 10.1 – Land Use Planning & Development Control as the availability of potable water can constrain development and land use options.

119 Miscellaneous
State of the Environment supplementary report 2002-2003

203 Kempsey Shire Council Report - Hardcopy

A supplementary SoE report ancillary to the comprehensive SoE of 1999-2000 and supplementary reports in subsequent years. Its purpose is to provide an update on issues in previous reports, identify new issues and describe trends in environmental indicators. It lists a wide variety of pressures and responses under the general headings land, water, air, biodiversity, waste and toxic hazards, noise, Aboriginal and non-Aboriginal heritage. It also describes the Kempsey Shire Council management plan and reports on the achievement of goals outlined within the plan. It contains figures and tables on population growth projections, NPWS conservation areas, exotic weeds and feral animals, threatened flora and fauna, endangered habitat sites, environmental activities, and environmental issues and programs.

Because of its broad nature this SoE report is of relevance to all of the issues listed in Section 10.

120 Flood Mitigation
Macleay River Flood Mitigation Environmental Impact Statement – Additional Drainage Seven Oaks Area

1978 Department of Public Works, NSW Report - Hardcopy

An EIS for a proposal to deepen and widen approximately 16 km of drains as the final stage of flood mitigation in the Seven Oaks area. The aim of the works is to facilitate the rapid removal of the final few centimetres of floodwater and thereby reduce the effects of flooding on pasture. The study finds no adverse impacts, except the possibility of short term siltation as a consequence of the works, and therefore recommends that the proposal proceeds.

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(02) 6566 3248 ron.kemsley@kempsey.nsw.gov.au

The nature of the works makes this report relevant to 10.5 – Floodgate and Drain Management. Because the works facilitate the drainage of low lying lands in ASS prone areas it is also relevant to 10.4 Acid Sulfate Soils and 10.3 Floodplain Wetlands Management.

121 Management Plans & Studies
Hat Head National Park Draft Plan of Management


This management plan provides descriptions of the biophysical environment of Hat Head National Park, its cultural heritage and uses. It outlines objectives and strategies for managing the park, and develops a framework and policies for its management under the headings Landscapes, geology, soils and hydrology, Climate, native plants and animals, Invasive plants and animals, Erosion management, Cultural Heritage, Restoration of the park, Recreation opportunities, Scientific use and, Management operations. It outlines a strategy for implementation of the plan including ongoing review priority to proposed activities. It includes an A3 size map of the park.

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The Hat Head National Park includes remnants of previously more extensive freshwater wetlands (10.3 – Floodplain Wetlands Management) and is also an important mooring and transit area for migratory birds (10.1 – Coastal Management) and protects many important natural features (10.9 – Habitat Protection).
Hydrographic, Tidal and Navigation Surveys

South West Rocks Creek Hydraulic Investigations of Boat Harbour Proposal

Department of Public Works, NSW

Report - Habitat

This study was undertaken in response to concerns about a proposed boat harbours and other hydraulic infrastructure developments in South West Rocks Creek (Black Creek). In recent years, public interest has increased in the area due to natural and historical features. The study involved an analysis of geotechnical, hydraulic and environmental data, and the preparation of a project that would simulate the proposed development. It provides a preliminary estimate of the environmental impacts of the proposed development and identifies the significance of these impacts with respect to the purpose of the proposed development and other relevant policies and plans. It also identifies potential areas for improvement and provides recommendations for future planning and development. John Schmidt, DPWH Kempsey (02) 6522 1522 john.schmidt@dpwh.nsw.gov.au

Relevant to 10.6 – Boating Use and 10.8 – Tourism Management because SWR Ck harbour remains an important facility for recreational and commercial fishermen. The potential of the proposed works to reduce the tidal prism and therefore the transport capacity of commercial and recreational use is also relevant to 10.3 – Floodplain Wetlands Management. By its nature, the SWR Ck harbour is also susceptible to the impacts of 10.13 – Climate change and sea level rise.

Miscellaneous

Kempsey Water Supply Augmentation Stage 2B - Review of Environmental Factors

Bruce Fidge & Associates

Report - Habitat

Review various options for improving water supply volumes, security and quality for the Kempsey Shire Council. This work involved a comprehensive assessment of existing and potential water sources, analysis of water demand and supply, and identification of potential augmentation measures. The report recommends an augmentation scheme consisting of an off-river storage and pumping system at the Fattorini Creek site, a service reservoir along Armidale Rd, 7 km of additional pipeline in Kempsey, trunk duplication between Frederickton and Bellimbopinni, augmentation of the South West Rocks borefield, and three additional bores on a road reserve in Hat Head National Park. It includes maps of the existing and improved works, relevant correspondence and consultation, and a number of diagrams and graphs of bore levels and rainfall-infiltration relationship. Ron Kemsley, Kempsey Shire Council (02) 6563 5216 ron.kemsley@kempsey.nsw.gov.au

Relates directly to 10.1 – Land Use Planning & Development Control as the availability of potable water can constrain development and land use options. Relevant to 10.6 – Boating Use and 10.8 – Tourism Management because SWR Ck harbour remains an important facility for recreational and commercial fishermen. The potential of the proposed works to reduce the tidal prism and therefore the transport capacity of commercial and recreational use is also relevant to 10.3 – Floodplain Wetlands Management and 10.9 – Habitat Protection.

Groundwater

Kempsey sewerage treatment area – additional groundwater assessment at Gayte Point, NSW

Cathy & Partners Pty Ltd

Report - Habitat

An additional assessment of support for a development proposal for the north-western boundary of Gayte Point. Specifically, this report examines the availability of groundwater resources in the area. The report identifies the suitability of the groundwater resource for various development purposes and provides recommendations for future planning and development. Ron Kemsley, Kempsey Shire Council (02) 6563 5216 ron.kemsley@kempsey.nsw.gov.au

Relates to 10.1 – Land Use Planning & Development Control for the ability to treat and dispose of effluent. Relevant to 10.3 – Floodplain Wetlands Management and 10.9 – Habitat Protection.

Groundwater

Submission for the Ron Chris Kemsley, MP – Minister for the Environment concerning the establishment of boorallie in the Hat Head National Park

Kempsey Shire Council

Report - Habitat

A submission to establish four production bores on a road reserve in Hat Head National Park to augment water supply in South West Rocks by 5 ML per day. This submission was submitted during Stage 5 of water restrictions in NSW drought and is based on an earlier (1987) unsuccessful submission which forms the bulk of the proposal. The submission includes an appendix. It includes location map and map of proposed borefield. Ron Kemsley, Kempsey Shire Council (02) 6563 5216 ron.kemsley@kempsey.nsw.gov.au

Relates directly to 10.1 – Land Use Planning & Development Control as the availability of potable water can constrain development and land use options. Relevant to 10.6 – Boating Use and 10.8 – Tourism Management because SWR Ck harbour remains an important facility for recreational and commercial fishermen. The potential of the proposed works to reduce the tidal prism and therefore the transport capacity of commercial and recreational use is also relevant to 10.3 – Floodplain Wetlands Management and 10.9 – Habitat Protection. It is also relevant to 10.9 – Habitat Protection as any draw down of the coastal aquifer may affect wetlands within the National Park which are important habitats.
Report - Land Use and Water Management Impacts on Fishes and Agriculture Resources in the Lower Macleay - Working Party Report

Ron Kemsley, Kempsey Shire Council

Available published information on the linkages between fish kills, fish decline and the agronomy of soils of the lower Macleay is reviewed with specific reference to the effect of flood mitigation and drainage works. Although these works have achieved their original aims of maintaining nuisance flood impacts and improving drainage, the ecology of permanent and seasonal swamps has been changed, grazing productivity reduced, and water quality degraded. Four initiatives are suggested to alleviate these problems including establishing a Lower River Land and Water Care Committee, establishing a public enquiry, and preparing a detailed floodplain management plan.

Historical and Cultural Clybucca Historic Site - Draft Plan of Management

NSW NPWS Planning Officer, NSW NPWS    P O Box 61 Port Macquarie

The NSW NPWS is inviting comments on this plan by Monday 30th May.

Wetlands Macleay Wetlands Management Plan

Terry Parkhouse

This mapping defines 21 Vegetation Units representing 40,232 hectares and lists species recorded in 20 of the vegetation units, bird species, Threatened species and Jamba and Camba listings are also made. A history of the Macleay Valley wetlands is included and recommendations are made for the 5 main wetland areas and project proposals made for MASSLAG.