7.8 Entrance Dynamics and Beach Condition at The Entrance and North Entrance Beaches

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SUMMARY

As part of the Federal Government's Better Regions Grants Program, a $70,000 grant was provided to Council to undertake studies of The Entrance Channel. The emphasis of the study was to consider the options of beach sand nourishment at The Entrance beach and the need or otherwise for training walls at The Entrance. The conditions of the grant required that the final Report be referred to Council for information. (see Attachment).

RECOMMENDATION

That Council receive the report on Entrance Dynamics and Beach Condition at The Entrance and North Entrance Beaches.

BACKGROUND

A $70,000 grant was provided to Council by the Department of Regional Australia, Regional Development and Local Government under its Better Regions Grants Program to undertake studies of The Entrance Channel and environs. The purpose of the grant was to enable an examination of management options for sand nourishment at The Entrance beach and the need or otherwise for breakwalls at The Entrance channel. The grant was a commitment from the 2007 Federal Election and was secured by Craig Thompson MP Member for Dobell. The grant conditions require that the final Report be referred to Council for information.

In October 2010, Council commissioned the consultants Umwelt and SMEC to undertake the studies and their report entitled "*Entrance Dynamics and Beach Condition at the Entrance and North Entrance Beaches*" was submitted to Council in March 2011. The information and recommendations contained in the report are proposed to be carried forward in the development and implementation of Council's Coastal Zone Management Plan.

The Report has been referred to the Tuggerah Lakes Estuary, Coastal and Floodplain Management Committee (TLECFMC) at its meeting of 7 April 2011 and the committee has supported referral of the Report to Council.

The Study

Council has been managing aspects of the Entrance Channel for flooding, water quality and public amenity purposes since the early 1990's but the effectiveness of these management practices has been difficult to assess. This is because little is known about sediment transport and hydrodynamics within the channel and even less is known about how the channel will respond to changing climate conditions such as increases in wave height and sea level rise. Therefore, the Study proposed to address a range of complex and interconnected issues including dredging (of The Entrance Channel), use of dredged sand for sand nourishment (at the Entrance and North Entrance beaches), flooding, tidal exchange, sea level rise and the option of training walls at the Entrance.

The Study included a review of past investigations and studies into the Entrance dynamics and an analysis of historical photographs was also undertaken which revealed the nature of change around the channel entrance, its sand shoals and nearby beaches.

A major part of the study was the development of a conceptual model of sediment transport within The Entrance Channel and along the coast, with accompanying gross estimations for the amount of sand being moved under various conditions. This involved collation, review and analysis of existing data and other qualitative information about sedimentary processes at The Entrance and along North Entrance Beach. The conceptual model is essential to provide a sound understanding of how the system operates now and has operated in historical times. The report also considers how management options such as training walls may effect sediment distribution between the channel and beaches.

Whilst the report is a major step in understanding the dynamics of The Entrance Channel, it falls short in quantifying that understanding. The study therefore recommends that further numerical hydrodynamic and sediment transport models for The Entrance channel and adjoining ocean beaches be developed to describe and test a range of scenarios. These scenarios would include the current situation and various future sea level rise and other climate change scenarios. At this stage, the dynamics of coastal lagoon (ICOLL) entrances, such as Tuggerah Lakes, under climate change scenarios are poorly understood and few attempts have been made to model the channel entrance dynamics of any major ICOLL system.

Both the conceptual model and the proposed numerical model will also assist the Office of Environment and Heritage's (formally DECCW) hydrodynamic study of the Tuggerah Lakes system, currently underway and supported by a Caring for Our Country grant.

Conclusions from the Study

The Report concluded that:

- The current dredging patterns and frequency of dredging at the Entrance Channel are appropriate as a short to medium term measure to address the issues of sediment build-up, flooding, water quality and public amenity.

- The volume of sediment involved in the dredging and its placement at the North Entrance beach is not sufficient to prevent longer term erosion or shoreline recession along the coastal beaches, particularly as sea level rises.

- None of the investigations to date indicate that construction of a breakwall or training walls would benefit the Tuggerah Lakes system or the North Entrance beach, in fact the study indicates that training walls may severely impact the North Entrance area by increasing erosion and coastal recession.

- Increasing the volume of dredged sand and widening the channel to a permanently open condition is also not supported as it could have significant and detrimental impacts on the ecology and water quality of the lakes.

Recommendations from the Study

The Study recommended that:

- Council should continue its existing dredging program in the short to medium term.

- Council should undertake photographic and survey monitoring of the behaviour of The Entrance and North Entrance Beach to clarify actual responses to storm events and dredging activity.

- Council should install with support from the Office of Environment and Heritage (formally DECCW) a water level monitoring station at The Entrance to gauge water level changes over time resulting from climate change and channel dredging.

- Council should invest in a 3D hydrodynamic model and sediment transport model for The Entrance. The development of these models will only proceed if grant funding is secured. The approximate cost of developing the models, which will utilise the outcomes of this study as a basis, is estimated at approximately $150,000. Both the conceptual model and the proposed numerical model will assist the Office of Environment and Heritage's hydrodynamic study of the Tuggerah Lakes and its ecology as well as provide a more complete understanding into altered dredging and sand nourishment options at the Entrance Channel and nearby beaches.

Comments

The study provides a clear advance on Council's current understanding of the dynamics of sand movement around the Entrance Channel and nearshore coastal zone. The results of the study support Council's current dredging program and will assist in the development of future dredging proposals and the necessary applications for approval to the State Government. It will also provide useful information in assessing the outcomes of utilising the dredged sand for sand nourishment at the Entrance and North Entrance beaches and to assess the impacts on nearby beaches and developed areas.

As recommended by the Study, this understanding should be assisted by the development of the proposed numerical model. The model would examine how various channel configurations would affect lake flooding, such as by the addition of training walls or by the creation of a wider dredged channel or the impact if the channel is closed. The development and use of the numerical hydrodynamic model will provide more certainty to current and future options for managing the Entrance Channel and a greater understanding of assessing the implications or impacts of those options.

The addition of monitoring to assess channel movements and the installation of a water level gauge would be of significant benefit in providing data for use in the modelling.

It is intended that the recommendations of the report be incorporated into the implementation of the Coastal Zone Management Plan and will form part of a suite of actions under the adaptive management and knowledge management strategies within the Plan.

It is acknowledged that the costs involved in implementing the Study's recommendations will generally need to be sourced from grant funds or by way of developing partnerships with the state or federal government. Council therefore needs to be aware that despite the positive benefits that will be achieved from implementing the recommendations, it is likely that implementation will need to be staged and may take a substantial period to complete. With respect to the recommendation regarding dredging, Council's current programmed dredging is funded from general fund. Subject to Council consideration in the Strategic Plan, this program should continue in its current form.

A major conclusion from the study is that none of the investigations to date indicate that construction of a breakwall or training walls would benefit the Tuggerah Lakes system or the North Entrance beach. In fact the study indicates that training walls may severely impact the North Entrance area by increasing erosion and coastal recession. Similarly, with a cost estimated at approximately $40m to $60m for breakwall construction, and the potential cost of mitigating increased erosion at the Entrance North and associated ecological impacts estimated in the vicinity of $100m plus, the economic and community benefits of a breakwall would need to be extreme to make this a sustainable option for Council to even consider.

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ATTACHMENTS

1	Executive Summary - Draft Entrance Dynamics and Beach Condition at the Entrance and North Entrance Beaches	D02583703

Executive Summary

This study was commissioned to provide further analysis of the sediment transport processes affecting sediment budget and coastal morphology at North Entrance Beach and The Entrance to Tuggerah Lake. The aim of the study was to clarify sediment transport linkages between The Entrance channel and North Entrance Beach and to identify and evaluate potential options for managing sedimentary processes in this dynamic coastal landscape, to reduce risks associated with coastal erosion hazards.

North Entrance Beach lies at the southern end of the zeta curved Tuggerah coastal embayment. The southern extension of the beach is an intermittent spit and berm which forms at the mouth of the Tuggerah lake entrance channel. In historical times the mouth of the estuary closed for periods of up to three years. The sand deposits were scoured out of the entrance area by major flood flows. Since dredging of the outer entrance shoals commenced in 1993, the average channel width has declined compared to the average pre dredging condition. The range of channel conditions has also narrowed. This is in part due to medium term rainfall and storminess patterns.

Coastal hazard studies indicate that over the last 30 years, North Entrance Beach has receded at average rates of 0.2 to 0.5 metre per year. Unlike any other NSW beaches, North Entrance beach has not fully recovered from the storm bite erosion of the 1970s. The apparent sediment budget deficit at North Entrance Beach means that multiple dwellings are situated within the immediate coastal erosion hazard zone.

Since 1993, Wyong Shire Council has dredged sand from the entrance of the lake, placing most of the dredged material on the southern end of North Entrance Beach. There have also been significant changes to the configuration of the full tidal delta, including reclamation and channel straightening.

The study incorporates:

- Review of previous studies and conclusions about hydrodynamic and sedimentary processes affecting ICOLLs and associated beaches, with particular reference to the estuary mouth of Tuggerah Lakes and along North Entrance Beach
- Analysis of historical aerial photographs which reveal the extent of change at The Entrance and North Entrance Beach over the last 40 years, together with a review of factors influencing the condition of the estuary entrance
- Preparation of a longshore sediment transport model for North Entrance beach, extending from The Entrance to just north of Curtis Parade
- Review of the stability of the entrance channel of Tuggerah lakes and its propensity to close.
- Review of recent assessments of the effectiveness of dredging at The Entrance to achieve the stated flood mitigation purpose and other outcomes.
- Consideration of how sea level rise associated with climate change could affect sedimentary processes at the lake entrance
- Consideration of whether construction of training wall(s) at The Entrance could contribute to a neutral sediment budget for the entrance and North Entrance Beach area.
- Evaluation of potential sources of sand that could be used to nourish North Entrance Beach.