4.7 Expansion of the Tuggerah Lakes Ecological Response Project

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SUMMARY

This report seeks approval for the engagement of the NSW Department of Environment, Climate Change and Water (DECCW) to undertake further study into the Tuggerah Lakes Ecological Response Project. The further study is in accordance with Council's funding agreement with the Federal Government in relation to the Restoration of Tuggerah Lakes Estuarine System through Improved Water Quality Management.

RECOMMENDATION

That Council approve the engagement of the NSW Department of Environment, Climate Change and Water to undertake further study into the Tuggerah Lakes Ecological Response Project, under contract, for an amount totalling $450,000.00 excl GST.

BACKGROUND

History of Tuggerah Lakes Hydrodynamic Modelling

In 1996, prior to the establishment of Tuggerah Lakes Estuary Management Plan (TLEMP), Council undertook the Adaptive Environmental Assessment and Management Program for the Tuggerah Lakes system and associated catchments (AEAM). A major component of this study was the development of a model that described the hydrodynamics of the Tuggerah Lakes estuary.

The hydrodynamics (circulation, mixing and flushing) of an estuary is a function of its physical characteristics such as shape, width, depth, and tidal movements. The AEAM found that the tidal flushing (ocean water entering through the entrance) of the Tuggerah Lakes estuary contributed very little to the circulation and mixing patterns within the lakes. Other lakes' "flushing" studies (such as *Tuggerah Lakes, Entrance Training Walls: Technical Discussion*; Patterson, Britton and Partners) have shown that the current daily "flushing" (water moving in and out through the entrance) of Tuggerah Lakes is about 1% of the total lakes' volume.

These studies have shown that if a more permanent entrance was constructed (i.e. twin breakwalls), the volume of water being "flushed" would only improve by 1%. Similar investigations have been done for construction of a second entrance at Budgewoi, similar to the Dawesville Channel on the Peel-Harvey estuary in Western Australia. It has been shown that similartio a permanent entrance, "flushing" for the Tuggerah Lakes estuary would only improve by 1% and the effects would be limited to the small area surrounding the channel. Unfortunately for the Peel Harvey estuary, a second entrance did not produce the perceived benefits to the entire estuary because like the Tuggerah Lakes estuary, significant flushing

comes from its large catchment, pushing water out through the lakes entrance ie from the river and creeks. Therefore the Tuggerah Lakes are more sensitive to the quality of the water entering from the catchment than from the ocean, and the only significant flushing that occurs is due to water entering from the creeks and rivers and then exiting through the entrance.

The process of lake water mixing within an estuary occurs when separate water bodies within the lakes join and dilute each other. In the Tuggerah Lakes estuary, moderate to strong winds are more important in this mixing process than are tidal flows from the ocean. The surface area of the Tuggerah Lakes estuary is large and its depth is relatively shallow (average 1.7m), which can at times result in waves and turbulence. Mixing within the open water of the lakes is primarily driven by wind action. However the amount of mixing that occurs between the shallow seagrass habitats (edges of the lakes) and the deeper open waters (middle of the lakes) of the estuary was assumed during the AEAM process to be minimal. Other evidence suggests that this is an incorrect assumption and therefore should be re-examined as it has direct implications for the way in which Council invests in stormwater treatment.

The hydrodynamic modelling undertaken during the AEAM study stated that the shallow water was directly affected by the quality of the stormwater draining immediately into the lake system from the catchment that surrounds the edges of the lakes. The deeper sections of the lakes were directly affected by the stormwater that drains into the creeks before entering the deeper zones of the lakes.

Currently, Council commits substantial funds in improving the stormwater quality from the catchments that drain directly to the shallow edges of the lakes based on the AEAM statement that stormwater affects the water quality of the shallow edges of the lakes. It was assumed that this relationship was responsible for the large algal blooms that occurred around the lakes' foreshores during the late 1980's and early 1990's. The TLEMP suggests that this assumption may not be entirely correct and that the deeper water may mix with the shallow water more efficiently that previously assumed. To ensure that Council invests in stormwater improvement in the most appropriate locations, this assumption needs to be tested. The outcome would be a shift in emphasis of investment from the catchments that drain directly to the edges of the lake to the catchments that drain into the rivers.

Development of the Hydrodynamic Model

On 10 December 2008, Council signed the initial funding agreement with the Federal Government (the Government) for the implementation of the TLEMP.

The TLEMP, when funded through the *"Caring for our Country"* initiative, is limited to the funding of works considered to be "environmental" in nature that improve the water quality of the Tuggerah Lakes estuary. This contract is being managed by the Federal Department of the Sustainability, Environment, Water, Population and Communities (SEWPC).

Within the initial contract, SEWPC included a condition that Council engage DECCW to develop a hydrodynamic model for the Tuggerah Lakes. This was a significantly more sophisticated model than the one developed for the AEAM project. This modelling work:

- Refined existing model/s (AEAM) of the Tuggerah Lakes catchment to ensure that they are able to describe what actually happens during rainfall events. For the model to be a realistic representation of what actually occurs in the lakes' system, it is crucial that

water samples are collected during storms so that the results can be used to check that the model predicts the same outcome as that which actually occurs during a rainfall event;

- Developed a hydrodynamic (water flow) model for Tuggerah Lakes and the creeks entering the lakes to assess impact of sediments and nutrients on the lake system;

- Established an ecological response model that predicts the impact on the plants and animals from the sediments and nutrients that come from the catchment;

- Used the hydrodynamic and ecological response models, to assess the impact of changes to land use and impact of climate change on the lakes;

- Developed sediment and nutrient run off levels considered acceptable to protect the Tuggerah Lakes estuary. This would ensure that development in the catchment did not negatively impact the Tuggerah Lakes estuary;

- Established planning guidelines to guide development in relation to sediment and nutrient run off ensuring the protection of the Tuggerah Lakes estuary.

The initial contract covered works for the financial years 2008/2009 and 2009/2010 totalling $8.6 million. Savings ($2M) made in the initial contract means that Council can now undertake include further Ecological Response modelling originally scoped for Stage 2 of the Federal contract to value add to the investigations undertaken to date. These works - through DECCW - are part of an original funding agreement between Council and the Federal Government.

The remainder of the $20 million will be incorporated in the following contract currently being negotiated with the Federal Government.

Expansion of the Tuggerah Lakes Ecological Response Model

Tuggerah is an urbanised coastal lake that supports significant areas of seagrass and a large recreational fishery. Anthropogenic (human) pressures on the lake are predicted to greatly increase over coming years, threatening its ecological values and the industries they support. Wyong Council requires a decision support tool that is capable of describing the linkages between catchment pressures and their impacts on key ecosystem attributes.

DECCW has already developed a tool which predicts changes in primary production and seagrass distribution linked with changes in catchment landuse. This model, and all other currently available ecological response models, are not sufficient to provide the necessary level of analysis to allow the prediction of anthropogenic impacts on seagrass health and associated ecosystems, including fish. Further, very little is known about the foodweb dynamics in these systems, and the linkages between catchment disturbances, primary producers (microalgae and seagrasses) and fisheries production. The proposed project will carry out high-level research into these areas in Tuggerah Lakes and integrate the results into the existing ecological response modelling package. The project will link catchment management to environmental outcomes which are highly valued by the community and are key priorities listed in the Estuary Management Plan.

The modelling package will be used to test the effects of various land use/management scenarios on how much nutrient and sediment would be released into the waterways, and the flow on impacts on the system's ecology. This will include an assessment of a range of different sized sediment/nutrient loads to determine where the system exceeds upper limits. Anything above these limits means key estuarine processes could potentially suffer irreversible changes. An understanding of these limits is fundamental to setting appropriate targets to manage pollutant loads. Priority programs 9, 12, 17, 23 and 24 of the *Tuggerah Lakes Estuary Management Plan* all express the importance of a decision support tool to generate outcomes based on scientific evidence to assist management.

The way in which Council will utilise the results of the study:

1. To inform future estuary management planning (that fits within and/or assists with any future revision of the TLEMP)

2. To assist Council in determining relevant environmental criteria (such as water quality standards) for inclusion in its relevant planning controls (ie, LEP, DCP etc).

3. To aid Council in making strategic planning decisions concerning land-use within the Lake catchment.

4. To assist in quantifying water quality and aquatic ecology impacts associated with larger development proposals.

5. To provide a tool for prioritising environmental rehabilitation and water quality improvement works within the catchment.

6. To inform future water quality and aquatic monitoring programs for Tuggerah Lakes

7. To provide tools (such as conceptual models) to assist Council in its community education programs.

Secondary benefits may include:

8. To assist other agencies by informing relevant Lake and catchment strategies.

9. To assist other agencies in better incorporating Lake ecosystem response in decisions. Examples include Water Pollution Licenses (DECCW), Pt3A Development Planning (Dept of Planning) or decisions regarding distribution of rehabilitation funding (HCRCMA and DECCW).

LGA Requirements

In this instance, Council receives an exemption from the normal tender process under Section 55 of the Local Government Act 1993 as Council is engaging a government entity. This section of the Act explains the requirements for tendering, and subsection 3 explains the type of contracts to which Section 55 does not apply. The engagement of DECCW classifies as an exemption under this subclause.

> ***"(3) This section does not apply to the following contracts:***
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> *a contract entered into by a Council with the Crown (whether in right of the Commonwealth, New South Wales or any other State or a Territory), a Minister of the Crown or a statutory body representing the Crown "*

It should be noted that this study does not intend to investigate lakes flushing dynamics (i.e. how well the ocean water entering through the lakes entrance "flushes" the lakes) as this has been the subject of numerous studies and has shown to be minimal. Given that these studies have shown that any intervention at the lakes entrance would not produce the perceived water quality benefits to the lakes, it is not the intention of the TLEMP to pursue interventions such as breakwalls at The Entrance, second entrances or temporary seawalls and in fact, these structures are prohibited by the TLEMP, which is a statutory document.

Further to this a federally funded project is currently looking at the interactions of sedimentary processes operating at the entrance to Tuggerah Lakes and on adjacent beaches; as well as how structural controls at The Entrance (such as a northern training wall) would impact on sediment dynamics and the stability of North Entrance beach and the sand shoals in the Entrance. It would be prudent to await the findings from this study to allow this information to be included in any future management decisions.

DETAILS OF THE PROJECT

Project Tasks and Budget

Table 1 summarises the main tasks of the project and the budget assigned for its development:

Summary of Main Project Tasks

Deliverable	Description of Tasks Included in the New Variation Variation No 5	Date
Deliverable 1	Recruit staff and commence Rapid Riparian Assessment	April 2011
Deliverable 2	Model the effectiveness of the Streambank Rehabilitation Program	April 2011
Deliverable 3	Report on results of rapid assessment and evaluation of management options.	April 2011
Deliverable 4	Investigate and describe the trophic linkages within Tuggerah Lakes	May 2011
Deliverable 5	Integrate seagrass model and foodweb model into Ecological Response Model	May-June 2011
Deliverable 6	Produce final report on ecological processes in Tuggerah lake and effectiveness of potential catchment management actions in meeting the ecological condition targets of the receiving waters	30 June 2011

Budget

Component	Amount (excl GST)
Data Review	$10 800
Riparian Assessment Tool	$5 600
Foreshore Rehabilitation Gains	$3 600
Foodweb model	$187 000
Seagrass model	$202 000
Ecological Process Measures	$41 000
Grand Total	**$450 000**

Payment Schedule

	Amount	Milestone	Date
Payment 1	$1500,000	Deliverables 1 & 2	30 April 2011
Payment 2	$200,000	Deliverables 3 and progress on 4 -6	30 May 2011
Payment 3	$100,000	Deliverable 6	30 June 2011

STRATEGIC LINKS

Annual Plan

Principal Activity	*Strategy or Program*	*Financial Line Item No and Description*
A More Sustainable Community	Not applicable	
A More Sustainable Economy	Not applicable	
A More Sustainable Environment	Implementation of Estuary Management Plan: 8.2.2 Learn more about key processes in the estuary (under Priority Program 23)	
Infrastructure	Not applicable	
Organisation	Not applicable	

Contribution of Proposal to the Principal Activity

The proposed works are one of the identified projects under the TLEMP, and will fill key data gaps and apply targeted managerial actions resulting in more efficient use of public funds and less disturbance to an already pressured system.

Link to Shire Strategic Vision

Priority Objective	*How the proposal contributes or links to the Priority Objectives in Shire Strategic Vision and Annual Plan*
Communities - Communities will be vibrant, caring and connected with a sense of belonging and pride in their local neighbourhood.	Strategy 1.1: Expand and support programs that increase participation among all ages.
Travel - There will be ease of travel within the Shire, and to other regional centres and cities. Travel will be available at all hours and will be safe, clean and affordable.	Nil Impact.
Facilities and Services - Communities will have access to a diverse range of affordable and coordinated facilities, programs and services.	Strategy 3.2: Provide and maintain a range of community programs focused on community development, recreation, culture, environment, education and other issues.

Priority Objective	*How the proposal contributes or links to the Priority Objectives in Shire Strategic Vision and Annual Plan*
Education - The community will be well educated, innovative and creative. People will attain full knowledge potential at all stages of life.	Strategy 4.1: Generate community awareness and behavioural change
Employment - There will be a strong and sustainable business sector and increased local employment built on the Central Coast's business strengths.	Nil Impact
Telecommunications - Information communication technology will be consistent with world's best practice and adaptive to technological advances across all sectors.	Nil Impact.
Natural Areas - Areas of natural value in public and private ownership will be enhanced and retained to a high level in the context of ongoing development.	Strategy 7.1: Preserve threatened and endangered species as well as ecological communities and biodiversity. Strategy 7.2: Expand and continue programs focussed on restoring degraded natural areas in our community.
Environmental Programs - There will be a sense of community ownership of the natural environment through direct public involvement with environmental programs.	Ongoing Services: Council provides a range of services to protect and enhance the Shire's natural qualities and move towards a sustainable future.

Financial Implications

The works are fully funded through the TLEMP using Federal Government Caring for our Country grant funds.

Principles of Sustainability

The project will provide long term management options concerning protection of estuarine health through land-use planning, water quality and aquatic ecology impacts and the prioritisation of environmental rehabilitation works. This will result in better use of public funds while providing tools (such as conceptual models) to assist Council in its community education programs.

CONSULTATION

As with the first contract, the Federal Government has directed Council to engage DECCW to further develop a the Ecological Response model for the Tuggerah Lakes estuary.

GOVERNANCE

The works have been directed and approved by the Federal Government under its Caring for Our Country initiative.

CORPORATE RISKS

Risk	Possible Outcome	Mitigation Method
Inability of DECCW to deliver the works on-time and on-budget.	Loss of Council reputation. Penalties from non-compliance	Prepare an Agreement that includes the scope of works, and relevant milestones for that work and payments, and appropriate dispute resolution clauses.
Fraud and corruption allegations from favouring DECCW over other providers	Loss of Council reputation. Investigations into Council practices and possible penalties	Council is not required to invite tenders for the contract where the contract is with "a statutory body representing the Crown" (s.55(3) of the *Local Government Act 1993*).

CONCLUSION

The establishment of a contract between DECCW and Council for the development of a Hydrodynamic and Ecological Response Model for the Tuggerah Lakes is a condition of the original funding agreement between Council and the Federal Government. It is therefore recommended that Council approve the engagement of DECCW to undertake the project under contract for an amount totalling $450,000.00 (excl GST) as discussed in this report.

ATTACHMENTS

Nil.