Department of Primary Industries

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23 July 2007

Our Ref:

Mr Nick Easy
General Manager
Channel Deepening Project
Port of Melbourne Corporation
GPO Box 261
Melbourne
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Dear Nick,

Re: Entrance deepening

This letter outlines my reassessment of the risk of channel deepening to nutrient cycling if the Entrance were deepened to RL -22m. I'm happy to clarify any issues that may arise at any time.

Yours sincerely

Andy Longmore

Victoria
The Place To Be

Supplementary Statement - Entrance Channel Depth

Introduction

The Port of Melbourne Corporation (PoMC) is currently submitting a Supplementary Environment Effects Statement (SEES) to an Inquiry set up by the Minister for Planning for the Port Phillip Bay Channel Deepening Project (CDP).

My report within the SEES is: Longmore AR (2006) Supplementary Environment Effects Statement, Head Technical Report: Nutrient cycling- current conditions and impact assessment. Marine and Freshwater Systems Report Series No. 17. Primary Industries Research Victoria, Queenscliff. This report forms Appendix number 43 in the SEES, and incorporates a review of algal blooms by Ms Jennifer Hale.

I have been asked to consider any implications on my conclusions in the original report based on an assumption of an Great Ship Channel Depth of RL-22m and the modelled hydrodynamic conclusions set out in Cardno Lawson Treloar supplementary report "Entrance Channel Depth" (July 2007).

Objective

The objective of this supplementary statement is to describe any potential impact on *Nutrient Cycling* based on the assumption of a Great Ship Channel depth to RL-22m in comparison to the planned depth of RL-19.1m.

Methodology

The risk assessment methodology used is consistent with that described in Longmore (2006), SEES Appendix 43 and has been guided by URS as Risk Advisor to PoMC. I have treated this as a predicted event (highly probable that it will occur), which I believe is a conservative assumption. Since the deeper channel may not be realised for some years after dredging is completed, it has no effect on the assessment of risk of algal blooms arising from nutrient stimulation from dredging. However, it may have an ongoing impact on nutrient cycling, and specifically on denitrification.

Results

If the Great Ship Channel were to be at a depth to RL-22m in comparison to the planned depth of RL-19.1m, this would affect the following results of my risk assessment (Table 1):

The assessment of the risk of the CDP to nutrient cycling would increase from "negligible" to "minor".

Two mechanisms may be invoked by a change in flushing, one of which applies to the centre and north of the Bay, and the other which applies in the south.

CLT (2007) has concluded that the deepening of the Great Ship Channel to RL -22m may lead to a decrease in average flushing time of the Bay of 14%. Field studies and modelling carried out for the Port Phillip Bay Environmental Study (summarised in Longmore 2006) indicated that nitrogen is recycled about 6 times between water column and sediment before being flushed from the Bay (or lost to the atmosphere), and the limited flushing which allows the recycling to proceed so many times is one of the reasons denitrification is so efficient in Port Phillip Bay. A decline in flushing time of 14% is roughly equivalent to a reduction in the number of recyclings from 6 to 5. If we assume denitrification efficiency is linearly related to flushing time (Seitzinger *et al*. 2006), then a reduction in flushing time of 14% may lead to a reduction in denitrification efficiency of a similar amount. Such a change is still within normal variation, but the change would be ongoing, and applies on more than a regional scale, so that I have raised the consequence from "negligible" to "minor". This is an extremely conservative estimate, because arguments already presented to the Panel on the decreasing effect on denitrification of each recycling loop suggest that loss of the last recycling will make less than 1% difference to the overall denitrification efficiency.

In the absence of any field measurements on and south of the Sands, CSIRO (Harris *et al*. 1996) concluded that denitrification efficiency was low in the south, because nutrients and organic matter were flushed away before they could either induce algal blooms or settle on the sediment. Recent measurements for the EES and SEES (summarised in Longmore 2006) do not provide strong support for this conclusion, though denitrification efficiency was much lower on one occasion than measured elsewhere in the Bay. However, if the CSIRO hypothesis is correct, an increase in flushing would lead to a further decline in denitrification efficiency in this area. Once again, because measurements to date in this area have been so variable, the change is likely to be within natural variation, but would be ongoing. Therefore the consequence has been raised from "negligible" to "minor".

PoMC has proposed to augment the existing DSE denitrification monitoring program for the duration of dredging and up to two years after. Since erosion at the Entrance may not be complete for some years (if it occurs at all), the changes that could occur in denitrification may not be detected during the PoMC monitoring period. Even so, any longer-term changes due to erosion in the Entrance, if greater than natural variation, should be detectable at the DSE monitoring sites. There would then be no need to continue the PoMC monitoring beyond two years after completion of dredging.

Table – Sensitivity Analysis – Comparison of channel depth RL-19.1m and RL-22m

Impact Pathway	**Impact Pathway (cont.)**	**Potential Impact**	**Consequence – RL-19.1 m**	**Consequence – RL-22m**

Impact Pathway	Impact Pathway (cont.)	Potential Impact	Consequence – RL-19.1 m	Consequence – RL-22m
Change in tidal flushing of the Bay	Change in nutrient flushing	Nutrient cycle	Negligible	Minor

References

Cardno Lawson Treloar. "Supplementary Report – Entrance Channel Depth" July 2007.

Harris G, Batley G, Fox G, Hall D, Jernakoff P, Molloy R, Murray A, Newell B, Parslow J, Skyring G, Walker S 1996. Port Phillip Bay Environmental Study Final Report. CSIRO, ACT.

Longmore AR (2006) Supplementary Environment Effects Statement, Head Technical Report: Nutrient cycling- current conditions and impact assessment. Marine and Freshwater Systems Report Series No. 17. Primary Industries Research Victoria, Queenscliff. (This report forms Appendix number 43 in the SEES, and incorporates a review of algal blooms by Ms Jennifer Hale).

Seitzinger S, Harrison, JA; Boehlke, JK; Bouwman, AF; Lowrance, R; Peterson, B; Tobias, C; Van Drecht, G 2006. Denitrification across landscapes and waterscapes: A synthesis. Ecological Applications 16, 2064-2090.

SKM. 11 July 2007. "SEES - Channel Deepening Project. Scour Assessment - The Entrance" SKM letter to PoMC.