



**Independent Review of the
Draft Yarra River Estuary
Environmental Flow
Recommendations: Comment
on Revised Report**

A Report prepared for Melbourne Water by:

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1. Overview

Melbourne Water has commissioned consultants SKM to determine the environmental flow requirements of the Yarra River, including its estuary. The present report is the second prepared by us as part of an independent review of SKM's conclusions with respect to the estuary and, in particular, of the adequacy of the environmental flow recommendations for the estuary. This report makes comment on the revised version of the Yarra River environmental flows report which followed our initial review (SKM, Final Recommendations Report: Minimum Environmental Water Requirements and Complimentary Works Recommendations, September 2005).

In our first review of the draft Yarra River estuary environmental flow report (Sherwood and Crook, August, 2005) we made the following recommendations:

- The flow recommendations for the estuary reach should be revisited, taking into consideration the data presented in the studies by Beckett *et al.* (1982) and, possibly Hinwood *et al.* (1977).
- A flow-based risk assessment for the Yarra estuary should be conducted using the scheme outlined in Pierson *et al.* (2002) or a similar approach.

The final SKM report has addressed both of these satisfactorily and the discussion of the estuary's environmental characteristics and flow needs is greatly strengthened as a result.

They have developed an acceptable conceptual model for the estuary. We agree, however, with their conclusion that present data is not sufficient to allow flow recommendations for the estuary.

Other comments on particular components of SKM's final report are given below.

2. Comments on Specific Sections

2.1 Environmental flow objectives

Geomorphology: The concerns raised regarding sediment removal by bed scour have been adequately addressed in the revised report.

Fish: The comments relating to more specific and quantifiable objectives for fish have been adequately addressed in the revised report.

Water quality: A flow related objective specifically for water quality has not been included as suggested. However, the authors have made mention of the potential problems associated with increased residence times in this section and the issue is dealt with further in subsequent sections. Further comment on the potential for adverse outcomes on water quality is provided below.

2.2 Environmental flow and complimentary work recommendations, including any benefits to the estuary of the upstream environmental flow recommendations

As suggested, the authors have included reference to the study of Beckett et al. (1978, 1982) and have conducted a preliminary assessment of adequacy of the flow recommendations for Reach 6 for meeting the estuary's flow requirements. As pointed out by Pierson et al. (2002) there is not necessarily a relationship between the environmental flow needs of the freshwater sections of a river and its estuary and so such extrapolations must be accepted with caution given our limited data on the Yarra estuary (see Recommendation 3.4 of this report).

2.3 Assessment of the adequacy of the recommended 4000 ML/d flushing flow.

In response to our comments in the first review (Sherwood and Crook, August, 2005) the authors have adjusted the conceptual model of estuarine flow to reflect the fact that a 4000 ML/d flow is unlikely to fully flush the estuary according to the results of Beckett *et al.* (1982). The authors have also recognised that a hydrodynamic model is required to determine if the recommended channel maintenance flow would serve to adequately flush the estuary.

2.4 Adequacy of the Reach 6 recommendations for meeting estuarine requirements

The flow recommendations for Reach 6 (Mullum Mullum Creek to Dights Falls) were designed specifically to meet the objectives within Reach 6. They were not designed to meet objectives for the estuary. However, the consultants were asked to make an assessment of the adequacy of these flows in meeting the flow requirements of the estuary. This assessment is reviewed in the sections below.

2.4.1 Low flows

Although the authors have made considerable efforts to analyse the adequacy of the recommended low flows in meeting the flow requirements of the estuary, we still have several concerns regarding the recommended low flows.

Their analysis leads the authors to suggest that the low flow recommendations will lead to an increase in residence time of sub-surface water in the Punt Road region from ~10 days (based on the 80th percentile natural summer flow of 700ML/day; p138) to ~15 days and suggested that this is “not much greater than estimated residence times under natural low flows of 10 to 12 days” (see page 142). Following on from this, it is stated that “the flow recommendations for Reach 6 are unlikely to present a significant increased risk to the Yarra estuary”.

We have concerns about these statements on several fronts. Firstly, if the residence time estimates are correct, this represents an increase of 50%, which could be considered a significant increase. Secondly, it is likely that the

impacts of the recommended flows on sub-surface residence times have been underestimated. The estimated residence time of 15 days is based on the 350 ML/d low flow recommendation for winter. The natural equivalent flow for winter is 1641 ML/d (Table 4.12). If one extrapolates from Figure 4.104 as the authors have done, the natural residence time under winter low flows for the Punt Road region is ~3 days, rather than 10-12 days. Therefore, the winter residence time would be estimated to have increased from ~3 days under natural conditions to ~15 days under the flow recommendations (ie. a 500% increase).

The impacts of the summer low flow recommendation (200 ML/d) on water residence times are not discussed in the report. The data of Figure 4.104 do not cover such low flows. It is during the summer/autumn low flow period when the probability of anoxia in sub-surface waters is increased – due to higher productivity associated with sunnier days, lower water turbidity, greater residence times and higher temperatures of water.

On this basis, we reiterate our initial conclusion that there is a risk that the low flow recommendations for Reach 6 will not be adequate to protect the environmental and social values of the Yarra estuary.

2.4.2 Other flow components

As outlined in our first review, it is difficult to assess the adequacy of the other recommended flow components (eg. freshes, high flows) in the absence of a hydrodynamic model and sufficient ecological data. Whilst we consider that provision of adequate flushing flows and low flows are the highest priority, the adequacy of the high flows and freshes recommended for Reach 6 in meeting the requirements of the estuary also needs to be specifically assessed.

3 Recommendations

- 3.1 The final report be accepted as it has reviewed the available literature on the estuary adequately.

3.2 The Report does not make any flow recommendations for the estuary (Reach 7) because of the limited data available. Instead, the authors' conclude (p142):

However the specific flow requirements of the estuary cannot be determined without further investigation beyond the scope of the current study, including the development of a hydrodynamic model. A specific study similar to that undertaken in the Werribee estuary by [Sherwood et al. 2005] is recommended.

We strongly support these recommendations which are consistent with the recommendations for future work contained in our earlier report (Sherwood and Crook, August, 2005).

3.3 Given the uncertainties, particularly around the low flow estimates for summer (200ML/d) and winter (350ML/d), the recommendations for Reach 6 environmental flows not be accepted as final recommendations appropriate for the estuary (Reach 7). We make no comment on the adequacy of these flows for meeting the objectives for Reach 6 itself, however, as this is not within the scope of our review.

3.4 All flow recommendations for Reach 6 be adopted as *interim recommendations* for the estuary until the necessary hydrodynamic studies of the estuary are completed and estuary specific recommendations are made.

3.5 Water allocation decisions for the Yarra should not compromise future capacity to meet environmental flow needs of the estuary when these are established.

4. References

Beckett R., Easton A.K., Hart B.T., Ho T.C.C. and McKelvie I.D. (1978) *A Study of the Hydrodynamics of the Yarra and Maribyrnong Estuaries*, Water Studies Centre, Caulfield Institute of Technology, Technical Report No. 7 (92pp).

Beckett R., Easton A.K., Hart B.T. and McKelvie I.D. (1982) Water movement and salinity in the Yarra and Maribyrnong Estuaries, *Australian Journal of Marine and Freshwater Research*, **33**, 401-15.

Hinwood J.B., Watson J.E., Mills D., Dandy G. and Borage D. (1977) *Hobsons Bay Environmental Study – Marine Study for 6 Webb Dock*, Centre for Environmental Studies, University of Melbourne, 650pp.

Pierson W.T., Bishop K., Van Senden D., Horton P.R. and Adamantidis C.A. (2002) *Environmental Water Requirements to Maintain Estuarine Processes*, Environment Australia, Environmental Flows Initiative Technical report No. 3 (147pp).

Sherwood J. and Crook D. (2005) *Independent Review of the Draft Yarra River Estuary Environmental Flow Recommendations*, Prepared for Melbourne Water, Victoria, August, (14pp).

Sherwood J., Crook D., and Fairbrother P. (2005) *Werribee River Estuary Environmental Flow Requirements*, Prepared for Melbourne Water, Victoria (68pp).