

MEMORANDUM

From: Tony Minns, Director, Goyder Institute for Water Research

Re: Goyder Institute Peer Review of the South Australian Government eco-hydrological assessment of additional model scenarios for the Basin Plan

PREAMBLE

A peer review was undertaken by the Goyder Institute of the South Australian Government's eco-hydrological analysis of additional model scenarios for the Basin Plan for each of the South Australian environmental assets, being the floodplain, river channel and Coorong, Lower Lakes and Murray Mouth. The objective of this peer review was to ensure that the analysis and interpretation undertaken by South Australian Government scientists was scientifically defensible. Additional ecological interpretation of the analyses by the peer reviewers was not part of the scope of this peer review.

This memo is based on the outcomes of a staged process, described in detail at **Attachment A**, which included separate review of the proposed methodology followed by a review of the documentation of results. The peer reviewers would like to acknowledge the work undertaken by the South Australian Government scientists in undertaking the analysis and interpretation of results within such short timeframes and with limited modelled scenarios available, and are impressed with the quality of the resulting assessment.

While there are marked ecological improvements evident with 3200 GL compared to the 2800 GL scenario, many of the South Australian Government defined metrics are still not fully met. This suggests a further increase in flow might achieve even greater environmental benefits. This supports the 2012 Goyder Institute Expert Panel Assessment (Lamontagne et al., 2012) suggestion to model a wider range of possible scenarios. However, the peer reviewers were advised by the MDBA that scenarios above 3200 GL are not planned to be modelled at this point in time and are therefore out of the scope of this peer review.

Peer Review Outcomes

The peer reviewers endorsed the methodology applied in this assessment as fit-for-purpose given the constraints on time and availability of model scenarios. The analysis and interpretation undertaken by South Australian Government scientists was found to be scientifically defensible.

The peer reviewers accept the Technical Note produced by the SA Government scientists as meeting the requirements of suitable and appropriate documentation of the eco-hydrological assessment.

Yours sincerely,



Dr Tony Minns
Director,
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Peer Review Findings

The peer reviewers have reconfirmed that the methodology employed in the assessment of the draft Basin Plan (Bloss *et al.* 2012; Heneker and Higham 2012; Higham 2012) is a sound approach to assess the two additional model scenarios provided by the MDBA within the time available. This methodology was previously reviewed by the Goyder Institute Expert Panel in April 2012 and found to be fit-for-purpose (Lamontagne *et al.*, 2012).

In the South Australian Government assessment, a finer scale analysis in both space and time was undertaken against the South Australian Government defined hydrological indicators. In addition, the Murray Flow Assessment Tool (MFAT) was applied to the floodplain and river channel assets to assess the ecological response of the finer scale hydrological analysis. The peer reviewers endorsed this new component to the assessment of environmental outcomes, finding that the more detailed analysis provided greater insight into the incremental effects of larger volumes of water and relaxed constraints for ecological outcomes.

The peer reviewers endorse the presentation of results in the Technical Note '*Science Review of MDBA Modelling of Relaxing Constraints for Basin Plan Scenarios*' by Gibbs *et al.*, in the context of the quality and content expected of a Technical Note document.

The Peer reviewers would like to highlight the following points that cannot be addressed in the current South Australian Government assessment due to the constraints on time available for the analysis. These points below should be considered in the development of environmental watering plans:

- As identified in the Goyder Institute Expert Panel Report (Lamontagne *et al.*, 2012), the Basin Plan and associated Environmental Water Plans should pay attention to the aspect of drought recovery of degraded assets following prolonged periods of low flows.
- The peer reviewers recognise that there has been limited field validation of the assumptions regarding the ecological response to hydrological conditions. Monitoring of ecological responses to environmental watering would be required for model validation and to support an adaptive management framework that improves future planning and management of environmental watering events.
- As stated in the MDBA report '*Hydrologic modelling to inform the proposed Basin Plan*' (MDBA, 2012): "An iterative approach to incorporating environmental demands for the CLLMM into the modelling was applied which takes into account the level to which water delivered to achieve environmental outcomes upstream will contribute to achievement of downstream environmental targets. In particular, it recognises that the spatial location of CLLMM at the end of the Murray-Darling Basin allows it to accrue the benefits of return flows from upstream environmental water deliveries."

The reviewers recommend that the South Australian Government work closely with the MDBA to improve the representation of CLLMM water demands to achieve CLLMM outcomes in the modelling scenarios.

- Water quality issues, other than salinity in the Lower Lakes and Coorong, has not been considered and is not currently possible due to the lack of information available to make a reasonable assessment. However, the peer reviewers recommend that water quality issues are identified as a risk to achieving some of the environmental outcomes sought by South Australia.

Peer Review Outcomes

The peer reviewers endorsed the methodology applied in this assessment as fit-for-purpose given the constraints on time and availability of model scenarios. The analysis and interpretation undertaken by South Australian Government scientists was found to be scientifically defensible.

The peer reviewers accept the Technical Note produced by the SA Government scientists as meeting the requirements of suitable and appropriate documentation of the eco-hydrological assessment.

Attachment A: Peer Review Process

To provide the context for the outcomes of the interim peer review advice it is necessary to describe the peer review process undertaken and to summarise the findings of each stage of this process.

The Goyder Institute Peer reviewers consisted of four members of the original ten member Expert Panel (detailed in Lamontagne et al., 2012) and supplemented with additional expertise in the areas of hydrology and hydro-ecology.

The Peer Reviewers include:

Reviewer	Organisation	Area of Expertise
Jim Cox – Chair	SARDI/Adelaide University	Hydrology, Catchments, Water Quality
Jason Nicol	SARDI	Vegetation, Floodplain, Channel, CLLMM#
Todd Wallace	Adelaide Uni	Vegetation, Floodplain
Qifeng Ye	SARDI	Fish, Channel
David Paton	Adelaide Uni	CLLMM#
Ian Overton	CSIRO	River hydrology and environmental indicators

CLLMM – Coorong, Lower Lakes and Murray Mouth

Due to the time pressures constraining the analysis and peer review process, the peer review was undertaken in a staged approach. These stages were:

1. Review of methodology (undertaken and reported by the Goyder Institute Expert Panel April 2012 and debriefing for peer reviewers on 13 August 2012) and Review of metrics (review and advice provided by Jim Cox, Qifeng Ye and Ian Overton on 21 August)
2. MDBA Briefing (29 August 2012) (committee comprising SA Government scientists, the Premiers Murray-Darling Basin Plan Task Force and the Chair of The Goyder Institute Peer Review)
3. Workshop review of the outcomes of the interim findings (3rd September 2012)
4. Peer review of the final report and outcomes of the SA Government assessment

Stage 1: Review of Methodology and Metrics

The SA Government scientists provided an overview of the intended approach to be applied to the additional modelled scenarios provided by the MDBA. It was confirmed that the same approach as undertaken as part of the previous SA Government assessment of the draft Basin Plan (Bloss *et al.* 2012; Heneker and Higham 2012; Higham 2012), which was reviewed by the Expert Panel, would be applied to the additional MDBA modelled scenarios.

The Peer Reviewers re-confirmed their concerns regarding the limitations of the MDBA model approach as identified by the Expert Panel (Lamontagne et al., 2012):

- The available MDBA model for the Lower Lakes is inaccurate under very low flow conditions, compromising its ability to evaluate water level and salinity targets in the lakes or flows into the Coorong during droughts;
- Several potential important environmental stressors (e.g., floodplain salinity and climate change) are not considered in the current assessment provided by the MDBA; and
- The tools to evaluate the impact of flow regime changes on the salt balance for the South Australian River Murray, in particular for floodplains, are currently not available.

The peer reviewers recognise that the SA Government assessment is not able to address the above limitations at this time.

Stage 2: MDBA Briefing

The MDBA modellers briefed the SA Government scientists, members of the Premier's Murray-Darling Basin Plan Task Force and the Chair of the Goyder Institute Peer reviewers on their modelling approach and key findings from their assessment (29th August 2012).

The key findings of the 3200 GL with relaxed constraints (RC) scenario MDBA were:

1. To ensure consistency with previous modelling to inform the draft Basin Plan, the MDBA did not change their modelling assumptions for the two new scenarios to allow comparison between the new and previous flow scenarios
2. An increase to the flow peak and duration and improved environmental outcomes in the mid-high level floodplain
3. The 80,000 ML/day high-flow target for the Riverland-Chowilla Floodplain was only achieved under this scenario
4. Achievement of 17 out of 18 MDBA-defined flow indicators within the 80,000 ML/day range across the four indicator sites of Barmah-Millewa, Gunbower-Koondrook-Perricoota, Hattah lakes and Riverland-Chowilla Floodplain were achieved under this scenario
5. The South Australian water level target of 0.4m AHD 95% of the time was only met for the Lower Lakes under this scenario (confirmed post-meeting by MDBA via official correspondence)
6. MDBA analysis indicates that the 2800 RC (key constraints relaxed) scenario was no different in meeting MDBA-defined EWRs for the floodplain compared to the 2800 GL scenario

Stage 3: Workshop based Review

The Goyder Institute facilitated a workshop, Chaired by Ian Chessell, Chair of the Goyder Institute Management Board, as a means to efficiently and effectively review the SA Government assessment within the timeframes available, and to make a valuable contribution to the SA Government input into the finalisation of the Basin Plan. The outcomes of this workshop formed the basis of interim recommendations to the SA Government and are documented below.

The SA Government scientists presented the outcomes of their assessment for each of the South Australian environmental assets for each of the MDBA modelled flow scenarios, i.e. Baseline, without development, 2800 GL with and without constraints, 3200 GL with and without constraints.

The SA Government scientists accept the key findings of the MDBA (Stage 2 above) and note the importance of these findings for key SA environmental assets. However, in order to better quantify the environmental benefits for an expanded set of South Australian environmental assets, the SA Government scientists have undertaken a more detailed assessment of the MDBA model outputs.

The SA Government assessment included specific analysis of the ecological response of key indicator species (eg River Red Gum, Lignum, Black Box, *Ruppia tuberosa*, Golden Perch, Murray Cod) where applicable to the Chowilla Floodplain, Coorong, Lower Lakes and Murray Mouth. However, the main channel assessment was not presented at the workshop.

The peer reviewers found that the interim assessment was scientifically defensible. However, there were some points of clarification to be addressed in the preparation of the final technical report.

- The significance of the improvements between the model scenarios requires further clarification and description of the actual or absolute benefits. The use of percentage improvement can be misleading and needs to be tempered with the actual outcome against the percentage of a target that is actually delivered.

- A systems approach should be applied in the presentation of results and environmental benefits, recognising that environmental benefits differ for each environmental asset and a stand-alone description for each environmental asset does not necessarily provide a narrative on the benefits to the system or region as a whole.
- The MDBA and South Australian Government defined EWRs that are not met, together with the environmental risks associated with not meeting those EWRs, should also be documented for all model scenarios.

These points were addressed in the final Technical Note, with the exception of identification of the risks of not meeting the EWRs as these had previously been identified and documented (Bloss et al, 2012; Heneker & Higham, 2012; Higham, 2012; Lamontagne et al, 2012) and time was not available to undertake any additional analysis and interpretation.

Stage 4: Peer Review of Technical Note

The Technical Note was reviewed against the following criteria:

- Is the manuscript clearly written?
- Is the Note's story cohesive and tightly-reasoned throughout? If not, where does the text deviate from the central argument?
- Have the authors articulated the hypotheses/questions being assessed? Have the authors answered these questions satisfactorily?
- Can all results be readily verified with reference to tables, figures or statistical information? Are all tables and figures necessary, readily interpretable and fully labelled?
- Are their conclusions supported by the evidence provided? Are these adequately addressed in the results and discussion?
- Point out errors in techniques, facts, calculations or interpretations?

Minor revisions regarding presentation of results, explanation of methodology and results, clarity of the summary of key findings and inclusion of figures and tables have been addressed to the satisfaction of the peer reviewers in the finalisation of the Technical Note. The peer reviewers observed that a Technical Note does not have the level of interpretation of data, discussion and conclusions that are included in a more detailed Technical Report or Scientific Paper.

References

- Bloss, C., Steggles, T., Bald, M. and Heneker, T.M. (2012). *Hydro-ecological analysis of the proposed Basin Plan – South Australian Floodplain*. SA Department for Water, Adelaide.
- Heneker, T.M. and Higham, J.S. (2012). *Review of the Basin Plan water recovery scenarios for the lower lakes, South Australia: hydrological and ecological consequences*. Technical Report, SA Department for Environment and Natural Resources, Adelaide.
- Higham, J.S. (2012). *An analysis of MDBA modelling outputs for the draft Basin Plan: hydrodynamic modelling of the Coorong and Murray Mouth*. Technical Report, SA Department of Environment and Natural Resources, Adelaide.
- Lamontagne S, Aldridge KT, Holland KL, Jolly ID, Nicol J, Oliver RL, Paton DC, Walker KF, Wallace TA, Ye Q (2012) *Expert panel assessment of the likely ecological consequences in South Australia of the proposed Murray-Darling Basin Plan*. Goyder Institute for Water Research Technical Report Series No. 12/2.
- MDBA, 2012, Hydrologic modelling to inform the proposed Basin Plan - methods and results, MDBA publication no: 17/12, Murray-Darling Basin Authority, Canberra.