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ANALYSIS OF GROUNDWATER IN THE 2011 DRAFT MURRAY-DARLING BASIN PLAN

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ANALYSIS OF GROUNDWATER IN THE 2011 DRAFT MURRAY-DARLING BASIN PLAN

The draft Basin Plan proposes a large increase in the quantity of groundwater available for use. This is in contrast to the earlier findings of the Murray–Darling Basin Authority in the Guide to the Basin Plan and CSIRO in the Sustainable Yields project which both recommended decreasing current levels of groundwater extraction. The lack of regard for protecting this important resource means that the draft Basin Plan should be rejected.

The Murray-Darling Basin Authority recently released a document titled '*The proposed Groundwater Baseline and Sustainable Diversion Limits: Methods Report'* to provide details on the calculation of the proposed Sustainable Diversion Limits for groundwater systems throughout the Basin.

Important issues have been neglected and indefensible assumptions have been made in the analysis of groundwater sustainability to the extent that the public, and ultimately Parliament, are being misled about the sustainability of groundwater use in the Basin.

Specifically:

1. The groundwater environmentally sustainable levels of take (ESLTs) in the draft Basin Plan have been derived using unjustified assumptions.
2. The assumptions adopted to calculate the ESLTs ignore much of the long-term connectivity of surface and groundwater
3. There has been a steady increase in the Baseline Diversion Limit - the current level of usage of groundwater – which is then used to justify increased groundwater use
4. The draft Basin Plan fails to identify impacts on groundwater dependent ecosystems

Surface water users and the environment will feel major effects as a result of this potential increase in groundwater extractions. As much as half of the 2,600 Gl increase is generally good quality water with the other half being deeper saltier water which would only be useful for activities other than irrigation. Much of the good quality water being opened up for use comes from fractured rock aquifers of the eastern highlands which, along with the large alluvial aquifers, provide the baseflow for virtually all the creeks and rivers in the eastern and central parts of the Murray-Darling Basin.

Ultimately the failure of the draft Basin Plan to include the impacts of the increase in groundwater extractions in the surface water modelling means that the surface water Sustainable Diversion Limits are unlikely to deliver the claimed outcomes and water users who rely on extractions from the Basins rivers will see their water asset eroded as the upstream groundwater users extract the water first.

The failure to adequately analyse the impacts of increasing groundwater extractions on surface water means the draft Basin Plan will not adequately protect environmental assets, particularly those dependent on low flows.

There is also the potential that these groundwater increases will be made available free of charge or at discount rates to irrigators who are currently receiving large sums of taxpayer money for their surface water entitlements. If the newly available groundwater was released at a nominal rate, irrigators would receive a free or cheap resource whilst being able to sell their surface water entitlements for a windfall profit.

This approach of dramatically increasing extractions without a good understanding of the impacts is what created the current problems in the Murray-Darling Basin. It is costing taxpayers $8.9 billion to fix the mistakes of the past. We should not repeat them with groundwater.

1. The groundwater ESLT's in the draft Basin Plan have been derived using unjustified assumptions

Modelled groundwater resource units (13 units)

The draft Basin Plan divides the Murray-Darling Basin aquifers up into 79 groundwater units. Numerical groundwater models currently cover 13 of these 79 resource units. The areas covered by the models are generally the most heavily used alluvial systems.

According to the Authority "These models were developed or modified for the CSIRO Murray-Darling Basin Sustainable Yields Project (CSIRO 2008) and all of the NSW numerical models were originally developed and calibrated by the New South Wales Office of Water or its predecessors."[1] The same models were used in the development of groundwater SDLs in both the Guide to the proposed Basin Plan and the Draft Basin Plan.

The draft Basin Plan increases groundwater extraction in the 13 modelled units by over 450Gl from those calculated in the Guide. This increase is the result of changes in the assumptions underlying the models and "consultations with the states and water users."

This is most evident in the case of four major NSW alluvial aquifers. These aquifers are currently having their extraction entitlements reduced under the *Achieving Sustainable Groundwater Entitlements* program in NSW[2]. The program uses public funds to compensate groundwater users for reducing their annual entitlement limits.

In this program the required reduction in extractions to achieve sustainability (as identified by the science) was modified at the start of the program to meet objections from stakeholders.

The MDBA modelling again confirmed that the *Achieving Sustainable Groundwater Entitlements* limits would not restore these aquifers to sustainability.

The MDBA agreed to establish the SDLs for these aquifers at the *Achieving Sustainable Groundwater Entitlements* limits and not at sustainable levels of extraction. Consequently, the Sustainable Diversion Limit for these major aquifers falls far short of achieving sustainability.

The Authority advocates an adaptive management approach starting with the Achieving Sustainable Groundwater Entitlements limits. These limits have no scientific basis and the draft Basin Plan gives no indication of what the negative outcomes of only achieving these limits would be compared to achieving sustainability. Although adaptive management is sensible in principle it is not often successfully applied in practice, particularly in water management.

Groundwater resource units without models (66 units)

In those groundwater units where models do not exist the Authority utilises the Recharge Risk Assessment Method (RRAM) to determine preliminary extraction limits (PEL) which are then used to develop the SDL.

The Recharge Risk Assessment Method was used as a prioritisation tool for the Guide to the Basin Plan. Its results were never intended to be used to provide quantitative recharge estimates. Given the uncertainities in quantitative predictions from RRAM, the Authority applies the following scale factors when turning the recharge estimates into SDLs:

- High risk aquifers – 10% of estimated recharge
- Medium risk aquifers – 50% of estimated recharge
- Low risk aquifers – 70% of estimated recharge

In developing countries where the priority is short term exploitation of resources as opposed to long term sustainability it is common to find that 50% of recharge is allocated for development. But it is very surprising to find that 50% and 70% of estimated recharge are being proposed for development of medium and low risk aquifers in Australia.

Given the great uncertainties in the calculation of the recharge rates, the need to retain groundwater resources for future generations, and the limited information available about reliance of ecosystems on groundwater discharges, using risk factors of 50% and 70% of the recharge is very concerning.

Assigning up to 50% - 70% of the available recharge to consumptive use, when we don't clearly understand the impacts is how the Murray Darling Basin became overused in the first place.

The Gunnedah-Oxley Basin provides a specific example of the Authorities high risk approach. Extraction in this unit was increased from 0 Gl/y in the Guide to 300 Gl/y in the Draft Basin Plan. In 2010 the NSW Office of Water released the *Gunnedah-Oxley Basin MDB Groundwater Source Report Card*[3] . It assessed the risks of an extraction volume of 371 GL per year. The following risks were identified:

- High overall risk to aquifer from groundwater extraction;
- High risk to groundwater dependent ecosystems from declining groundwater levels ; and
- High risk of increasing frequency and duration of low flows in rivers.

Given these risks it appears the Gunnedah-Oxley Basin would be high risk. According to the Authority the Gunnedah-Oxley Basin and the two aquifers associated with it have a recharge of approximately 800Gl/y. Consequently, using the Authority's scaling rules, extraction should be less than 10% of the 800Gl/y recharge; i.e about 80 Gl/yr maximum. Compare this to the 331 Gl/yr being proposed for the Gunnedah-Oxley Basin and its two associated aquifers, with the Gunnedah-Oxley Basin alone making up 300 Gl of this. No explanation is provided of why 331 Gl/y is the proposed SDL when the Guide proposed 0 Gl/y and the Authorities own rules suggest it should be a maximum of 80 Gl/y.

Questions must also be raised about the failure of draft Basin Plan to take into account spatial distribution of extraction points in its analysis of the aquifers and the failure to make any attempt to recover water beyond the baseline diversion limits in highly connected systems.

2. The assumptions adopted to calculate the Sustainable Diversion Limits ignore the long-term connectivity of surface and groundwater

Connection

In the documentation supporting the draft Basin Plan the Authority states that for the purpose of determining Sustainable Diversion Limits, rivers that are classified as losing streams (i.e. ones where there is a flux of water from the rivers to the underlying aquifers) can be treated as unconnected systems. This is then used to justify the assumption that drawing these aquifers down further will not increase the loss of water from the overlying rivers.

However, this assumption is incorrect. The aquifers that receive water from losing river reaches will provide water to these rivers further upstream or downstream; i.e. there are gaining reaches elsewhere. Allowing additional extractions from these aquifers simply means that the level of the watertable will drop, and the extent of the losing stream will increase into areas that are currently gaining streams. Reducing the length of these gaining streams will affect river flows, including important base flows.

Basically, there is no free lunch – aquifers that receive recharge must discharge their water somewhere to maintain the water balance. Allowing additional extractions from these aquifers must reduce the amount of water that discharges into rivers. Selecting only part of the aquifer to argue that there is effectively no connection between the aquifer and the river is highly misleading.

Fractured rock aquifers and baseflow

Connectivity is particularly relevant for the fractured rock aquifers of the eastern highlands. The water in these aquifers is generally good quality and may be as much as half of the 2,600 Gl increase in potential groundwater extraction. These aquifers connect to the large alluvial aquifers of the riverine plains and so discharge from these aquifers provides the baseflow of virtually all the creeks and rivers in the eastern and central Murray-Darling Basin.

Failure of the draft Basin Plan to include the impacts of increased groundwater extraction from these fractured rock aquifers (in addition to the increased extraction from the alluvial aquifers) in the determination of surface water sustainable diversion limits means that claimed environmental outcomes in the Plan will be compromised.

This is a real concern for water users who rely on extractions from these rivers. They will see their water asset eroded as the upstream groundwater users extract the water first. Both the environment and irrigators with surface water entitlements will lose.

Timeframes

The MDBA adopts an inappropriately short time frame when assessing the impacts of extractions on groundwater systems. Thus, when considering the four *Achieving Sustainable Groundwater Entitlements* aquifers that underlie losing rivers, the Authority states that 'there is a low risk of depleting the volume of groundwater stored in these aquifers within the period of the first Basin Plan'. However, the period of the Basin Plan (20 years) is inappropriate for considering impacts on groundwater which responds much more slowly to changes than surface water. In some cases it takes decades to centuries for effects to be apparent.

3. There has been a steady increase in the Baseline Diversion Limit which is supposed to represent the current level of usage for groundwater extraction

The Authority defines Baseline Diversion Limits as "the best estimates of the Murray-Darling Basin Authority for current usage levels"[4]. These levels have changed considerably since the Guide to the Basin Plan was published only 13 months earlier. Across the Basin as a whole there have been some baselines that have increased and some that have decreased.

However the accumulated decrease in baselines across the Basin is less than 20 Gl. On the other hand, the accumulated increase in baselines across the Basin is in excess of 600 Gl. This dramatic increase in claimed baseline water use matters. Since the Baseline Diversion Limit is used to establish the Sustainable Diversion Limit this large creep in baseline use in just 13 months has the effect of increasing the Sustainable Diversion Limits available for consumptive use and decreasing the available environmental water.

The Murray-Darling Basin Authority provides no evidence to justify the 600 Gl increase in baselines over the 13 month period since the publication of the Guide.

4. The draft Basin Plan fails to identify impacts on Groundwater Dependent Ecosystems

Groundwater-dependent ecosystems (GDEs) are defined as ecosystems that have any dependence on groundwater for their survival at any time[5]. Their occurrence and their dependence on groundwater are not well understood and large increases in groundwater extraction have the potential to harm these ecosystems. The National Water Commission has recently released a Groundwater Dependent Ecosystems toolbox and is scheduled to complete a $5.5 million project to develop an Atlas of Groundwater Dependent Ecosystems this year. This will be the first national mapping of these important environmental assets.

The Murray-Darling Basin Authority has not outlined the impacts of the increases in extractions on groundwater dependent ecosystems, apart from some impacts on base flows, in its draft Basin Plan. The document acknowledges that groundwater use should not impact on key environmental assets but there are no instances in the subsequent setting of SDLs where the impact of over 2,600 Gl of increased groundwater extraction on Groundwater Dependent Ecosystems is discussed or identified. Lack of information on groundwater dependence should be a reason for caution.

The omission of any assessment of the impacts on groundwater dependent ecosystems from the groundwater document means it is impossible to determine if the groundwater Sustainable Diversion Limits in the draft Basin Plan meet the requirements of the Water Act.

Conclusion

The major lesson from the last 50 years of management of the surface waters of the Basin is that, once water is allocated to consumption, it is very difficult to return it to the environment even when time shows that over-allocation is resulting in severe environmental effects. This lesson is as true for groundwater as it has been for surface water.

In light of these experiences the setting of Sustainable Diversion Limits for groundwater should be approached very cautiously. We have much poorer knowledge of groundwater than we do of surface water. There is a good chance that, as our understanding grows, we will find that we have underestimated the extent to which increased groundwater use will affect ecosystems, downstream surface water users and existing groundwater users. Given this, the draft Basin Plan should adopt a conservative approach and not establish such over-generous Sustainable Diversion Limits which will be difficult and costly to modify later

Acknowledgement

This Statement has been prepared on behalf of the Wentworth Group of Concerned Scientists in association with Mr Tim Stubbs, Environmental Engineer of the Wentworth Group of Concerned Scientists.

References

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[4] Murray-Darling Basin Authority, 2011. *Plain English summary of the proposed Basin Plan – including explanatory notes*. MDBA, Canberra, November 2011, p87

[5] National Water Commission, 2011. *Australian groundwater-dependent ecosystems toolbox,* National Water Commission, Australian Government. http://nwc.gov.au/publications/waterlines/69-70 *Accessed 4 April 2012*.