macleod submission for windsor inquiry on mdba guide for a draft basin plan

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SUBMISSION COVER SHEET

"Inquiry into the impact of the Murray-Darling Basin Plan in Regional Australia".

Organisation	Concerned citizen
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A short summary of this submission can be found below and as a foot note on page 2.

In summary, the Guide is late and for regional irrigators, remains disappointing particularly in terms of detail. Opportunities exist to improve the efficiency of environmental water distribution such as Low Banks in forested areas and use of individual regulators. The now disbanded Barmah Millewa Forum provides a suitable model for EWA accounting and use.

macleod submission for windsor inquiry on mdba guide for a draft basin plan

SUBMISSION FOR:

"Inquiry into the impact of the Murray-Darling Basin Plan in Regional Australia" following the release of the GUIDE to the proposed BASIN PLAN

Author

This submission is made by Donald Macleod a retired water resources engineer with over 38 years experience in water resources, port and transport infrastructure works and their environmental approval. This experience includes time with the (then) State Rivers & Water Supply Commission (SRWSC) and the (then) River Murray Commission as well as consultancies for the Murray Darling Basin Commission (MDBC) particularly on the Barmah Millewa Forest. His recent CV activity is summarised below.

- BE (Civil) (Melb), BA(ANU), DipTRP(Melb).
- Past Chair, Industry Advisory Committee, Civil and Environmental Engineering, University of New South Wales.
- Past Chairman Maunsell Pty Ltd and Maunsell Holdings Pty Ltd.
- Consultant, Environmental Engineering, Maunsell (now AECOM).
- Maunsell - Lead consultant Barmah-Millewa Forest Water Management Plan 1991.
- Provision of Secretariat and Technical Services to Barmah Millewa Forum 1998-2005.

Introduction

This submission is based on the Macleod submission already lodged with the Murray Darling Basin Authority (# 689022) on the Guide to Draft Basin Plan, Volume 1. It has been re-written and re-arranged to concentrate on the Committee's Terms of Reference (1), (2) and (3)

1. The direct and indirect impact of the Proposed Basin Plan on regional communities, including agricultural industries, local business activity and community wellbeing.
2. Options for water-saving measures or water return on a region-by-region basis with consideration given to an analysis of actual usage versus licence entitlement over the preceding fifteen years.
3. The role of governments, the agricultural industry and the research sector in developing and delivering infrastructure and technologies aimed at supporting water efficiency within the Murray-Darling Basin.

In summary, the Guide is late and for regional irrigators, remains disappointing particularly in terms of detail. Opportunities exist to improve the efficiency of environmental water distribution such as Low Banks in forested areas and use of individual regulators. The now disbanded Barmah Millewa Forum provides a suitable model for EWA accounting and use.

In examining each of these issues, the Committee will also consider community views on:

- Measures to increase water efficiency and reduces consumption and their relative cost-effectiveness;
- Opportunities for economic growth and diversification within regional communities; and
- Previous relevant reform and structural adjustment programs and the impact on communities and regions.

Background

The headings adopted in this submission for the Inquiry's three terms of reference shall be:

1. Regional Impacts
2. Water Use Efficiencies
3. Improved Infrastructure in Irrigation Areas

The submission assumes that the Minister's Burke's press release and the comments made at the MDBA's Sydney Community Consultation session on November 3, 2010 will allow the Authority to treat social and economic objectives as equal with environmental issues and that a new and lower range of possible environmental allocations will be examined.

First of all, the staff of the Authority (although I notice that no members of the presumably large team are named) should be complimented on the elegant logic and the high standard of presentation in the Guide Volume 1 and the accompanying Technical Volume Their preparation time has been well spent in reviewing a vast (but unfortunately somewhat limited) data bank and drawing together a number of competing strands into a comprehensive document. MDBA staff will later see the Basin Plan as a career highlight.

But like all complex issues and of necessity, there are important value judgments introduced which in turn have lead to some disappointing and doubtful conclusions. These concerns about the conclusions will be discussed in later sections.

Throughout its long history since 1917, the reforms of the River Murray Waters Agreement have been characterized by three features. They are:

Drought

All major challenges and subsequent reforms have followed a serious drought. The 2010 reforms clearly meet this pattern. It would appear that droughts are required in order to help concentrate the minds of irrigators and administrators and then more particularly governments.

"Nothing New"

> Although many may now claim ownership, there is nothing new about the 2010 re-introduction of so-called environmental flows. Any reference to the two components (a diversion component and a large dilution component) of the South Australian Entitlement will quickly confirm that environmental flows have always been part of the River Murray Waters Act. In addition and as another example, the Barmah Millewa Environmental Water Allocation (EWA[1]) has been in place for nearly twenty years.

"Devil lies in the Detail"

> In nearly 100 years of River Murray studies, the one abiding characteristic has been that "the devil lies in the detail". By producing annual average flow figures, stakeholders (both irrigation and conservation) have to take on trust that the annual averages are representative and will be realized somehow despite the fact that historically, Murray shares divided between consumptive uses and carry-over reserves, the allocations made available to users and tight river regulation has always been dominated by what happens during droughts and water shortages. The Guide's presentations would have been enhanced if resource allocations for say a typical flood year and for a typical drought year had been included.

Of these three characteristics the last is the most important. Issues associated with the Guide's lack of detail will now be taken up under the Inquiry's three headings.

1 Regional Impacts

In pandering to the city based so-called "green vote" two recent inquiries have already put paid to the 150 year old River Red Gum industry in both Victoria and New South Wales. Both inquiries gave scant credence to local views and advice and certainly in NSW, the Minister will not answer questions concerning the promised assistance to local industries. The Basin Plan must not become a third imposed event. However, the omens are not good as (1) the token level of 2009 and early 2010 community involvement and (2) the Guide's outlining of yet another bureaucratic solution are two of the characteristics of both River Red Gum Inquiries.

More specifically, the people of the Murray Darling Basin have every reason to be disappointed by the Guide's suggestions because of:

Delayed Release of the Guide Volume

Outside the conclusions, there remains one serious item of criticism and that is timing. The Guide was published at least four months late and accepting the MDBA's

report layout (page (iv)), only two volumes of the promised 21 have been made available.

The Murray communities have been forced to be very patient. For a document/plan promised in early 2010, to be provided with a “Guide to a Draft of a Plan” in October 2010 is playing a very dictatorial game. The hostility displayed at the public meetings is well deserved.

The River Murray community in particular and probably the whole Murray Darling Basin community as well, is very well informed and capable of understanding all the issues. It is a pity that over the past year most of the Authority’s public meetings have only been show pieces with little or no real information released.

Contrast in Allocation Priorities

There is a serious flaw in the Guide. It concerns the degree of so-called accuracy being applied to the two competing applications of water use and environment needs. Individual valleys are presented with flows and uses quoted to an accuracy of one GL/a (in a Basin with total inflows of over 30,000 GL/a) while environmental judgments rely upon three bands notionally covering “fair to good”. Regardless of the Authority’s current obsession that an extra 3,000GL/a is required to meet the Water Act’s environmental needs there is an equally good argument in favour of testing additional environmental flows of 500, 1000, 1500 and 2000GL/a as well as the now apparently favoured 3000 to 4000 GL/a. As you know, both 500GL/a and 1500GL/a have enjoyed high status and thus privileged positions in the past. The Living Murray’s target is still 500GL/a and members of the Wentworth Group were once keen advocates of the 1500GL/a figure. All these broad scale figures stand in marked contrast with the precise reductions in diversions.

The harsh reality is that for over 50 years of my experience, the environmental movement has never joined the process of carefully analyzing floods and droughts and then regulating water flows into icon sites, largely because they have little reliable science and no hard operational data on which to base their judgments. It is much easier for environmentalists to call for large flows with no management challenge that hopefully won’t then be noticed. The Guide’s encouragement toward better definition of the required environmental and loss flows is worthwhile.

The lack of detail concern can be expressed in other words. If the MDBA was seeking to win EIS and then government approval for a major water project, it would be necessary (as is required for all road, freeway and port projects) to put a near final but very detailed design (correct to the nearest mm) out for public scrutiny. The MDBA’s annual averages are a good first step; they are certainly interesting as a summary but almost irrelevant till low flow year details are revealed. Further comments on the “nothing new” and the “devil lies in the detail” aspects now follow:

Await Expiry of State Water Plans

One point made clearer at the Sydney presentation is the fact that the apparently necessary environmental water can probably be easily achieved through voluntary sell-offs. Rather than provoking the current city versus country stoush, why not wait

patiently during the currency of the two key State Water Plans [NSW 2014 and Victoria 2019] and then see where the numbers then lie?

Effect of the Buy Back Program

The socio-economic study would be better directed towards businesses in individual towns and not to the large regions favoured by the MDBA consultants as “Buy Backs” don’t help business activity in individual towns.

Management and the Role of CMA’s

The large number of river valleys being analysed also requires simplification. Will 15 Catchment Management Authorities be asked to manage SDL’s? Will they also request environmental water from storages? Will State Water Plans have an over-arching role in management?

Biased Reference Lists

The Authority appears to be proud of their “1200 strong reference list”. The list is unfortunately characterized by its modernity. For example, the Barmah Millewa Forest water requirements paper produces a final table that is almost identical to that produced by Leitch in 1990, Maunsell in 1991 and Maunsell McIntyre in 2002. Sticking with the Barmah Millewa, why is there no reference at all to the Barmah Millewa Forum, Barrie Dexter and Leon Bren, all of whom wrote extensively and published widely on Barmah floods, Barmah vegetation associations, water needs by vegetation association, the use of engineering works to improve the efficiency of environmental water use, reports of major floods (including the uses of the Barmah Millewa EWA and reports on Forest research projects.

2 Water Use Efficiencies

Floods and Environmental Flows

The Guide correctly identifies flows in excess of consumptive needs as flows for the “environmental and to cover river loss”. However, it then fails to acknowledge that even if the reallocation of 3000GL/a from use to environmental purposes is achieved, it will only represent about 15% of the environment and loss total. In other words, it will always be a small proportion of the total environmental and loss flow and by definition, will require very careful management including accumulation rules, storage locations and storage release rules. None of these matters has been addressed. Nor has the matter of check flows at the proposed Hydrologic Indicator Sites and their integration in to the whole system of river regulation. As a disappointing example, in the MDBA’s assessment of environmental water requirements, Chapter 10, Barmah-Millewa Forest water requirements paper repeatedly quotes flood flows as “flows downstream of Yarrawonga” yet the station does not appear in the long list of Hydrologic Indicator Sites.

Engineering Works for Improved Water Efficiency

At the MDBA's public meetings and within the Guide, the use of engineering works to improve the efficiency of environmental water applications has been advocated but not described in any detail. The Barmah Millewa Forum experience would suggest that this reform although clearly necessary (and already practised in a number of other Murray locations) will always be opposed by the lunatic fringe of the conservation movement. The Guide should be identifying such works at this time as they will reduce the high demands already on the table. The Barmah Millewa Forum investigated and found in favour of such items as:

- Low bank works to spread water in flood plain forests.
- Watering of selective areas by controlling flows through individual regulators
- Use of Forest creeks as by-passes of river chokes.

The full 2003 Forum report on the use of Low Banks (Maunsell (January 2003), entitled *Evaluation of Banks for Localised Flooding* for the Barmah Millewa Forum can be made available if required. Appendix A presents a summary of the main points.

Allocation of Environmental Water

Will the allocations for the 18 Icon sites follow the long established and successful Barmah Millewa Forest pattern? These rules allow for annual accumulation (at 150 GL/a) to an upper limit of 600GL, the allocation is stored in Hume Reservoir and is available for lending for consumptive uses. Furthermore, will any environmental allocation be available for trading?

Priorities between Environmental Users

How will priorities between the 18 Icon sites be determined and administered? In addition, who will "own" the allocation, will they pay water charges, and can the "owners" trade with other water users?

Pandering to State National Parks Needs

For example, what water will be assigned to the new and much publicised Barmah Millewa Forest National Parks? The two recent River Red Gum Inquiries have made much of their water needs no doubt hoping to be rescued by the MDBA Basin Plan

Climate Change Allowances

If the 115 years of record remains the Authority's flow record, and given the CSIRO's claims that global warming started in the 1980's, presumably two thirds of the assumed 3% drop in inflows to the year 2020 is already built into the flow record from 1980 to 2009. Given that the Guide is chasing serious percentage changes from key river valleys, why not drop the allowance for this initial analysis and accept a watching brief on climate change flow influences and then, if necessary, introduce adaptive management techniques?

Wild Fire Risks

The Upper Murray catchment has already endured two major fires (affecting over 1,000,000 ha each time) since 2002. Reports from the MDBC have shown that the regeneration of the forest has a significant impact on streamflows which can stretch out to over twenty years. Will the Authority's modeling and the Plan make any risk allowance for repeat events? Given the proven inability of the current land managers to control such outbreaks, wild fire risks are clearly much more important than climate change.

River Murray Hydrologic Record

Having reviewed the Guide Volume 1 and the supporting Technical Volume, it remains amazing that there is no mention in the 10 pages of references (and see below as well) of the Murray hydrologic record. Here we have at least 3500 station years of daily river flows and irrigation diversions matched against no more than 10 snapshots of environmental conditions at perhaps 10 Icon sites. Without the flow record the MDBA has nothing yet this priceless data appears to be not appreciated.

3 Improved Infrastructure in Irrigation Areas

Evaporative Losses in the Lower Lakes

Of the extra environmental and loss flow of 3000GL/a, over 2000GL/a is proposed to run to sea. If nothing else, better justification of maintaining the huge evaporative losses in the SA terminal lakes (up to 1000GL/a) is required as maintaining the terminal lakes as freshwater is not natural, tidal action and flushing via the river mouth could be enhanced by training walls and the proposed weir at Wellington could become a suitable check point for salt loads leaving the Basin and for Adelaide's water quality objectives

Over Allocation

Critics of River Murray management have made much of the so-called "over allocation" of irrigation water. As the MDBA's figures make clear, any over allocation is at the margin and is only revealed by using an arbitrary SDL figure of 60% of pre development flows. The MDBC Cap was already working to bring back this figure.

River Murray Environmental Flow Outcomes

Rather than the repeated use of one over-simple measure in mapping the environmental flow outcomes are there not a range of measures that could be applied? At the Sydney public meeting, the Authority's Chief Executive spoke briefly of "other measures than SDL being used to assess environmental health". As the Guide contains no such additional information, readers and listeners must become more confused and thus concerned that other even more arbitrary judgements are being applied. The over-reliance of the arbitrary "60% of the non development

outflow" needs more justification. Need it be the same percentage for all catchments? What if it became 50%?

Furthermore, would the peer group of scientists be offering the same judgements in October 2010 rather than judging the 10 year drought ravaged system in 2008/2009? What plans are in hand to measure the resilience of the River Murray environment following the current floods? What plans are in hand to monitor the new 18 Icon sites? In the days of the Barmah Millewa Forum, the monitoring program was amongst the most important.

Links between River Health and Water Use

More work is required to explain the link between so-called "river health" and environmental and loss flows rather than just claiming that continuing water use requires a "healthy river". The Guide does not explain how more frogs on the floodplain or stronger Red Gums help current diverters. Dilution can and does improve algal outbreaks and help reduce salinity but that role has been part of River Murray allocations and river regulation for over 90 years.

Management after SDL's

Given that all 25 catchments will have their own outflow requirements judged on a rolling five year basis, how will this regulation be achieved? For "run of the river" streams (such as the Ovens probably) flows may be used "as they come" but there is already evidence that the Victorian authorities may devise plans to limit its use to Victorian irrigators. For others such as the Murrumbidgee (presumably) annual operating plans will be required to allow coordination with MDBA storage releases.

River Murray Water has been an excellent river manager in the past but I can see none of their influence in the Guide or in the Technical Volume. When will their expertise be applied? Much more detail is required.

Misallocated Geography

One feature of many of the presentations in the Guide is the involvement of the Darling and its tributaries. As even the Guide makes clear, the Darling is a "non event", its hydrologic characteristics are entirely different to the Murray and furthermore, it only influences Murray regulation once every 10 years and at best, only represents 17 % of the flow to South Australia as a long term average. Why not separate the MDBA into a Murray Authority and a Darling Authority and get on with the real work? The earlier River Murray Commission and the MDBC got their priorities much better aligned.

River Murray and Murray Tributaries

The Authority's new obsession with SDL's and 60% outflows from catchments has produced some analogous outcomes. While the initial introduction of SDL catchments (Figure 8.3) presents a recognizable pattern but when applied to the environmental flow outcomes, (Figure 6.6), the generalization has gone too far. For

example, the Guide accepts the Ovens at Wangaratta as an outflow gauging station and proceeds to paint it green and rank it as “good”. However, the Murray at Jingellic, the Mitta at Tallandoon and the Kiewa at Bandianna all of which have large upstream catchments, low usage and high outflows are painted red and ranked as “poor”. The Guide has therefore ignored the traditional river stretches in order to present a biased and misleading picture. More mainstream river sections (rather than the only one used to Wentworth) should have been presented and particularly for the Yarrawonga, (the Murray between Hume and Yarrawonga may even have been ranked “good” under such a system) Torumbarry and Euston sections. Readers cannot perform their own analysis with the Guide’s Table C1 data. It is hoped that more mainstream analyses will be presented in the Draft Plan.

I was pleased to see some simple water balance diagrams showing Basin inflows, irrigation and water supply diversions, environmental flows and river losses. They are helpful but the so-called 3000GL/a to 7500 GL/a options (in Tables C1 to C3) should be subject to the same treatment. While clearer for individual catchments, the Murray Valley itself with many major off takes cannot be easily seen or understood.

Another good example of the lack of equality concerns the harsh treatment of the Goulburn, Murrumbidgee and Murray irrigators. The crude percentages released by the Department of Water and the Sydney Morning Herald on 19 October 2010 hide the real issue that of the 3000GL/a to be recovered, over 2000GL/a (see Guide Table C1) is required from these three large and most efficient irrigation areas with the balance coming from the rest of the Basin. Furthermore, of the recovered water licences and already allocated environmental flows, these three areas have already contributed more than 60% of today’s total.

5 Conclusions

Equity Issues

1. To reduce un-certainty within the Murray Darling community, it is important that any new Draft Plan timetable is adhered to. The delay in releasing the Guide is to be regretted particularly as it added to local dismay following the forced demise of the River Red Gum industry and the Sugarloaf pipe taking water out of the Basin to service Melbourne.
2. The Draft Basin Plan must achieve a better balance between the needs of regional towns and communities (clearly the current “losers”) and the anonymous and assumed to be large, environmental groups the apparent “winners” than the Guide’s current arrangements..
3. Conclusion (2) applies particularly to the relative accuracies required of diversion reductions (accurate to one GL/a) and the three band broad brush approach allowed for environmental flows. In addition, there are no management challenges to use the environmental flows effectively.
4. The annual averages suggest that only relative minor changes are required to achieve an acceptable balance between use and the environment.
5. This conclusion should be checked against low flow operations and environmental watering during floods.

6. The remaining lives of the two State Water Plans allows time for the "buy-back" changes to continue after which the use and environment positions could be reviewed.
7. Greater use should be made of earlier Murray research and investigation work, remember "there is nothing new about the River Murray".
8. The planned socio-economic studies must get down to the detailed impacts in individual towns and avoid further regional assessments.

Water Use Efficiencies

9. Past changes to the River Murray Waters Act have had three characteristics, namely (1) prompted by drought, (2) often presented rebadged old solutions and (3) provided sufficient detail to deal with the many complications. Characteristics (1) and (2) certainly apply today. What is missing are the details particularly:
    - "Ownership" of any environmental allocations.
    - Priorities between icon site allocations
    - Storage and operating rules for all EWA's. The Barmah Millewa EWA rules offer a sound and proven model.
    - Climate change allowances, most of the proposed allowance to 2020 is already built into the streamflow record.
    - Further wild fires in the upstream catchments pose a greater risk than climate change.
    - More convincing links between river health and water use need to be identified.
    - Misapplied geography, the Darling and its tributaries should form a separate system.
    - Even treatment of the upstream Murray tributaries (Ovens, Kiewa, Mitta Mitta and Murrumbidgee) and more River Murray sections will lead to better presentations.
10. Regardless of any new EWA created, the bulk of necessary water must come from floods. Rules that identify storage of floods and subsequent optimization of the combined use of floods and EWA's in intervening years is the next priority.

Improved Infrastructure in Regional Areas

11. Give priority to constructing the proposed weir at Wellington and the reversion of the Lower lakes to sea water.
12. Buying more time might allow more research and the preparation of more definite statements to be made on environmental resilience.

13. This study should include further consideration and better presentations on the links between river health and water use.
14. Over-allocation needs a more comprehensive definition than the arbitrary "60% of no development flows".
15. Plans for the management of catchments against SDL's.

10 December 2010

Donald J Macleod

APPENDIX A

NTERVENTION and ADAPTATION

Regardless of any climate change effects, the introduction of the Guide's long list of "Hydrologic Asset Sites" will ensure competition for Murray resources will become more intense. Using direct water management and engineering works to enhance water use efficiencies must occur.

Introduction

A number of recent Murray reports encouraged by the CSIRO have spent considerable time worrying about the possible impact of climate change on future River Murray flows. This concern can be monitored and if considered serious, it can then be progressively met by adaptive management. However, for all the Murray River Red Gum Forest, the die is already cast. There is a huge difference between the frequency, and size of the so-called "natural floods" (the floods that would have occurred over the past 110 years in the absence of all dams, weirs and irrigation developments) when compared with the frequencies associated with current storage and irrigation developments.

This feature has been well documented over many years for the Barmah Forest particularly by Bren (Bren, (1988a), (1988b) and Dexter (1986), and later by Maunsell for both Forests (Maunsell (1991).

Recent studies by a number of authorities (starting with the Victorian "Sharing the Murray" 1997 and endorsed by the then MDBC's "The Living Murray" program in 2003) have advocated that future flooding of the Barmah (and by inference, the Millewa Forest as well) will be limited to about 50% of the current Forest. Both the Victorian VEAC River Red Gum Inquiry and the companion NSW Natural Resources

Commission Assessment adopted the same stand. This approach is in marked contrast with that advocated by the Barmah Millewa Forum in 2003 when a number of “interventions and adaptations” were analysed and proposed. They included:

1. By selectively using existing regulators, determine those areas of the Barmah Millewa Forest that could be watered using generally small and carefully controlled flows.
2. To overcome irrigation delivery shortfalls caused by the Barmah Choke, use major creeks in both forests as “bypasses”
3. Raise parts of the existing forest road system to create “low banks” which together with the operation of both existing and new regulators, manage forest watering over large areas and over long durations.

Each of these approaches will now be discussed in turn.

Forest Creeks as Choke Bypasses

The use of major Forest creeks has already been practiced on two occasions. In 2002, Gulf Creek was used as a “bypass’ for the September to December period. The long steady period of significant flows (about 2000ML/d from a River Murray flow at Tocumwal of about 14,000ML/d) provided a second generous watering of the Gulf Water Management Area in two years as the Spring/Summer of 2000/2001 had also been a good flood year. Ecologists from DSE and GBCMA mapped the flooded area, carried out surveys of bird and frog breeding and offered commented on forest health. All parameters showed positive results.

In the following year 2003, the NSW creeks, Bullatale and Tuppal were used for the same purpose. State Forests NSW carried out similar surveys.

The latest Barmah Choke Study (MDBA 2009) has listed creek bypasses in the works to be considered and analysed as a new strategy is developed to meet demands in the lower Murray

Low Bank Works

Introduction

As part of the Forum’s Research program in 2000/2003, a series of investigations were carried out under the general heading of “Mike 11 Hydraulic Model Gulf Water Management Area”. These projects included:

1. Evaluation of air borne laser altimetry technology in the Barmah Forest.
2. Development of a Digital Elevation Model of the Gulf WMA. The Gulf WMA was selected for the DEM trial as a 1960’s SRWSC “dumpy level and staff” survey existed to allow comparison to the air borne altimetry. The project

proved to be wonderfully successful with tree top, understorey and ground levels being confirmed through a DEM of over 3,000,000 points.

3. The DEM and its close contours then became the basis for first, the evaluation of low banks to enhance localised flooding. The following Maunsell Report provides details:

Maunsell Australia Pty Ltd (January 2003), *Mike 11 Hydraulic Model Gulf Water Management Area, Evaluation of Low Banks for Localised Flooding,* for the Barmah Millewa Forum, January 2003

4. The fourth exercise was the development of a hydraulic model of the Gulf WMA which used flow data from the 2005 bypass operation..

This low bank project was a larger scale version of a series of small regulators introduced into the Millewa Forest in the 1970's. The operation of these regulators (which was not necessarily authorised at the time) utilised irrigation rejection flows to water areas of stressed trees. The engineering of the technique was modified in the Water Management Plan (Maunsell July 1991) to address water (particularly "Back Water", the lack of oxygen due to low through flow) quality issues. Joe Murphy of (then) State Forests, Mathoura introduced the technique. A reference to his work can be found in:

- Murphy Arthur ("Joe") (1990) *"Watering the Millewa Forest",* page 247 in Mackay Norman and Eastburn David (editors) (1990) "The Murray", Murray Darling Basin Commission

Low Bank Study Objectives

The object of the Study was to examine the benefits of "Low Banks" within the Gulf WMA to extend the flooded area from small floods and to minimise the use of water resources including the Barmah Millewa EWA

Project Definition

The Gulf "Low Banks" extended the flooded areas by some thousands of hectares. The water supply was introduced to the WMA through the existing Gulf regulators. The increases in flooded area ranged from 1500ha for a bank 0.2m high to 4200 ha for a 2m bank.

To address environmental issues, a large downstream regulator allowed for both fish passage and through flows to minimise water quality effects. In 2003 dollars, the cost of all the banks at about $1000/ha flooded was regarded as high.

The following plan taken from the above reference shows the works required for the "so-called "Top Water Level (TWL) "96.4" project. It had the following features:

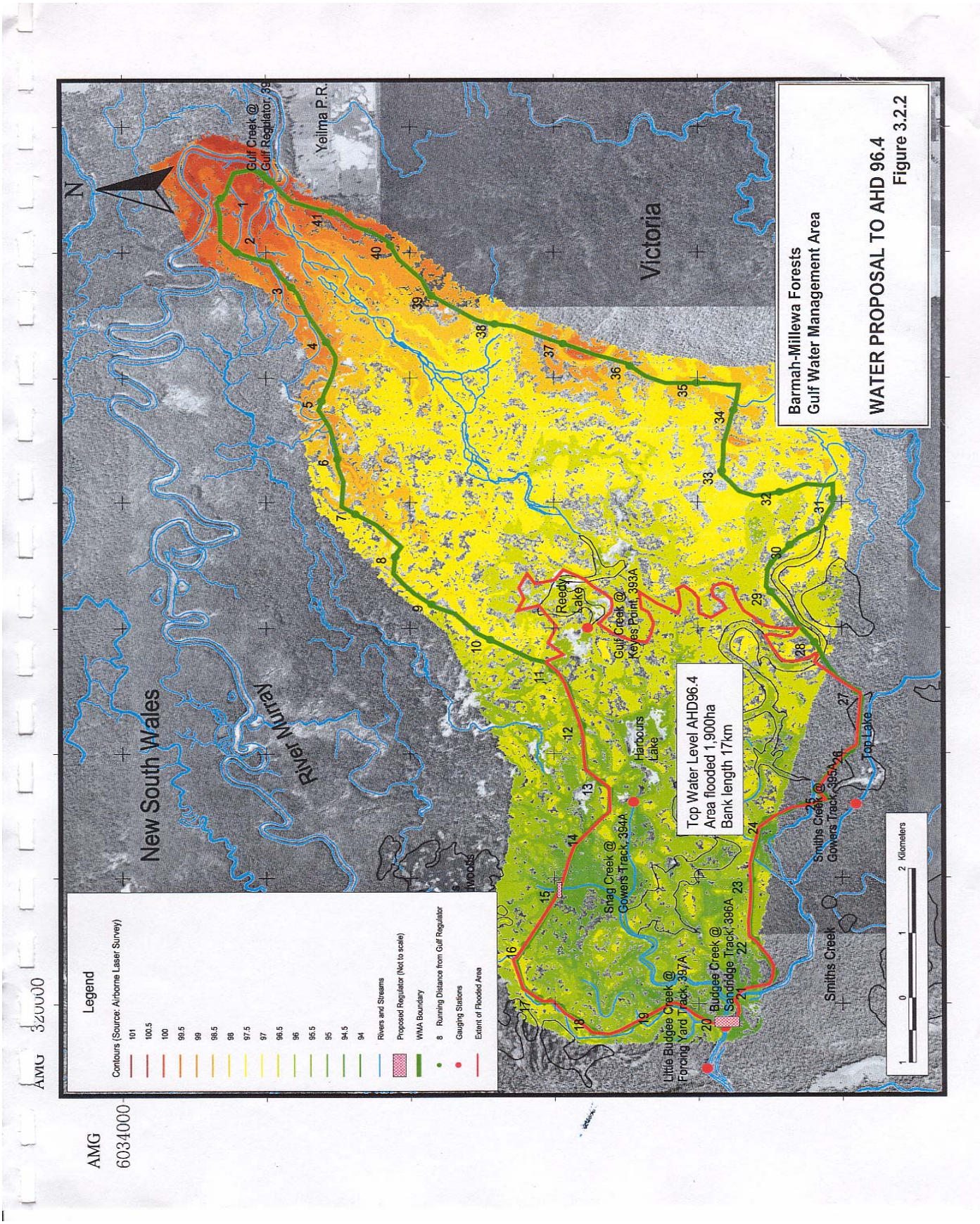
- Bank length 17km (The bank could become part of the Forest road system).
- Bank width 10m

- Clearing for bank and roadway 24ha
- Clearing for borrow pits 20ha
- Bulk earthworks 293,000m3
- Maximum bank height 2m
- Average bank height 1.2m
- Regulator waterways 24m2 and 12m2
- Regulator capacities 2000ML/d and 1000ML/d
- Estimated cost $1.9M.

In this submission in order to preserve relativities and to maintain consistency with the later cost comparisons figures, all dollar values shall remain in 2003 dollars.

Comparison with Natural Flooding Alternative

As well as developing a series of Low Bank works, the study compared their performance with the “natural flooding” alternative. In these “natural flooding” cases, it was assumed that sufficient water would be introduced through the Gulf Regulators to produce the same flooded area as the Low bank work. The following table shows the details of the comparison for the TWL 96.4 case and for a year (thought at the time to be three years in every 10) when flooding was to be practised.


WATER PROPOSAL TO AHD 96.4
Figure 3.2.2
Barmah-Millewa Forests
Gulf Water Management Area
Top Water Level AHD96.4
Area flooded 1,900ha
Bank length 17km
Legend
Contours (Source: Airborne Laser Survey)
101
100.5
100
99.5
99
98.5
98
97.5
97
96.5
96
95.5
95
94.5
94
Rivers and Streams
Proposed Regulator (Not to scale)
WMA Boundary
8 Running Distance from Gulf Regulator
Gauging Stations
Extent of Flooded Area
New South Wales
Victoria
River Murray
Yelma P.R.
Gulf Creek @ Gulf Regulator, 39
Reedy Lake
Gulf Creek @ Keyes Point, 393A
Harbours Lake
Shag Creek @ Gowers Track, 394A
Budgee Creek @ Sandridge Track, 396A
Little Budgee Creek @ Fencing Yard Track, 397A
Smiths Creek @ Gowers Track, 395A
Top Lake
Smiths Creek
Woods
N
AMG
6034000
320000
0
1
2 Kilometers

Preferred Low Bank TWL 96.4 and the Small Flood Alternative: Water Resources and Cost Comparison

Feature		Low Bank Works		Small Floods	
	Unit	**Basis**	**Value**	**Basis**	**Value**
TWL Low bank project	RL		96.4	Not applicable	
Flooded area within Gulf WMA	ha		1900		1900
Flooded period	months	2No 15 day shoulders plus 3 months	A,S,O&N		A,S,O&N
Small flood flow	ML/d			Taken as 1,600ML/d through the Gulf regulators	
COSTS		**All costs in 2003 dollars**			
Capital cost	$1000		1,874	Not applicable	0
Annual cost	$1000	Taken as 8% of capital cost	149	Not applicable	0
Operating cost in flood year	$1000	0.2 person year on a 2.7 multiplier	46	0.2 person year on a 2.7 multiplier	46
WATER USE					
Water to fill	ML/a	Flooded area volume	12,500	Assumed in the 1600ML/d flow	
Evaporative loss	ML/a	0.47m/a	8930	Covered in the 1600ML/d	
Water quality through flow	ML/d	Assumed as 400ML/d	48,360	Covered in the 1600ML/d	
Estimated returns to the Murray	ML	80% of through flow plus volume to fill	51,188	Assume 70% returns	135,408
Estimated total water use	ML		18,602	Difference between inflow & outflow	58,032
Water cost	$1000		1,395		4,352
FLOOD YEAR COSTS	$1000	Total	**1,591**	Total	**4,398**

The Gulf WMA was always one of the better watered areas of the Barmah Forest. Both Bren and Dexter estimated the historic frequency of flooding was 7 years out of 10. Introducing the Low Bank works and /or the "natural flooding" option would allow the flooding frequency to be increased to 10 years out of 10. This increased frequency would produce benefits in terms of increased tree growth as well as allowing the forest to act as a more effective carbon sink.

The detailed report provides the background to the benefit estimates but for the TWL 96.4 project under consideration, the annual benefits were estimated at $69,000.

The increased timber production was valued (based upon Timber Communities Australia advice) on a range of uses including fine furniture, sawn logs, sleepers, firewood and mulch. Carbon sequestration added about 25% to the stem volume values.

The Low Bank analysis also investigated the likely value of "other environmental benefits", i.e. other than timber and greenhouse. This assumption was made that the water costs of achieving the same flooded area inferred one measure of environmental benefits. For the TWL 96.4 case, the inferred "other environmental benefits" after subtracting timber and greenhouse benefits was between $9,000/ha and $12,000/ha.

Evaluation of Unit Values

A number of relevant comparisons are set out in the following table.

Unit Value	Low Bank Works	Natural Flooding	Ratio Low Bank Works/Natural Flooding
Flood year water use (Ml/a)	18,602	58,032	0.32
Flood year water use per hectare (ML/ha/a)	10	31	0.32
Flood year cost/hectare ($/ha)	837	2,315	2.8
Non-flood year cost/hectare ($/ha)	79	0	Infinite

For non-flood years, the maintenance and capital costs for the Low Bank works continue but the Small Flood alternative does not incur any costs for these years.

The table summary clearly shows the Low Bank works offer superior performance in terms of lower water use and cost effectiveness.

Effect of Water Costs

As the first table shows, the really dominant (at 70%) annual cost in the comparisons is water costs. They were deliberately included because each other water user on the Murray is required to pay not only for the licence to divert (the so-called current water

"buy back") but also for the water actually diverted. The same principle has been applied to environmental uses. If water costs are excluded, the unit rates change significantly. The Low bank works costs become $100/ha/a and the Small Flood $24/ha/a.

Application to Other WMA's

In 2002, the Gulf WMA was the only area that could be analysed as the trail DEM was only available here. The position today is much improved as DEM's are available for not only the whole of the Barmah Millewa Forest but for all other Icon Sites. It is the availability of a DEM that has facilitated investigations for channel location in Koondrook and Perricoota as well as Chowilla.

The 2002 Gulf case is conclusive but had the Low Bank proposals been applied to other WMA's, the comparisons would be improved as:

- The Gulf WMA has a steep creek gradient and the flooded area is therefore lower for similar bank heights.
- As a WMA enjoying a high flood frequency (7 years out of 10), other less endowed WMA's would show a better performance in terms of timber production.

As part of the development of a draft MDB Plan, the next step should be to apply the technique to other WMA's particularly in Millewa Forest. The Water Technologies model could provide a suitable basis provided new low banks and roads can be incorporated. As for the Gulf case comparisons could then be made of flooded areas and water use.

Advice could also be sought from environmental consultants on biological criteria and the likely EIS/approval process. These aspects were not studied in the Gulf example.

Selective Regulator Operations

These projects form a subset of the use of major creeks as Choke by-passes. In this case, field trials on key regulators would quickly determine the forest areas flooded by small controlled releases. The results could then become part of a watering procedure to be applied on a selective or priority based basis.

The Barmah Millewa Forum suggested this process for many years but unfortunately, the land management authorities could not be persuaded.

The Water Technologies model (provided a number of earlier concerns about verification identified by MDBA reviews have been satisfactorily resolved) already used in the NRC NSW Red Gum assessment could also allow the process to be tested but it is noticed that no such results for either forest appear to be available.

Selective regulator operations also offer the possibility of reducing the need for additional in-forest regulators to move environmental flows from one WMA to an adjacent WMA.

Staffing and Operations

As with all forms of intervention and adaptation, there will an increased need for trained and enthusiastic staff. Accordingly, forest staff will need to become opportunistic in the use of temporary small flushes from say irrigation rejections. Given that National Parks are chronically understaffed, such staff would be better located within Forest NSW.