

***A Better Way – for the Murray Darling Basin*** is a serious solution for the basin!

**The Document, “*A Better Way –for the Murray Darling Basin*,”** is researched and written by Senior Investigative Journalist in Marine & Aquatic Ecology, Ken Jury from Goolwa in South Australia.

Of thirteen pages, the main document outlines in plain terms, the processes required to turn the fortunes of all basin states around by retracing early years and benefits gained from South Australia’s Lower Lakes, the Coorong and the Murray Mouth.

***A Better Way – for the MDB*** - provides a series of processes necessary to enhance basin grower’s water availability, to protect Adelaide’s river water supplies, to return the lower lakes back to estuarine and to revitalise one of Australia’s largest estuarine fisheries.

The costs are minuscule compared to a \$13 Billion Dollar budget for the MDB Plan.

**In a ‘snapshot’ 2 page only, these are the steps required.**

1. Build one more river lock named Zero between Wellington and Taillem Bend on the River Murray in Sth. Australia. It should be founded on friction piling as the new alternative to bedrock.
2. During the same construction period, remove the cumbersome, stacked Goolwa Barrage concrete stop logs from each bay and replace with single, thick-walled polly-tanks to fit current height and width dimensions in each barrage bay. Each tank lifting/lowering hydraulics will be serviced by the water below, while each tank will have its own pump, operated remotely according to daily river operations elsewhere.
3. During the refurbishment of the Goolwa logs, we then set about removing Bird Island located in the delta, or Coorong end of the Mundoo Channel. Prior to building Mundoo Barrage, Bird Island was a mere, small sandbar of little significance. Today, its grown to several vegetated hectares and it blocks about 70% of free passage of out flowing water from Lake Alexandrina, through Mundoo channel and straight across to the Murray Mouth close by.

4. With these items in place, the barrages are opened to allow pristine Southern Ocean water entry on a rising tide. The gates are automatically closed again at peak tide.
5. By now we would have saved 1800GL of fresh, river water upstream of the new Lock Zero. Small portions of fresh water will be released from the new lock into lakes entrapped ocean water for a gradual estuarine mix. Gradually, because the Lower Lakes are known for wind seiche\* mixing of stratified water. Even Captain Sturt found stratified water in the Lower lakes.
6. Previously, the Lower Lakes, and the Murray Mouth used an average 4500GL/yr of river water. That amount will no longer be required. There will be a surplus freshwater return 2700GL 'plus'/year of freshwater for use back upstream where our food producers will benefit. The 'plus' is an average 9GL year of freshwater from several Lofty Ranges streams, flowing into the lakes.
7. The Lower Lakes and the Murray Mouth will require refreshing from time to time. With Mundoo and Goolwa barrage operations, the surface levels of the 840 sq km Lake Alexandrina and Lake Albert will lowered by a mere 20cm on an outgoing tide. This will provide a massive 150GL flush of the lakes system and the river mouth in one single outgoing tidal session. The river mouth should no longer suffer blockage!
8. Both flushing and replenishment can be done at will on an outgoing tide and during the next rising tide.

It's a win – win for those who want to save expensive freshwater to improve our food security. It's a win for many locals who want to see the return of these massive lakes to estuarine.

It's certainly a win with our basin freshwater resources and for the Murray Darling Basin river environment's.

Ken Jury  
Senior Investigative Journalist  
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**Full document version available by attachment!**

**\*Wind seiche**

Similar to holding a saucer filled with water to ones mouth and gently blowing across the top, causing the water to build up on the opposite side. The Lower Lakes and Goolwa channel region are susceptible to prevailing South to South West prevailing winds from the Southern Ocean.

# “A Better Way” for the Murray Darling Basin!

Supplementary to the documentary *Muddied Waters - A Clear Solution*.

And:

- It won't cost the earth – certainly not A\$13 billion dollars.
- It won't damage floodplain farms and force farmers from their land.
- No need for water entitlement diversion reductions to service a government wish.
- Will use a portion only of the freshwater volumes currently used for the Lower Lakes etc. with provisions for handing back the balance for productive upstream use.
- No need for costly over-bank flooding and subsequent property damage.
- No disruption for growers - improved growth in Australian foodstuff production and export.
- Growers and communities throughout the basin and the nation will benefit.
- Massive sulphuric acid mobilisation below Lock One will be checked.
- Murray River environments, aquatic life and biota will benefit.
- A working estuary will reward immeasurably with huge benefits and because:
- The MDB and the Lower Lakes are within a highly variable system; the Lakes will always be a reversible system – fresh generally during natural flooding and estuarine at other times.

**However: Climate Change with sea level rise is already upon us. It will make all of this inevitable by (circa) 2050. This will affect the 7.6km barrages and all of the island embankments between.**

Please make: **Today's urgent priority for tomorrows Future!**

Anything else will be a very poor and costly alternative  
Contents by Ken Jury of GOOLWA SA  
Last updates - 06/05/16

**Very much in brief:**

To keep the Murray Mouth open nine out of ten years, a former Federal Water Minister ordered large volumes of fresh water flushed down the 2,500km Murray River system. Much will be lost along the way! Upwards of 60% evaporation loss alone is possible across the basin(fmr.MDBCdata), and that's without the additional river floodplain constraints issues where additional evaporation and seepage from forcing shallow water over dry, fertile floodplain land will occur, with an extreme likelihood of extensive top soil loss.

Historically, minimal water flows have been maintained throughout the length of the Murray River since the 1936 completion of the Hume Dam. The Murray system since then is regulated through this storage to **assist with avoiding over-bank flooding** in narrow sections of the Murray system **at all times**, save for rare natural flood occasions. Similarly, large volumes of water released from the Murrumbidgee River storages in recent years, although these have already caused damage and heightened concerns for growers.

Given the government proceeds with its "constraints" issues, there is no doubt whatsoever it will cause extensive damage to flood plain property and soils located in these extensive areas where narrower river sections occur, particularly in NSW and Victoria, where fencing, crops, stock, farm infrastructure and bridges etc. will suffer various levels of damage, some will be permanent. Councils throughout river regions including the 18 Ramroc group of councils are very concerned, while compensation and insurances alone will be difficult for all parties.

There are potential threats to upstream holiday homes in South Australia, notwithstanding a possibility of damage on reaching the lower Murray flats in South Australia. There're increasing concerns from among ordinary Australians with little basin connection who are learning about the ways of the authority with its constraints issues, and they're venting their dis-belief that a government and its agency would pursue such a course of destruction and waste.

A waste that would have been further exacerbated by the extra 450 gigalitres proposed (not confirmed) in Goolwa, SA by the then Prime Minister Julia Gillard as additional to the 2750GL/yr designated up to 2019, to be increased to 3200GL and forced down the Murray and Murrumbidgee systems by about 2024. Reduced volumes have since been discussed in August, 2015.

The *Murray Darling Basin Authority (MDBA)* had proposed to increase the flows from the current maximum of between 25,000ML/day and 40,000 ML/day through several severely restricted river flood plain reaches, farms and other properties, including extensive public and private holdings found along these systems.

As an example, flows three years ago (2012) through the Millewa and Barmah Chokes were controlled at 10,500ML/day and about 8500ML/day respectively.

The original *MDBA* proposal was to fulfill a flow-rate of 2000GL/yr over the Lower Lakes barrages for 95 per cent of the time with a minimum 650GL at all times, in line with what the agency announced in its first *Guide for the Basin Plan*. Simply though, the MDB system and subsequent rain runoff into the catchments doesn't provide enough for additional flows of river water over riverbanks and floodplain expanses, to service a whim of overbank flooding as a means to cater for the Lower Lakes and the Murray

Mouth at the end of system! It's quite apparent today this nonsense will be thwarted by a lack of freshwater.

**An important Quote:**

From a fact sheet (undated), the former *Murray Darling Basin Commission (MDBC)* advised its concerns with the *Barmah Choke* on the Upper Murray River system when it wrote, "there're other environmental challenges in river management with the *Barmah Choke*. Operating the river for long periods at top-of-bank levels leads to notch erosion and bank instability."

"The *Barmah Choke* also limits the ability to target the delivery of environmental flows from upstream storages to downstream icon sites," the former *MDBC* said.

**Seriously:**

None of the proposed, man-forced over-bank flooding impulses down the Murray, the Goulburn and Murrumbidgee systems need occur, notwithstanding the likelihood of extensive property damage. Certainly not when attempting to keep the Murray River mouth clear. Distance and evaporation alone will defeat such a destructive notion!

**There is a Solution:**

All it will take is one more river Lock; we'll call it *Lock Zero* given the current first lock, *Lock One* is located some 275km upstream of the Murray Mouth, at Blanchetown in South Australia, together with minor barrage adjustments and the removal (or part removal) of an unwanted island that grew from being a sandbar.

**Importantly:**

History reveals much about the interaction of the Murray River with the Lower Lakes, the Coorong and the Southern Ocean.

In pre-barrage times, it was a variable Lower Lakes when low flows meant the remaining fresh water flows had to compete with regular Southern Ocean intrusions, as the latter pushed fresh water back into the upper end of the Lower Lakes and on occasions, into the river resulting in a mix of ocean and fresh water, becoming estuarine as naturally found upstream in most global estuaries. Importantly, the lakes in pre-barrage times contained extensive water bodies that were extremely useful, with high value outcomes.

Records from pre-barrage times reveal how estuarine fish populations flourished high up in Lake Alexandrina to where it supported major commercial fishing operations for 44 or so commercial fishers who were based at Milang, some of whom regularly fished towards the top of Lake Alexandrina area, where they harvested freshwater Murray Cod, Callop (Yellowbelly or Golden Perch) and estuarine Mulloway, often in the same hour and on the same day.

Prior to the barrages, each of the fresh and estuarine species were almost plying the same water column save for the natural stratification of fresh water accompanied nearby by estuarine water, at times the fresh still stratified but expected to gradually mix into estuarine water, at which stage the cod would follow freshwater trails for survival while mulloway remained in estuarine water. Often within close proximity; sometimes found in areas less than a few hundred meters apart. History reveals how Pioneer; Captain Charles Sturt discovered stratified lakes water following his arrival out of the River Murray into Lake Alexandrina.

Fishers primarily established their grounds by taste-testing for fresh water and saline water in the often stratified water columns. These details are provided from an interview by the author of this paper with one of the few remaining **Lower Lakes Commercial Fishers, Mr Victor Woodrow** (in his upper eighties today) who fished with his late father near the top of Lake Alexandrina in the area described above until the completion of the Goolwa Barrage. Mr Woodrow resides in retirement today in the suburb of Marion, Southwest of Adelaide).

**Records reveal how flourishing estuarine fish populations in the Lower Lakes came to an abrupt end when the barrages were completed.** Following the introduction of the barrages, estuarine fish, invertebrates and general biota once found in the Lower Lakes and sometimes as far upstream at Swan Reach during low flows in pre-barrage times, were shut out from what was previously a magnificent estuarine system. A system that supported a major South Australian fishery supplying SA state fish needs with surplus being railed into Victoria, for almost five decades.

Today, fish species including Mulloway and Black Bream continue to be guided into the Coorong part of the estuary due to their DNA, but the barrages thwart them even though these fish come right up to these concrete structures with a view to reaching the lakes and channels to breed. It is known through recent fish tagging that mulloway entering the Glenelg River in Victoria, where this river is slightly located in South Australia, do not breed in this river. Science tells how they rest and feed in the Glenelg River and then make their way to the Coorong with the notion of entering and breeding in the Lower Lakes.

Some suggest that the basin ends at the real mouth of the river just below Wellington at the head of Lake Alexandrina and not 45km downstream at 'the bottom of the lakes, east-south-east of the Coorong, at the Murray Mouth where the river spills into the sea.'

#### **Significantly:**

So long as the barrages are open to exhaust flooding freshwater, with regular high tides and even during neap tides, together with regular, strong prevailing westerly winds, it's inevitable that Southern Ocean intrusions will reverse out-flowing fresh water back through the river mouth, and through the open barrages, pushing fresh and by now, ocean and fresh (estuarine) flows back upstream into Lake Alexandrina, towards the entry point of the Murray River into the larger Lake Alexandrina.

The threat of sea level rise is real and proven so that we can with certainty expect increases in Ocean intrusion into the Lower Lakes! There're already noticeable signs along Australia's southern coast.

#### **NASA said in its extensive August 26<sup>th</sup>, 2015 “Global Climate Change” data, “Warming seas and melting ice sheets,”**

“For thousands of years, sea level has remained relatively stable and human communities have settled along the planet's coastlines. But now Earth's seas are rising. Globally, sea level has risen about eight inches (20 centimeters) since the beginning of the 20th century and more than two inches (5 centimeters) in the last 20 years alone.”

“Scientists estimate that about one-third of sea level rise is caused by expansion of warmer ocean water, one-third is due to ice loss from [the massive Greenland and Antarctic ice sheets](#) and the remaining third results from melting mountain glaciers. But the fate of the polar ice sheets could change that ratio and produce more rapid increases



in the coming decade,” NASA said 10/09/2015. Footnote: NASA, BOM and the CSIRO share their data on climate change.

In the Lower Lakes Murray Mouth region, evidence has been collected from officially located automatic beacons streaming out ‘real time’ probe data. This data, by now in computer storage, is ready for our hard copy printouts, containing ECu (electrical conductivity unit levels), otherwise known as salinity level plots accurately describing in ‘real time,’ ocean water ingress being recorded across the Lower Lakes system, into the government’s electronic monitoring system.

These computer findings are regularly monitored and recorded on hard copy in an exercise to reveal that water in the lakes is often estuarine. A series of plot data collected by the author and a colleague scientist also reveals ocean ingress occurrences when southern ocean water actually circumnavigates Hindmarsh Island.

There is a huge waste of expensive freshwater entering the lakes with much of this becoming highly saline and wasted. The Lower Lakes aren’t lakes but leaky, shallow depressions of sand, silt and river debris culminating in the formation of extensive acidic soils with high levels of seepage and evaporation. They were formed by receding ocean water about 7000 yrs ago, leaving remaining sand, silt and calcareous ridges that border the lakes and the SE natural drains today. The lakes combined today hold 2018GL.



NE Lake Albert, the smaller of the two lakes at the peak of the Millennium Drought. The black dots are cattle seeking water from an ever receding lake. Pix by Ken Jury

The 4,500GL annual average of freshwater used in the Lower Lakes, the Goolwa Channel and Murray Mouth region during the peak of the Millennium drought was valued then at around A\$10 billion dollars.

The figure of \$2.4 million dollars per gigalitre was likely the absolute top tender buyback figure during the Millennium drought, when water was scarce! Water prices have since fallen with an average tender price for High Security water (SA) during 2012-13 standing at about \$1.675 million per gigalitre. This figure puts a value on Lower Lakes stored and used water for an average year at around \$7.53 Billion dollars, and they (the previous Govt.) say they'll continue to send water towards the river mouth for 9 out of every 10 years

Basically, precious freshwater is being sent down to evaporate, to be drained and to be wasted in the ocean! This is ludicrous! One wonders what the return would realise when using the same volume of water for additional food grown in the basin over the same period?

**There's a much better way:**

To make better use of limited fresh water and with the help of free, highly oxygenated Southern Ocean water, another lock (Lock Zero), should be built upstream of Wellington towards Tailm Bend.

**A more practical foundation opportunity for another Lock is available today!**

As *Rowan* BSc Hon. points out, in today's world it's no longer a problem when not locating sound bedrock for river footings, when the use of friction piling has very much become the accepted alternative.

One recent example of friction engineering is the Hindmarsh Island Bridge where friction piling was successfully used to hold this massive structure in place.

As old as it is, the Goolwa barrage also sits on this type of friction footing!

**Benefits to be gained from preventing uncontrolled use and loss of River Murray water in Lake Alexandrina:**

An additional lock, Lock Zero should be built and used to regulate minimal freshwater flow into Lake Alexandrina to mix with ocean water, forming and maintaining an estuarine environment, and for the first time, to provide for the control of the pool height between Lock One at Blanchetown and Lock Zero, while providing the means to greatly assist in clearing the Murray Mouth.

This in itself would rid this section of the river of acid mobilization, so bad at times that even the authorities openly admit defeat with treatment of mobilised acid-laden water, notwithstanding a possible threat to the intake pipes that feed water back to Adelaide hills storages.





Liming highly acidic water in Currency Creek that flows into the Goolwa Channel.



Currency Creek succumbs to drought; oxygen reaches cracked acidic soils leading to the mobilization and formation of sulphuric acid to a dangerous pH.1.5 which is similar to that found in a car battery. Nearby Lake Alexandrina contains at least 500 million tonnes of acidic soils.

**Returning to an estuarine system during low or nil fresh water flows:**

In what would have been a natural occurrence in pre-barrage times, the use of clean, highly oxygenised water from the Southern Ocean, mixed with a percentage of stored fresh water gradually released from upstream through Lock Zero; the Lower Lakes system would again become estuarine to inundate the lakes and deal with any drying lake or channel mud while limiting acid sulfide development and mobilisation throughout the estuarine environment. All without using massive volumes of expensive irrigation water, year after year, that should otherwise should be better used to produce Australia's food.

By retaining the barrages, freshly mixed estuarine water could be held within the lakes system for extended periods, and released out of the lakes/channels, from selected barrages to provide strong scouring flows to begin and then regulate the removal of silt and sand from the areas between the barrages and the Murray Mouth outlet to the sea.

Using lake stored estuarine water, the system can be flushed at will because replenishment of the lakes with free ocean water will greatly supplement much smaller quantities of freshwater from behind Lock Zero!

By allowing lake levels to recede by 10 to 20cm only by selective use of barrage gates, estuarine water from the 840 sq km surface of the lakes will provide ample flushing and scouring water for the river mouth.

#### **Scouring the channels and mouth:**

Upgrading the barrages will enable restriction of the outgoing flows to elected channel(s), to bias the movement of sand and silt during outflows, and regulated to suit falling tides. **Further important details on river mouth flushing available on page eleven.**

To enable selective flushing, there should be an upgrading at the Goolwa Barrage where the lifting of multiple barrage compartment concrete logs stacked on top of each other is both cumbersome and time consuming as they're handled individually- one by one as commonly seen at this barrage today.

This is an extremely costly and time wasting exercise to continue with when it's necessary to reach the desired scouring out-flow swoosh effects from this barrage.

Yes, lifting single concrete logs this way is far from practical and it's outdated.

The alternative is for a single, thick walled poly tank to fit the slot in each bay, to operate in one single lift and fall motion to enable necessary strength in water outflows to clear the mouth and keep it clear while equally affording opportunity to direct outflows of estuarine water towards the mouth with a view to a portion of this water entering the southern section of the northern lagoon in the Coorong.

The lakes themselves would gradually become estuarine again and develop channels and flats, quickly becoming colonized with estuarine biota associated with the cycles of inundation and exposure to inter-tidal zones.

#### **The savings would be massive:**

During average river flow years, the use of ocean water mixed with a 40% portion of fresh would free up a minimum 2700 ggalitres/yr of freshwater being part of what was previously used in the lakes and the channels, now to be re-directed back upstream as



surplus freshwater for food production with some towards environmental flows for up-river environments. **There's more, but first:**

**Remove this sandy, highly vegetated knoll, shown above:**

Bird Island as its known, faces the river mouth, is located downstream of the Mundoo Barrage and it must be removed as it directly blocks about 70% of the flow from this barrage to the mouth. This obstruction and a minor connected peninsula gradually formed and vegetated as a result of building the Mundoo barrage. It also impedes movement both ways of Coorong water and water released from the Mundoo Barrage and 3 other barrages within the area that would otherwise clear the mouth of sand and silt.

**A formula for success:**

Combined, the lower lakes hold approx. 2018GL of freshwater at capacity and often its highly saline water. That's approximately 750GL below the original 2,750GL amount of fresh water being sought by the *MDBA* and a former Water Minister from upstream food growers, **as its environmental saviour.**

In consideration of a future for the Lower Lakes system, we should keep in mind how these lakes and nearby channel environs regularly require at least 4500gigalitres/yr of freshwater. This amount includes top-ups to replace and maintain evaporation and seepage from the shallow lakes, to maintain the channels leading to the river mouth by providing for scouring these extensive systems before & beyond the barrages, and to supply regular scouring flushes to keep the mouth open.

Current scouring success rates today are minimal, extremely wasteful and expensive.

On occasions in recent months, larger vessels have not always been able to comfortably navigate across the Coorong adjacent to the inside of the Murray Mouth. Dredging the mouth continues at great expense! That expense in one single decade reached \$50 million dollars in a single year.

**With change – we can do with much less:**

Simplistic perhaps, but logically there's a view to reduce the fresh water maintenance volume for the lower lakes to just 40%, (about 1800GL/yr) as a freshwater allowance required to mix with barrage entrapped, highly oxygenated Southern Ocean water for the return of a healthy estuarine system within the Lower Lakes.

In order to do so, and as mentioned previously, there will be the need for retaining the barrages (with some minor and in-expensive modification) so that fast manipulation of incoming ocean water and outgoing estuarine water can occur un-impeded.

Albeit, after retaining 40% (1800GL of fresh) for an estuarine mix behind a new lock we'll name "Zero", there remains a freshwater balance of 2,700GL as a left-over from an annual average of 4,500GL/yr previously used within the lakes and for clearance purposes etc.

This represents a meagre 50GL below the 2750GL MDBA water claw-back figure, at the time dumped upon famers and irrigators etc, for the environment, and to keep the mouth clear.

We should also bear in mind a likely additional freshwater saving, over and above from not allowing freshwater into the lakes on its own, to be lost to salinity increase, massive evaporation and seepage and for clearing the mouth. There're more positives here!

**Yes, a reversal of the system has many possibilities:**

There're often seasonal periods when the elected 40% or 1800GL/yr of freshwater required for mixing in the lakes may be further reduced due to seasonal Lofty Ranges rain run-off reaching the lakes. There's a handful of streams that reach the Lower Lakes including Currency Creek and the Finnis and Angus River's that yield significant winter freshwater flows that often reach Lake Alexandrina. This Lofty Ranges run-off water will again help compensate growers or it could be held as future fresh water meant for the lakes (to mix with ocean water), being held upstream of Lock Zero for this purpose.

Moreover in an adaptive way of thinking, to suit the situation at the time when ensuring the continuity of the estuary or, if additional fresh flows persist through flood or minor flood, then ocean water and flood water would be adjusted by way of the now rejuvenated barrages and through Lock Zero to suit the situation. In all circumstances the biota throughout will adjust both ways (fresh or estuarine), as it most certainly always does in an estuarine environment!

**Estuarine water:**

Importantly, estuarine water can be made up of varying volumes of fresh and ocean water as is naturally the case in most estuarine deltas worldwide. Contrary to claims (and alleged state Govt. tests), estuarine water occurs at varying levels in all estuaries worldwide. These are generally healthy eco-systems that provide immeasurable benefits

including commercial and recreational. Ramsar is generally keen to promote the values of a workable estuary.

Returning the Lower Lakes to estuarine would once again create a very useful and beneficial environment. Estuaries 'the world over' are known for their productiveness! Such the case with viable fisheries! It's a known fact that Mulloway (one of many examples of quality commercial fish known to the region) would gradually return to the Lower Lakes again to become part of a major fisheries nursery and breeding ground, for the return of a larger fishery. In turn, tourism would surge ahead and so would development.

#### **How little did the River hold during the Millennium drought?**

In our worst drought in history, during the year when about 1100 GL were lost to evaporation from the lakes, a qualified individual had set-about measuring as best he could, water volumes held in the river/anabranches and backwaters between Wellington at the head of Lake Alexandrina and the border with NSW during the same year. The results concluded that evaporation and seepage claimed a greater loss of water from the Lower Lakes than what the river contained at the same time within the South Australian section of the river. Annually, these water losses alone cost multiple billions of dollars while losses during the worst millennium drought years from the Lower Lakes would have likely reached higher levels in the region.

#### **Flushing the river mouth:**

On returning the lakes to estuarine; during periods when flushing is desirable across the Lower Lakes system, carefully selected barrage gates would be opened to coincide with outgoing tidal periods with particular emphasis on directional flow towards the Murray Mouth. In particular the operation of Mundoo Barrage with released flows moving through Mundoo channel delta that faces the Murray Mouth. Should the level in the lakes fall only 10cm on a single outgoing tide as an example, then this would represent an overall 75 GL of water that would flow out through all selected barrage gates towards the mouth during the same outgoing tidal period. A 20 cm lake surface drop would realise somewhere in the order of 150GL that would be used in one out going, single tidal session to successfully scour and clear the mouth. Volumes of this dimension have only been available in previous flood times. Basically, the use of Southern Ocean water becomes the greater component for this estuary, while its also provides the means for clearing the mouth region. Replenishment of ocean water into the lakes can be done often and at will, during incoming tidal periods as required. Due to barrage control of water in and out, marinas should not be affected to where it would be detrimental, providing suitable but simple management strategies are agreed and exercised.



**Engineering improvements to the Goolwa Barrage would allow for the quicker movement of larger volumes of water.** Photo Ken Jury



In the photograph above, removed logs are shown on the top of the barrage to the right, just beyond one of two rail lines that support a crane (out of shot) used as the mobile lifting or lowering device across the barrage. The other rail line is found slightly right of the pedestrian walk. Log slots are located centrally in the structure, as seen across the top, in every bay across the barrage where individual logs are lowered down between the protective steel lined slots found at either end of each bay, to accept individually inserted or removed logs.

The concrete logs in the Goolwa Barrage represent gates (or logs) that either harness or release water. Goolwa barrage is one of five barrages spread over 7.6km. Earthen embankments separate the remaining four barrages.

An engineering solution is considered regarding the current issue of lifting and manipulating the cumbersome concrete blocks in the Goolwa barrage. There is a view, these should be replaced with much lighter single polyethylene tank-like/hollow blocks (single lift units or tanks), call them what you like, to fit the same slot dimensions in the Goolwa Barrage, in each single bay compartment instead of a stack of cumbersome concrete blocks so that each can be raised and lowered with a simple water hydraulic ram/bag pressurised by a common pump. We believe that the use of purposely built high quality, UV stabilised and reinforced polyethylene single tanks would be equally robust to that of concrete, while providing a lighter, faster and more economic method of water management through the barrages.

These could easily and quickly be manufactured locally. The ram would press against a boom (tappet- like) over each gate (tank) with the hydraulic pressure delivered to each ram by piping from a single pump. Leakage under this circumstance would not be an issue as the fluid for the hydraulics is the water already located at the source of the need, and tank lowering need only drop the ram and expel the water through a simple valve.

We believe that selective lifting of multiple blocks across the barrages in a single action will provide the necessary estuarine water outflows to clear the mouth and keep it clear

while affording opportunity to direct outflows or inflows of clean ocean water or to expel outflows of ocean/freshwater towards the mouth and, to offer minimal assistance to the southern end of the northern lagoon of the Coorong.

Importantly, my colleagues and I share the belief that neither the former 2750GL/yr nor 3,200GL/yr would have made any useful difference to keeping the mouth of the river clear. There are many reasons including the fact that most of this water, when available would be sent downriver to be lost.

Furthermore, and as an example in 2011; during the months of March to May in that year, a remnant minor flood came down the river whereby flows of up to 80GL/day were seen passing Goolwa and through the opened barrage gates. Flows at this rate made no discernable difference to the sand bars and the depth of the channel through the Murray Mouth. In fact at the time, prevailing wind and tides pushed much of this water back through the open barrages, as is the case on many occasions during autumn and winter.

**Note: A single gigalitre is equal to one km x one km by one metre deep.**

The weight and power behind the volumes of freshwater sent in recent times are hard pressed to match the weight and push of the mighty southern ocean and with water availability waning, one would seriously expect that the Lower Lakes should not be kept in a freshwater condition only.

Ken Jury, Senior Investigative Journalist (Marine & Aquatic Ecology)  
Exec. Producer, *MuddiedWaters-A Clear Solution* documentary.

Please note: My documents are always 'Work in Progress' documents. (6/05/2016)



## Future demands Barrages must remain in place!

The completion of the **Federal Senate Select Committee on the Murray-Darling Basin Plan, Refreshing the Plan** document ('wrap' paper) of March 2016 includes 31 Senate Committee recommendations. In its Executive Summary, the Senate Committee considers the implementation of the Plan requires greater effort to minimise its negative impacts.

For example, in its **Recommendation 14**, (3.284) the committee recommend the government undertake cost-benefit analyses of the following options for adapting the management of the Lower Lakes and Coorong, and their social economic and environmental impacts throughout the basin, under these dot points:

- *removing the barrages;*
- *removing some of the barrages;*
- *modifying some of the barrages (such as Tauwitcherie and Mundoo);*
- *allowing the ingress of salt water into the Lower Lakes during periods of low flow;*
- *and investigating the construction of an additional lock at a location above Lake Alexandrina, such as near Wellington, SA either in concert with the above options or as a single change.*

In further recommendations: **(3.285)**, the Committee says, ***“Should such an analysis indicate that one or more of these leads to more positive social economic and environmental outcomes than the current basin plan, the committee recommends the Plan be amended accordingly.”***

The five dot points above are representative of some of the proposals put forward by various Senate Inquiry witnesses, through inquiry presentations, written submissions and other supporting documents gathered during the course of nine separate senate inquiries across the Murray Darling Basin.

**By seriously investigating the first two dot-point subjects**, we find extensive downsides and many likely impacts on adjacent towns by removing the barrages! These towns include **Goolwa, Meningie, Milang and Clayton**.

During the Millennium drought and to assist lakeside industries, freshwater feeder pipes were introduced down both sides of the Lower Lakes from the Murray River near Tailem Bend. Currently, some lakeside irrigation continues using Lower Lakes water, depending on type of use and levels of salinity at the time.

The established lakes edge environment and infrastructure adjacent to these towns would suffer major losses when the water subsides following the removal of the barrages. The barrage barriers ordinarily maintain lakes and channel water at an approximate Australian Height Datum of AHD 0.75 above sea level

since they were completed in 1940. By controlling water levels located upstream of the barrages to Lock One; the lakes and channel surface water levels would ordinarily be maintained at a satisfactory levels to create reasonable surface water alignment with extensive, purposely built infrastructure including marinas, landings, jetties, pumps and various thoroughfares throughout the surrounding edges of the lakes and channels bordering the 840 sq km Lower Lakes system.

Removing the barrages would drastically affect both private and commercial property amenity and vessel passage from these towns. Most vessel movements located on the upside of the former barrages would be either completely neutralised or extremely limited when wanting to reach and access the Coorong. Creating a natural (barrage-free) estuary on the edge of these towns today, would not be acceptable to the residents and industry alike, and to countless thousands of tourism visitors who frequent each of the locations for respite, and recreation including numerous water activities.

Wind seiche is regular in this region where surface levels can vary up to a half metre or more during extremely windy conditions. During these periods in post-barrage times, it's not unusual to find the barrages closed to assist in limiting the impact. However, during tidal ebb and flow, without the barrages, ocean water would quickly penetrate into the Lower Lakes system, and at the turn of the tides, it would just as quickly flow back out, through the Murray Mouth. Wind seiche would on occasions add to or lower tidal ebb and flow levels.

Without the barrages in a natural tidal system, the ebb and flow of the tides in this region would conceivably last all day or all night, or part thereof which would repeatedly remove the amenity or useful water lapping features of the surrounding region where receding tides would expose putrid, acid bearing muds and leave vessels stranded for many hours until the next tidal period. Conceivably, this situation may extend upstream for 274km to Lock One at Blanchetown unless a proposed Lock Zero is built below Taillem Bend prior to dismantling the barrages. Without the barrages and Lock Zero, the affects would also be noticeable upstream in lower Murray River regional river towns including those associated with managing the water intake pipes for Adelaide's reservoir's, located at Swan Reach, Mannum and Murray Bridge, below Lock One at Blanchetown.

**Given we suffered during the disastrous Millennium drought, isn't it time to seriously think about the basin holistically, about forecasts of less rainfall into the storages resulting in less for taking from basin rivers, with the dire need to protect Australia's food security, and why many have a false expectation that we have an endless river water supply that will naturally flow 2500km downriver to fill every expectation when it comes to fresh river water only for the Lower Lakes and to clear the Murray Mouth!**

As a result of low rainfall over the catchments and reduced water levels in the whole of basin storages (Ref attached MDBA data, Whole of Basin Storage figures

saved by the author Oct 2012-2016), revealing reduced rainfall and river flows. While already witnessing visible signs of sea-level rise!).

### **The barrages most certainly should be retained and improved.**

They'll become increasingly important in limiting the impacts from future severe weather conditions and sea level rise. Those that advocate the removal of the barrages have obviously not studied the current and future implications of their proposal. Conversely, many deem this 'remove the barrages' proposal lacking in substance from underestimating the Lower Lakes region and the wider basin area including the far-away mountain storages. Of paramount importance to reaching any conclusions are the subjects of future climatic conditions, likely reduced rain runoff in the catchments, less water for food production and the environment and reduced future levels of downstream water availability from the mountain storages, some 2,500 km upstream. The distance alone between the mountain storages and the Murray estuary place major hurdles with river water supplies over long distances with major losses estimated up to 60% volume levels from evaporation and seepage loss alone is possible, (ref: former MDBC).

In a barrage removal scenario without Lock Zero, towns in the lower Murray River reaches up to Lock One at Blanchetown would also face dire consequences of a continuous ebb and flow tidal existence, whereby receding ocean water, would create an unsightly scene of exposed mud and debris notwithstanding inconvenience to river towns as well as the four towns fronting the Lower Lakes. River bank slumping as occurred in the lower Murray River during the drought would occur again and further destroy property close to the river edge. The loss of amenity and inconvenience to various boating organisations, including the historically famous *Goolwa Regatta Yacht Club* and the *Goolwa Aquatic Club*, its sailing craft, powerboats, canoe and kayak activities would be enormous. All would be drastically if not completely compromised in a tidal only Lower Lakes estuarine system.

For lakes towns, all have planned and developed substantial surrounding infrastructure designed to take advantage of the beauty of the attached waterways that bring property safety, delightful attractiveness and community usefulness throughout the whole lakes district.

The four towns in the region are also holiday destinations for multiple thousands and for full-time residents who have chosen these idyllic places to live and enjoy the benefits of what this unique setting naturally offers with its waterways and nature's other attractions.

### **Are there options for the three Senate recommended dot points below that will cater for the Lower Lakes and Channel?**

- *modifying some of the barrages (such as Tauwichee and Mundoo);*



- *allowing the ingress of salt water into the Lower Lakes during periods of low flow;*
- *and investigating the construction of an additional lock at a location above Lake Alexandrina, such as near Wellington, SA either in concert with the above options or as a single change.*

**There are options including a very progressive proposal as discussed 'in brief' below!**

***A Better Way-for the Murray Darling Basin***, is a 13-page paper first released in early 2012 and further updated by the author, Investigative Journalist in Marine & Aquatic Ecology, Ken Jury of Goolwa in South Australia. Contact details on final page.

A Better Way –for the MDB was written following extensive investigations across the whole Murray Darling Basin, with a view to providing a suitable basin-wide solution to Australia's largest food growing crisis while enduring reduced freshwater availability throughout!

### ***“A Better Way” for the Murray Darling Basin!***

The full paper version is supplementary to the documentary *Muddied Waters - A Clear Solution* that screened in December 2012. Copies of this paper available by emailing to the author! Details page 6.

The full version describes how:

- It won't cost the earth – certainly not A\$13 billion dollars.
  - It won't damage floodplain farms and force farmers from their land.
  - No need for water entitlement diversion reductions to service a government wish.
  - Will use only a portion of the freshwater volumes currently used for the Lower Lakes etc. with provision to hand back the balance for productive upstream use.
  - No need for costly over-bank flooding and subsequent property damage.
  - No disruption for growers - improved growth in Australian foodstuff production and export.
  - Growers and communities throughout the basin and the nation will benefit.
  - Massive sulphuric acid mobilisation below Lock One will be checked.
  - Murray River environments, aquatic life and biota will benefit.
  - A working estuary will reward immeasurably with huge benefits and because:
  - The MDB and the Lower Lakes are within a highly variable system.
- The Lakes will remain a reversible system – fresh generally during natural flooding and estuarine at other times. Climate Change with sea level rise is already upon us. It will make all of this inevitable by (circa) 2050. This will affect the 7.6km barrages and all of the island embankments between.

### **Briefly, with: *A Solution for the Murray Darling Basin!***

All it will take is one more river Lock; we'll call it Lock Zero given the current first lock is located some 275km upstream of the Murray Mouth at Blanchetown in South Australia. With minor barrage adjustments and the removal (or part removal) of an unwanted island adjacent to the mouth, that grew from being a sandbar, the basin and our food security can then be saved.

Lock Zero should be built to regulate minimal freshwater flow to (40%-1800GL/per yr) into Lake Alexandrina to mix with ocean water, forming and maintaining an estuarine environment, and for the first time, provide for the control of the pool height between Lock One at Blanchetown and Lock Zero, while providing the means to greatly assist in clearing the Murray Mouth. This will create a saving of 2700GL of freshwater to grow our food!

This will rid the lower river section below Blanchetown of acid mobilization, so bad at times that even the authorities openly admit defeat with treatment of mobilised acid-laden water, notwithstanding a possible threat to the intake pipes that feed potable water back to Adelaide hills reservoir storages.

By retaining the barrages, freshly mixed estuarine water would be held within the lakes system for extended periods, and released out of the lakes/channels, from selected barrages occasionally to refurbish and provide strong scouring flows, to regulate the removal of silt and sand from the areas between the barrages and the Murray Mouth outlet to the sea.

Using lakes stored estuarine water, the system could be flushed at will through the barrages while replenishment for the lakes would be activated with free ocean water on the next incoming tide, followed by mixing with a small portion of freshwater stored behind Lock Zero to be naturally mixed by wind seiche!

**In flushing the lakes; by allowing lake levels to recede by up to a maximum of 20cm only by opening selective barrage gates, estuarine water from the 840 sq km surface of the lakes will provide flushing volumes of scouring water for the river mouth at a rate in the order of 150GL used in one single out going tidal session to successfully scour and clear the mouth.**

To enable selective flushing, an upgrading of the logs in the Goolwa Barrage is recommended given the lifting of the current single barrage concrete logs stacked on top of each other is both cumbersome and time consuming as they're handled individually - one by one as commonly seen at this barrage today.

The alternative in each of the Goolwa barrage compartment bays is for single, thick walled poly tanks to fit the overall slot in each bay, to operate by using nearby water through a single pump to each tank as the hydraulic in one 'single lift and fall motion' to enable necessary increased flow pressure with outflows to assist in clearing the mouth and keeping it clear. Equally, to provide opportunity to direct outflows of estuarine water towards the mouth with a view to a portion of this water flowing though to the southern section of the northern lagoon of the Coorong.

The removal of a sandy, highly vegetated knoll that badly restricts outgoing water passage through the Mundoo Channel, located directly opposite the Murray Mouth. Bird Island as its known faces the river mouth, is located downstream of the Mundoo Barrage in the Mundoo delta on the edge of the Coorong. Its removal is necessary as it blocks about 70% of the flow from this barrage to the mouth. This obstruction and a minor connected peninsula gradually formed and vegetated as a result of building the

Mundoo barrage. It also impedes movement both ways of Coorong water, and water released from the Mundoo Barrage and 3 other barrages within the area that would otherwise clear the mouth of sand and silt. These changes are necessary for allowing the Lower Lakes system to require much less freshwater.

Simplistic perhaps, but logically there's a view to reduce the fresh water maintenance volume for the Lower Lakes to 40%, (about 1800GL/yr) as a freshwater allowance required to mix with barrage entrapped, highly oxygenated Southern Ocean water for the return of a healthy estuarine system within the Lower Lakes.

### **A Reversal of the system has many possibilities:**

There're often seasonal periods when the elected 40% or 1800GL/yr of freshwater required for mixing in the lakes may be further reduced due to seasonal Lofty Ranges rain run-off reaching the lakes. A handful of streams actually reach the Lower Lakes including Currency Creek and the Finnis and Angus River's that yield significant winter freshwater flows that often reach Lake Alexandrina. This Lofty Ranges run-off water will again help compensate growers or it could be held as future fresh water meant for the lakes (to mix with ocean water), being held upstream of Lock Zero for this purpose. Moreover in an adaptive way of thinking, to suit the situation at the time when ensuring the continuity of the estuary or, if additional fresh flows persist through flood or minor flood, then ocean water and flood water would be adjusted by way of the now rejuvenated barrages and through Lock Zero to suit the situation. An upgraded Lower Lakes system as proposed would still be a reversible system. During low river flows it should be estuarine while river flood times may enable the river to completely fill the confines of the Lower Lakes as was generally the case. In all circumstances the freshwater or estuarine water biota throughout will adjust both ways as it most certainly always does in an estuarine environment!

### **Estuarine water:**

Importantly, estuarine water can be made up of varying degrees of fresh and ocean water as is naturally the case in most estuarine deltas worldwide. Contrary to claims (and alleged state Govt. tests and claims in the Lower Lakes), estuarine water occurs at varying levels in deltas of most estuaries worldwide. These are often healthy ecosystems that provide immeasurable benefits to communities and governments alike.

Returning the Lower Lakes to estuarine would once again create a highly productive and useful environment. **However, the barrages are necessary in this case!**

### **Estuaries 'the world over' are known for their productiveness!**

Such the case with viable fisheries known to exist in the Lower Lakes in pre-barrage times! It's a known fact that Mulloway (one of many examples of quality commercial fish known to the region) would gradually return to the Lower Lakes again to become part of a major fishery and fisheries nursery and breeding ground, for the return of large, productive fishery. In turn, tourism throughout would surge ahead and so would development!

Ken Jury of Goolwa in SA – Senior Investigative Journalist (Marine & Aquatic Ecology), May 2016.