



Analysis of the Existing Situation of the Lower Lakes, Coorong and Lower River Murray of South Australia December 2009

This is a brief summary of the facts known at this time of the existing situation of the Lower Lakes, (Lake Alexandrina and Lake Albert) the Coorong and the Lower River Murray. A proposal to return the Lower Lakes to an estuary is outlined. This proposal is supported by the growing community group called LakesNeedWater. For more detailed information and sources visit the website LakesNeedWater.org.

Existing Situation:

- *Very Low Inflows*
- *The Barrages and Evaporation*
- *Lake Levels below Sea Level*
- *Acid Sulphate Soils*
- *Bioremediation*
- *Salinity Problems*
- *Dredging the Mouth*
- *Lower River Murray Problems*

Very Low Inflows

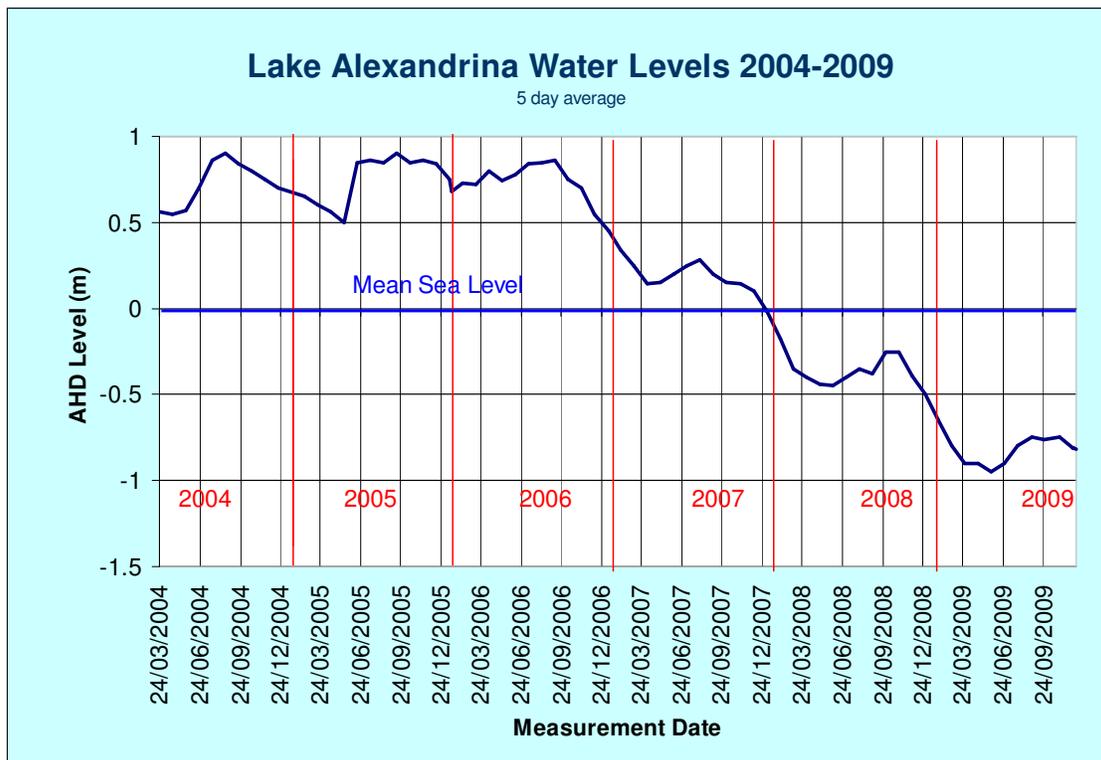
- Since 2002 inflows to the River Murray have been about 4000GL per year, or less than half the long term median inflows. This is partly due to over-extraction upstream, and partly due to the most severe drought in recorded history. Global warming could result in a fall in runoff of up to 40% in the next 25 years.

The Barrages and Evaporation

- The barrages (built 1940) have produced an unnatural, large, shallow fresh water storage which also allows high evaporation, estimated at 750-950 GL per annum.
- This water could be used to raise river levels upstream, thereby restoring the riverine environment, if the Lower lakes returned to an estuarine system by the opening of the barrage gates, and the building of a barrier at or near the junction of the river and the lake.

Lake Levels below Sea Level

- Presently -0.5m AHD for Lake Albert, and -0.82m AHD for Lake Alexandrina.
- Levels will continue to decline during the coming summer (2009-2010) and should reach - 1.5m AHD in Lake Alexandrina.
- SA government promises of 150-170GL for Lake Alexandrina, will only raise the water level in Lake Alexandrina by about 25 cm. Contrast this with the 1.75 metre drop since before the drought.
- Lake Albert has already reached a critical acidification level (see below), and is to be allowed to drop to -1.0 metre before 35GL allocated will be pumped into it.



Acid Sulphate Soils

- Widespread acid sulphate soils have developed on the exposed Lake beds due to oxidation of sulphidic sediments previously covered by estuarine waters before the barrages were built.
- Currency Creek, the Finnis River, Loveday Bay, and other areas (photos 1 and 2) have been seriously affected, although the first two have been ameliorated by the Clayton and Currency Creek regulators.



Photo 1. Exposed Lake bed, northern Lake Alexandrina, November 2009



Photo 2: Close up of lake bed at left. Yellow crystals of indicate highly acidic soils

- Further declines in water levels will increase the acid production to such a level that it could overcome the natural alkalinity of the lake waters. This occurs when rainfall dissolves the acid which runs off into the main lake bodies, turning them acid. This would be even more disastrous for any living organisms in and around the Lakes.
- The seriousness of this risk is shown by the decision to recommence pumping of water from Lake Alexandrina to Lake Albert should the levels in the latter fall to -1.0m AHD .
- Presently estimated trigger points for this change (-0.5m AHD for Lake Albert, and -1.5m for Lake Alexandrina) are still being refined by further research, however, Lake Albert has already reached its trigger level, and Lake Alexandrina will probably reach it by the end of this summer.
- The SA Government has decided to allow the levels in Lake Albert to pass this trigger since there is presently not enough water to prevent it. Therefore fish kills in Lake Albert are expected, since no further "fish outs" are to be supported.
- The delay of the decision to build the weir at Pomanda until 2011, means that the two summers of 2010-12 will allow for even further declines in water level should the river inflows stay at these all time lows, since it would take about one year to build a weir. It is doubtful that the government of South Australia will have the means to purchase further environmental entitlements to maintain the Lake levels above trigger points, presuming they are available.
- Strong winds have at times caused dust storms from the exposed lake beds. Health problems have been attributed to the dust which comprises fine Aeolian sands and corrosive material.

Bioremediation

- Trials by the government have been only partly successful, and these presently cover a small proportion of the exposed sediments (about one quarter, not including what will be exposed this summer).
- Pre-germinated seed incorporated in November 2009 are described as "successful". But this is yet to be proved effective in the longer term over the summer period. Seeding of the large number of highly acidic areas such as Loveday Bay will require vast amounts of limestone to be spread (thousands of tonnes), since the pH tolerances of the *Puccinellia* grass used is only around pH 5. Levels of pH <2 have been measured in Loveday Bay.
- Seeding and other bioremediation efforts have been concentrated around population centres where voters live or have large vineyards (eg Tolderol). There remain very large areas of exposed lake shores (see photos) which are already highly acidic, and for which no immediate bioremediation is planned. These have low population densities, but will still contribute to the acidification of the lakes.

Salinity Problems

- Water salinities in the Lower Lakes have increased and the water cannot now be used for irrigation. Lake Albert is currently at 9,000 EC units and is expected to reach saltwater (55,000 EC units) by March 2010 at the latest, even with pumping of 35GL from Lake Alexandrina. Lake Alexandrina is currently at 7000 EC units and expected to double each year making it seawater by mid 2012 (assuming inputs are enough to maintain the current level only).
- Some irrigators can now access water from a new pipeline from Taillem Bend, but this could be under threat from saline lake water intrusion as the result of wind blown slugs which went past Taillem Bend last summer.
- Proposed "shandying" of lake water with seawater if trigger levels are exceeded will increase these problems, and could also lead to hypersalinity, especially in Lake Albert, since there would be no opportunity for refreshing from tidal exchange.
- There has been a marked impact on wildlife. Bird numbers are significantly lower and much of the fringing vegetation around the former lake boundaries is now dead, and the Ramsar Treaty obligations have been ignored.

Dredging the Mouth

- The vastly reduced area of the former estuary after the barrages were built has led to build up of sand accretions inside the mouth from the flood tide delta.
- No outflow to the sea has meant that continuous dredging of the Murray Mouth has been necessary to keep it open and allow tidal flow to the northern end of the Coorong.

Lower River Murray Problems

- Slumping and cracking of river banks downstream of Lock 1 has resulted in evacuation orders for riverside homes and structural damage to the Swanport Bridge.
- Many wetlands below Lock One are at high risk of turning acidic.
- A new weir located near Wellington or Pomanda Island, would alleviate these problems for the region between Lock One, Blanchetown and Wellington.

Proposal

Return the Lower Lakes to their estuarine condition and reconnect the Lower Lakes to the Coorong and the sea. Build a weir or lock near Wellington to prevent incursion of saline water into the river. Fresh water would flow over this structure when river flows are high enough and fish movement should be accounted for as well.

This idea has been met with much opposition and fear mongering about its supposed deleterious effects. This idea continues to be called 'last resort' or attempted as a 'temporary measure'. However, there has been **no evidence** published in the public realm to support claims made by government consultants and civil servants as to why this proposal could not work. The main objections could be overcome with engineering solutions. They are as follows:

Increase Tidal Circulation

- The development of hypersalinity would be prevented by tidally induced circulation in the lakes. The present low tidal signal at the barrages would be greatly increased up to that of the open ocean (1.5m spring tides) if the sand accretions inside the mouth (caused by the barrages) were cleared or channels dredged. This could also happen through natural scouring.

Modify Barrage Gates

- The barrage gates would need to be changed from their present configuration to a design which could be operated quickly to take advantage of heads of water on either side. The five barrages could be operated independently according to the patterns of seiching within the Lakes to allow water in or out.
- The change from the previous artificial fresh water system is only a reflection of the dynamism which is part of the natural system. The system would fluctuate back and forth according to the flows coming down the river, which may or may not increase in the foreseeable future. As in several other semi land locked marine systems around the Australian coast, such as the Gippsland Lakes.

Seawater Does Not Make Sulphidic Soils Worse

- The presence of seawater will not make the acid sulphate worse as some with vested interests have suggested, since the sulphidic soils will be covered with water. Acid sulphate will only worsen **if the lake beds are exposed as they are now.**
- There is **no evidence** that to allow seawater to cover already acidified sediments would cause mass precipitation of iron oxides. More likely is that seawater's considerable buffering capacity will help raise the pH.
- The local water tables used for irrigation will not be affected since they are deep and confined, and there is very little leakage from the overlying unconfined saline aquifers.

Estuaries Are Natural

- An estuarine system is more "natural" than the present artificial system caused by building the barrages. A new wetland based on rich species diversity adapted to estuarine conditions would develop, a far cry from the present paucity. The Ramsar Treaty obligations would be kept, since there is no requirement that any particular wetland should be fresh or marine.
- Species which can only endure fresh water would migrate to the refuges behind the regulators, or into the river.

Conclusion

The State and Federal governments do not appear to understand the urgency of the situation which is looming over the next year. Trigger levels for the lakes turning acidic have been reached. There have been multiple occurrences of acid sulphate soils reaching the turning point as far back as May 2009 in Loveday Bay. We now see those acid 'triggers' being extended. We are also seeing deadlines for the Pomanda Weir being extended. Valuable time has been lost over the last two years with the insistence on a fresh water solution.

We have yet to see any plans or details as to how seawater would be incorporated into the Lower Lakes and yet we see the estuarine concept dismissed and discounted. We have seen no scientific evidence that returning the Lower Lakes back to their pre-barrage state of an estuary is impossible. In fact, some scientists support the concept.

If the concept of the Lower Lakes returning to their estuarine state was explored with open minds with our best scientists and engineers involved, we have no doubt that it would be possible to accomplish this environmental restoration.

Sources

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