

Lake Mokoan Study

Summary of issues raised in the 55 public submissions received on the Lake Mokoan Study.

Issue	Comment	Submissions Mentioned In
Community Consultation		
Desires more time to prepare submission.	Extended from 19 September 2003 to 17 October 2003	1, 2, 19,
Believe that communications have been poorly managed through the consultation process.	The study included an extensive program of consultation and communication (V1 S1.3).	18, 30, 41
Consult and cooperate with Yorta Yorta people.	Yorta Yorta Nations representation sought on Community Reference Group but not taken up. Heritage issues are considered on the study report. Would need to be consulted if project is progressed.	17
The proposal for a bank across the spit was not put forward by the community.	The Spit Bank was proposed by the consultants to retain the deepest part of the lake, remove the shallow eastern shore from the storage and reduce the fetch for wind wave action.	41

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Option Support		
Option 1 preferred subject to meeting the needs of the lake irrigators.	Requires the connection of Lake Eildon to Lake Nillahcootie to maintain supply reliability on the Broken system with a slight lowering of supply reliability on the Goulburn system. Provides the greatest water savings.	3, 17, 23, 32, 49
Support for Option 4.	Essentially maintains the status quo. Results in no water savings. Option 4 places limits on the annual increase and decrease in storage level and the rate at which water can be released from storage that reduce the effective of the lake as a water resource. The limits are necessary to maintain water quality and recreational value.	4, 6, 5, 9, 8, 13, 10, 11, 12, 14, 15, 21, 22, 25, 26, 28, 30, 31, 33, 34, 35, 36, 38, 39, 40, 42, 41, 45,46, 47, 50, 52, 54, 55
Option 2B1 is the favoured option for reconfiguring the lake. Note that some of these prefer Option 4 but support Option 2B1 if lake is to be partitioned.	This option maintains the maximum water depth and operational rules of the existing lake and provides maximum storage volume of the modified storages.	21, 23, 26, 28, 33, 34, 35, 41, 45, 53
Option 2B1 managed as a shallow permanent storage provides an outcome that best represents the pre European settlement condition of Winton Swamp.	Significant earthworks would have had to be carried out to lower the level of Winton Swamp.	46
Support the adoption of Option 2B3.	Has a positive NPV at 4%, significant water savings, a low capital cost and low risk profile, however has results in a drop in security in the Goulburn system.	7, 17, 49

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Option Opposition		
Opposed to Option 1.	Has the greatest impact on the local economy.	4, 5, 12, 33, 55
Opposed to Options 2B3, 3B1 and 3B3.		5, 45, 55
Environmental		
Lake supports a large range of bird life and is high environmental value as a wetland.	Non-fishing bird life is not expected to change. Fish eating birds are expected to strongly decrease with the decommissioning of the lake. (V1 S3.6.5)	6, 53
Not in favour of Option 1 due to high energy inputs in diversion of water from Lake Eildon.	Water supply offset requires pumping water from Lake Eildon to discharge into the Broken River catchment above Lake Nillahcootie, a lift of between 30 and 90 metres depending on the water level in Lake Eildon. This option will reduce security on the Goulburn system.	7
With a higher lake level the evaporation level will be reduced.	A higher lake level increases the surface area and therefore the evaporation.	9
Heritage issues are less significant in Option 4.	There would be essentially no change under Option 4 relative to the current situation	13
More evaporation will occur from the storage of Broken River water in Lake Victoria.	The modelling indicates that on average very little of the saved water will be stored in Lake Victoria, but rather passed down the river as additional flow.	10
The more efficient management of outflows could lower lake losses. For example the early use of Mokoan water.	Lake Mokoan can only be used to supply customers in and downstream of the Casey's	10

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	Weir pool and is currently operated to meet this demand while supply is available.	
Advantages to native fish in having shallow lakes.	Viability of the lake as a recreational fishery relies heavily on restocking.	16
Do not believe enough has been made of Living Murray issues and pending research should be resolved before implementing change with Lake Mokoan	The options for the future management of the lake are consistent with the objects of the Living Murray project noting that feedback and comment from the Living Murray project was not available at the time the Lake Mokoan study was undertaken.	15, 19
Lake could have an important role in the Living Murray project.	Role would be determined from that project.	24, 38, 41, 50, 55
The lake perimeter already provides a considerable area of manageable wetland.	Nevertheless the lake in its present form loses a considerable volume of water through evaporation.	15, 40
From an environmental perspective Option 2B3 is the next favoured to the decommissioning of the lake.	This option also has a positive NPV at 4%, significant water savings, a low capital cost and low risk profile. The downside is that system security is reduced.	17
Decommissioning the lake will destroy the existing macrophyte community, increasing the occurrence of blur green algae.	The water regime should suit macrophytes, which will out-compete algae for nutrients. Therefore algal blooms are not expected to be a problem (V2 S5.5.4).	33
Harmful environmental effects of uncontrolled flows in Broken River ignored.	Uncontrolled flow in this case would be similar to the pre-existing natural flows from the Mokoan catchment.	41

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Concerned that if reclaimed land is not commercially viable it will become a haven for noxious weeds and vermin.	This would be addressed in the detailed planning for the project.	41, 48
Changing Lake Mokoan would mean changing a wetland that already meets criteria for recognition as of international importance.	With the exception of Options 3B1 and 3B3 the criteria will still be met	41, 48
Evaporation is a cost of managing the environment.	As for any business every opportunity is made to minimise costs. In terms of evaporative loss, Lake Mokoan would be considered inefficient when compared to most other storages.	41
Winton Swamp was originally a significantly larger than proposed under Option 1 and unless returned to that condition will lessen the value of environmental, recreational and water savings gains of the decommissioning.	The wetlands proposed under Option 1 are based on the physical characteristics of the swamps and topographical data prior to the construction of Lake Mokoan.	46
Much has been done locally to develop habitat corridors between the lake and the Warby Ranges and there is concern that this will be lost through changes to the lake.	This would be taken into account in any redevelopment of the area removed from the storage.	48
Water Quality		
Would like to see the lake held at the highest possible water level as this resulted in a marked improvement in water quality.	Not practical as lake was created as a storage for water supply. The variable climatic conditions experienced in Australia result in large variations in resource availability and water supply demand and consequent variations in lake water level.	4, 9, 13
Turbidity could be reduced by the establishment of a dense buffer of trees on the south side of the lake to lift the prevailing	The scientific evidence is that the turbidity is the re-suspension of sediment that results from the	10

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winds to reduce wave action and reed beds along the shore and also by the banning of large power boats and jet skis.	exposure of the lake bed to wind and wave induced critical shear stresses. High water levels decrease this exposure. Partitioning the lake will remove the shallow eastern end from the storage and reduce the fetch of the lake that affects wave size.	
Reconfiguring the lake will set back the lake water quality improvement that that has occurred.	The works will have an affect on water quality however, it will remov e a large area of shallow water from the storage and reduce the wind fetch, which are major contributors to the lake turbidity.	14, 15, 21, 33, 38, 39, 41, 50, 54
A smaller lake does not seem consistent with attaining improved water quality.	A shallower lake will provide a more suitable environment for aquatic vegetation, whilst a smaller lake will reduce wind fetch distance and hence reduce wave size, both of which could possibly reduce the susceptibility of the lake to algal blooms, thus countering the effect of higher shear stresses due to the shallower depth. Large annual fluctuations in water level will not benefit water quality.	15
A shallower lake, as a result of either lowering the lake FSL or operating it as an annual storage, is not supported as it cannot deliver the same benefits in terms of water quality.	This is acknowledged in the study.	21
Poor water quality can be addressed with better control of the lake operation.	A number of the operating rules currently in place are due to the water quality concerns – acknowledging there maybe room for improvement.	41

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Supply Reliability / Security		
Believe every opportunity should be taken to store water with benefits to irrigation and urban water supply, environmental flows and recreation.	Further storage in Lake Mokoan would have a slight improvement in security, will not increase the volume available for use due to the Cap limitations, and would reduce existing environmental flow. Reducing the water lost through evaporation will increase the water available for the environment and will occur as natural stream flow down the river system.	6, 5, 9, 13, 12, 36, 38, 42, 50, 53, 55
Suggests the purchase of water entitlement would be a better alternative.	Purchase of water entitlement could be a legitimate offset option, however only the physical offsets were considered in this study.	7, 27
Option 4 ensure water security long term.	Option 2B1 and Option 4 maintain water security.	13, 40, 41
Lake has been a benefit to farming and horticulture in the Broken, Goulburn and Murray Valleys.	Agreed, however the selected option will be configured to maintain the status quo.	13
Concern over ensuring supply of water entitlement without the existing storage. Especially since 100% of entitlement is required for horticulture and has always been available, although the indications are that the Broken system has a reliability of only 80%.	The Minister has given an undertaking that there will be no reduction in reliability of supply to existing customers.	11, 47
Every opportunity should be taken to conserve water for dry periods.	Increasing the diversion to Lake Mokoan does marginally improve security offset by a marginal	14

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	increase the water lost to evaporation.	
Concern with maintaining supply reliability during construction for options that require the spit bank.	Considerable planning and scheduling of the works will be required to ensure supply reliability.	21
Offsets will affect other catchments. Raising Lake Nillahcootie is not a reliable offset.	The impacts of offsets on the Goulburn system have been identified in the study. Supplying the Broken from the Ovens will require the harvesting of more water or the purchase of existing entitlement in that system. The effectiveness of raising Nillahcootie is reflected in a small reduction in shortfall.	29
Reliability of supply has only reduced as a result of the deterioration in the lake water quality.	The evaluation is based on the existing situation that has been ongoing for nearly 20 years.	40, 41, 44
The current reliability of supply of 80% is based on the unavailability of supply from the lake at the end of January nine years in ten due to water quality problems. Whereas the reliability is greater than 90% with the lake fully functional.	The system modelling was based on the existing conditions and has been verified by DSE.	41, 44
Impact of requirements from preliminary dam safety review of Lake Nillahcootie on Broken system security not mentioned.	Design review has only recently commenced. At this time there is no information to suggest that the outcomes would impact on the ability to fill the storage to FSL.	41
Effect of Option 1 on security on the Goulburn and the Murray has been dismissed.	The impact on supply reliability is documented in the report and clearly reduces system security.	41

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Crops in the upper catchment use less water.	Agreed, this is usually due to higher rainfall, however as entitlements are fixed, all this means is that irrigators in these areas require less to irrigate and therefore buy less water for development or conversely sell surplus water in the water market.	41
Recreation		
Lake of limited recreational value.	The lake, which is located close to the major regional centres of Benalla, Wangaratta and Shepparton is a stock fishery and popular with recreational anglers, a popular duck hunting area, used for power boating and the base for a sailing club.	3
Lake has a high recreational/tourist value.	The lake is popular for fishing, duck hunting, power boating and sailing and complements visits to the local wine production area.	6, 9, 8, 13, 16, 15, 20, 21, 37, 38, 46, 50
Option 2B1 is the only modified storage option that maintains the recreational fishing values of the storage.		8
No recognition given to the work involved in developing Lake Mokoan as a fishery.	The economic value of Lake Mokoan as a fishery was determined in the study (V1 S5.4.1).	18, 42, 41, 50
Options for a smaller lake would not support a sailing due to small area or widely fluctuating water levels.	This recognised in the study.	54

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Flooding		
Diversion of flows to Lake Mokoan and the lake itself reduces flooding in Benalla and along the river downstream.	The diversion of flow to Lake Mokoan has negligible effect on flood flows through Benalla. The presence of the lake, which has been designed to store all the runoff from its catchment, will reduce flood flows downstream. The extent of the reduction will depend on the magnitude and timing of the flood events. (V2. S 3.8.6)	6, 9, 11, 21, 22, 31, 33, 29, 38, 41, 44, 50
Offsets		
Is there a need for the Tungamah pipeline offset for Option 2B1 given that with a smaller lake there is likely to be an improvement in the water quality and will be available for supply for longer periods?	The study conservatively assumed that without an improvement in water quality, which would increase the availability of water from Lake Mokoan, the pipelining of the Tungamah system would be required to maintain the system supply reliability.	21, 33, 28
Link the Tungamah pipeline and Lake Boga & Little Murray Weir projects to the Lake Mokoan project	Tungamah pipeline has been considered as a potential offset in this study. The project Brief for the Lake Boga and Little Murray Weir called for linkages to be explored.	34
Buying back water licences as an offset should be investigated.		34
Costing		
Option 4 requires least cost.	True, but there are no water savings with Option	13, 15, 21, 40

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	4.	
Diversion of Broken River water to East Goulburn Main Channel is common to all storage options, not just Option 4.	Broken River diversion to Shepparton Irrigation Area is included in Option 4 to increase early demand on Lake Mokoan to reduce evaporation. This is not proposed for other options therefore the cost is only included in Option 4.	13, 28, 41
Annual additional cost to for Goulburn Valley Water to treat Lake Mokoan water for supply to the City of Shepparton is claimed to be a guess.	Costs were provided by Goulburn Valley Water having regard to the proportion and turbidity of flow from the Goulburn and Broken Rivers.	10
Earthquake is likely to impact directly on ADI regardless of secondary impact from failure of lake embankment	G-MW has an obligation to manage risks due to its assets having regard to the scientific knowledge available at the time.	10, 31
Costs are loaded with 45 percent contingency allowance, which are significant compared to costs for other projects.	The inclusion of a contingency allowance is standard practice in the costing of engineering projects. The size of the allowance is dependent on the degree of engineering input. A 40% contingency allowance is standard for feasibility study costs.	10, 21
Ridiculous to abandon a valuable asset that would be difficult to replace in the current environmental and political climate.	Any decision on the future management of Lake Mokoan will be made having regard to the economic, social and environmental impacts and that there will be no reduction in reliability of supply to existing customers.	11
No detail or costing of offsets to maintain supply reliability.	Has only referenced the executive summary and not the main report.	16

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Option costs not substantiated.	The option costs have been produced from feasibility level information and design and compared with the costs for similar works. The costs also include a 45% contingency allowance, which is standard practice for feasibility level studies.	15
The cost to rehabilitate the existing embankment is high compared with the cost to bring the dam wall at Lake Eildon up to contemporary standards.	This cost was provided by G-MW. Further investigation and design is required to confirm the cost.	21, 33
G-MW policy is to bring all storages up to contemporary standards, therefore the refurbishment cost should not be included in the costs.	The cost has been included as it will vary depending on the option adopted.	21
A significant cost of Option 2B1 is associated with the drainage of the natural catchment upstream of the storage. There is also the need to pump supply to existing Lake Mokoan diverters. An option would be to reconfigure the pumping station to allow both supply to irrigators and the draining of the natural catchment to the lake.	The flow rates for maintaining supply to the Lake Mokoan diverters and removing the runoff the natural catchment are very different and the one pump could perform both tasks. However given G-MW's experience in pumping the dead storage volume out of Waranga Basin, pumping the runoff from upstream of the storage is an alternative to diverting it around the storage.	21, 28
Offsets required for decommissioning the lake are neither practical nor feasible.	The diversion of water from Lake Eildon to Lake Nillahcootie would be a major civil engineering undertaking and has been costed accordingly.	33
Basis for the costs of "running" Lake Mokoan, productivity from irrigation water and the benefits from farming the area reclaimed by the lake decommissioning and failure to mention	Mokoan operation costs were provided by G-MW and are based on actual costs. Lake Mokoan also includes inlet and outlet channels and diversion weirs. The productivity from	36

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Broken Creek Irrigators.	irrigation water is based on available information. Use of reclaimed land is covered in V2 S4. The Broken Creek irrigators are considered as customers downstream of Casey's Weir.	
Assurance that ongoing cost of alternative supplies will not be passed on to customers in the future.	Annual costs of alternative supplies were included in the economic evaluation as a component of the option costs.	40
Reinstatement of supply to existing entitlement holders on Lake Mokoan not spelt out.	A cost of any change to Lake Mokoan includes the reinstatement of supply to existing lake diverters.	50
Cost of diversion works to EGM not substantiated.	Costs were based on recent experiences with the construction of a major pumping station on the River Murray, low level weirs on the lower Broken Creek and pipeline costs.	41
Shepparton water treatment cost should not be included in Option 4 as option allows for full lake restoration.	Currently Option 4 as will other options impact on water quality at Shepparton and as such water treatment cost is included. Potential decrease or increase in these costs has also been considered based on the view of project environmental team on likely changes in water quality.	41
Restoration fencing and offset pumping costs underestimated.	Costs based on available data and estimates of flow transferred.	41
Lake Mokoan operating cost is for a specific year of high expenditure and not an average.	Costs were provided by G-MW for 2001/02 and are believed to be reasonable for the storage,	39, 41

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	which includes the diversion weirs and inlet and outlet channels. The cost of restoration work is not included in the operating cost.	
Operating costs for the lake can be reduced significantly with the restoration, and could be shared further because of the benefits of the environmental flows.	The higher than average operation costs of the Broken Storages are currently shared across the whole Goulburn Basin.	41
Water Savings		
Recognise the desirability of reducing evaporation.	Average annual evaporation for Lake Mokoan estimated at 37,000ML.	3, 7
There are other opportunities for water savings in the Murray Darling Basin as a whole where there will be a lower loss of benefits that need to be investigated.	Investigations are being undertaken into water savings from the improvement of the efficiency of irrigation and domestic and stock water supply systems. Water savings investigation are being undertaken in areas of the Murray Darling Basin.	10, 33
All shallow lake water conservation storages need to be investigated for water savings opportunities.	This study is one of numerous studies that will be undertaken following major studies that have identified potential opportunities for water savings in the bulk water and irrigation distribution systems of northern Victoria. Similar studies will be undertaken in the other states.	16
Evaporation provides humidity in upper catchment areas and therefore indirectly contributes to water flows rather than being considered a total loss.	The timing of the evaporation does not benefit the yield of the Broken River system.	15, 53
All water savings options, including improvements in irrigation system and application efficiency, need to be considered in	This study was the outcome of a study into the Water Savings in the Bulk Water Systems in	15, 33

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making a decision on the future of Lake Mokoan.	Northern Victoria, SKM 2002. A study has also been completed into Water Savings in Irrigation Distribution Systems, SKM 2000. Further work is being undertaken identify water savings projects from this study.	
No solution presented for the storage and use of evaporation savings except for supply to the Shepparton Irrigation Area.	A number of possible solutions for storing water savings are referred to in V2 S3.5. Most of these would be the subject of further studies. For example the current <i>Option for Water Savings – Little Murray Weir / Lake Boga</i> project.	38, 39, 41, 44, 50
Whilst Option 4 does produce water savings little can be gained from reducing Broken River water use.	Broken River water use will not change under any of the options.	53
Future Development		
Lake Mokoan has been identified as the basis for new irrigation development in the Warby Ranges and changes to the lake will impact on the cost of this development.	The lake would facilitate new irrigation development in the Warby Ranges at the lowest cost. However, this development must occur from the transfer of existing water entitlement from within the Broken valley. New water allocation cannot be made for this development or existing entitlement transferred from outside the Broken valley as this will reduce the reliability of supply to current users. Water sourced within the Broken valley would have to be supplied by enlarging the capacity of the proposed delivery infrastructure or duplicate supply system. Entitlement sourced from the Ovens valley for	16, 33, 41, 51, 55, 50

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	<p>new development in the Warby Ranges would have to be supplied from that system.</p> <p>Hence changes to Lake Mokoan would increase the cost of supplying any new development.</p>	
<p>Not enough recognition given to the climatic impact of the lake on the local viticulture industry.</p>	<p>This impact is discussed in V2 S3.8.1.</p>	<p>30, 40, 41</p>
<p>Significant water savings can be achieved from high value horticultural development (Warby Ranges and other sites in the Broken River Valley) using state of the art technology resulting in more efficient use of water resources.</p>	<p>Water Savings unlikely to be achieved from new development as developers will only buy the water they require, minimised by the use of technology. Water Savings maybe achievable by supporting existing enterprises to apply new technology.</p>	<p>55</p>
<p>New viticulture development curtailed, compared with other areas, by uncertainty on future of the lake.</p>	<p>This is one reason, the other is that new development is also affected by restrictions on the transfer of water into the Broken system, the small amount of water available for permanent trade and the relatively small entitlement in the system. Other areas have greater flexibility for water transfer.</p>	<p>40</p>
<p>Economic Analysis</p>		
<p>Decommissioning the lake would impact on the economy of the area and decrease property values.</p>	<p>The value of the lake to the local economy has been considered in the evaluation of the options (V1).</p>	<p>33, 41</p>
<p>Economic benefit of river system to rural enterprises is grossly</p>	<p>Economic assessment is based on the best</p>	<p>11</p>

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understated in available economic data.	available information.	
Option 2B3, 3B1 and 3B3 reduce supply reliability, possibly increasing turbidity that will impact on occurrence of blue green algae, decrease native fish and increase carp and with resulting loss of economic benefit to the region.	These options do reduce supply reliability. Turbidity is expected to be less due to reduced wind effects and better conditions for vegetation. Whilst fish numbers supported are likely to be reduced, the current restocking regime can be continued.	33, 38, 50
Believe those impacted by changes to lake should be compensated for future loss of income/property value.	Not practical to address in the study.	33, 38, 40, 41, 50
Not all the disadvantages of the options, such as recreation and tourism, loss of future development and fire protection, have been included.	Recreation has been included, fire issues have been addressed and loss of future development is speculative.	41
Study concludes that no viable commercial enterprise can be applied to the lake bed yet evaluations of options assume that reclamation not be necessary as it can be returned to commercial use.	The outcome of the study is that with changes to the storage there will be land available for commercial use, however, it is unlikely that this land will be commercially viable.	41, 55
Lake has high amenity value with residents and wine tourists.	Whilst the study recognises that different lake configurations will have different impacts on wine tourists (V1 S5.4.6) their economic value was difficult to predict.	30, 38, 40
Lake Reclamation		
Viability of reclaimed land after decommissioning of lake is questionable.	Refer V2 S4.	33,
Responsibility for management of reclaimed land and for what purpose?	A decision on the management of the reclaimed area would need to be included in	33, 30

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	the recommendation of the preferred option.	
Study did not consider land between FSL and resumption boundary.	There will be resumption buffer zones for all options involving the reconfiguration of the lake.	41
Greater risks with the restoration of the reclaimed areas.	The report acknowledges that exposed sediments may be highly erodible, there will be localise areas of erosion such as drainage lines, soil of restored dryland may require restoration and there is some uncertainty of seedbank condition.	44
Other Benefits		
Lake is an asset for modern bush fire fighting practices, particularly for the Warby Ranges.	Only Option 1 will impact on fire fighting.	14, 20, 33
The lake being downstream of the Barmah Choke has the potential to provide significant benefits for the River Murray.	This is acknowledged, as subject to the availability of the water and the storage is not closed as a result of a blue green algae outbreak, the storage is used to supplement the River Murray during the peak demand period in February and March. This currently only happens if the Broken allocation is > 170%.	21, 24, 41, 55