

Queensland Floods Commission of Inquiry  
PO Box 1738  
Brisbane QLD 4001

**To The Honourable Justice Catherine Holmes,**

**Submission to the Queensland Floods Commission of Inquiry  
regarding the future Operation of Wivenhoe Dam.**

In this submission the “Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam” will be referred to as the “Operation Manual”.

AEP (Annual Exceedance Probability) values can vary between hydrology reports so the numbers given in this submission are meant to be indicative of accepted values rather than the submission of an undisputed “absolute” value. The aim is to provide a “feel for the size” of quoted discharge rates.

I would like to submit the following points.

**1) Part of the original intent of the operation of the Wivenhoe Dam appears to have been compromised since the introduction of the auxiliary spillway.**

The part of the original intent of the Wivenhoe Dam was to provide flood mitigation.

The flood mitigation level of Wivenhoe is listed as 1,450,000 ML.

Since the introduction of the auxiliary spillway with its fuses<sup>1</sup> and Rev 7 of the Operation Manual this value is more realistically 910,000 ML. Past this value the emphasis on flood mitigation is withdrawn.

The Operation Manual allows ‘unrestricted’<sup>2</sup> release at a water elevation above 74m or 910,000 ML ie the Operation Manual has reduced the flood mitigation capacity to 910,000 ML (62.8% of its maximum design value). The manual states “*Strategy W4... Wivenhoe Storage Level predicted to exceed 74.00m AHD... No limit on Maximum Release rate... There are no restrictions on gate opening increments or gate operating frequency once the storage level exceeds 74.0 AHD, as the safety of the dam is of primary concern at these storage levels.*”<sup>3</sup>

The safety of the dam is not in jeopardy at the controlled release of water to the fuse plug level nor at the design level. The only thing in jeopardy is the cost of replacing the fuses<sup>4</sup>!

The flood mitigation level to the start of the fuses blowing is closer to 1,190,000 ML.

If the dam discharge is controlled at a reasonable discharge rate (not ‘unlimited’<sup>5</sup>) up till the fuse plug initiation then an extra 25% flood mitigation is available. Still 18% short of the advertised 1,450,000 ML.

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<sup>1</sup> “The original dam, which was built in 1985, was designed to manage a flood event that has a 1 in 30,000 chance of occurring in any one year. Revised rainfall data from the Bureau of Meteorology now shows that the Probable Maximum Precipitation (PMP) or maximum amount of rainfall possibly in a storm event, is larger than first thought.” (Wivenhoe Alliance brochure). The additional 165m spillway was added in 2005. .

<sup>2</sup> Any dam release is limited by the ability of the spillway to discharge water (which is why an auxiliary spillway was added in 2005 complete with fuses). “Unrestricted” does not mean “unlimited”. At 74m this limit for Wivenhoe main spillway is about a 200-year flood level increasing to around a 450-year event when the fuses start to blow. So it is physically not possible to get a 2000-year flood release from Wivenhoe at these lower levels unless the fuse plugs have already initiated and the auxiliary spillway is also discharging water. In the later case (with no fuses remaining) it is possible to discharge a 4000 year event at 74m,

<sup>3</sup> Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam Rev 7 pg 34.

<sup>4</sup> and that the dam level will eventually drain back to the 67m level (maximum drinking water storage level).

<sup>5</sup> The current discharge rate is not unlimited but ramps up very quickly to values, which are not considered to be flood mitigation levels.

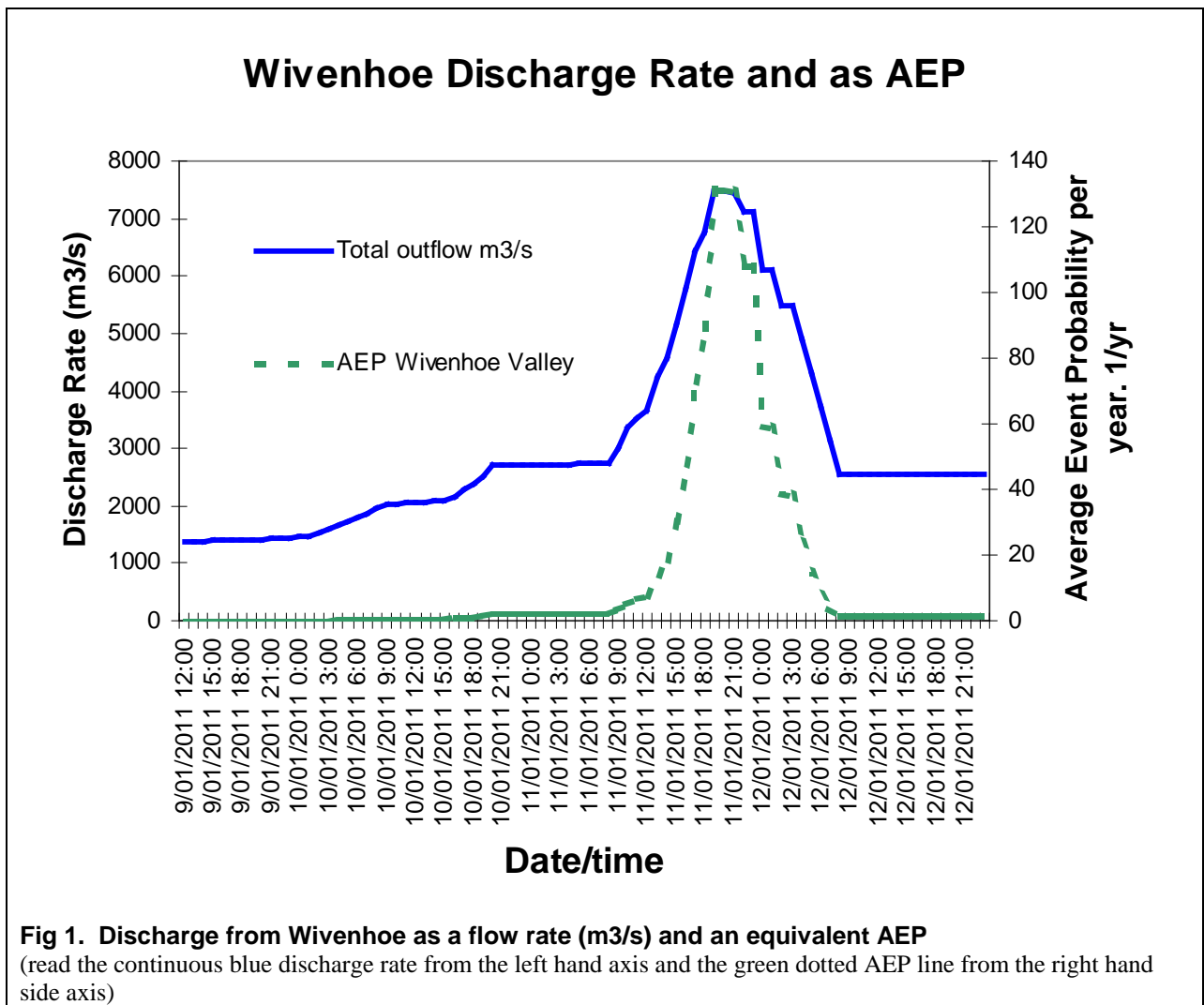
If the dam discharge is controlled up till the design level of 77m then all the fuse plugs have initiated and ‘unlimited’ discharge would be valid as this is then truly dam saving mode and the volume of retained flood water is above 1,450,000 MI.

Practical operation would be likely somewhere between these 2 conditions (the later being a greater than 10,000-year event).

The fuse channels can take all the flow up to about a 400 yr AEP however one would want to already have the discharge gates at least partially open at this point from both an overstress and risk perspective<sup>6</sup>.

It would seem more appropriate to limit the dam discharge to a rate that would be considered as a reasonable flood mitigation rate for the majority of its mitigating capacity (AEP -see point #2 & #3 below).

In summary I suggest the Operation Manual be altered to make the discharge more reasonable for a major range of the dam to more closely reflect its design flood mitigation capacity.



<sup>6</sup> By definition the gates would already be open at this point as water was being discharged before the fuses operate, eliminating that concern

## **2) The Operation Manual produces dam discharge rates that would not be considered to be 'flood mitigation'.**

Above the 74m level (some 1.7m below the first fuse initiation level) the Operation Manual ramps up the discharge rate from a 10-year to a 500-year rate before the first fuse blows.

Fig 1 above shows the recent Brisbane flood event with the discharge rate plotted as AEP. (This rate was as per the manual.)

It indicates that the dam was discharged at a rate equivalent to the expected flow past that point (if there were no dams present) that would occur every 100 years.

I don't wish to criticise in hindsight but illustrate the events of the last flood by the use of the AEP values. At 11:00 on 11/1/11 the controllers had increased the discharge to around the 10-year AEP rate as per the Operation Manual (discharge rate is related to dam height). If this discharge rate had been held from this point in time till the fuse level, the dam would not have reached the first fuse plug level and the flood in Brisbane would have been significantly lower due to the maximum discharge being around half of the actual. ie a 10-year flood just below Wivenhoe vs a 100-year flood.

To continue to illustrate this extreme situation - should the rain have continued to fall at the 2000 yr AEP rate indefinitely (or the maximum inflow to the dam at 11:00 on 11/1/11) the operators would have continued to increase the discharge rate (as per the Operation Manual) and the dam level would have blown the first plug level then the dam level decreased slightly and stabilised. The second fuse would not have blown.

So the dam was not in danger even if this extremely high inflow rate persisted forever.

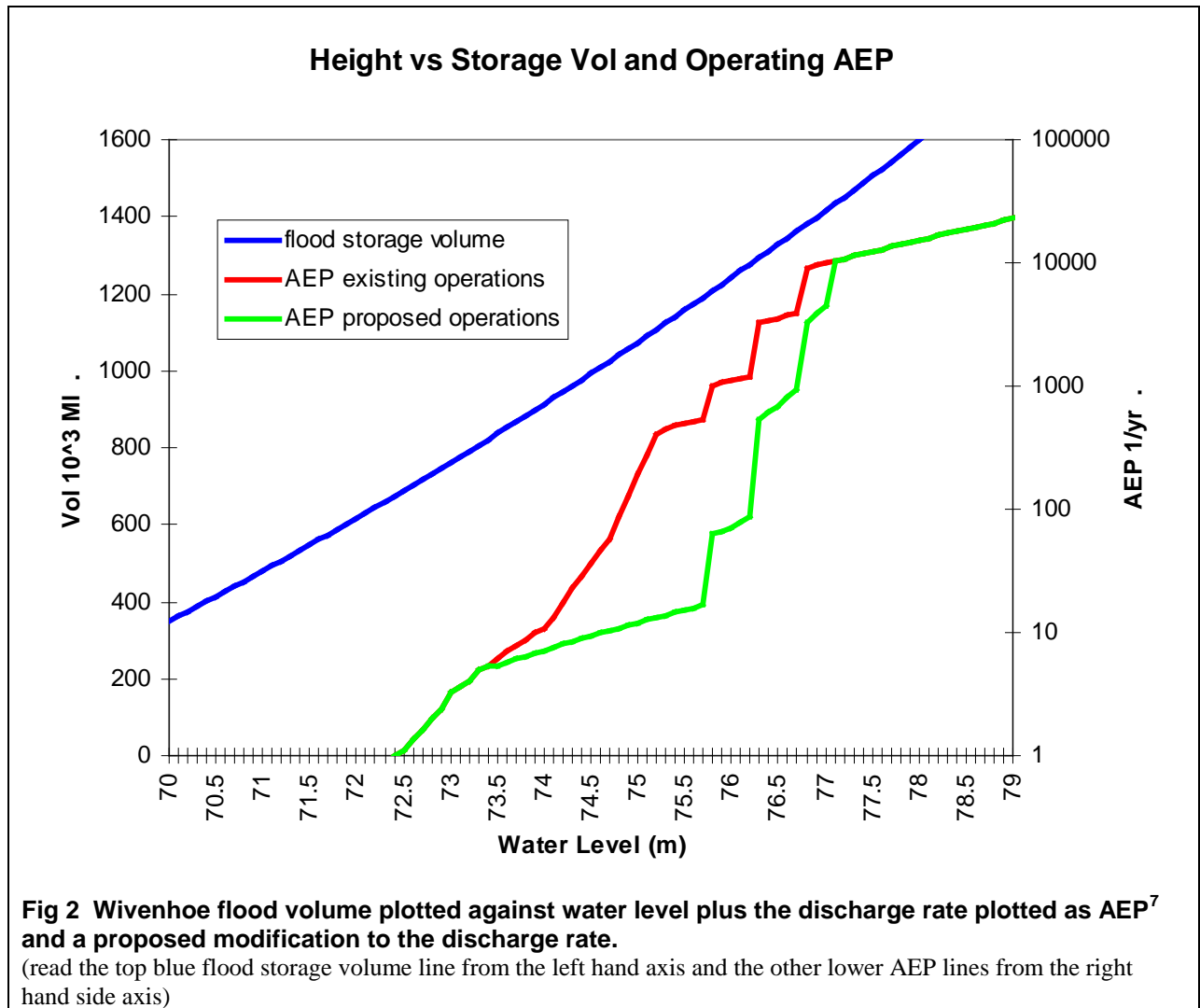
Brisbane would obviously have been flooded at a 2000-year level if the rain continued at the 2000-year level indefinitely but the point is that the dam would not have been in danger. The only thing in danger from such an extreme event, was a fuse plug, which is designed to be sacrificial in extreme circumstances.

## **3) The Operation Manual can be easily modified to a more 'practical' discharge level.**

The Operation Manual discharge rates (release gate heights) for a given dam height can easily be modified to produce a more 'user friendly' downstream flood whilst utilising the existing dam capacity and without increasing the risk to the dam.

Fig 2 below shows how by restricting the flow till the dam level is higher gives an effective 25% increase in the capacity of Wivenhoe dam for 'no cost'. This brings the dam operation closer in line with its original intent. It also does not change the risk to the dam (although increases the risk to the fuses!)

The note above shows how if this procedure had been in operation in January the flood event would have been significantly reduced.



I acknowledge the fine work the SEQWATER personnel did in such an extreme situation in following the previously set out procedures. I am only criticising the Operation Manual and associated procedures, which in my opinion, have deviated from the original intent. The dam did reduce the height of the flood but if operated in the way proposed above, would have reduced the flood height considerably.

Thank you for your consideration of this submission.

Kind regards

Ian

<sup>7</sup> Values of AEP above about 2000 are less credible but are plotted for illustrative purposes and shows the dam crest flood of 1 in many tens of thousands of years, is not altered by these procedures.