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The Hon. Justice Catherine Holmes  
Commissioner  
Queensland Floods Commission of Inquiry  
PO Box 1738  
Brisbane QLD 4001

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Dear Commissioner

### **Manual Strategies – Extended Hearings**

It is on record that I sought leave to appear before the Commission following its establishment and leave was not granted. It is now not without considerable reservations that I make this submission but feel compelled to do so in the public interest. I respectfully request that this submission be included as part of the closing material to be considered on your website.

As a flood victim whose family has lost so much and continues to suffer on account of emerging structural building problems, and on account of all other flood victims, it deeply saddens me that as an ordinary person living within one of the distressed communities I had to take extraordinary steps.

Following recent events I now have a vested interest in ensuring that the “*Manual of Operational Procedures for Flood Mitigation at Wivenhoe and Somerset Dam*” (the Manual) contains strategy rules that are capable of enhancing the mitigating benefits of the dams. I am deeply concerned and troubled by some interpretations given to Strategies W2 and W3 at recent hearings. My concerns now also extend to the interpretation and application of Revision 9 of the Manual and I urge the Commission to test through examples the extent to which the revised Manual enhances the mitigating benefits of Wivenhoe Dam.

In the public interest I wish to provide for your consideration an interpretation of Strategy W2 and of Strategy W3 that is based upon looking beyond the literal interpretation of the rules and goes to the substance as to why the rules were substantially rewritten in order to demonstrate an interpretation that makes sense in every respect, including from an operational perspective.

### **An attempt to review the rules in 2007**

The Brisbane Valley Flood Damage Minimisation Study No.242 in 2007 at page 4 sets the scene for a comprehensive rewrite of the Manual in conjunction with the upgrade to Wivenhoe Dam:

*At the time of the application development, an upgrade process to the Wivenhoe Dam was underway with the construction of a three bay right abutment fuse plug spillway, as a dam safety mechanism to cater for floods in the probability range of 1:5,000 to 1:100,000 (or extremely rare events). In conjunction with this upgrade, the Dam operational procedures were being*

*rewritten for very rare events to avoid if possible the operation of the fuse plug spillway. **These operational procedures concentrated on dam safety as the first priority and used an increasing step release procedure depending on dam water level, with the second priority to minimise flooding effects downstream.** (Emphasis added)*

The objectives of this study included to determine if the “operating rules” for Somerset and Wivenhoe dams can be modified and thus minimise damage caused from a given flood event. The project success factors included lower flood damage by changing the operating rules of the dam. Whilst the project was halted after the completion of phase 3, the damage curves quantified that the current Wivenhoe Dam Operating rules are flexible enough to minimise damage downstream and upstream.

There were four operating rules at the time from procedure 1 through to procedure 4. Procedure 1 no longer applied - “If the level reaches EL 68.5 m AHD in Wivenhoe Dam, operations switch to Procedure 2 or 3 as appropriate.” This is due to recognition that the Manual only requires more conservative releases below EL 68.5m AHD. Set out below are extracts from that Manual:

#### Procedure 2

*Under Procedure 2, water is to be released from Wivenhoe Dam with care being taken not to submerge Fernvale Bridge and Mt Crosby Weir Bridge prematurely. Typically releases will take place on the rising limb of the flow from Lockyer Creek. If this flow is sufficient to submerge Mt Crosby Weir Bridge (1,900 m<sup>3</sup>/sec), releases are to be increased such that the combined flow from Lockyer Creek and Wivenhoe Dam releases does not exceed either:-*

- (i) 3,500 m<sup>3</sup>/sec at Lowood or*
- (ii) the greater of the peak flow of Lockyer Creek or the predicted peak flood flow of the Bremer River.*

*Should the Mt Crosby Weir Bridge be flooded by flows from catchments downstream of Wivenhoe Dam, the upper limit of the combined Lockyer Creek flow and releases from Wivenhoe Dam shall, subject to (i) and (ii) above, not exceed 3,500 m<sup>3</sup>/sec at Lowood.*

#### Procedure 3

*Under Procedure 3, water is to be released from Wivenhoe Dam such that the combined Lockyer Creek flood flow and Wivenhoe Dam release is not to exceed 3,500 m<sup>3</sup>/sec at Lowood. The releases are to be regulated such that the total regulated flow at Moggill gauge downstream of the Bremer River junction does not exceed 4,000 m<sup>3</sup>/sec [which is the upper limit for non-damaging flows for the urban reaches of the Brisbane River].*

*The gate opening constraints are to be overridden when the gates will be overtopped during normal operation.*

It can be seen from the above that Procedure 3 set a limit on releases from Wivenhoe Dam such that the combined Lockyer Creek flood flow and dam release is not to exceed 3,500 m<sup>3</sup>/sec at Lowood. **The intention of Procedure 3 appears very similar to that of Strategy W2.**

#### **A comprehensive review in 2009**

In 2009 SEQWater completed a comprehensive review and revision of the Manual.

In exhibit 56 Mr John Tibaldi advised Messrs Peter Borrows, Rob Drury and Jim Pruss on 14 August 2009 that attached was the agenda to discuss the Manual amendments. He added, **“In essence, the Flood Mitigation Manual Objectives are not being changed in any way, but some of the procedures that support these objectives are currently wrong and must be corrected.”** (Emphasis given by Mr Tibaldi)

Exhibit 65 sets out the notes on the revision. A more practical approach was introduced in preference to the procedural approach previously adopted. Flood events can vary in intensity, duration and distribution over an area in excess of 10,000 square kilometers and accordingly there are an infinite number of flood event scenarios that the Manual needed to account for:

*The new approach does not change the original operational intent contained in the previous Manual, but does allow the optimization of flood mitigation benefits, depending upon the magnitude of the flood event at any one time...*

*Strategies are likely to change during a flood event as forecasts change and rain is received in the catchments. It is not possible to predict the range of strategies that will be used during the course of a flood event at the commencement of the event. Strategies are changed in response to changing rainfall forecasts and stream flow conditions to maximize the flood mitigation benefits of the dams.*

*Flowcharts have been provided in the updated Manual to assist in Strategy Selection.*

## **Selection of Strategies**

Page 23 of Revision 7 of the Manual sets out the Wivenhoe Flood Strategy Flow Chart. **It makes it abundantly clear the purposes for which Strategy W2 and W3 are to be selected and used.**

### **Strategy W3**

Applying the flowchart, if the maximum flow at Lowood is likely to exceed 3,500 m<sup>3</sup>/s and the maximum flow at Moggill is likely to exceed 4,000 m<sup>3</sup>/s then strategy W3 must be used. This is a situation where the severe weather event has moved into the unregulated catchments of the Lockyer and Bremer and it is likely that there will be significant naturally occurring peak flood flows from these sources emptying into the Brisbane river that are above the non-damaging thresholds of 3,500 m<sup>3</sup>/s at Lowood and 4,000 m<sup>3</sup>/s at Moggill, excluding releases from Wivenhoe Dam.

The rules in Strategy W3 are in two parts –

The first part provides that prior to the naturally occurring peak at Moggill (ie the flood peak coming from the Lockyer and Bremer because these are rules about dealing with floods) the flow at Moggill is to be minimised. The only way the flow at Moggill can be minimised is by closing all the gates at Wivenhoe Dam. By closing the gates at Wivenhoe Dam it prevents a potential additional source of flow

that would otherwise increase the flow rate and property damage at Lowood and Moggill. A failure to minimise the flow at Moggill by closing the gates at Wivenhoe Dam prior to these large damaging flows from unregulated sources would appear to be to be a serious breach of the Manual.

The second part says that after the naturally occurring peak (ie again flood peak) has past then the flow at Moggill is to be lowered to 4,000 m<sup>3</sup>/s as soon as possible. Depending upon the lake level of Wivenhoe Dam post the closing of the gates, it may not be possible to lower the flow at Moggill to 4,000 m<sup>3</sup>/s immediately and ensure that the flood storage compartment can be emptied within 7 days. Strategy W3 permits releases to be varied up to a maximum of 4,000 m<sup>3</sup>/s to enable the 7-day rule to be satisfied.

I cannot see any credible alternate debate on the interpretation of Strategy W3.

### ***Strategy W2***

Applying the flowchart, if the maximum flow at Lowood is likely to be less than 3,500 m<sup>3</sup>/s and the maximum flow at Moggill is likely to be less than 4,000 m<sup>3</sup>/s then use Strategy W2. This is a situation where the weather event is less severe in the unregulated Lockyer and Bremer catchments (under the non-damaging thresholds of 3,500 m<sup>3</sup>/s at Lowood and 4,000 m<sup>3</sup>/s at Moggill, excluding releases from Wivenhoe Dam) and may to varying degrees be less or more severe in the catchments above Wivenhoe Dam, namely, the Upper Brisbane River and Stanley River.

**The intent of Strategy W2** is to limit the flow in the Brisbane River to less than the naturally occurring peaks at Lowood and Moggill, while remaining within the upper limit of non-damaging floods at Lowood (3,500m<sup>3</sup>/s). The naturally occurring peak at Lowood (ie again the flood peak) comprises the naturally occurring peaks from the Lockyer and Brisbane River (above Lowood). The only way then that the flows at Lowood can be limited to less than 3,500 m<sup>3</sup>/s is by limiting the releases out of Wivenhoe Dam (ie the post dam situation).

The first part of the rule states that the target maximum flow in the Brisbane River at Lowood is the lesser of:

- The natural peak flow at Lowood excluding Wivenhoe Dam releases, and;
- 3,500 m<sup>3</sup>/s

The natural peak flow at Lowood is stated above in the **intent of Strategy W2**. It is the pre dam situation and includes flows from the Lockyer Creek and Brisbane River (ie from above the junction with the Lockyer) at Lowood. Please refer to the intent statement above – there is no reference to Wivenhoe Dam.

An alternate way of approaching it is to adopt the technical meaning for concepts like “natural flow” and “peak flow”.

For the purposes of this submission I have chosen to source the definitions from eWaterCRC. eWaterCRC was established in July 2005, the result of a merger between two former Cooperative Research Centres - the CRC for Catchment Hydrology and the CRC for Freshwater Ecology - and a number of other Australian

water-focused organisations. eWater's mission is to be a national and international leader in the development and application of uniquely Australian products for truly integrated water cycle management. eWater seeks to advance the leading edge of water management tools and applications in Australia in support of the National Hydrologic Modeling Strategy.

eWater provides definitions for key concepts including -

- “natural flow” - Water movement in accordance with gravitational forces, without artificial intervention.
- “peak wet weather flow” - The maximum volumes of water flowing into a sewage treatment plant, down a waterway or through a catchment, during or soon after a period of heavy rainfall.

**Accordingly, it is submitted that the definition of “natural peak flow” is the maximum volume of water flowing in accordance with gravitational forces, without artificial intervention, during or soon after a period of heavy rainfall. This is again the pre dam situation including flows from Lockyer Creek and Brisbane River (from above the junction with the Lockyer) at Lowood.**

*Some illustrative examples*

<i>Natural peak flow</i>			<i>Applying W2 rule-Target flow</i>	<i>Less Lockyer</i>	<i>Maximum dam release</i>	<i>Minimum Dam storage</i>
<i>Lockyer</i>	<i>Brisbane above Lockyer</i>	<i>Lowood</i>				
<i>m3/s</i>	<i>m3/s</i>	<i>m3/s</i>	<i>m3/s</i>	<i>m3/s</i>	<i>m3/s</i>	<i>m3/s</i>
<i>500</i>	<i>2000</i>	<i>2500</i>	<i>2500</i>	<i>500</i>	<i>2000</i>	<i>0</i>
<i>550</i>	<i>2500</i>	<i>3050</i>	<i>3050</i>	<i>550</i>	<i>2500</i>	<i>0</i>
<i>600</i>	<i>3000</i>	<i>3600</i>	<i>3500</i>	<i>600</i>	<i>2900</i>	<i>100</i>
<i>650</i>	<i>3500</i>	<i>4150</i>	<i>3500</i>	<i>650</i>	<i>2850</i>	<i>650</i>
<i>700</i>	<i>4000</i>	<i>4700</i>	<i>3500</i>	<i>700</i>	<i>2800</i>	<i>1200</i>
<i>750</i>	<i>4500</i>	<i>5250</i>	<i>3500</i>	<i>750</i>	<i>2750</i>	<i>1750</i>
<i>1000</i>	<i>8000</i>	<i>9000</i>	<i>3500</i>	<i>1000</i>	<i>2500</i>	<i>5500</i>

Applying this interpretation the intent of Strategy W2 is achieved, that is, to limit the flow in the Brisbane River to less than the naturally occurring peaks at Lowood and Moggill, whilst remaining within the upper limit of non damaging flows at Lowood (3,500m3/s).

An alternate approach would be to apply a literal interpretation to Strategy W2, namely that the natural peak flow at Lowood excluding Wivenhoe Dam releases is solely attributable to Lockyer Creek and any run off above Lowood into the river.

<i>Natural Peak flow</i>			<i>Applying W2 rule- Target flow</i>	<i>Less Lockyer</i>	<i>Maximum dam release</i>
<i>Lockyer</i>	<i>Local runoff</i>	<i>Lowood</i>			
<i>m3/s</i>	<i>m3/s</i>	<i>m3/s</i>	<i>m3/s</i>	<i>m3/s</i>	<i>m3/s</i>
500	20	520	520	500	20
550	30	580	580	550	30
600	40	640	640	600	40
650	50	700	700	650	50
700	60	760	760	700	60
750	70	820	820	750	70
1000	110	1110	1110	1000	110

Such an interpretation is not only inconsistent with the scheme of the Manual but also with Procedure 3 under Revision 6 of the Manual. The first part of Procedure 3 is very similar to the first part of Strategy W2, namely, water is to be released from Wivenhoe Dam such that the combined Lockyer Creek flood flow and Wivenhoe Dam release is not to exceed 3,500 m3/sec at Lowood.

The second part of the rule in Strategy W2 relates to targeting a maximum flow in the Brisbane River at Moggill, being the lesser of:

- the natural peak flow at Moggill excluding Wivenhoe Dam releases, and
- 4,000 m3/s.

As the second part of the rule relies upon the same interpretation of “natural peak flow” it is unnecessary to restate the application of the rule.

## **Conclusion**

Strategy W2, interpreted correctly, is an effective strategy for mitigating flows in the Brisbane River under the weather situations described above. It provides an opportunity once the lake level exceeds EL 68.5m AHD to release additional water but in a way that limits the flow in the Brisbane River to less than the naturally occurring peaks at Lowood and Moggill, whilst remaining within the upper limit of non damaging flows at Lowood (3,500m3/s). On a “water in / regulated water out” basis, it enables Wivenhoe Dam to retain as empty, part of its flood storage compartment to be used to minimise the flow at Moggill in situations where a severe weather event moves into the unregulated catchments of the Lockyer and Bremer or a further event occurs like that detailed under Strategy W3 above.

**If the above interpretations are accepted by the Commission then as a matter of urgency it is requested that Revision 9 of the Manual be reviewed and rigorously tested to ensure it is able to provide at least the same level of mitigation benefits at a FSL of 100%.**

Yours faithfully

John Craigie