0774-01-B
9 March 2011

John Tibaldi
Dam Safety Manager
Queensland Bulk Water Authority (t/a Seqwater)
P.O. Box 2437
North Ipswich Qld 4305

Dear John,

SUBJECT: REVIEW OF THE OPERATION OF WIVENHOE AND SOMERSET DAMS DURING THE JANUARY 2011 FLOOD EVENT

1 BACKGROUND

Seqwater has the responsibility for the operation of Somerset and Wivenhoe Dams under the provisions of the Water Supply (Safety and Reliability) Act 2008. The Act requires Seqwater to operate these dams accordance with the "Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam" (the Manual). The latest version of the manual is Revision 7 dated November 2009.

Greg Roads of WRM Water & Environment Pty Ltd (WRM) was requested to review the operations of these dams during the severe flooding that occurred along the lower Brisbane River over the period 6 to 19 January 2011. The review is based on data and information provided in the report by Seqwater entitled “January 2011 Flood Event. Report on the operation of Somerset and Wivenhoe Dam” (the Report) dated 2 March 2011.

This brief report presents the findings of the review.

2 SCOPE OF WORK

Following the review, Seqwater has requested that the following questions be answered:

1. The January 2011 Flood Event occurred between 6 January 2011 and 19 January 2011. Was the release of water from Wivenhoe Dam and Somerset Dam during the January 2011 Flood Event in accordance with the Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam (Revision 7)(the Manual)?
2. Based on the information contained in the draft report (the Report), were there any aspects relating to the operation of Wivenhoe Dam and the operation of Somerset Dam during the January 2011 Flood event not in accordance with the Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam (Revision 7)?

The response to the above questions is based on the information provided in the Seqwater Report with particular reference to:

- Section 2 - Flood Event Summary.
- Section 9 - Dam Inflow and Flood Release Details.
- Section 10 - Flood Management Strategies and Manual Compliance.

No independent modelling or a detailed assessment of the modelling given in Appendix A of the Report was undertaken as part of this review.

3 SUMMARY OF DAM OPERATION

3.1 Compliance

The Manual details a set of strategies to operate both Wivenhoe and Somerset Dams during a flood event. There are four strategies for Wivenhoe Dam named W1, W2, W3 and W4 that change depending upon the stored water level in the dam and the expected inflows to the dam and inflows to the Lower Brisbane River from the Bremer River and Lockyer Creek. There are five subsets of strategies within W1 named a, b, c, d and e. These are designed to minimise the disruption to the downstream community caused by the closure of the various bridges that cross the Lower Brisbane River.

Somerset Dam has three sets of strategies named S1, S2 and S3 that complement the Wivenhoe Dam strategies. The first two sets of Somerset Dam strategies are designed to maximise the available flood storage and mitigation potential of the two dams at any time during a flood. The third strategy, which was not used during the January event, is to protect the structural safety of the dam.

Table 3.1 provides a summary of the compliance criteria detailed in the Manual for each operating strategy. It also shows the date and time when Seqwater transitioned into each strategy and provides comment on whether each criteria was complied with during the event. Note that there is considerable latitude within the above strategies to operate the dams differently and still comply with the Manual. It is outside the scope of this review to comment on whether the dam should have been operated differently.
<table>
<thead>
<tr>
<th>Strategy</th>
<th>Transition Date and Time</th>
<th>Compliance Criteria</th>
<th>Complied</th>
</tr>
</thead>
</table>
| W1a      | 6 Jan 0742hrs            | Water Level > 67.25m AHD  
Release < 110m$^3$/s  | Yes  
Yes |
| W1b      | 7 Jan 0200 hrs           | Water Level > 67.5m AHD  
Release < 380 m$^3$/s  
Colleges Crossing closure considered  
Burton Bridge remained trafficable | Yes  
Yes  
Yes  
Yes |
| W1c      | 7 Jan 0900 hrs           | Water Level > 67.75m AHD  
Release < 500 m$^3$/s  
Burton Bridge closure considered  
Kholo Bridge remained trafficable | Yes  
Yes  
Yes  
Yes |
| W1d      | 7 Jan 1500 hrs           | Water Level > 68.00m AHD  
Release < 1900 m$^3$/s  
Kholo Bridge closure considered  
Mt Crosby Weir Bridge remained trafficable | Yes  
Yes  
Yes  
Yes |
| W1e      | 7 Jan 2200 hrs           | Water Level > 68.25m AHD  
Release < 1900 m$^3$/s  
Mt Crosby Weir Bridge closure considered  
Fernvale Bridge remained trafficable | Yes  
Yes  
Yes  
Yes |
| W2       | 8 Jan 0800 hrs           | Not used as releases exceeded naturally occurring peak | Yes |
| W3       | 8 Jan 0800 hrs           | Predicted Water Level > 68.5m AHD  
Predicted Water Level < 74.0m AHD  
Release < 4000 m$^3$/s  
Achieve Moggill flow targets  
Lower level objectives considered | Yes  
Yes  
Yes  
Yes  
Yes |
| W3       | 10 Jan 0100 hrs          | Predicted Water Level > 68.5m AHD  
Predicted Water Level < 74.0m AHD  
Release < 4000 m$^3$/s  
Achieve Moggill flow targets  
Lower level objectives considered | Yes  
No (refer to comment 1)  
Yes  
Yes  
Yes |
| W4       | 11 Jan 1300 hrs*         | Predicted Water Level > 74.0m AHD  
Predicted Water Level < 75.5m AHD  
Water Level > 74 m AHD  
Gate opening sequence followed  
Structural safety of dam considered  
Lower level objectives considered | Yes  
Yes  
Yes  
Yes  
Yes |

*Comment 1: The release exceeded the naturally occurring peak.
<table>
<thead>
<tr>
<th>Strategy</th>
<th>Transition Date and Time</th>
<th>Compliance Criteria</th>
<th>Complied</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gate Closure</td>
<td>12 Jan 2100 hrs</td>
<td>Flood levels lower than during flood</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Peak outflow less than peak inflow</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Flow at Lowood reduced to 3,500m³/s quickly</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lake level &lt;67.5 m AHD within 7 days</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Gate closure sequence followed</td>
<td>No (refer to comment 2)</td>
</tr>
<tr>
<td>Somerset Dam</td>
<td></td>
<td>Wivenhoe water level &gt; 67.0m AHD</td>
<td>Yes</td>
</tr>
<tr>
<td>S2</td>
<td>6 Jan 0742hrs</td>
<td>Predicted Wivenhoe water level &lt; 75.5m AHD</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Somerset water level &lt;100.45 m AHD</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Crest gates raised</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Storage operating target line followed</td>
<td>Yes</td>
</tr>
<tr>
<td>S2</td>
<td>7 Jan 1900hrs</td>
<td>Wivenhoe water level &gt; 67.0m AHD</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Predicted Wivenhoe water level &lt; 75.5m AHD</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Predicted Somerset water level &lt; 100.45 m AHD</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Storage operating target line followed</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Peak outflow less than peak inflow</td>
<td>Yes</td>
</tr>
<tr>
<td>Draw Down</td>
<td>12 Jan 2100 hrs</td>
<td>Wivenhoe water level falling</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Somerset water level &gt;100.45 m AHD</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Wivenhoe levels not increased by Somerset releases</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Peak outflow less than peak inflow</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lake level &lt;99 m AHD within 7 days</td>
<td>Yes</td>
</tr>
</tbody>
</table>

* Equal to time outflow exceeded 4000 m³/s

3.2 Comments on Compliance

The following comments are given on the two potential non-compliance issues shown in Table 3.1.

1. At 0100 hours on 10 January, flood modelling showed that the Wivenhoe Dam storage level would reach 74.7m AHD with the forecast rainfall and 72.9m AHD without the forecast rainfall. No guidance is given in the Manual as to whether forecast rainfall is to be used as a trigger for Strategy W4 to commence. Notwithstanding, the Wivenhoe storage level at the time was well below 74m AHD (at 69.97m AHD) and the modelling with forecast rainfall showed that a fuseplug was not in danger of being activated, and therefore the structural safety of the dam would not be compromised. On this basis, it would appear that it was appropriate for Seqwater to persist with using strategy W3 and protect urban areas from inundation at that time.

2. Between 0500 hours and 0800 hours on 12 January during the recession of the flood, the time interval between successive closing of individual gates of Wivenhoe Dam was less than the 20 minute minimum given in the Manual. The dam outflows had fallen to 4,000 m³/s at the start of this period. There is no minimum period between gate closures above this outflow. This compliance requirement appears to contradict the other requirement to reduce flows at Lowood to below 3,500m³/s as quickly as possible. The Manual is not clear on which compliance requirement takes precedent in this situation.
4 CONCLUSIONS

Based on a review of the Report, Seqwater has operated Wivenhoe Dam and Somerset Dam in accordance with the Manual over the period 6 January 2011 and 19 January 2011. Two minor deviations from the Manual appear to have occurred over the period. This may be due to a lack of clarity in the manual rather than non-compliance.

Please do not hesitate to contact me if you have any queries.

For and on behalf of
WRM Water & Environment Pty Ltd

Greg Roads
Director