

Appendix H

SunWater response to Independent Review (Hydrologist report)

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Contact: [REDACTED]
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28 May 2015

Office of the Inspector-General Emergency Management
GPO Box 1425, Mail Cluster 15.7
Brisbane QLD 4001

BY EMAIL: [REDACTED]

Dear Mr MacKenzie

2015 Callide Creek Flood Review
Response to the WBM BMT Hydrology Report as provided to SunWater 27 May 2015

I refer to the BMT WBM Hydrology Report, "Independent Review of Callide Creek Flooding, Tropical Cyclone Marcia, February 2015" as provided by your office on 27 May 2015. Thank you for the opportunity to review this and provide responses.

The attached table details SunWater's response to the draft BMT WBM Hydrology Report as received from the Inspector General Emergency Management on 27 May 2015.

The attached response is further to SunWater's preliminary comments that were provided on 26 May 2015 in relation to preliminary draft model calibration and outcomes of modelling carried out by BMT WBM.

This letter provides comments with respect to other matters identified in relation to the full revised hydrology report received 27 May 2015 and are not specific to the model calibration and outcomes as noted above.

The response is set out in tabular format to allow for consideration of SunWater's comments in relation to specific paragraphs, sentences or phrases within the Report.

Please contact SunWater's project manager for the Callide Review, [REDACTED], on (07) [REDACTED] via email [REDACTED] if SunWater can be of any assistance or offer any further explanation in relation to these matters.

Yours sincerely

A handwritten signature in blue ink that reads "Tom Vanderbyl".

Tom Vanderbyl
General Manager
Bulk Water and Irrigation Systems

Att(s)

SunWater's Responses to Draft WBM BMT's Hydrology Report as provided by the Inspector General Emergency Management on 27 May 2015

Item No.	Hydrology Report Reference	Statement / Content in Hydrology Report	SunWater Comment	Suggestion
Gate Opening Time:				
1	Executive Summary, page (i), 2 nd paragraph	“It is estimated that just before 20:30 on Friday 20 February 2015, the gates automatically opened in response to the rising water level in the dam.”	SunWater has provided separate detailed comment regarding gate opening time in SunWater’s Response to the draft Review Report as provided by IGEM 18 May 2015, as issued by SunWater 21 May 2015 (refer to “Gate Opening” item). The time stated is based on a theoretical estimation, considering storage levels as recorded at the headwater gauging station, which is located approximately 370m upstream of the spillway in the direction of flood flows.	Suggest more accurate words as follows replace the references in column 3: “Based on theoretical estimations from storage levels, the Callide Dam gates opened automatically sometime after 8:30pm although the exact time of gate opening cannot be confirmed as there is no equipment connected to the gates that records this information. SunWater’s operators reported from onsite that they believed hearing a rumble in the spillway between 8:37pm and 8:42pm which they assumed at the time to be from the gates opening.”
	Executive Summary, Page (iii), 1 st dot point at top	“At 20:28 the water level in the dam reached the theoretical middle gate trigger level of 216.260m. It is expected that the middle began to open at this time. It is possible the gates could have opened slightly earlier or later, depending on the exact configuration of the gate opening mechanism.”	This does not account for the flood slope effects (level difference at any given time) between the dam headwater gauging station and the location of the spillway and gates, and similarly considering flows entering the dam as recorded upstream at the 96k gauging station. This would result in a difference in estimated level at the gates (i.e. lower), compared to the headwater gauging station, as flood waters are entering the dam. This would result in calculation of a later gate opening time.	
	Executive Summary, Page (iii), 2 nd dot point	“... 11 minutes after the gates are estimated to have opened at 20:28.”		
	Conclusions, Page 114, 2 nd dot point	- text similar as above	Based on SunWater’s theoretical estimations from storage levels, the Callide Dam gates opened automatically sometime between 8:30pm and 8:45pm. This also assumes that the actual gate opening occurred exactly in accordance with the design gate opening water level, and that there were no other wind or wave effects from the cyclone that may have impacted on the accuracy of gauging station measurements.	
	Introduction, Page 3, 2 nd paragraph	“It is estimated that just before 20:30 on Friday 20 February 2015, the gates automatically opened in response to the rising water level in the dam.”		
	Event Description, Page 37, Section 4.1.1	“At 20:28 the water level in the dam had exceeded the middle gate trigger level of 216.260m. It is expected that the middle gates began to open at this time.”	SunWater suggests that when hypothesizing about the precise gate opening time, equal if not greater weight should be given to the recorded observation of the onsite operators. Between 8:37pm and 8:42pm, SunWater’s onsite operators are logged as reporting via a phone call at the time: <i>“believes there may be a rumble in the spillway now. Assume it is the gates opening.”</i> This is the earliest evidence of when the gates may have commenced opening. The first positive confirmation that the gates had actually opened was when SunWater’s onsite operator is logged as hearing the sound of the water flowing down the spillway at 8:51pm	
	Event Description, Page 39, Figure 4-1	“Friday 20:28; 216.26m – Middle pair of gates start to open.” and “Friday 20:35; 216.41m – Outer pairs of gates start to open.”		

SunWater’s Responses to Draft WBM BMT’s Hydrology Report as provided by the Inspector General Emergency Management on 27 May 2015

Item No.	Hydrology Report Reference	Statement / Content in Hydrology Report	SunWater Comment	Suggestion
Modelling Predictions:				
2	Executive Summary, Page (ii), Dot point at bottom	<p>“An error in the calculation of the rainfall required to fill the dam resulted in a delay in prediction by SunWater that the dam would exceed the full supply level and begin to discharge into Callide Creek during the event. Based on the current operational rules associated with the dam, this would not have had an effect on downstream flooding.”</p> <p>- text identical as above</p>	<p>SunWater accepts that there was an initial calculation error for preliminary predictions as made early on 19 February 2015. However, these calculations were not an input to SunWater’s spreadsheet model and were not a factor in the decisions made by SunWater’s dam safety technical decision maker.</p> <p>SunWater continued with observing dam levels and inflows, as well as updating its spreadsheet model for forecasting storage level increases based on measured inflows, to provide guidance in accordance with SunWater’s notification requirements under the EAP.</p> <p>SunWater provided a number of warnings on 20/05/2015 to the LDMG regarding possibility of when the dam may spill, and it is noted that the LDMG attempted to issue a warning at 4:51pm on 20/05/2015.</p>	<p>Suggest that the dot points on page (ii) and page 114 be updated as follows:</p> <p>“Although there was an initial calculation error for preliminary predictions made early on 19 February 2015, these calculations were not an input to SunWater’s spreadsheet model and were not a factor in the spreadsheet forecast modelling that guided decisions made by SunWater. Based on the current operational rules associated with the dam, this would not have had an effect on downstream flooding.”</p> <p>Also suggest that 1st para on page 107 be updated as follows:</p> <p>“From review of the communication logs, there appears to have been an error made during calculation of the rainfall and runoff required to cause a spill from Callide Dam.</p> <p>... However should the correct rainfall depth have been assessed on 19 February, then SunWater may have considered it more likely that the dam might spill. Despite this, SunWater’s view is that this information would not have changed their operations during the event.”</p>
	Conclusions Page 114, 1 st dot point			
	7.2.1 Page 107 1 st paragraph	<p>“From review of the communication logs, there appears to have been an error made during calculation of the rainfall and runoff required to cause a spill from Callide Dam.</p> <p>... However should the correct rainfall depth have been assessed on 19 February, then SunWater would have known there was a high likelihood that the dam would have spilled.”</p>		

Item No.	Hydrology Report Reference	Statement / Content in Hydrology Report	SunWater Comment	Suggestion
3	Section 7.2.3 Page 97 Bottom paragraph	<p>“Whilst the spreadsheet model appears to have a miscalculation in the depth of runoff required to cause Callide Dam to spill, there is no reference to a simulation of the URBS model, with application of the 200-400mm rainfall forecast by the BoM throughout the event. Review of the spreadsheet model or URBS model has not been undertaken for this review, so it is unknown whether the URBS model would have better informed the operators.”</p> <p>“Models and spreadsheets used for flood forecasting – the spreadsheet model used appears to be in error, and the more comprehensive hydrologic models are not currently fit-for-purpose.”</p>	<p>This is incorrect. Forecast rainfall depth is not an input to SunWater’s spreadsheet model.</p>	<p>Statements throughout the report that imply that the spreadsheet model used forecast rainfall as an input arte incorrect and therefore must be removed.</p>
	Executive Summary, Page (iii), 3 rd dot point, 4 th sub-dot point			
	Key Findings Page 117 Dot point in – Models and spreadsheets	<p>“The spreadsheet used for calculation of rainfall and runoff required to fill the storages appears to be in error.”</p>		
4	Section 6.7 Page 106 1 st dot point	<p>“Improved prediction methods, including rainfall forecasts, models and spreadsheets would have predicted Callide Dam would have been likely to spill at least 2 days in advance of the actual spill.”</p>	<p>This is incorrect and inconsistent with information from the Bureau of Meteorology on their “flood response timeline” (presented at ANCOLD on 28 May 2015) which indicates that there is insufficient certainty around rainfall forecasts two to three days in advance of an event. In this time window, BOM typically will only issue a flood watch that is non-specific with respect to location. Specific flood warnings are typically only issued up to 12 hours in advance of an event. In the case of the flood event in the Callide on the 20th February 2015, BOM’s first flood warning was issued after 10pm.</p>	<p>Dotpoint 1 on page 106 is incorrect and must be deleted.</p>

SunWater's Responses to Draft WBM BMT's Hydrology Report as provided by the Inspector General Emergency Management on 27 May 2015

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Annual Exceedance Probability:				
5	Executive Summary Page (i) 1 st paragraph	"In the upper reaches of the Callide and Kroombit catchments, the rainfall is estimated to have a return period of between 200 and 500 years. The highest intensity rainfall was recorded at the Kroombit Tops gauge, having a return period of approximately 500 years.	SEQ Water first identified and recorded 200-500 year rainfall leading to 10,000 year design flows and levels at North Pine Dam in 2011. Design levels of the order of 5,000 year AEP were observed at Callide in 2015, with 200-500 year AEP rainfall. SunWater can confirm that the flow experienced at Callide in 2015 was equivalent to the original Probable Maximum Flood estimate* when the dam was constructed around 1965 showing just how extreme an event this was. It is also comparable with the maximum recorded and observed for extreme events per catchment area in the world using data from the International Association of Hydrological Sciences (IAHS).	The paras in column 3 are incorrect. The hydrology report should emphasise the uncertainty and differences regarding the calculation of annual exceedance probability for this event, depending on recorded rainfall or streamflows or dam storage level increases (inflow volumes). The hydrology report should also cite references to confirm that this was clearly an extreme event and that calculations in the range between a 200 year and 5,000 year return are plausible.
	Section 1.5 Page 16 Last dot point	"Contrary to media reports and early suggestions by SunWater, the flood event is not considered to have a 10,000 year return period. Rainfall observations suggest the return period across the Callide Dam catchment varied between a 200 year and 500 year return period event.	* (As per the 1960's Callide Dam Design (by A. E. Wickham))	
	Section 4.4.2 Page 68 Last paragraph	"The EAP identifies water levels in the dam having exceeded 217.11m ADH as having a 10,000 year return period. ... Based on the maximum rainfall intensity having a 200-500 year return period, it is unlikely the event was a 10,000 year magnitude return period.		

Item No.	Hydrology Report Reference	Statement / Content in Hydrology Report	SunWater Comment	Suggestion
Assessment of the extent to which recommendations of the 2013 review of Callide Dam operations were implemented:				
6	Table Page 115 Item 3	<p>Manual method of controlling the gates: "There have been no changes to the control infrastructure as recommended. This would have affected operations during the February 2015 event, but would not have significantly affected flooding"</p>	<p>This is not true. SunWater's procedures were changed substantially. To simplify operations and reduce the risk associated with gate oscillation the gate operation sequence was limited to only single pair manual operation which is able to eliminate gate "hunting" phenomena. This also enabled full opening of one pair of gates. Previously with all three pairs opened concurrently which was difficult to control and limited the maximum gate opening for manual operation. The flood operations manual were revised to include a transition to automatic procedure.</p>	<p>The statements in column 3 are incorrect and should be amended to acknowledge the work as carried out.</p>
	Table Page 115 Item 4	<p>Modelling of inflows, and the rating curve for the 96km gauging station for high flows. Improvements in instrumentation and modelling: "No improvements to instrumentation and modelling have been implemented. Failure to implement this recommendation resulted reduced warning time to downstream residents."</p>	<p>The rating curve for the 96km gauging station was extended immediately following the 2013 flood event to include higher flows - including survey of the peak 2013 heights, flood slope & cross sections. The flood model spreadsheet was also enhanced in 2013 to include measured rainfall and unit hydrograph techniques. Other activities are also in progress including working with BoM to establish access to rainfall alert station data. Budget has also been identified to establish two rain and one river height station, in addition to the existing network. SunWater is also developing an URBS model for the catchment, however this is currently of limited use without detailed rainfall stations and history of data to support it.</p>	<p>The statements in column 3 are incorrect and should be amended to acknowledge the changes made since 2013.</p>
	Table Page 115 bottom item (not numbered)	<p>"There are also a number of minor recommendations contained within the body of this report." "Little or no progress."</p>	<p>The recommendations related to this item were recommendations for DEWS, not for SunWater.</p>	<p>Responsibility for recommendations should be clarified.</p>
	Recommendations Page 119 Item G1	<p>"Implement recommendations from Review of Callide Dam Gate Operations in the January 2013 Flood Event, where not otherwise noted here."</p>	<p>SunWater has responded to DEWS in February 2015, advising of significant progress or completion of the recommendations that were SunWater's responsibility.</p>	<p>The recommended work as carried out, or in progress or completed, needs to be acknowledged.</p>

SunWater’s Responses to Draft WBM BMT’s Hydrology Report as provided by the Inspector General Emergency Management on 27 May 2015

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Other General Corrections:				
7	Executive Summary, page (ii), Figure 1	Text box in the figure aligned with 22/02/2015 midday timing on the graph, states “Saturday 14:00, Test pump turned off and middle pair of gates closed” Similar references to this figure as included elsewhere in the report.	This should be “Sunday”, not “Saturday”, in accordance with when the gates actually closed.	Correction should be made as noted
8	Section 2.2.5 Page 31, 5 th last dot point	“SunWater has the responsibility for warnings within a 10km radius of the dam, and Council outside this area”	The 10km downstream notification area is measured by distance downstream (creek distance), as it relates to duration of time for flow, and is not measured by radius from the dam. The area applicable is also limited to within a determined inundation area (i.e. by level).	Suggest words be changed to: “SunWater has the responsibility for notifications within a 10km downstream distance from the dam (measured in terms of AMTD along the creek) and Council for warning the entire disaster area.”

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