16

16 Operation of Wivenhoe and Somerset dams

Prior to January 2011, it is unlikely that many in south-east Queensland had a clear understanding of the capabilities of Wivenhoe Dam. The January 2011 flood was the first large flood to test the dam since it was built in 1984. Images of Wivenhoe Dam during the flood, such as that depicted below, will long remain etched in the memories of Queenslanders.

Wivenhoe Dam, January 2011 (Dean Saffron, Fairfax Syndication)

The Commission considered the operation of Wivenhoe, Somerset and North Pine dams in chapter 2 of its interim report. Those three are the only dams in Queensland specifically charged with mitigating floods.

The focus of the Commission in its investigation of the operation of dams for the interim report was on issues that could be resolved before the start of the 2011/2012 wet season as well as those matters of such importance

that they should be commenced, even if they could not be completed, before the next wet season. For example, a principal recommendation for the 2011/2012 wet season was that, should the Bureau of Meteorology predict a wet season of greater or equal severity, the level of Wivenhoe Dam should be lowered to 75 per cent of its full supply level for the duration of the wet season. The Commission also recommended an interim review of the flood mitigation manual by the beginning of the 2011/2012 wet season to resolve uncertainty about the operational procedures contained in it and the basis on which flood engineers should make decisions under the manual.

In January 2012 questions emerged about the evidence that had been given on the operation of Wivenhoe and Somerset dams in January 2011, on which the Commission had based its findings. In particular, questions were asked about whether the operational strategies set out in the flood mitigation manual for Wivenhoe and Somerset dams had been engaged at the correct times. In order to resolve these questions the Commission held an additional 10 days of hearings in February 2012. The Commission's findings arising from these hearings are set out in this chapter.

The interim report also left open two matters relating to dams: the consequences for flooding in Brisbane of the operation of Wivenhoe and Somerset dams in January 2011 and the longer term review of the flood mitigation manuals relevant to Wivenhoe, Somerset and North Pine dams. The Commission obtained modelling in respect of the first question and further evidence was received as part of the additional hearings. The results are dealt with in this chapter. A different aspect of the topic, the effect of dam releases on the riverbanks upstream and downstream of the dams, is dealt with in chapter 17. The longer term review of the flood mitigation manuals and a number of other issues concerning the operation and effect of dams around Queensland are also dealt with in chapter 17.

Before continuing, it should be noted that the Commission was required by its terms of reference to examine the 'implementation of the systems operation plans for dams across the state and in particular the Wivenhoe and Somerset release strategy and [make] an assessment of compliance with, and the suitability of, the operational procedures relating to flood mitigation and dam safety'.[1]

These terms did not allow a consideration of all aspects of dams in Queensland. They confined the Commission's attention to the *operation* of dams across Queensland and the suitability of their operational procedures. Specifically, they did not permit examination of topics such as changes to infrastructure, whether by way of new dams or upgrades to existing ones. In particular, the benefit of raising the wall of Wivenhoe Dam, a topic that was, amongst others, the subject of an expert rapid assessment commissioned by the Queensland Government during 2011,[2] is not an operational matter, and so falls outside the term of reference. No investigation has been conducted by the Commission into that matter. The cracking in Somerset Dam was examined only because its possible effect on the dam's operation was raised in the context of the January 2011 flood event. Those matters did not prompt, nor did the terms of reference otherwise provide for, a general review of dam safety in Queensland.

Consideration of the dam-related topics which are within the Commission's terms of reference should proceed only after certain basic propositions are made clear. First, no dam can guarantee the prevention of flooding in areas downstream of it. All dams have limits to the amount of water they can hold without their structural integrity's being at risk. All have spillways (gated or ungated) to let water out so that their levels do not get too high. Dams of every size will let out water in large floods. Exceptional circumstances aside, all dams do mitigate floods to some extent.

Second, all floods are different. The amount of mitigation provided by a dam will depend on the amount of rain that falls, where it falls and over what period. Wivenhoe Dam, for example, receives water from only half of the Brisbane River catchment; if rain falls downstream of the dam, it can do nothing to mitigate any resulting flood.

Third, dam operators do not have the gift of foresight. A large flood is indistinguishable from a small flood when the first rain falls. Operators' ability to respond to flooding is hindered by the inaccuracy of rainfall forecasts and gauges, river level gauges and modelling. All that can be asked is that they act competently on the best information available to them and report faithfully what they have done.

16.1 Overview

The Interim Report

In its interim report the Commission made a number of findings relating to the operation of Wivenhoe Dam. Section 2.3 dealt with Seqwater's preparedness for floods leading up to the 2010/2011 wet season. Section 2.4 set out a chronology of the consideration by government, in October to December 2010, of lowering the level of Wivenhoe Dam to 75 per cent of its full supply level. Section 2.5 addressed the manual of operational procedures for flood mitigation at Wivenhoe Dam and Somerset Dam (the manual). The manual sets out four strategies for the operation of the dam during a flood. These are known as strategies W1, W2, W3 and W4. The manual and these strategies are discussed further in sections 16.2 and 16.3 below.

Section 2.7 of the interim report contained a chronology of the flood event that occurred at Wivenhoe and Somerset dams in January 2011, including rainfall in the dam catchment, inflow into the dams and the decisions made by the flood engineers. As part of the chronology, the times at which each operational strategy was engaged during the January 2011 flood event were given as follows:

- W1 from the start of the flood event on 6 January to 8.00 am on 8 January
- W3 from 8.00 am on 8 January to 8.00 am on 11 January
- W4 from 8.00 am to 9.00 pm on 11 January
- the draw down of the lake from 9.00 pm on 11 January to 19 January.

In making the findings in respect of when each strategy was used, the Commission relied on the official report of the January 2011 flood event that was published by Seqwater on 2 March 2011 (the March flood event report),[3] and the statements and testimony of the flood engineers who managed Wivenhoe Dam during the flood event. Those engineers gave sworn evidence to the inquiry that the official report was accurate,[4] and gave accounts of their involvement in the flood event consistent with that report. The March flood event report and the flood engineers' testimony gave an account of the flood event that signalled compliance with the manual in respect of the choice of strategy.

Compliance with the manual is not limited to the choice of operational strategies; it encompasses choices as to release rates, use of weather forecasts and streamflow information and drain down times. The Commission identified two areas in which the manual had been breached: the use of rainfall forecasts and the registration of flood engineers with their professional body.

The Commission also relied on the views of a number of experts in hydrology and dam operations that the manual had been complied with.

Seqwater commissioned peer reviews of the operational decisions made during the flood event[5] and provided the Commission with the reports prepared by Emeritus Professor Colin Apelt, Mr Greg Roads and Mr Leonard McDonald.[6] Seqwater provided a report by Mr Brian Shannon with a supplementary submission to the Commission on 4 April 2011. All of these experts concluded that, but for possible minor deviations turning on the manual's interpretation, Wivenhoe Dam was operated in accordance with the manual. None of them raised any concerns about the account of events given in Seqwater's March flood event report.

The Commission asked its independent expert, Mr Mark Babister, to review Seqwater's March flood event report and the reports of the peer reviewers, other than Mr Shannon's report, and to consider whether the releases from the Somerset and Wivenhoe dams were in accordance with the manual.[7] In answering that question, Mr Babister said:

> Three independent reviews found that the dam releases were in accordance with The Manual. Minor deviations were observed that were attributed to ambiguity within The Manual.[8]

Mr Babister did not depart from, or take issue with, the opinions expressed in the three reports he had reviewed.

Reporting by *The Australian* and the reopening of hearings

On 23 January 2012 *The Australian* newspaper published a story about the results of an investigation it had conducted into the strategies used at Wivenhoe Dam in the January 2011 flood.[9] That article pointed to documents produced by the flood engineers and others in January 2011 that suggested that the transition to strategy W3 had not occurred at 8.00 am on 8 January 2011, as recorded in Seqwater's March flood event report and the Commission's interim report.

The Commission conducted an initial review of the material identified by *The Australian* and other contemporaneous records of strategy choices. The Commission required Seqwater, the dam operator, and SunWater, which was contracted to run the flood operations centre at the time of the January 2011 flood event, to produce any documents they had in their possession that proved that W3 had been engaged at 8.00 am on 8 January. Neither possessed any such documents beyond those already provided to the Commission prior to its interim report.

The Commission received and reviewed a large number of additional documents received from parties in response to requirements to provide information. Among other materials, the Commission received copies of the flood engineers' personal emails, backups of electronic records held on the flood operations centre's server and the hard copy materials sent to the expert peer reviewers.

The results of the Commission's review of materials, and the lack of any definitive contemporaneous record of strategy choice, suggested that there was sufficient cause to reopen public hearings in order to obtain sworn evidence from those who were involved in the operation of Wivenhoe Dam in January 2011 and in the preparation of records of those decisions. In order to allow time for these additional hearings, the deadline for the delivery of the Commission's final report was extended from 24 February 2012 to 16 March 2012.[10] The Commission held ten days of additional public hearings from 2 to 11 February 2012. As with all other parts of the Commission's investigations, work to gather relevant evidence was also conducted outside the public hearings.

The issues and their resolution

The Commission's focus in this final phase of hearings was narrow compared to the wide range of topics considered previously. In general terms, it sought to resolve six questions:

- Which operational strategies were engaged at Wivenhoe Dam during the January 2011 floods and when were these strategies engaged?
- Did the engagement of operational strategies at Wivenhoe Dam during the January 2011 floods comply with the manual?
- Was the account given in Seqwater's March flood event report of the choice and timing of operational strategies used at Wivenhoe Dam during the January 2011 floods accurate?
- If the account given in the March flood event report was not accurate:
  - why was it not accurate?
  - who was responsible for it being inaccurate?
  - who in Seqwater knew, or should have known, of the inaccuracy?
  - who in government knew, or should have known, of the inaccuracy?
- If the engagement of operational strategies at Wivenhoe Dam during the January 2011 floods did not comply with the manual, and/or if the March flood event report was not accurate, why was this not identified by the expert peer reviewers?
- If the engagement of operational strategies at Wivenhoe Dam during the January 2011 floods did not comply with the manual, was that non-compliance consequential?

In the public hearings the Commission heard oral evidence from 27 witnesses:

- the four flood engineers and eight flood officers who had been on duty during the January 2011 flood event
- four other Seqwater employees, including senior managers with responsibility for the operation of Wivenhoe Dam and the preparation of the March flood event report
- three state government officials, including the then responsible Minister and the Director, Dam Safety, who holds responsibility for reviewing the March flood event report
- two senior managers from the South East Queensland Water Grid Manager
- the four expert peer reviewers engaged by Seqwater and another expert who prepared a report on Wivenhoe Dam operations during the flood event
- the Commission's independent expert Mr Babister.

This chapter sets out the results of the Commission's investigation in this final part of its work. These issues have now been comprehensively ventilated, albeit in a short period of time. Generally, unless otherwise stated, the Commission has made findings of fact on the balance of probabilities. It has made its ultimate adverse findings only where satisfied that the evidence, taken as a whole, does not reasonably allow of any other conclusion.

The Commission's interim report contained, in section 2.6, comment which reflected favourably on the flood engineers, and in section 2.7, a summary of dam operations at Wivenhoe and Somerset dams in January 2011 which included a chronology of the strategies used during the flood event. (This chronology was derived from the March flood event report.) Any opinion expressed in section 2.6 of the interim report must now be qualified by reference to the conclusions contained in this chapter and the result of any further investigations. It also follows, from conclusions drawn in this report, that regard can no longer be had to section 2.7 of the interim report as a source of information about the deployment of strategies.

Consideration was given to written submissions made by some of the parties[11] that any adverse findings about the conduct of the flood engineers, and recommendations in that regard, should be delivered in a confidential annexure. It was contended that to do otherwise would affect their reputations, and possibly the safety of them and their families, and that adverse publicity could prejudice any subsequent criminal proceedings.[12]

There is force to the submission so far as the effect on reputation is concerned, but, on balance, and in a context in which the allegations have been ventilated in a public hearing, the Commission considers that the concern for protection of reputation is outweighed by the public interest in open resolution of issues concerning the operation of the dam. There is also the consideration that the Commission has not made the same findings against Mr Ruffini. Fairness to him dictates that that fact should be made public; but to do so must inevitably produce by inference the conclusion that findings have been made adverse to the remaining engineers, so that there is little point in suppression of them.

There is no evidence of a risk to the safety of the engineers or their families. The risk of prejudice in subsequent criminal proceedings, should they in fact occur, is no greater than that likely from committal proceedings in any high profile case; that argument is not a compelling one.

It is important to note that this Commission was never intended as a means of conducting forensic investigations into whether all those connected with the response to the December 2010/January 2011 flood were telling the truth and had given consistent accounts of their actions. This chapter of the report, which sets out the results of such a forensic exercise, is exceptional. Issues aside from those listed above have not, generally, been examined with the same scrutiny. To do so would have made it impossible for the Commission to adequately address all aspects of its terms of reference given the resources and time available to it. However, once raised, the issue of whether those connected with the operation of the dam were telling the truth had to be resolved; it was fundamental to how the response to the January 2011 flood was managed.

Individuals named in this chapter

This chapter records the Commission's findings about the decision-making, knowledge and interactions of a number of individuals. The individuals named in this chapter are listed below, with descriptions of their roles at the time of the floods.

Flood Engineers

Robert (Rob) Ayre	Senior Flood Operations Engineer
Terrence (Terry) Malone	Flood Operations Engineer
John Ruffini	Senior Flood Operations Engineer
John Tibaldi	Flood Operations Engineer

Flood Officers

Neville Ablitt	Data Collector / Flood Officer
Kim Hang	Data Collector / Flood Officer
Albert Navruk	Data Collector / Flood Officer
David Pokarier	Data Collector / Flood Officer
Richard (Bill) Stephens	Data Collector / Flood Officer
Mark Tan	Data Collector / Flood Officer
Petrus Gerhardus Louw Van Blerk	Data Collector / Flood Officer
John West	Data Collector / Flood Officer

South East Queensland Water Grid Manager

Barry Dennien	Chief Executive Officer
Daniel Spiller	Director of Operations; Acting Chief Executive Officer 25 December 2010 to 8 January 2011

Dam experts	
Colin Apelt	Emeritus Professor and Honorary Research Consultant, Department of Civil Engineering, University of Queensland, appointed by Seqwater to peer review the March flood event report
Mark Babister	Flood hydrologist; Director, WMA Water; independent expert appointed by the Commission
Brian Cooper	Dam engineer, appointed by the South East Queensland Water Grid Manager to prepare a report on the operation of Wivenhoe Dam
Leonard McDonald	Dam safety and risk consultant; appointed by Seqwater to peer review the March flood event report
Gregory (Greg) Roads	Director/Principal Engineer, WRM Water & Environment; appointed by Seqwater to peer review the March flood event report
Brian Shannon	Retired civil engineer, former chairman Australian National Committee on Large Dams; appointed by Seqwater to peer review the March flood event report
The Premier, the Minister and their Directors-General	
The Hon. Anna Bligh MP	Premier of Queensland
Kenneth (Ken) Smith	Director-General, Department of the Premier and Cabinet
The Hon. Stephen Robertson MP	Minister for Natural Resources, Mines and Energy
John Bradley	Director-General, DERM
James (Jim) Reeves	Director-General, DERM (from 29 August 2011 only)
Debra-Lee (Debbie) Best	Deputy Director-General, DERM; Acting Director-General, DERM, 25 December 2010 to 10 January 2011
Terrence (Terry) Wall	Associate Director-General, DERM; Acting Director-General, DERM, 10 to 11 January 2011
DERM	
Peter Allen	Director, Dam Safety
Robert (Bob) Reilly	General Manager, Office of the Water Supply Regulator
Other Seqwater personnel	
Peter Borrows	Chief Executive Officer
Robert (Rob) Drury	Dam Operations Manager
Chloe De Marchi (nee Cross)	Dam Safety and Emergency Response Support Officer
James (Jim) Pruss	Executive General Manager of Water Delivery

16.2 The flood mitigation manual for Wivenhoe Dam and Somerset Dam

The operation of Wivenhoe and Somerset dams during floods (that is, when the level of either dam rises above its full supply level) is governed by a flood mitigation manual.

At the time of the January 2011 flood event, the relevant manual was Revision 7 of the Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam.[13] It was a 'flood mitigation manual' pursuant to Chapter 4 Part 2 of the *Water Supply (Safety and Reliability) Act 2008*, requiring approval by the chief executive of the Department of Environment and Resource Management.[14] Revision 7 was approved in November 2009; since the January 2011 floods it has been superseded by Revision 8 and Revision 9.[15]

The manual's purpose is to prescribe procedures for the operation of the dams, to reduce, so far as practicable, the effects of flooding associated with the dams.[16] This purpose is to be achieved 'by the proper control and regulation in time of the flood release infrastructure at the dams, with due regard to the safety of the dam structures'.[17] The manual explains that the prime purpose of incorporating flood mitigation measures into the dams is to reduce flooding in the urban areas of the floodplains below Wivenhoe Dam.[18]

To achieve that purpose, the manual sets out 'strategies' for use during flood events at the dam. A flood event occurs when the level of either Wivenhoe Dam or Somerset Dam is expected to rise above the dam's full supply level. The manual contains four strategies for use at Wivenhoe Dam (W1, W2, W3 and W4) and three strategies for use at Somerset Dam (S1, S2 and S3). The manual provides for flood engineers in a flood operations centre to operate the dams in accordance with the manual during flood events. It sets out how the flood engineers should decide which strategy they should operate the dams in at any time, and how much water to release. The manual includes details of what gate openings should be made if communications between the dam and the flood operations centre are cut. For a more detailed description of the manual, see section *2.5.1 Structure of the Wivenhoe manual* in the Commission's interim report.

The manual states that it must be used for the operation of the dam, but there is no legislative requirement to that effect.[19] However, section 374 of the *Water Supply (Safety and Reliability) Act* confers on Wivenhoe Dam's operators protection from civil liability for acts and omissions done or made honestly and without negligence in observing the operational procedures in the manual. Given its significant legal effect, the manual cannot be regarded simply as a set of technical instructions.

16.3 The manual requires a choice of strategy

Counsel for Mr Ayre and SunWater,[20] Seqwater[21] and Mr Tibaldi[22] advanced an argument that as a matter of legal interpretation, the flood mitigation manual did not require a conscious choice of strategy in the operation of the dam in the January 2011 event at any stage between the application of strategy of W1 through to the point at which W3 became applicable by virtue of the lake level. The only circumstances in which choice was required were where there was a decision to invoke a strategy on a predicted lake level, or where the lake level was at 68.5 metres and the releases from Wivenhoe Dam were less than the natural peak flow rates at Moggill and Lowood, in which case the flood engineer could choose to move to W3 and out of W2 by increasing releases from Wivenhoe above the peak rate. The move to W3 at 8.00 am on 8 January was automatic by reason of the lake height having reached 68.5 metres and the flows from the dam exceeding the natural peaks at Moggill and Lowood. No decision was required. On that view, it was, then, proper to look later at what had occurred and apply the appropriate strategy label to it; as Mr Tibaldi had done in his preparation of the March flood event report.

Counsel for Mr Malone[23] did not make a similar contention, instead submitting that there had in fact been a conscious engagement of strategy W3 at 8.00 am on 8 January. Counsel for the State[24] said that the determination of strategy as between W2 and W3 occurred 'almost automatically'. That submission went on, however, after noting considerations Mr Ruffini had detailed in his evidence, to observe that the decision as between strategies 'required some thought', and indeed more, a decision not to drastically reduce discharges as W2 required, thus extending the drain down time.

An analysis of the manual leads to two conclusions: firstly, that the flood engineers must consciously choose or adopt the strategies (W1, W2, W3 or W4) under which Wivenhoe Dam operates; and, secondly, that the engineer on duty at any point during the flood event must recognise the strategy under which he is acting in the operation of the dam.

16.3.1 Objectives and procedures

The preface of the manual explains the significance of the procedures it contains:

> Given their potential significant impact on downstream populations, it is imperative that Wivenhoe and Somerset Dams be operated during flood events in accordance with clearly defined procedures to minimise impacts to life and property.[25]

Section 1.7 describes the manual as containing the operational procedures for Wivenhoe and Somerset dams and requires that it be used for the operation of the dams during flood events.[26]

The preface also makes clear the primary objectives of the procedures. They are, in order of importance, to:

- Ensure the structural safety of the dams
- Provide optimum protection of urbanised areas from inundation
- Minimise disruption to rural life in the valleys of the Brisbane and Stanley Rivers
- Retain the storage at Full Supply Level at the conclusion of the Flood Event
- Minimise impacts to riparian flora and fauna during the drain down phase of the Flood Event.[27]

These objectives are repeated later in the manual, under the heading General.[28]

Merely having regard to the 'objectives' when operating the dam will not amount to compliance: the manual contemplates that the 'objectives' and 'procedures' are different things. So, for example, section 5.2 Operation provides:

> The Senior Flood Operations and Flood Operations Engineers use the RTFM [Real Time Flood Model] for flood monitoring and forecasting during flood events to operate the dams in accordance with this Manual. This is done by optimising releases of water from the dams to minimise the impacts of flooding in accordance with the *objectives* ***and*** *procedures* contained in this Manual.[29]
>
> (emphasis added)

16.3.2 The role of the flood engineers

Section 2.2 of the manual requires the designation of a Senior Flood Operations Engineer to be in charge of Flood Operations at all times during a Flood Event. Release of water at the dams during Flood Events is, according to section 2.2, 'carried out under the direction of the Duty Flood Operations Engineer'.

Section 2.3 provides that the responsibilities of the Senior Flood Operations Engineer when rostered on duty during a Flood Event are to:

- Set the overall strategy for management of the Flood Event in accordance with the objectives of this Manual.
- Provide instructions to site staff to make releases of water from the Dams during Flood Events that are in accordance with this Manual.
- Apply reasonable discretion in managing a Flood Event as described in Section 2.8.[30]

Mr Ayre was the Senior Flood Operations Engineer during the January 2011 flood event.

Section 2.4 requires that flood operations engineers:

- Direct the operation of the dams during a flood event in accordance with the general strategy determined by the Senior Flood Operations Engineer.
- Follow any direction from the Senior Flood Operations Engineer in relation to applying reasonable discretion in managing a Flood Event as described in Section 2.8. Unless otherwise directed, a Flood Operations Engineer is to follow this Manual in managing Flood Events and is not to apply reasonable discretion unless directed by the Senior Flood Operations Engineer or the Chief Executive.
- Provide instructions to site staff to make releases of water from the Dams during Flood Events that are in accordance with this Manual.[31]

To understand what is meant by the capacity of the Senior Flood Operations Engineer to 'apply reasonable discretion' and the requirement that Flood Operations Engineers follow the manual unless otherwise directed by the Senior Flood Operations Engineer, it is necessary to turn to section 2.8 of the manual. It vests a discretion in the senior flood engineer to depart from the manual, but a precondition is that he hold the opinion that it is necessary to depart from the procedures. This implies a requirement for the senior flood engineer to have turned his mind to the procedures in the manual: that is, to have consciously considered the strategies provided for in the manual and to have rejected them as being appropriate to meet the flood mitigation objectives in the circumstances. Meanwhile, the flood engineers must follow the manual (that is to say, apply its procedures) unless otherwise directed.

16.3.3 Selection of flood operations strategies

Section 8.4 Flood Operations Strategies says:

> There are four strategies (W1 to W4) **used when operating Wivenhoe Dam during a flood event as outlined below. These strategies are based on the Flood Objectives of this manual**.
>
> (emphasis added)

The language of 'use' is, self-evidently, inconsistent with the notion that the strategies are merely a form of labelling which can take place after the event. And it is difficult to see how something which was no more than a characterisation of actions and conditions after they have taken place could seriously be called a 'strategy'. The word itself implies the adoption and use of a set of tactics.

Section 8.4 then repeats the objectives set out above. The section goes on to state:

> **Within any strategy**, consideration is always given to these objectives in this order, when making decisions on dam releases.
>
> (emphasis added)

To give consideration to the objectives 'within a strategy' clearly requires a conscious recognition that the strategy has been invoked.

The concept of making decisions 'within' a strategy recurs later in 8.4:

> When determining dam outflows **within all strategies**, peak outflow should generally not exceed peak inflow.
>
> (emphasis added)

Section 8.4 explicitly uses the language of choice:

> The strategy **chosen** at any point in time will depend on the actual levels in the dams and the following predictions, which are to be made using the best forecast rainfall and stream flow information available at the time:
>
> Maximum storage levels in Wivenhoe and Somerset Dams.
>
> Peak flow rate at the Lowood Gauge (excluding Wivenhoe Dam releases).
>
> Peak flow rate at the Moggill Gauge (excluding Wivenhoe Dam releases).
>
> (emphasis added)

It is plain that that process of choice must admit of more than one possible result. As the flood engineers were at pains to point out when they gave evidence in April 2011,[32] the weight to be given to any rainfall forecast was a matter for their determination and, it follows, could produce varying outcomes. The allowance for prediction in the choice of strategy inevitably introduces an element of subjective judgment.

The section goes on to consider when strategies must be altered:

> 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 maximise the flood mitigation benefits of the dams.
>
> (emphasis added)

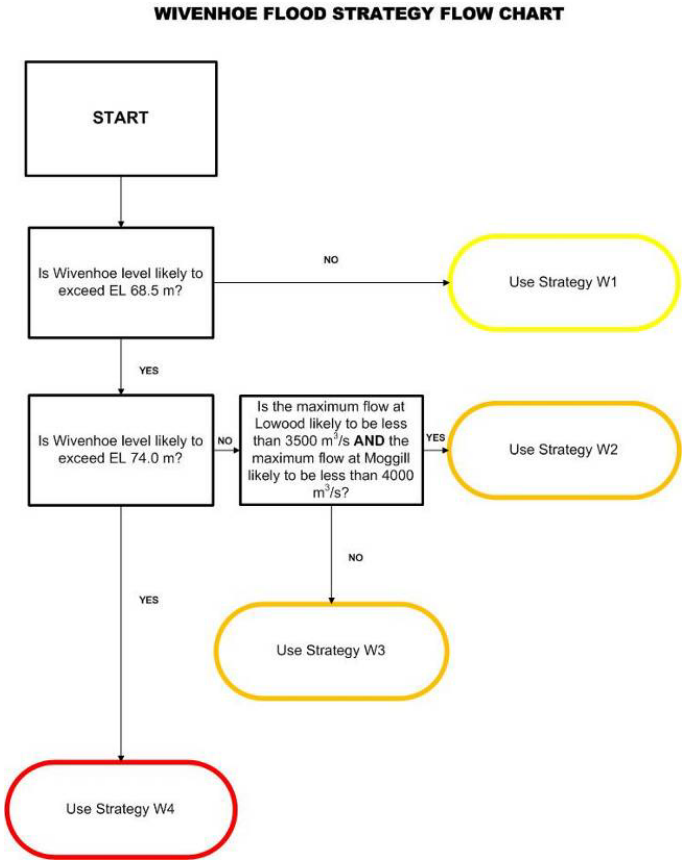
Again, the terms used are those of active choice: strategies do not simply change by reference to events, they are to be changed. This is the language of conscious decision making. Choice (and change to that choice) is to be made by taking into account rainfall forecasts, flow conditions and the aim of maximising the dams' flood mitigation capacities.

Section 8.4 demonstrates how contemporaneous selection of a strategy is to be undertaken. It sets out a flow chart 'showing how best to select the appropriate strategy to use at any point in time'.[33]

The flow chart is a 'decision tree', again requiring actual selection of strategy depending on the circumstances which are operating at any point in time. For example, if Wivenhoe Dam is not likely to exceed 68.5 metres, it requires 'use' of strategy 1; if it is likely to exceed 68.5, it requires further decision making down the tree.

The flow chart appears below.[34]

Figure 16(a)



Mr Tibaldi's evidence on 15 April 2011 was helpful in explaining just how the flowchart (which he designed) is to be used:

> The flowchart is on page 23 and the sentence prior to the flowchart says: 'A flowchart showing how best to select the appropriate strategy', so previously we have got all our information together, now we're coming to the stage where we're going to select the appropriate strategy – 'a flowchart showing how to best select the appropriate strategy to use at any point in time is shown below.' So once you've got all your information together, now you have got to select your strategy, now you go to the flowchart. You will notice in the flowchart that forecast is not mentioned at all, but the engineer that has to choose the strategy has to make an engineering judgment or a judgment about what is likely. He is asked essentially two questions about what is likely. The first question is about the likely level in Wivenhoe Dam. Again, he has got to make a judgment on what is likely. He can assign whatever weight his judgment feels worthy in terms of the forecasts. Now, as I said, generally given the great uncertainties in the QPF [quantitative precipitation forecasts] as provided by BOM, no weight is provided to those forecasts. However, as I said, there are three circumstances under which you may provide – assign some weight to those forecasts.[35]

(Mr Tibaldi went on to explain the circumstances under which forecasts could be given weight. He did not return to the second question of likelihood about which the engineer had to make a judgement, but it seems probable in context that he was referring to the maximum flow at Moggill and Lowood; the flow chart requires an assessment of likely flows at both points.)

Even without the benefit of Mr Tibaldi's explanation, the language of the flow chart is clear in directing the user to actually turn his or her mind to which is the appropriate strategy. It is not designed for after-the-event labelling.

The manual continues by identifying the strategies and the conditions for their use, which include the 'primary consideration' for each. The primary considerations coincide with the objectives set out earlier. Strategy W1 applies

when the lake level is predicted to be below 68.5 metres AHD, the maximum release is predicted to be less than 1900 m^3/s, and the primary consideration is minimising disruption to downstream rural life.[36] As with other strategies, it can be seen that there are elements of prediction requiring the exercise of judgment.

The manual goes on to deal with the sub-strategies (W1A – W1E) and sets out what the flood engineer operating the dam must do under each. Generally, it says, those 'strategies require a great deal of control over releases and knowledge of discharges from Lockyer Creek'. It seems obvious that an engineer who does not know in which of those strategies he is operating the dam cannot know what is required of him.

The manual requires that if the level of Wivenhoe Dam reaches EL 68.5 metres, the engineer must 'switch' to W2 or W3 as appropriate.[37] The word 'switch' is active, connoting contemporaneous thought, decision and action.

W2 is a 'transition strategy' in which 'the primary consideration changes from Minimising Impact to Downstream Rural Life to Protecting Urban Areas from Inundation'.[38] Again, the conditions under which W2 can be invoked involve elements of prediction: that the lake level is predicted to be between 68.5 and 74 metres, and that the maximum release is predicted to be less than 3500 m^3/s. The manual elaborates: '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 (3500 m^3/s)'; the combined peak river flows should not exceed those shown in a table. The table sets out the 'target maximum flow in the Brisbane River': at Lowood, it is to be the lesser of the natural peak flow without the dam releases and 3500 m^3/s, while at Moggill it is to be the lesser of the natural peak flow without the dam releases and 4000 m^3/s.

The manual sets out the conditions in which W3 is engaged: as for W2, the lake level is predicted to be between 68.5 and 74 metres; but in this instance, the maximum release should not exceed 4000 m^3/s. The primary consideration is protecting urban areas from inundation.[39] Again, the manual explains the intent of the strategy, which is: 'to limit the flow in the Brisbane River at Moggill to less than 4000 m^3/s, noting that 4000 m^3/s at Moggill is the upper limit of non-damaging floods downstream'.

16.3.4 Move to strategy W3 mandated by the manual

As previously indicated, it was contended by some, but not all, counsel for the parties, that strategy W2 became inapplicable immediately and automatically when releases from Wivenhoe Dam exceeded the projected natural peak flow at Lowood or Moggill; as was the case at 8.00 am on 8 January. Counsel for Seqwater[40] pointed out that that was the effect of the evidence of the flood engineers, three of the four experts engaged for peer review of the March flood event report, and Mr Babister, the hydrologist engaged to perform modelling for the Commission.

Mr Tibaldi explained that the rationale for strategies W2 and W3 was to accommodate where the rain fell; if it was in the Lockyer and Bremer catchments, the W2 strategy would prevail, because the flows from those waterways would be setting most of the peak flow, and would potentially dictate the highest peak in the river 'so that's what you want to try and get under'.[41] There were 'targets about what you're trying to set as the flow in the river'.[42] The aim then would be to hold back water in the dam. If on the other hand, the rain was falling above the dam, the tributary flow would be less important.[43] If, as he had originally thought, the flowchart required a move to W2 before W3, it would have been necessary on 8 January to drop releases from Wivenhoe Dam back to something in the order of 100 m^3/s; that had plainly not occurred.[44] It was not appropriate to switch to W2, because the conditions of the strategy set out in the manual could not be met. The flow in the river already exceeded the estimated peak flows downstream at Lowood and Moggill.[45]

Mr Ayre described the choice between W2 and W3 in his seventh statement:

> The selection of the release rate is what will determine whether you're in Strategy W2 or W3. If you pick a release rate which is less than the naturally occurring flow at Lowood, then you're adopting a W2 strategy. If you pick a release rate that is higher than that, then you are choosing W3.[46]

This was consistent with a more general statement he made in the course of his evidence that while on duty during the flood event, the flood engineers used release rates to choose strategy (rather than vice versa).[47]

On Mr Ayre's account, the conscious decision to move to W3 had been made at 5.00 am on the morning of 8 January, when Mr Ruffini issued a gate directive which would produce the second of those results.[48] That meant that when the lake reached 68.5 metres he, Mr Ayre, had no choice as between W2 and W3, because the releases already exceeded the expected downstream peaks.[49]

More generally, Mr Ayre said that the selection of one of those strategies rather than the other depended on the 'overall objective of the event': if it were to optimise protection against downstream flooding, W3 would be considered; but if the engineer wanted to minimise disruption to rural life, strategy W2 or W1 would be selected, depending on the lake level.[50]

Mr Malone adopted the suggestion put to him that no conscious decision is made by a flood engineer to go to W2 at all; whether W2 applied was dictated by the lake level and the fact that the release rates from Wivenhoe Dam were greater than the anticipated natural peak flow rates at Lowood and Moggill.[51]

Mr Ruffini agreed with the proposition that on an examination of the figures for downstream flows and Wivenhoe Dam releases it would have been obvious without further calculation that strategy W2 was 'unavailable' when the lake level reached 68.5 metres.[52] He elaborated, however: the ramping down of flows which a move to W2 would entail would make a seven day drawdown impossible, so the strategy was not viable; although if rain upstream of Wivenhoe Dam stopped, a longer drawdown might be worthwhile. It was undesirable to reduce the rate at which Wivenhoe Dam was releasing once some of the bridges were already affected, because bringing them in and out of operation had safety implications, and it was also undesirable to move release rates up and down because of the effect on riverbanks. There were other practical reasons for not wanting to 'jump into that space'. Importantly, he recognised that it was necessary to think about the situation and the attendant problems.[53] He would make the assessment as to whether to move into W2 or W3 by reference to his operational spreadsheet; it would not take very long.[54]

Professor Apelt's view was that the W2 strategy was 'simply unavailable' because the releases at Wivenhoe Dam exceeded the predicted naturally occurring peaks at Moggill; the choice as between W2 and W3 was made for the engineers by the prevailing circumstances, and the manual required them to use W3 from the time when the lake level crossed 68.5 metres for the conditions they were dealing with.[55]

Mr Roads found the application of W2 confusing; its application was 'clarified' for him by a discussion with Mr Tibaldi in which the latter had told him that because the dam was already 'discharging at a rate that was higher than the naturally-occurring flow… at Lowood excluding Wivenhoe… W2 was somewhat redundant'.[56] There was, however, scope to reduce releases to below the projected naturally occurring peak.[57] The lake level indicated that the engineers were 'in W2 or W3 by going into that water level'; what release strategy they then had depended on the situation.[58] Mr Roads agreed with the proposition that W2 was 'just not available' because the releases from Wivenhoe Dam were greater than the predicted naturally occurring peaks at Lowood and Moggill[59] but also agreed that it was not automatic that W2 could not be contemplated simply because the flows from Wivenhoe Dam currently exceeded those peaks; those flows could be adjusted to accord with W2. The decision could be made almost immediately to reduce flows to get back into W2; but he accepted that in the interim the dam would be operated in W3.[60]

Mr Shannon did not seem consistently to subscribe to the view that W2 was automatically inapplicable when Wivenhoe Dam releases exceeded the Moggill and Lowood peaks, although he made it clear that he regarded it as practically not relevant in the circumstances of the day. It was applicable in circumstances where the major flows were coming from Lockyer Creek and the Bremer River, as opposed to the Wivenhoe Dam catchment.[61] It was suggested to him that it was understandable that where the major rainfall was in the Wivenhoe Dam catchment that a flood engineer would naturally think of W3 and would not have regard to W2. He responded:

> Oh well, the manual dictates that he must, sort of thing, but as I say in the report it is entirely predictable on average that W2 won't be relevant. So it's not that he wouldn't be mindful of W2 but it is predictable that W2 won't be relevant in the circumstances, there will be a direct move from W1 to W3.[62]

Mr Shannon did not adopt the questioner's suggestion that an experienced engineer would, given where the rainfall was occurring and the modest flows from the Lockyer and Bremer, appreciate that it was a W3 event without needing to go through the mental process of considering the application of W2. His answer suggested he thought there was more to it than that:

> It might suggest to him, but, I mean, in these circumstances I was - given the disasters that had happened around the Scenic Rim and over the Rim, I suppose, in Toowoomba, it was only when I went back and looked at the detailed data that I realised that the flows coming down Lockyer weren't as big as I might have anticipated, and so while in the generality I might accept what you are saying, based on general reports that

> I had picked up I might have thought that there was a bigger flow coming down Lockyer, in which case the flood engineers would have had to have been aware of that and --[63]

On further questioning, Mr Shannon agreed that it could be concluded that W2 was 'simply physically unavailable' once the lake level crossed 68.5 metres because the anticipated naturally occurring peaks at Lowood and Moggill were significantly lower than the releases from Wivenhoe Dam. A flood engineer with the relevant model results could see that immediately, and would know from a comparison of the Wivenhoe Dam releases with the downstream flows that the major rainfall event was happening in the Wivenhoe Dam catchment, making references to W2 'fanciful'.[64]

Mr Babister accepted the proposition put to him that if the releases from Wivenhoe Dam were above the maximum permissible releases available under W2, W2 would not be an option.[65] Mr McDonald (to whom that proposition was not put) took rather a different view. He regarded the flow chart as saying that the engineers should go to W2, but they had bypassed it for the reason given in the March flood event report. He thought W2 would have been an appropriate strategy in the conditions.[66]

As the answers of Mr Ruffini and Mr Shannon illustrate, the witnesses may not have appreciated the distinction between the W2 strategy's being 'unavailable' (with its connotation of an automatic result) and its not being 'appropriate' (the manual's word) in the circumstances of the day.

The premise underlying the questioning and the submissions, that the use of W2 was precluded once the flows from Wivenhoe Dam exceeded the projected naturally occurring peaks at Lowood and Moggill, is doubtful. Section 8.4 of the manual prescribes the limiting of the Brisbane River flow to less than naturally occurring peaks as a 'target' or 'intent'. It does not render W2 'unavailable' if the flows from Wivenhoe Dam are already above that point.

It would be odd if the manual did have that effect, because it would mean that the adoption of a strategy which might be entirely appropriate given the outlook for conditions in the Lockyer and Bremer catchments would be excluded by the circumstance that the existing dam flows exceeded, however marginally, the conjectured peaks downstream. On Seqwater's argument,[67] though, the flood engineer in that instance could scale down releases until he reached the point at which W2 was said to be available, and would in the interval be operating the dam in strategy W3. The construction argued for, that an engineer in those circumstances would be operating the dam in strategy W3, although all his actions were taken according to the objectives of W2, is, to say the least, artificial.

In effect what was argued was Mr Ayre's proposition: that release rates determine the strategy as opposed to the strategy determining the release rates. It is untenable. Section 8.4 of the manual makes it clear that decisions as to release rates are made within the governing strategy, not the other way round.[68] A high release rate from Wivenhoe Dam may be an indication that strategy W2 has not been in fact adopted; it may be a factor in deciding that it should not be; but the mere fact that at the time when the lake level reaches 68.5 metres it exceeds the projected natural downstream peaks does not preclude the strategy's adoption. That feature does not absolve the engineer of choice, when the lake level reaches 68.5 metres or as conditions change, whether to proceed by limiting dam releases in accordance with the intent of W2 or to proceed with releases under W3. The manual does not, as was contended, dictate the result; what is needed is an assessment of conditions – the catchments in which rainfall is expected, the likely inflows into Wivenhoe Dam, current release rates, and expected downstream peaks – against the manual to decide which strategy should be adopted.

Even if that view of the manual be wrong, and W2 was, as was contended, 'unavailable' purely by reason of the Wivenhoe Dam releases exceeding the anticipated downstream peaks, it remains the case that the engineer on duty had to reach that conclusion. The manual requires that the operator 'switch' to whichever of W2 or W3 is appropriate. The decision as to appropriateness might have been one which could be readily and swiftly made on the information available at 8.00 am on 8 January, but it was a decision nonetheless. It cannot be accepted that the manual dictated, and that there was, an automatic move from W1 to W3, requiring no conscious adoption of the latter strategy.

It is worth mentioning the approach of Seqwater as reflected in its 4 April 2011 supplementary submission to the Commission, when it sought to deal with a criticism made by Mr McDonald of its failure to implement strategy W2. This was said:

> As explained in the Wivenhoe Flood Report, Strategy W2 was bypassed early in the event because it was not possible to limit the flow in the Brisbane River to less than the naturally occurring peaks at Lowood and

> Moggill…. There was no failure to comply with the Wivenhoe Manual because the requirements of Strategy W2 could not be fulfilled at the relevant time, so the appropriate course was to invoke Strategy W3, which is what Seqwater did.

That language of bypassing W2 and invoking strategy W3 seems to contemplate an active approach and choice between the strategies.

The combined effect of:

a. the language of the manual, which is that of choice and use of a strategy, not of retrospective labelling

and

b. the prescription in section 8.4 that the strategy chosen is to depend on:
   i. the actual levels in the dams and
   ii. predictions of their maximum storage levels and peak flow rates at Lowood and Moggill (excluding dam releases), which are to be made using the best forecast rainfall and stream flow information available at the time

and

c. the flowchart, which directs choice of strategy

and

d. the conditions for application of each of the strategies, which in each case involve prediction of the lake level, and for W1 and W2 of the likely maximum release rate

and

e. the need for a decision as to which of W2 and W3 is the appropriate strategy to which to 'switch'

is to make it clear that what is needed is the flood engineer's application of contemporary judgment to both the existing conditions (so far as the dam level and inflows and outflows are concerned) and their likely evolution (including the results of likely rainfall). A flood engineer cannot sit back and let the strategy be dictated by the lake level. For each strategy there is a point at which the actual lake level requires its application; but waiting for that point to be reached before the relevant strategy is brought into play in itself entails a decision not to act earlier, on the predicted lake level. And when the lake level reaches 68.5 metres, the flood engineer must consider which of strategies W2 and W3 is appropriate and take action accordingly to meet the intent of the strategy chosen. A failure to do so constitutes a breach of the manual.

16.3.5 Does the manual require that an engineer be conscious of the strategy in which he is operating?

It is not merely a question of how the transition takes place; there is the further question of whether the manual requires that an engineer recognise which strategy is in place at any given time during the period for which he is responsible for operating the dam.

Advancing the contrary view, Seqwater[69] placed reliance on evidence from three of the peer reviewers; oddly, perhaps, given its counsels' acceptance in their closing submissions that construction of the manual was a matter of legal interpretation.[70]

Professor Apelt said that in his review of the March flood event report, he had been concerned with the substance of what the flood engineers did in determining whether it was consistent with a strategy. He considered it sufficient for the flood engineers to have a clear understanding of what they were required to do; it was not for him 'the essence', he said, that the strategy be identified by the engineer's thinking '"This is W3" or whatever...'[71]

Mr Roads said both that it was necessary for a flood engineer to be aware of the strategy in which he was operating the dam[72] and that what mattered was 'not what label they give it, it is what they actually released and whether those releases were in compliance with the manual'.[73] In regard to the latter, he said, he 'took the manual quite literally in that sense, and in the question that [he] was asked to do'.[74]

Mr Shannon accepted that a reading of the manual would require that a flood engineer appreciated what strategy he was operating the dam under,[75] but also said that so long as the engineer knew what the requirements were in

the circumstances, he 'wouldn't be too concerned' whether it was 'in the front of his mind to put the label of the strategy on it'.[76] He would, however, 'expect them to know exactly when they needed to consider varying their operating strategy according to the lake levels which is the primary requirement of the manual'; the heading of the requirement could be looked up to ascertain which strategy it fell under.[77] Asked whether his opinion was that the key thing for the engineers to have in mind was the criteria to be achieved under W3, rather than consciously putting a label on the strategy they were applying, he said that he 'didn't mean to imply that they would disregard it'. Rather, he expected that it would be inculcated in the engineers 'what the conditions were that accorded with the different strategies'.[78]

The fourth of the reviewers, Mr McDonald, expressed his view more succinctly: 'If you want to comply with the manual, you need to be conscious of what strategy you are in' at all times during the dam's operation.[79] To learn that the March flood event report was a reconstruction of how the dam was operated would likely have changed his opinion as to compliance; the objectives varied according to the strategy, and the engineer needed the requisite mindset in operating the dam. It might not change the releases actually made, but regard had to be had to the objectives for the strategy.[80]

It can be seen that the views of those experts were far from cohesive. Their evidence, it should be recognised, was given in the context of each having, a year previously and at some speed, reviewed a version of the March flood event report and found it accorded with the requirements of the manual. Nothing suggested that any had recently studied the manual or considered the issue now raised. In the circumstances and given the variations as between them, and in the case of Mr Shannon and Mr Roads, in the course of their evidence, their views were not particularly helpful.

The suggestion that it is enough for an engineer to act in accordance with a strategy without adverting to it is not logical. To know what objectives he must aim at and what he must do by way of compliance with the manual, he must know under what strategy he is acting. It follows inevitably from the strictures of each strategy as to the objectives to be kept in mind and maximum permissible releases that not only must strategies be actively chosen as conditions change, but a flood engineer must be aware throughout his shift of the strategy under which he is operating the dam. If that was not the case throughout the course of the January 2011 flood, there was a breach of the manual.

16.4 The flood engineers' evidence as to the manual's requirements for adoption of strategies generally

What the flood engineers had to say about the manual's requirements for the change from strategy W1 to a higher strategy has already been outlined. It is necessary here to refer to the flood engineers' evidence as to their broader understanding of the manual's requirements for adopting and meeting the strategies. That is so not because their beliefs could affect whether it was in fact breached, but because, as counsel for Seqwater submitted,[81] what they understood is relevant to whether they honestly considered the manual had been complied with and whether there was any intention to mislead with the March flood event report.

Mr Tibaldi accepted that a strategy must be adopted during the flood event.[82] But he followed that concession with these assertions: that if the lake level changed, the strategy must have changed irrespective of what the engineer operating the dam at the time thought; and that there was no requirement for the engineer to actually turn his mind to the strategy which was applicable at any given time, because the manual did not say so.[83] Subsequently, however, he agreed that it was a 'reasonable expectation' that a flood engineer would be required by the manual to turn his mind to a choice of strategy as he was operating the dam[84] and accepted that it was impossible to read the manual in any other way than as requiring that a flood operation engineer make a choice of strategy during the event.[85]

Mr Tibaldi's evidence given in April 2011 as to the use of the flowchart is set out above. To that can be added his evidence given at the same time about the decision-making process for choosing strategies set out in section 8.4 of the manual, which, he said, was simply a description of what people had always done in making operational decisions. Under section 8.4, the first step in decision-making was the assembling of information as to actual rainfall, forecast rainfall, and stream flow. Mr Tibaldi said:'[I]f you want to make the best decision possible, you need to use all those things.'[86]

Mr Ayre accepted that the manual required the conscious choice of a strategy at the time the dam was being operated[87] and that compliance could not be achieved by retrospectively constructing a version of events as to the way the dam was managed.[88]

In his statement of 23 March 2011, Mr Ayre had this to say about choice of strategy:

> When determining the appropriate strategy to invoke for Wivenhoe and Somerset Dams a number of factors must be considered and balanced. The combined operation of Wivenhoe and Somerset Dams must be taken into account, rainfall, loss rates and runoff must be calculated, dam levels must be monitored and river flow rates downstream of the Dams need to be considered (including flows from Lockyer Creek and Bremer River into the Brisbane River).[89]

In evidence in April 2011, Mr Ayre, in answer to the proposition that 'the decision to move between strategies and, more particularly, the decision as how to execute a particular strategy is one ultimately of judgments upon which there will typically be a number of reasonable alternatives, and that operators have to choose one', said 'I would agree, and it is an incremental change, as such.' [90] In a similar vein, he agreed that in 'making decisions as to which strategy to employ, and indeed, how you will transition between the strategies' he and his fellow engineers made 'a number of quantitative assessments and qualitative judgments'.[91]

Mr Ayre put his view rather differently in his seventh and final statement:

> Strategy labels are generally only attributed after the event as part of the reporting process.
>
> The Flood Engineer selects the strategy during the flood event by testing different release rates and then assessing the suitability of the release rates in respect of achieving objectives. The action that informs the choice of strategy is in fact the gate release rate and how that manages the lake levels and downstream flows.[92]

Mr Malone agreed that for engineers operating the dam during a flood event, one of the strategies must be engaged at any particular point in time, and the flood engineers would be adopting and applying different strategies at different times over the flood event. A strategy involved a primary consideration which whoever was operating the dam would have in mind, while also being mindful of possible other strategies which might occur in the future.[93] At any particular point the engineer would be fully aware what the situation was, and would be fully aware which of the manual strategies he was in.[94] However, he said, there was no occasion for a flood engineer to make a conscious decision to move to W2 or W3 in the event that the lake level exceeded 68.5 metres and the Wivenhoe Dam releases were greater than the natural peaks at Lowood and Moggill.[95] He accepted, though, that an engineer's failure to determine whether he was in strategy W2 or W3 would be a breach of the manual.[96]

Mr Ruffini accepted that the manual's reference to the 'strategy chosen' meant that the flood operations engineer on duty had to choose a strategy, requiring a conscious decision as to what was the appropriate strategy to apply, and to know consciously under which strategy he was operating in order to understand the objectives to be managed.[97]

What the March flood event report actually represented about choice and observance of strategy, and the evidence about how the flood engineers applied strategy during the January 2011 flood event, is the subject of the sections which follow.

16.5 The March flood event report: a record of strategy choice

The manual requires Seqwater to prepare a report after each flood event. That report '**must contain details of the procedures used**, the reasons therefore [sic] and other pertinent information' (emphasis added).[98] Seqwater must forward the report to the chief executive of DERM within six weeks of the completion of the flood event.[99] The report prepared in purported discharge of these obligations for the January 2011 flood event is the March flood event report.

Seqwater provided the March flood event report to the Commission on 3 March 2011, and it was made an exhibit in the Commission's first round of hearings.[100] In its 11 March 2011 submission, Seqwater confirmed that sections 2 and 10 of the March flood event report identified the steps it had taken throughout the January 2011 flood event and asserted, 'The explanation provided in those sections demonstrates that operational decisions were carefully considered and made in accordance with the Manual.'[101]

This section considers generally what the March flood event report portrayed about compliance with the manual, and more particularly, whether it represented, firstly, conscious rather than automatic adoption of strategy W3 at 8.00 am on 8.00 January 2011, and secondly, continuing and conscious engagement of that strategy in the days which followed.

16.5.1 The executive summary

The executive summary asserts that things were done 'in accordance with the Manual'. In this regard, it includes the following statements:

- 'During the January 2011 Flood Event, **operational decisions were made in accordance with the Manual**.'[102] (This proposition was also contained in the conclusion).[103]
- The dam was operated '**in accordance with the Manual**'.[104]
- 'The data collection and flood modelling systems... assisted informed decision-making, **in accordance with the Manual**.'[105]

(emphasis added)

16.5.2 Express statements as to strategy selection

Chapter 2, Flood Event Summary, contains a series of tables which break the flood event up into periods, each of which is distinguished by '**a transition or change to the flood operations strategy used**, **as defined by the Manual**'.[106] The preceding paragraphs also explain that:

> Each table also provides a summary of relevant background information and a summary of the information **that was used to make decisions** during the period covered by the table. This information includes:
>
> - The strategy used and/or adopted during the period...[107]
>
> (emphasis added)

The first of the columns in the tables is headed 'Date/time', the second 'Background'. The latter contains information about conditions and strategy transitions. The heading of the third column is 'Dam conditions', the fourth 'Rainfall and model results'. The final column is headed 'Strategy', and in that column are identified the strategies said to be operative at particular times, their imperatives and the actions taken within them. So, for the earlier parts of the flood event, the entries relevant to strategy selection and observance are:

a. Page 10, period from 7.42 am, 6 January 2011, until 2.00 am, 7 January 2011, under heading Background: Strategy W1A and Strategy W1B:

   ... Transitioned from Strategy W1A to W1B once the Wivenhoe lake level exceeded 67.50m.

b. Page 11, period from 2.00 am, 7 January 2011, until 9.00 am, 7 January 2011, under heading Background: Strategy W1B:

   ... Transitioned from Strategy W1B to W1C once the Wivenhoe lake level exceeded 67.75m.

   Under heading Strategy: Strategy W1B (Lake level greater than 67.50m, maximum release 380m^3/s):

   … Water was held in Wivenhoe Dam in an attempt to keep Burtons Bridge trafficable, in accordance with Strategy W1B.

c. Page 12, period from 9.00 am, 7 January 2011, until 3.00 pm, 7 Jan 2011, under heading Background: Strategy W1C:

   ... Transitioned from Strategy W1C to Strategy W1D once the Wivenhoe Dam lake level exceeded 68.0m.

Under heading Strategy: Strategy W1C:

> ... Releases from Wivenhoe Dam were managed in an attempt to ensure Mt Crosby Weir and Fernvale Bridge remained trafficable, in accordance with Strategies W1D and W1E.

Entries representing a considered move to a higher strategy begin in period 4:

d. Page 13, period from 3.00 pm, 7 January 2011, until 2.00 pm, 8 January 2011, under heading Background: Transition from Strategy W1D to W1E to W3:

... Transitioned from Strategy W1D to W1E when the Wivenhoe Dam level exceeded 68.25m (22:00 on 7 Jan 2011). Transitioned from Strategy W1E to W3 as it became apparent Wivenhoe Dam level would exceed 68.5m (08:00 on 8 Jan 2011). Strategy W2 was by-passed as it was not possible to achieve this strategy by limiting the flow in the Brisbane River to less than the naturally occurring peaks at Lowood and Moggill.

Under heading Strategy: Strategy W3:

... The strategy transitioned from W1 to W3 as it became apparent Wivenhoe Dam level was likely to exceed 68.5m and Strategy W2 couldn't be applied. Strategy W3 also required lower level Manual objectives to be considered…consideration was given to minimising disruption to downstream rural life and endeavouring to keep Mt Crosby Weir Bridge and Fernvale Bridge trafficable.

Entries thereafter represent active and conscious compliance with the requirements of strategy W3:

e. Page 14, period from 2.00 pm, 8 January 2011, until 1.00 am, 9 January 2011, heading Background: Strategy W3. Under heading Strategy: Strategy W3:

... Strategy W3 required the flow at Moggill to be lowered to 4,000m^3/s as soon as possible after the naturally occurring peak at Moggill (excluding Wivenhoe Dam releases). This was already achieved. Strategy W3 also required lower level Manual objectives to be considered. Therefore, with lake levels rising slightly (Wivenhoe Dam) and falling (Somerset Dam) consideration during this period remained on minimising disruption to downstream rural life and endeavouring to keep Mt Crosby Weir Bridge and Fernvale Bridge trafficable. Wivenhoe Dam outflows were more than doubling the natural peak flows at Moggill. Increasing releases from Wivenhoe Dam to produce a flow rate at Moggill of up to 3,000m^3/s would have meant transitioning back to operating strategy W1 in around 18 hours from this time. Therefore, increasing Dam releases could not be justified given the resulting impacts such a flow would have downstream, especially on localised flooding in Brisbane.

f. Page 15, period from 1.00 am, 9 January 2011, until 8.00 am, 9 January 2011, heading Background: Strategy W3. Under heading Strategy: Strategy W3:

... Strategy W3 required the flow at Moggill to be lowered to 4,000m^3/s as soon as possible after the naturally occurring peak at Moggill (excluding Wivenhoe Dam releases). This was already achieved. Strategy W3 also required lower level Manual objectives to be considered. Therefore, with lake levels falling at both Dams, consideration during this period remained on minimising disruption to downstream rural life and endeavouring to keep Mt Crosby Weir Bridge and Fernvale Bridge trafficable. Wivenhoe Dam outflows were more than doubling the natural peak flows at Moggill. Increasing releases from Wivenhoe Dam to produce a flow rate at Moggill of up to 3,000m^3/s would have meant transitioning back to operating Strategy W1 in around 18 hours from this time. Therefore, increasing Dam releases could not be justified given the resulting impacts such a flow would have downstream, especially on localised flooding in Brisbane.

g. The following three periods, which extend from 8.00 am, 9 January 2011 to 1.00 am, 10 January 2011, chart a history under the 'Background' and 'Strategy' columns of increasing predicted inflows, rising lake levels, and a move away from the aim of minimising disruption to rural life, with recognition of the prospect that urban areas would be affected. No specific allusion is made in these periods to strategy requirements, but the actions and reasoning in each column are recorded under the heading 'Strategy W3'.

h. Page 19, period from 1.00 am, 10 January 2011, until 9.00 am, 10 January 2011, heading Background: Strategy W3. Under heading Strategy: Strategy W3:

... The approach in the Manual which states the intent of Strategy W3 is to limit the flow in the Brisbane River at Moggill to less than 4,000m^3/s and protect urban areas from inundation, was adopted. Advice received from Brisbane City Council that the upper limit of non-damaging floods was below the 4,000m^3/s stated in the Manual was noted and taken into account in the decision making processes.

i. Page 20, period from 9.00 am, 10 January 2011, until 3.00 pm, 10 January 2011, under heading Background: Strategy W3:

... At 15:00, the attempt to restrict Brisbane River flows at Moggill to 3,500m^3/s was abandoned due to rainfall in the Dam catchments. A new target of 4,000m^3/s was set in accordance with the Manual,

on the basis that Strategy W3 intends to limit the flow in the Brisbane River at Moggill to less than 4,000m³/s and minimise urban damage. Under heading 'Strategy': 'Strategy W3'… Continued to follow the approach in the Manual which states the intent of Strategy W3 is to limit the flow in the Brisbane River at Moggill to less than 4,000m³/s.

j. Page 21, period from 3.00 pm, 10 January 2011, until 8.00 pm, 10 January 2011, under the heading Background: Strategy W3:

... In accordance with the Manual, a target of 4,000m³/s was set, on the basis of the intent of Strategy W3 to limit the flow in the Brisbane River at Moggill to less than 4,000m³/s.

Under heading Strategy: Strategy W3:

... The approach in the Manual, which states the intent of Strategy W3 is to limit the flow in the Brisbane River at Moggill to less than 4,000m³/s, continued to be followed.

k. Page 22, period between 8.00 pm, 10 January 2011, until 4.00 am, 11 January 2011, under heading Background: Strategy W3:

... In accordance with the Manual, a target flow of 4,000m³/s at Moggill was set on the basis of Strategy W3 to limit the flow in the Brisbane River at Moggill to less than 4,000m³/s.

Under heading Strategy: Strategy W3:

... Consideration focused on protecting urban areas from inundation and minimising urban damage. The target maximum flow at Moggill remained 4,000m³/s. The approach in the Manual, which states the intent of Strategy W3 is to limit the flow in the Brisbane River at Moggill to less than 4,000m³/s, continued to be followed… At 21:00, the Dam Safety Regulator was asked for permission to exceed a level of 74.0m in Wivenhoe Dam for a short period (maximum 12 hours) without invoking Strategy W4, provided the safety of the Dam could be guaranteed.

At section 4.3 of Chapter 4, Flood event procedures, this assertion is made:

> When the Flood Operations Centre was mobilised, the Duty Flood Operations Engineer ensured the following actions were undertaken:
>
> … Determined gate operations strategies for Somerset and Wivenhoe Dams based on the resulting data from the operations spreadsheet and **in accordance with the strategies outlined in the Manual**.[108]
>
> (emphasis added)

Chapter 10 of the March flood event report is titled, Flood Management Strategies and Manual Compliance. Section 10.4, Wivenhoe Dam – Manual Compliance, explains the table which follows it:

> Table 10.4.1 summarises **the strategies used** in the operation of Wivenhoe Dam during the January 2011 Flood Event and provides explanations of how **the use of these strategies complies with the Manual**.[109]
>
> (emphasis added)

Table 10.4.1 has four headings: 'Period', 'Strategies used during the period', 'Explanation of strategies used during the period' and 'Manual requirements'.[110] Apart from the references in those headings to use of strategies, the 'Manual requirements' are expressed in terms of commands to *use* strategies at different lake levels. Extracts from the table of particular relevance are set out below:

a. Page 189, period between 10.00 pm, 7 January 2011, until 8.00 am, 8 January 2011, heading Strategies used during the period: Strategy W1E. Under heading Explanation of strategies used during the period:

... The strategy transitioned from Strategy W1D to Strategy W1E once the lake level exceeded 68.25m. The strategy transitioned from Strategy W1E to Strategy W2 once the lake level reached 68.50m.

b. Page 190, at 8.00 am, 8 January 2011, heading Strategies used during the period: Attempt to transition to Strategy W2. Under heading Explanation of strategies used during the period:

... At this time, it was not possible to satisfy Strategy W2 by limiting the flow in the Brisbane River to less than the naturally occurring peaks at Lowood and Moggill. The calculated naturally occurring peaks at Lowood and Moggill were 530m³/s and 800m³/s respectively, whereas the release rate from the Dam at this time was 927m³/s. Accordingly, it was not appropriate to switch to Strategy W2, and Strategy W3 was adopted for use at 08:00 on Saturday 8 January 2011.

c. Page 191, period between 8.00am, 8 January 2011, until 8.00am, 9 January 2011, heading Strategies used during the period: Strategy W3, under heading Explanation of strategies used during the period:

   ... The naturally occurring peak at Moggill was estimated to have occurred at 05:00 on 08 January 2011 (i.e. in the past). Strategy W3 requires the flow at Moggill to be lowered to 4,000m^3/s as soon as possible after the naturally occurring peak at Moggill (excluding Wivenhoe Dam releases). This was already achieved. Strategy W3 also requires consideration of lower level Manual objectives, and on the basis of this requirement, consideration during this period was given to minimising disruption to downstream rural life and endeavouring to keep Mt Crosby Weir Bridge and Fernvale Bridge trafficable.

d. Page 194, period between 8.00 am, 11 January 2011, until 12.00 pm, 13 January 2011, heading Strategies used during the period: Strategy W4, under heading Explanation of strategies used during the period:

   ... On the basis of the information from the previous period, at the start of this period it was decided to transition to Strategy W4.

Of note is the following observation in chapter 16, Review of the Manual's Objectives and Strategies:

> As discussed in detail in Section 10, a range of strategies were used during the Event, in accordance with the Manual. Having to **apply** the strategies **during such an extremely large and rare event provided the opportunity to consider how the strategies are worded from a practical sense**.[111]
>
> (emphasis added)

The description of the tables in chapter 2 as giving information in relation to the flood operations strategy 'used' or 'adopted' can only mean that the strategies identified in them were actually used or adopted by the flood engineers; they were not simply the product of the conditions. The verb 'transitioned' is used repeatedly in the 'Background' column to convey active movement between strategies. Particularly significant are the comments in relation to the change recorded between W1 and W3. The first is: '[t]ransitioned from Strategy W1E to W3 as it became apparent Wivenhoe Dam level would exceed 68.5m (08:00 on 8 Jan 2011)'. If this were an automatic process, there was no reason to use the verb 'transitioned', and it was unnecessary to refer to what was 'apparent' if human intervention were not required in response to that appearance. What is being conveyed is the engineer's reaction to a consideration of the lake level by moving between strategies. The next is: 'Strategy W2 was by-passed as it was not possible to achieve this strategy'. This sentence conveys a consideration of the feasibility of W2 and rejection of it.

The Chapter 10 table actually records a move to W2: 'The strategy transitioned from Strategy W1E to Strategy W2 once the lake level reached 68.50m'. The choice then made is expressed unequivocally: 'Accordingly, it was not appropriate to switch to Strategy W2, and Strategy W3 was adopted for use'. Those sentences cannot be read as meaning anything other than that, as the manual requires, strategy W2 was actively in play but rejected as inappropriate, in favour of a positive choice of W3.

Mr Tibaldi drafted the Executive Summary and parts 2 (Flood Event Summary), 10 (Flood Management Strategies and Manual Compliance) and 19 (Report Conclusion) of the March flood event report.[112] When it was put to him that he had intended to convey by the entries in the preceding paragraph the impression that the operator of the dam in fact made a decision and adopted strategy W3 at 8.00 am on 8 January, he said that he regarded the words 'adopted', 'used', 'transitioned' and 'applied' as interchangeable.[113] That may well be so; the difficulty is that all represent conscious actions.

The document represents actions carried out in recognition of and compliance with the W strategies; in particular, it repeatedly alludes to undertaking considerations and steps needed to meet strategy W3. Those are presented as being taken in direct response to the strategy's requirements; for example, 'Strategy W3 required the flow at Moggill to be lowered'... 'Strategy W3 also requires consideration of lower level Manual objectives, and on the basis of this requirement, consideration during this period was given to minimising disruption to downstream rural life...' Adherence to the manual's approach to strategy W3's intent is reiterated: 'The approach in the Manual which states the intent of Strategy W3 … was adopted.' 'Continued to follow the approach in the Manual which states the intent of Strategy W3.' The language is consistent with only one interpretation: continuing advertence to the intent and requirements of strategy W3 as in place from 8.00 am on 8 January.

16.6 Evidence of strategy choice: the flood operations engineers

As the preceding sections explain, the manual required conscious adoption of, and operation within, strategies, and the March flood event report conveyed that both had occurred. This section deals with the evidence the flood engineers gave about actual strategy choice.

16.6.1 Mr Ruffini

Mr Ruffini asserted, in his statement of 24 March 2011, that the dams (Wivenhoe, Somerset and North Pine) were operated in accordance with the approved flood mitigation manuals.[114] In an interview, he said that he had gone through the main body of the flood event report, the flood event summary and the section concerning compliance with the manual 'pretty well';[115] he endorsed the manual compliance section as being accurate, and had no reason now to think it was not accurate.[116]

Mr Ruffini started a shift at 7.00 pm on 7 January 2011, taking over from Mr Malone, and stayed on duty until 7.00 am the following day. He began his evidence in February 2012 by saying that, during his 7-8 January 2011 shift, 'we started to transition into the W3 strategies'.[117] Subsequently, he elaborated on the basis for that statement. When he started his shift, a spreadsheet produced by Mr Malone, which he reviewed, showed the lake level getting towards 68.5 metres, the transition point into W3, at the end of his shift. He explained:

> So when I took over in terms of that, then we would have been W1 strategy. At the end of the shift - towards the end of the shift after Rob took over, it would have - the lake level would have hit the 68.5 and you would have transitioned into the W3. But what I was wanting to say is that you asked - make clear is that do I today I have a direct, clear memory that at that time did I say - did I write down anywhere that I was in W1, did I write down anywhere that I was in W3? At the time, no, I didn't. I didn't write those down. But what I was pointing to is that in the situation report I had written a little bit - there was a bit in there about the downstream boundary and what was happening at the downstream end, so that was - so I looked - so there was that bit. And when I look at those operational spreadsheets and I look at the drain pattern that we're going to after that, then that sort of fits in with that proposition. But I was saying I don't - I didn't want to say that yes, I had a direct - I can today recall exactly - for that - there are very few periods now twelve months on where you can say in this period can you exactly recall on that day at that time what you were doing. At this point on I don't, no.[118]

Mr Ruffini was asked to say, while looking at his own hard copy of the manual, whether he had during his shift turned his mind to any part of section 8.4. He responded, 'as a matter of normal operating practice we would turn our minds to those issues'. Asked to say whether he had a conscious recollection of considering section 8.4, he said that he could describe what he was thinking about by looking at the operational spreadsheet he had before him on the morning.[119] Mr Ruffini was shown a spreadsheet but said it was a later version; there was an earlier one which contained a model run showing the lake level reaching 68.5 metres some time on the morning on 8 January.[120]

Mr Ruffini was asked specifically, and repeatedly,[121] to identify the parts of section 8.4 to which he would have referred during his shift. He answered, unresponsively, that he 'would have' looked at the lake levels and the spreadsheet showing that 'we're heading to that transition at 68.5'.[122] He then did refer to looking at something actually in section 8.4 – the flowchart – but digressed again into saying he would have looked at the release pattern and a situation report.[123] He would like, he said, to look at his spreadsheet to refer to the release pattern and the lake level.[124] He concluded by saying:

> The things that I would have looked at when I came on, I would have looked at - if you had the spreadsheet in there, I would have said here's the lake levels, and then I would have referred to these levels and strategies about where the lake level – where we were with lake levels. So during my shift I'm looking at that. The release pattern, that sort of – that I'm proposing – that was given to me and then I futurely [sic] endorsed and went out there was proposing that we would move to – after the shift, or very soon after the shift, you would hit that 68.5 and move to a – move to a W3.[125]

None of that, it may be seen, was very much help in identifying what reference, if any, Mr Ruffini had had during his shift to the section of the manual dealing with strategy selection. It is not suggested that Mr Ruffini was being evasive; he typically had a rambling, discursive style of giving evidence, and he plainly was having difficulty grasping

what he was being asked: to point out what parts of section 8.4 of the manual he was considering, not what data he might have been looking at.

However, submissions from counsel for the State and Seqwater asserted that Mr Ruffini had been 'prevented' while giving evidence from seeing the spreadsheet he had prepared on the morning of 8 January;[126] indeed the State went so far as to assert that this was a 'denial of natural justice' to Mr Ruffini.[127] Both assertions are a nonsense, and may quickly be dealt with. An electronic copy of the document was in the possession of the solicitor acting for the State and it had been foreshadowed that counsel for the State might refer Mr Ruffini to it.[128] Moreover, before counsel for the State took his turn to question Mr Ruffini a Commission solicitor advised him that the spreadsheet could be brought up on a screen.

In the event, no counsel sought to show Mr Ruffini the spreadsheet, although counsel for the State did confirm with Mr Ruffini that he had been given the spreadsheet prior to hearings and gone through it to confirm what was in his mind during the flood event.[129] If counsel for the State – or any other counsel – seriously considered that referring Mr Ruffini to the spreadsheet would make his answers any clearer, or would in any broader way support his evidence, there was absolutely nothing to prevent his showing Mr Ruffini the document.

Mr Ruffini was asked whether he asserted there would have been a conversation with Mr Ayre at the handover of his shift at 7.00 am on 8 January during which the term W3 was used. He responded:

> I definitely believe I would have talked about exceeding the threshold and I probably would have - yes. Yes. I think so.[130]

Mr Ayre's evidence, as will shortly appear, was to different effect.

Under examination from counsel for Seqwater about his state of mind during his second shift in the flood event (from 7.00 pm on 9 January to 7.00 am on 10 January), Mr Ruffini said that his understanding during that shift was that he was operating the dam in strategy W3.[131] He was minimising the impact of urban flooding, something which, he maintained, the flood engineers had been doing since transition into W3, which, on his understanding, occurred when the lake level had crossed 68.5 metres on 8 January.[132]

When questioned about the March flood event report, Mr Ruffini said that Mr Tibaldi's method, as he understood it, was to look at what happened and decide what strategy it matched.[133] After putting all the information together, Mr Tibaldi had provided it to the other engineers to see if it 'matched their recollection'. He had looked at the information Mr Tibaldi assembled in his strategy spreadsheet for the March flood event report to inform himself about the state of mind he was in when he was making decisions and 'came up with what [his] recollections of that sort of thing were'.[134] His evidence as to what he had told Mr Tibaldi was as follows:

> Mr Callaghan: What did you say in response to the query as to whether or not it matched your recollection?
>
> Mr Ruffini: When I reviewed it I thought what he had written was accurate.
>
> Mr Callaghan: Did you say, 'yes, that matches my recollection?'
>
> Mr Ruffini: Did I say, 'That matches my recollection?'
>
> Mr Callaghan: Yeah. That was the question he asked you?
>
> Mr Ruffini: Well, yeah, I would think – did I – yes, I think that – well, obviously, yeah, I would have said that, yeah.
>
> Mr Callaghan: So you told him, 'Yes, that does match my independent recollection'?
>
> Mr Ruffini: That matches my recollection, yeah.
>
> Mr Callaghan: So it wasn't the case that you looked at it and came up with what your recollections were?
>
> Mr Ruffini: No. Well, I don't remember at the time as to – like, if he didn't remember – are you saying, okay, if we didn't remember at the time exactly what we were doing...[135]

Taken back to the issue of his response to Mr Tibaldi, Mr Ruffini said that he had looked at the material he had been using during the flood event – spreadsheets, situation reports, Bureau of Meteorology information and the flood event log – and concluded, 'Yep, that looks reasonable.'[136]

It is clear that Mr Ruffini's evidence as to his state of mind, in so far as it related to strategies, was not an actual and independent recollection but the product, after the event, of his examination of the data and Mr Tibaldi's analysis.

16.6.2 Mr Ayre

Mr Ayre began his shift at 7.00 am on 8 January 2011, an hour before the lake level reached 68.5 metres, requiring a change to a higher strategy. At the start of his shift, he and Mr Ruffini had not discussed any W strategy; they had talked about the amount of water stored in the dam, the current release rates, and the gate sequence that Mr Ruffini had proposed.[137] He could not recall any specific discussion about 'transitioning'.[138] Mr Ayre said that as far as he was aware, flood engineers did not make reference to the W strategies at shift handovers. Seqwater's flood procedure manual[139] prescribed that flood release procedures being applied should (with other information) be made known to incoming flood engineers at handovers, but that was a reference to existing or proposed gate sequences.[140]

In his statement of 23 March 2011, Mr Ayre included a table which set out a 'summary of strategies implemented'.[141] It includes a column which records the 'Time of Transition'. The strategy changes are documented as occurring at the times set out in the March flood event report, and the description of the by-passing of strategy W2 is in identical terms to those used in part 2 of the March flood event report. (A table included in one of Mr Ayre's later statements similarly listed the 'actual times strategies were implemented by the FOC [flood operations centre]'[142] consistently with what was recorded in the March flood event report.)

In a statement made on 29 March 2011, Mr Ayre gave this account of the strategy change:

> By about 8 am, Wivenhoe Dam had reached 68.52m AHD. Because this level was above the predicted lake level of 68.5 AHD relevant to strategy W1, I was conscious of the fact that we were transitioning the strategies from W1 to W2 or W3.[143]

He went on to say that he noted from a schedule attached to his first statement, which showed dam levels, inflow and release rates, that:

> by 8 am on Saturday Wivenhoe Dam was within the parameters of strategy W3 because the level of the lake was slightly above 68.5m AHD and Wivenhoe Dam was releasing above the naturally occurring peak flow at Lowood.[144]

When he gave evidence in April 2011, Mr Ayre was cross-examined about the first part of that account, particularly the reference to 'transitioning the strategies', and when W3 was actually engaged. He said it was engaged with the gate opening directive Mr Ruffini had issued during his shift, which would have had the effect of increasing releases to 1250 m^3/s by 2.00 pm that afternoon. (The implications of that directive are discussed in *16.7 Objective evidence as to strategy choice on 8 and 9 January 2011*.) He believed that to have occurred during the handover between them.[145]

Mr Ayre's evidence about how the transition occurred then became somewhat confusing: asked whether it was the case that he was not in fact transitioning from W1 to W2 or W3, but was actually in W3 at 8.00 am, he said that it was 'not a step jump process'. The engineers 'transition[ed] gradually from each of the strategies'; and since they had just entered the bottom of the range between 68.5 metres and 74 metres, they were still in that transition process. In further questioning, Mr Ayre continued to maintain both that the transition had occurred at 8.00 am and that the reference to 'transitioning the strategies' was correct because it was a 'gradual transition from each of the strategies'.[146]

The 'gradual transition' view was consistent with an answer Mr Ayre gave later in that hearing to a question about there being no stepped procedure for transition between strategies:

> Mr Ayre: That's correct. We progressively or incrementally change the release rates to accommodate the change in objectives.
>
> Mr Dunning: And, in effect, there is no bright line between when you have ceased to be in one strategy and you are in the next?
>
> Mr Ayre: Indeed. Yes, I agree with that.[147]

Mr Ayre's evidence in April 2011 suggested a view of strategy W2 as a transition between W1 and W3:

> Mr Ayre: Strategy W2 really is a transition strategy between strategies W1 and W3, where it may be possible to prevent the inundation of all except the two larger bridges, which is Mt Crosby Weir Bridge and Fernvale Bridge. So it has a limiting capacity in there. But it is designed to limit the flows to the naturally occurring flows that emanate out of the Lockyer and Bremer River if possible.[148]

...

Mr Rangiah: All right. And then you then get to Strategy W2 and Strategy W2 is itself a transition strategy, isn't it?--

Mr Ayre: That's what it's described as, yes.

Mr Rangiah: So, that's a period of time in which you're in transition from W1 to W3, in effect?

Mr Ayre: Yes.[149]

In his seventh statement, made in February 2012, Mr Ayre said that when he was on duty on 8 January 2011, he had noted that the predicted peak lake level, 68.8 metres, was above the limit of strategy W1's application, so that he would need to transition to a higher strategy, W2 or W3;[150] he also noted that the lake level had exceeded 68.5 metres at 8.00 am 'and so therefore the strategy had transitioned out of W1 and progressed to W3'.[151]

In his evidence given in February 2012, Mr Ayre reiterated that he was aware at the handover from Mr Ruffini on 8 January that the lake level was approaching 68.5 metres so that 'we would be transitioning from W1 to W2 or 3'.[152] Asked, however, whether it was the case that strategy W3 was adopted by him for use at 8.00 am that day, he responded:

> Well, the conscious decision to move to Strategy 3 was taken at 5 p.m. when John [Ruffini] issued the directive to increase the flows above the naturally occurring ones.[153]

(Mr Ayre corrected his reference to time to 5.00 am.) But the strategy, he went on to explain, remained a W1 strategy until the lake level exceeded 68.5 metres, at which point it became a W3 strategy, because Mr Ruffini had selected a release rate higher than the naturally occurring flow at Lowood.[154]

All of this had a distinct air of after-the-fact rationalisation, however, given Mr Ayre's acknowledgement that he could not consciously recall knowing, at 8.00 am on 8 January, whether he was in W2 or W3. He knew, he said, they had 'transitioned out', but there was nothing happening which meant he needed to differentiate between W2 and W3.[155] That was more generally true of the whole of his shift that day:

> I'm saying that I don't have a conscious recollection now of whether I thought we were in W2 or W3. I - there was nothing that, I suppose, occurred on that day which would have prompted me to make a decision as to are we in 2 or 3. We're meeting the objectives or the primary objectives of both scenarios. I wasn't actually responsible for making the conscious decision to move to 3. That was done by John Ruffini at the 5 o'clock directive. We were operating in a range which didn't bring the limits into play. So I guess I wasn't really contemplating anything other than we weren't in W1.[156]

To similar effect was Mr Ayre's response to a question about whether a flood engineer did or did not have in mind the question, 'What is the current strategy I'm using?':

> I believe we are aware of the objectives. We are aware of all of the associated parameters or conditions that describe the relevant strategies but do I go around necessarily thinking W3? No, not necessarily.[157]

Mr Ayre recalled that when Mr Tibaldi was drafting his sections of the March flood event report, he commented to the effect that strategy W2 had not been implemented. Looking at the flow data Mr Tibaldi had before him on his computer screen, Mr Ayre concurred; he recognised that the dam release was higher than the naturally occurring flow at Lowood.[158] It was, he said, a couple of weeks after the event, and he didn't 'necessarily recall with clarity', although he 'knew we transitioned at that time'.[159]

Mr Ayre said that Mr Tibaldi would have provided him with a draft of the March flood event report which said that strategy W3 was engaged at 8.00 am on 8 January. He did not dissent from that proposition, as he explained:

> Mr Ayre: No, because I knew the transition out of W1 had occurred at that time. I - in terms of the process, I would have been reviewing the sections which I knew, had most knowledge of and, according to my own forensic examination, that's what we came up with, yeah.
>
> Mr Rangiah: But you certainly made no conscious decision to move from the W1 strategy to the W3 strategy on the 8th of January?
>
> Mr Ayre: I didn't, no. That was effectively implemented through when the lake level had crossed 68.5.[160]

In questioning of Mr Ayre by counsel for Seqwater, this exchange took place:

Mr O'Donnell: On the basis of your evidence we've discussed before, your role as flood engineer wasn't one of deciding to transition it to the higher strategy, your role was to use the higher strategy in managing the dam for the balance?

Mr Ayre: Yes.

Mr O'Donnell:...while the water remained over 68.5?

Mr Ayre: On that occasion, yes.

Mr O'Donnell: And you've given evidence yesterday in your earlier statements that you were conscious that the water level had gone over 68.5 and, therefore, you were required to apply a higher strategy?

Mr Ayre: Yes.

Mr O'Donnell: And you also said in evidence yesterday that during that day, you appreciated your primary consideration had to be protection of urban inundation?

Mr Ayre: Yes.

Mr O'Donnell: And do you have a natural [probably 'an actual'] recollection of those being your thoughts on Saturday, the 8th, while acting as a flood officer?

Mr Ayre: Yes. I suppose having done the previous Thursday night shift and also having talked to Terry Malone when the event was being mobilised and, indeed, when Terry first proposed a strategy at the start of the event, I was very much aware that the sequencing they were putting in place was going to be designed to meet the objective as such.

Mr O'Donnell: So it's your sworn evidence to the Commission that during your shift on the Saturday, after 8 am, you were conscious that you had to apply a higher strategy?

Mr Ayre: Yes. I was conscious that we were looking at the objective of optimising the protection of urban areas.

Mr O'Donnell: And that you did apply the higher strategy in managing the dam during your shift?

Mr Ayre: I believe I did, yes.[161]

Despite the leading nature of the questions, the answers do not really advance matters beyond the evidence earlier cited. Both W2 and W3 meet the description of a 'higher strategy', and the primary objective of optimising the protection of urban areas is common to both.

Mr Ayre's evidence contains a number of concessions that he did not consciously adopt strategy W3 on 8 January, nor did he operate the dam with it in mind. Those concessions fit with his acknowledgement that 'strategy labels are generally only attributed after the event as part of the reporting process'.[162] The approach is consistent with what is now known about how the March flood event report was produced, and inconsistent with the manual's requirement that a strategy actually be adopted during the event. And it is at odds with other assertions by Mr Ayre about having 'engaged' or 'implemented' strategy W3 at 8.00 am.

Counsel for Mr Ayre argued that it was improbable that he, as a senior and experienced flood engineer, could have overlooked the significance of the lake level at 68.5 metres;[163] other counsel suggested that it was inconceivable any of the engineers could have done so.[164] But Mr Ayre said that this was the first time he would have been involved in a transition to strategy W3 and his understanding was that this was the first time for use of the strategy since 1999 – when he was not directly involved.[165] (Other evidence suggests that the dam was in fact operated under strategy W3 during flood events in October and December 2010,[166] on occasions when Mr Ayre was on duty, although he was not present at the transition to that strategy occurred, according to the flood event report.)[167]

Mr Ayre's experience was not such that his recognition of the need to adopt strategy W3 can be assumed from it. While some of his statements and evidence are to the effect that decisions about strategies were in fact made at the time of the event, the effect of his evidence is overwhelmingly to contrary effect: he made no conscious adoption of strategy W3 and indeed did not appreciate, in operating the dam, a need to draw a distinction between strategies W2 and W3. Contemporary documentary evidence, which is the subject of later sections in this report, suggests an even more fundamental failure to appreciate what stage the flood event had reached in terms of the manual strategies.

16.6.3 Mr Tibaldi

Mr Tibaldi took over duties from Mr Ayre at 7.00 pm on 8 January. He had no recollection of the handover.[168] Mr Ayre, however, said that he would have told Mr Tibaldi about the existing release rates and the three-day forecast. There was 'no naming of the strategy labels'.

In his statement of 25 March 2011, Mr Tibaldi said that W3 was 'adopted' at about 8.00 am on Saturday 8 January 2011.[169] In the same statement, Mr Tibaldi repeated the language of the March flood event report in relation to strategy W2: it was 'bypassed'. He explained that it was not possible to 'invoke' or 'implement' it 'in a practical sense';[170] a form of words which suggests that a decision was made at the time on considerations of feasibility.

In giving evidence in February 2012, Mr Tibaldi said that the evidence of change of strategy during the flood event lay in the data: the lake levels, the flows and releases. That information would indicate that a change of strategy had occurred, regardless of what was in people's minds.[171] He had found nothing recorded beyond what was contained in the March flood event report.[172] At the start of his first shift he expected that he would have read a situation report prepared by Mr Ayre at 5.53 pm (which is the subject of later consideration).[173] The focus was on increasing releases while keeping the Mt Crosby Weir and Fernvale bridges open; he imagined Mr Ayre would have explained that at handover.[174] But he had no actual recollection of what strategy he was operating the dam in:

> Mr Tibaldi: In terms of what strategy we were in, whether – I couldn't say if it was in the forefront of my mind or not if I put my mind to it. I could easily see that we weren't in strategy W1 because it was over 68.5, and I could easily see we weren't in strategy W2, if I had checked, because of the fact that we were just releasing too much water. As I said, whether that was in my mind at that time, I couldn't say. But certainly there's no question at that time, even though we're in strategy W3 – as we're allowed to, and as the manual requires – that we were protecting the bridges – the two highest bridges.
>
> Mr Callaghan: You're in W3 because you worked out that's what you must have been in?
>
> Mr Tibaldi: Since - you mean in the flood report?
>
> Mr Callaghan: Yes?
>
> Mr Tibaldi: Yes, that's correct.[175]

As was noted earlier (in *16.3 The manual requires a choice of strategy*) Mr Tibaldi's evidence on the topic of whether it was necessary for a flood engineer to undertake a conscious choice and implementation of strategy varied. His evidence did not suggest any conscious choice or use of strategy. His view that the dam had been operated in strategy W3 from 8.00 am on 8 January was based on a process of reconstruction from the data, although the March flood event report gave a different impression.

16.6.4 Mr Malone

Giving evidence in April 2011, Mr Malone said that he knew, when he came on duty at 7.00 am on 9 January 2011, that the dam was operating in W3 because 'it would have been discussed at the handover that morning'; 'or' (suggesting, presumably, an alternative explanation for his knowledge) it was 'obvious'.[176] In February 2012, however, he said that he did not recall any specific conversation about strategy with Mr Tibaldi, from whom he took over; their discussion would have been about flows and volumes.[177] He also gave evidence that he knew the 'basic requirements of the lake levels and the flow rates for the determination of strategies', and did not need to turn to the Wivenhoe manual to 'see what were the requirements for W2 or W3'.[178]

Asked some questions about his interpretation of the situation report issued by Mr Ayre at 5.53 pm on 8 January 2011, Mr Malone said that he knew the dam was being operated above strategy W1 and in strategy W2 or W3 on that day.[179]

Similarly, Mr Malone explained a reference to the application of W2 on 8 January in a summary document he had authored (the subject of discussion in a later section). It was possible that a reason for his reference to strategy W2 was that W2 was described as a transition from W1 to W3; and at the time he produced the summary (on 15 January 2011) no-one had worked out that W2 had been 'skipped'. No-one was really sure at the time of the flood event whether W2 or W3 was 'in play'. Although the March flood event report unequivocally recorded the bypassing of W2, that was not the state of mind of anyone at the time.[180] Subsequently, he qualified his evidence to say that that was his impression, but not necessarily the understanding of the other flood engineers; no-one had corrected his impression.[181]

That evidence suggests that Mr Malone had no contemporary belief that strategy W3 had been adopted on 8 January. It is consistent with what he said about his response to a report by Mr Brian Cooper, who was asked to audit compliance with the flood manual. The report contained a statement that 'W2 would have been in place' a day or so before 12 January 2011. Mr Malone said that he read Mr Cooper's report during the flood event. While 'there were some questions' about Mr Cooper's discussion of the application of strategies and whether he had interpreted the manual correctly, he saw 'nothing untoward' in the report; nor did anything stand out as requiring his attention.[182]

When it was put to Mr Malone that he had, during the January 2011 event, no real appreciation of what was involved with the strategy W2, he agreed that that might well be true.[183] Later he explained that W2 was confusing; it was referred to in the manual as a transition, and the conditions for its application were unclear. He did not, however, consider it to have been applicable on either of his shifts, on 7 and 9 January.[184]

Mr Malone's evidence raises doubt about whether the engineers consciously adverted to or adopted strategy during 8 January 2011. His evidence about his own state of mind, as at the start of his shift on 9 January 2011, does not suggest that he had then attempted any differentiation between W2 or W3.

Returning to the contention that the flood engineers could not have overlooked the implications of lake level for application of strategy, one can readily say what the flood engineers should have appreciated, and what they should have done. But the lack of any actual recollection about whether W2 or W3 was in place and the method by which the history of the flood event was later made the subject of record gives little confidence that what should have occurred is what did occur. Assertions that strategy W3 was in fact operative from 8.00 am on 8 January must be measured against the objective and contemporary evidence as to strategy choice.

16.7 Objective evidence as to strategy choice on 8 and 9 January 2011

There are a number of contemporaneous documents from which inferences might be drawn as to which operating strategies were engaged and when during the January 2011 flood event, and as to the states of mind of the four flood engineers about those matters.

They fall into four categories:

- information and data used by the flood engineers to make decisions (including inflow and outflow data, rainfall forecasts and results from the real time flood model)
- objective evidence of decisions made by the flood engineers (for example, release rates, gate operations directives and gate operations spreadsheets)
- documents prepared at the flood operations centre relevant to the operation of the dam (for example, situation reports, entries in the flood event log)
- documents prepared by others relevant to the operation of the dam (for example, technical situation reports, notes of teleconferences involving persons other than the flood engineers).

A schedule of documents contained in the flood event report and prepared in the period between 6.00 am on 8 January 2011 and 9.00 pm on 9 January 2011 was compiled by the Commission and tendered as Exhibit 1046. The schedule summarised four situation reports, two technical situation reports and 23 flood event log entries.

The flood event log and the situation reports were places in which it would have been appropriate to record the operating strategy in place at any given time.[185] None of those documents mentions operating strategy W3, nor, until late on 9 January 2011, the prioritisation of the prevention of urban inundation.[186] Two of the items listed in Exhibit 1046, the situation report of 5.53 pm on 8 January 2011[187] and the flood event log entry of 3.30 pm on 9 January 2011, refer to other operating strategies (W1 and W2). These two documents are dealt with separately below in sections 16.7.2 and 16.7.3.

Submissions have been made to the Commission as to the inferences that can be drawn from particular contemporaneous documents as to the state of mind of the flood engineers. Many of those documents, for the reasons explained below, do not enable an inference to be drawn.

Those documents that do enable an inference to be drawn do not support the view that W3 was implemented on the morning of 8 January 2011.

16.7.1 Documents from which no inference as to strategy can be drawn

Situation reports

There were six situation reports issued between 4.00 am on 8 January 2011 and 4.00 am on 10 January 2011.

Situation Report 8 was issued by Mr Ruffini at 6.32 am on 8 January 2011. Relevantly it states:[188]

> **Wivenhoe (Full Supply Level 67.00 m AHD)**
>
> At 0600 Saturday, Wivenhoe Dam was 68.45 m AHD and rising steadily with all five gates open and releasing about 890 m3/s. River levels upstream of Wivenhoe Dam were rising again, generating further inflow to the dam. It is intended to ramp up the release from Wivenhoe to 1,200 m3/s by midday Saturday 08/01/2011. Further assessments will be undertaken to determine increases above this level. However, given the high likelihood of significant inflows in the next week, this may be increased.
>
> ...
>
> **Impacts downstream of Wivenhoe**
>
> The projected Wivenhoe release of 1,200 m3/s combined with Lockyer flows and local runoff will mean that all crossings downstream of Wivenhoe (Twin Bridges, Savages Crossing, Burtons Bridge, Kholo Bridge and Colleges Crossing) will be adversely impacted for several days. At this stage Fernvale and Mt Crosby Weir Bridge are not expected to be affected but they could potentially be affected if the predicted rainfall totals eventuate.
>
> The current available assessments indicate that the combined flow in the lower Brisbane R would only add 50mm to an upper limit of 100mm to the recorded water levels in the City Reach of the Brisbane Rive [sic]. However, it is noted that tides in the lower Brisbane R will be 0.4 to 0.5 metres higher than predicted tides.
>
> Somerset Regional, Ipswich City and Brisbane City Councils have been advised of the Wivenhoe operating strategy.

Counsel for Seqwater submitted that this situation report suggested that Mr Ruffini was 'giving careful consideration to balancing the protection of rural and urban areas' and that he recognised that there would not be, at that stage, impacts in Brisbane.[189] If it were to be regarded as equivocal as to whether Mr Ruffini was operating the dam in W1 or W3, it still could not be used to infer that he was contemplating that the dam would continue to operate in W1.[190]

Situation report 9 was issued by Mr Ayre at 12.16 pm on 8 January and states:

> **Wivenhoe (Full Supply Level 67.00 m AHD)**
>
> At 1200 Saturday, Wivenhoe Dam was 68.60 m AHD and rising steadily with all five gates open and releasing about 1,150 m3/s. River levels upstream of Wivenhoe Dam have peaked and are now receding. However the further inflows into the dam has led to elevated levels It is intended to increase the release from Wivenhoe to 1,250 m3/s by 14:00 on Saturday 08/01/2011. This will maintain flows of up to 1,600 m3/s in the mid-Brisbane River throughout the afternoon.
>
> Further assessments will be undertaken to determine increases above this level given the high likelihood of significant inflows in the next few days. The interaction with runoff from the Bremer River and Warrill Creek catchment will also be assessed to determine an appropriate release strategy. Projections based upon the forecast rainfalls suggest flows of up to 1,200 m3/s will emanate from the Bremer River catchment.
>
> ...
>
> **Impacts downstream of Wivenhoe**
>
> The projected Wivenhoe release of 1,250m3/s and combined with Lockyer flows and local runoff will mean that all low level crossings downstream of Wivenhoe (Twin Bridges, Savages Crossing, Burtons Bridge, Kholo Bridge and Colleges Crossing) will be adversely impacted for several days. At this stage Fernvale and Mt Crosby Weir Bridge are not expected to be affected, but they could potentially be affected if the predicted rainfall totals eventuate and higher releases from Wivenhoe Dam are considered necessary.

The current available assessments indicate that the combined flow in the lower Brisbane River would only add 50mm to an upper limit of 100mm to the recorded water levels in the City Reach of the Brisbane River. However, it is noted that tides in the lower Brisbane R will be 0.4 to 0.5 metres higher than predicted tides. The tide level at the Port Office Gauge at 1200 Saturday was 1.56 m and rising.

Somerset Regional, Ipswich City and Brisbane City Councils have been advised of the Wivenhoe operating strategy.

The next situation report was issued at 5.53 pm on 8 January, again by Mr Ayre, and is dealt with below in *16.7.2 Situation Report at 5.53 pm on 8 January 2011*. It does not have a number because it was not included in Appendix E to the flood event report. In its relevant parts, it states:

Wivenhoe (Full Supply Level 67.00 m AHD)

At 1800 Saturday, Wivenhoe Dam was 68.65 m AHD and rising slowly with all five gates open and releasing about 1,250 m3/s. River levels upstream of Wivenhoe Dam have peaked and are now receding. However the further inflows may result from any additional rainfall. The current gate operation strategy will maintain flows of up to 1,600 m3/s in the mid-Brisbane River throughout the evening.

Since the commencement of the event on 02/01/2011, approximately 227,000ML has flowed into Wivenhoe Dam (including Somerset releases) with a further 200,000ML expected based on the recorded rainfall to date. Approximately 93,000ML has been released from Wivenhoe via the radial gates, hydro and regulator.

Impacts downstream of Wivenhoe

The current Wivenhoe release of 1,250m3/s combined with Lockyer flows and local runoff will mean that all low level crossings downstream of Wivenhoe (Twin Bridges, Savages Crossing, Burtons Bridge, Kholo Bridge and Colleges Crossing) will be adversely impacted for several days (until Wednesday 12 January). At this stage Fernvale and Mt Crosby Weir Bridge are not expected to be affected, but they could potentially be affected if the predicted rainfall totals eventuate and higher releases from Wivenhoe Dam are considered necessary.

The current available assessments indicate that the combined flow in the lower Brisbane River would only add 50mm to an upper limit of 100mm to the recorded water levels in the City Reach of the Brisbane River. However, it is noted that tides in the lower Brisbane R will be 04. to 0.5 metres higher than predicted tides. The tide level at the Port Office Gauge at 1700 Saturday was 0.06m and falling.

Somerset Regional, Ipswich City and Brisbane City Councils have been advised of the Wivenhoe operating strategy.

Forecast scenario – Based upon mid-range rainfall forecasts.

Assessments have been undertaken to determine possible increases to releases given the high likelihood of significant inflows in the next few days. The interaction with runoff from the Bremer River and Warrill Creek catchment is an important consideration as the event magnitude will require the application of Wivenhoe Dam flood operation strategy W2 (Transition strategy between minimizing downstream impacts and maximizing protection to urban areas).

Projections based upon the forecast rainfalls suggest flows of up to 1,200m3/s will emanate from the Bremer River catchment. If similar rainfall magnitudes occur in the Upper Brisbane and Stanley Rivers then increased releases may be required from both Somerset Dam and Wivenhoe Dam. Preliminary projections suggest that such a forecast will extend the release duration until next Saturday 15 January, but mid-Brisbane River flows will be kept to a maximum of 1,800m3/s. However, if falls are greater than those forecast releases from Wivenhoe Dam may need to adversely impact Mr Crosby Weir Bridge (1,900m3/s) and possibly Fernvale Bridge (2,100m3/s) but will be maintained below 3,500 m/3.

Situation report 10 was issued by Mr Tibaldi at 6.15 am on 9 January 2011, and states:[191]

Wivenhoe Dam (Full Supply Level 67.00 m AHD)

The dam level is currently falling slowly, with the current level being 68.58m AHD. River levels upstream of the dam are receding, however further inflows will result from any additional rainfall. The current gate operation strategy will maintain flows of around 1,600m3/s in the mid-Brisbane River. The current release rate from Wivenhoe Dam is 116,000ML/day. Since the commencement of the event on 02/01/2011 approximately 150,000ML has been released from the dam, with a total of at least 450,000ML to be released based on the currently recorded rainfall. The total release for the event is likely to increase over the next few days based on the current rainfall forecasts. At this stage, releases will continue until at least Wednesday.

Impacts downstream of Wivenhoe Dam

The current Wivenhoe Dam release combined with Lockyer flows and local runoff will mean that all low level crossings downstream of Wivenhoe (Twin Bridges, Savages Crossing, Burtons Bridge, Kholo Bridge and Colleges Crossing) will be adversely impacted until at least Wednesday 12 January. At this stage Fernvale and Mt Crosby Weir Bridge are not expected to be affected, but this may be revised if the predicted rainfall totals eventuate and higher releases from Wivenhoe Dam are considered necessary.

Somerset Regional, Ipswich City and Brisbane City Councils have been advised of the Wivenhoe operating strategy.

Situation report 11 was issued by Mr Malone at 5.51 pm on 9 January 2011, and states:[192]

Wivenhoe Dam (Full Supply Level 67.00 m AHD)

The dam level is currently rising again, with the current level being 68.70m AHD. Estimated peak inflow to the dam just from the Upper Brisbane R is about 5,000m3/s and, at this stage, the dam will reach at least 72.5 m AHD during Wednesday morning. River levels upstream of the dam are rising quickly with significant inflow being generated from the intense heavy rainfall. The current gate operation strategy will maintain flows of around 1,600m3/s in the mid-Brisbane River for the next 24 hours. This may mean temporarily reducing releases from Wivenhoe Dam as Lockyer flows increase. However, releases may have to be increased significantly during Monday depending on the rain in the next 12 to 24 hours. The current release rate from Wivenhoe Dam is 1,400m3/s (120,000ML/day).

Since the commencement of the event on 02/01/2011 approximately 210,000ML has been released from the dam, with an event total approaching 1,000,000ML (including Somerset outflow) based on the recorded rainfall to date. The total release for the event is likely to increase over the next few days based on the current rainfall forecasts. At this stage, releases will continue until at least Saturday 15th January 2011.

Impacts downstream of Wivenhoe Dam

The current Wivenhoe Dam release combined with Lockyer flows and local runoff will mean that all low level crossings downstream of Wivenhoe (Twin Bridges, Savages Crossing, Burtons Bridge, Kholo Bridge and Colleges Crossing) will be adversely impacted until at least Saturday 15 January.

At this stage Fernvale and Mt Crosby Weir Bridge will not be affected for the next 24 hours but there is a strong possibility that, if the predicted rainfall totals eventuate in the next 12 to 24 hours, higher releases from Wivenhoe Dam will be necessary. This may adversely impact upon Fernvale and Mt Crosby Weir Bridges as early as Tuesday morning.

Water levels in the lower Brisbane R will be impacted by the combined flows of Lockyer Ck, Bremer River, local runoff and releases from Wivenhoe Dam.

Somerset Regional, Ipswich City and Brisbane City Councils have been advised of the Wivenhoe operating strategy.

(emphasis in original)

Situation report 12 was issued by Mr Malone at 9.04 pm on 9 January 2011 and states:[193]

Wivenhoe Dam (Full Supply Level 67.00 m AHD)

River levels upstream of the dam are rising quickly with significant inflow being generated from the intense heavy rainfall. Flows in the Brisbane River at Gregor's Ck have already reached 6,700m3/s and the river is still rising.

The dam level is rising again, with the current level being 69.10m AHD (1,410,000ML with about 300,00 [sic] of flood storage). Estimated peak inflow to the dam just from the Upper Brisbane R alone may reach as high as 7,500m3/s and, at this stage, the dam will reach at least 73.0 m AHD during Tuesday morning. Given the rapid increase in inflow volumes, it will be necessary to increase the release from Wivenhoe Monday morning.

The objective for dam operations will be to minimise the impact of urban flooding in areas downstream of the dam and, at this stage, releases will be kept below 3,500m3/s and the combined flows is [sic] the lower Brisbane will be limited to 4,000m3/s. This is below the limit of urban damages in the City reaches.

The current release rate from Wivenhoe Dam is 1,400m3/s (120,000ML/day). Gate opening will start to be increased from noon Monday and the release is expected increase to at least 2,600m3/s during Tuesday morning.

Since the commencement of the event on 02/01/2011 approximately 220,000ML has been released from the dam, with an event total approaching 1,000,000ML without further rain and as much as 1,500,000ML with forecast rainfall of (both including Somerset outflow). At this stage, releases will continue until at least Sunday 16th January 2011.

Impacts downstream of Wivenhoe Dam

The projected Wivenhoe Dam releases combined with Lockyer flows and local runoff will mean that all crossings downstream of Wivenhoe (Twin Bridges, Fernvale, Savages Crossing, Burtons Bridge, Kholo Bridge, Mt Crosby Weir and Colleges Crossing) will be adversely impacted until at least Saturday 15 January in varying degrees.

Water levels in the lower Brisbane R will be impacted by the combined flows of Lockyer Ck, Bremer River, local runoff and releases from Wivenhoe Dam.

Somerset Regional, Ipswich City and Brisbane City Councils have been advised of the updated Wivenhoe operating strategy.

Situation report 13 was issued by John Ruffini at 1.14 am on 10 January and states, relevantly:

Wivenhoe Dam (Full Supply Level 67.00 m AHD)

River levels upstream of the dam are rising quickly with significant inflow being generated from the intense heavy rainfall. Flows in the Brisbane River at Gregor's Ck have already reached 7,350m3/s and the river has just peaked at 23:00 on Sunday 9 January.

The dam level is rising quickly, with the current level being 69.60m AHD (storing 301,000 ML). Estimated peak inflow to the dam just from the Upper Brisbane R alone may reach as high as 8,800m3/s and, at this stage, the dam will reach at least 73.3 m AHD during Tuesday morning. Given the rapid increase in inflow volumes, it will be necessary to increase the release from Wivenhoe during Monday morning.

The objective for dam operations will be to minimise the impact of urban flooding in areas downstream of the dam and, at this stage, releases will be kept below 3,500m3/s and the combined flows in the lower Brisbane will be limited to 4,000m3/s if possible.

Fernvale Bridge approaches and Mt Crosby Weir Bridge have been inundated and both bridges are now closed or are in the process of being closed.

The current release rate from Wivenhoe Dam is 1,400m3/s (120,000ML/day). Gate opening will start to be increased during early Monday morning and the release is expected to increase to at least 2,600m3/s.

Since the commencement of the event on 02/01/2011 approximately 240,000ML has been released from the dam, with an event total approaching 1,500,000ML without further rain and as much as 2,100,000ML with forecast rainfall of (both including Somerset outflow). At this stage, releases will continue until at least Sunday 16th January 2011.

Impacts downstream of Wivenhoe Dam

The projected Wivenhoe Dam releases combined with Lockyer flows and local runoff will mean that all crossings downstream of Wivenhoe (Twin Bridges, Fernvale, Savages Crossing, Burtons Bridge, Kholo Bridge, Mt Crosby Weir and Colleges Crossing) will be adversely impacted until at least Saturday 15 January in varying degrees.

Water levels in the lower Brisbane R will be impacted by the combined flows of Lockyer Ck, Bremer River, local runoff and releases from Wivenhoe Dam. If the predicted rainfall eventuates in the downstream tributary catchments the resultant combined flows in the lower Brisbane may exceed the threshold of damaging discharge in the urban areas within the next 24 to 48 hours.

Somerset Regional, Ipswich City and Brisbane City Councils have been advised of the updated Wivenhoe operating strategy.

Counsel for the Fernvale Residents submitted that the situation reports and flood event log entries between the middle of the day on 9 January and the morning of 10 January indicated that the flood engineers were focussed on keeping Mt Crosby Weir bridge and Fernvale bridge open. This, it was said, evinced a failure to make the protection

of urban areas from inundation their primary consideration as required by strategy W3.[194] In particular, counsel pointed to flood event log entries (9 January, 4.15 pm, 4.20 pm and 4.27 pm) and situation reports (9 January, 5.51 pm and 9.04 pm) in which, he said, the current strategy was identified as being to keep those bridges open.[195] The first indication that the Mt Crosby Weir bridge would be closed in the immediate future was a flood event log entry at 10.30 pm on 9 January, in which Mr Ayre suggested that the rails be taken off the bridge. Counsel submitted that the first time the objective of minimising the impact of urban inundation was mentioned in a situation report was the 1.14 am, 10 January 2011 report.[196]

Other counsel argued, to the contrary, that the lack of reference to 'W3' or 'urban inundation' could be explained by the requirement of the manual that reference be had to lower level objectives in all strategies, such as the prevention of disruption in rural areas by the submergence of bridges.[197] The situation reports, they said, provided the following 'clear evidence' that the impacts of releases on urban areas were being considered by the flood engineers at all stages of the event:

(i) indications that the councils responsible for urban areas had been consulted

(ii) references to increases in tides in the lower Brisbane River

(iii) references to other flood events[198]

(iv) the inclusion of the dam safety regulator on the list of recipients[199] and

(v) references to flows in the lower Brisbane River.[200]

As to the last, it was said that references in the situation reports over the weekend of 8 and 9 January 2011 to flows in the Brisbane River could only be relevant to strategy W2 or W3.[201] In response, counsel for the Fernvale Residents pointed out that while situation report 9 (12.16 pm, 8 January 2011), one of those relied on, did refer to water levels in the lower Brisbane River; so did situation report 6 (6.32 am, 8 January 2011), issued when the lake level was below 68.5 metres, and the only applicable strategy was W1.[202]

It is clear from the text of the situation reports, as early as the one issued at 5.57 pm on 7 January,[203] that the flood engineers were considering the effects of the releases they would make from the dam on the closure of bridges and on tide heights and flows in the lower Brisbane River. There were references to those issues both before and after the time at which W3 was said to have been engaged. That is unsurprising given the manual's direction that, in every strategy, all the objectives must be considered in order of priority,[204] so that in each of strategies W1, W2 and W3, disruption to rural life and inundation of urban areas should be considered. It is also clear that the bridges were a greater focus up until 9.00 pm on 9 January, when inundation of urban areas was given greater emphasis. While, if the flood engineers were operating the dam in strategy W3, protecting urban areas from inundation had to be their primary consideration, it does not follow that it would have been necessary to highlight it in situation reports while there was no immediate risk of urban flooding and it was still feasible that some, at least, of the bridges could be kept open.

Mention of either or both of the two priorities, directly or indirectly, does not establish which strategy the flood engineer writing the report thought was being applied, or the primary consideration that he held. The situation reports (excluding the situation report issued at 5.53 pm on 8 January 2011, dealt with below) are consistent with the flood engineers' having been in either strategy W1 or strategy W3, or, equally, with their operating the dam according to the described objective but without reference to strategy.

It is apparent from the excerpts of situation reports set out above that the first situation report to mention urban inundation is situation report 12, issued at 9.04 pm, 9 January 2011. It, as does situation report 13, uses the phrase '[t]he objective for dam operations **will be** to minimise the impact of urban flooding in areas downstream of the dam' (emphasis added). (That the wording is exactly the same in these two situation reports is likely to be due to the flood engineers' practice of cutting and pasting content in successive reports.)[205] It was put to some of the flood engineers that the use of the future tense 'will be' suggested that the objective had not been, up until that point, the prevention of urban inundation.[206]

Counsel for Seqwater submitted that, in the lower stages of W3, urban areas could be absolutely protected, making it unsurprising that the minimisation of urban inundation was not mentioned in earlier situation reports. The situation report simply indicated that the event had reached a stage where inundation of some urban areas was inevitable, and that the flood engineers were then focussed on the minimisation of impacts.[207] Counsel for Mr Ayre

and SunWater made a similar argument,[208] characterising the change in language as reflecting the point where the flood engineers abandoned any hope of achieving lower level objectives in strategy W3.[209]

Both views are reasonably open: the change in language to that of urban protection and the use of the future tense might signal a change of objectives and a move to a higher strategy; on the other hand, it might do no more than reflect a recognition of the change in immediate risk. In the circumstances, the Commission does not think any conclusion can be drawn either way from the language of situation reports 12 and 13.

Wivenhoe gate directives 3 and 4

Mr Ayre said in his evidence that the conscious decision to move to strategy W3 was effectively made by Mr Ruffini when he issued a gate opening directive at 5.00 am on 8 January 2011.[210] (In fact, the gate opening directive was issued at 4.50 am.[211]) That directive, and one issued by Mr Ayre at 8.15 am, put in place openings to increase dam releases to 1200 m^3/s by 2.00 pm on 8 January. Mr Ayre's contention was taken up in submissions.[212]

The argument was that the gate openings modelled by Mr Malone (and implemented by Mr Ruffini and Mr Ayre in their gate directives) contemplated a lake level higher than 68.5 metres, and thus, it was contended, contemplated a change of strategy, which could only be to W3, given that the intended releases exceeded the projected downstream peaks. Counsel for Seqwater also submitted that the releases were consistent with W3, inconsistent with W2 and 'neutral as regards W1'.[213]

The contemporaneous gate operations spreadsheets used by the flood engineers during their shifts do not support Mr Ayre's contention that Mr Ruffini's directive issued at 4.50 am on 8 January indicates a change in strategy from W1 toW3.

The series of gate openings implemented by Mr Ruffini and Mr Ayre on 8 January[214] is almost identical to the gate openings that had been planned by Mr Malone by 3.17 pm on 7 January 2011 in his operational spreadsheet.[215] The only differences between the actual gate openings and those planned by Mr Malone was the transposition of the time of one gate opening and consequent adjustment to the time of the gate openings that followed.[216] The actual gate openings and Mr Malone's planned gate openings produce almost identical outflows.[217] Mr Malone's operational spreadsheet from 7 January 2011 predicted a peak lake level less than 68.5 metres;[218] it follows that Mr Malone must have decided those gate openings were appropriate moving into the future at a time when he was operating in W1 with no expectation of moving to W2 or W3. It is to be noted that Mr Malone did not give any evidence that he contemplated the future use of strategy W3 during his shift, although he did say that he was aware of the potential for heavy rainfall in the beginning of the following week.[219]

It is true, as submitted by counsel for Seqwater,[220] Mr Tibaldi,[221] Mr Malone,[222] and Mr Ruffini and the State of Queensland,[223] that Mr Malone subsequently created a different spreadsheet,[224] which was used by Mr Ruffini during his shift, which did predict the lake level would rise above 68.5 metres. That does not change the fact that the gate openings actually implemented by Mr Ruffini and Mr Ayre on 8 January reflect the plan for increasing releases decided by Mr Malone at a time when there was no prospect of the lake level's rising above 68.5 metres. It may be that Mr Ruffini and Mr Ayre independently determined that Mr Malone's chosen plan to increase releases, despite having been devised for strategy W1, was nonetheless appropriate for strategy W3. On the other hand, it might be that they implemented Mr Malone's plan without recognising that the lake level indicated the need to adopt a different strategy. In the result, the gate openings directed by Mr Ruffini and Mr Ayre are consistent with management of the dam in either of strategies W1 and W3 (or neither).

In respect of Wivenhoe directive 4, Counsel for SunWater and Mr Ayre also submitted that the engineers must have used strategy W3, because they achieved the primary objective of strategy W3, protecting urban areas from inundation. It was argued that the primary objective was 'completely achieved', so the flood engineers were able to achieve lower level objectives as well, including by keeping open some rural bridges.[225] That was because the release strategy implemented by Mr Ayre with Wivenhoe directive 4 was aimed at keeping the flow in the mid-Brisbane River to 1600 m^3/s, a flow which, Mr Ayre said in evidence, was designed to prevent any urban inundation.[226]

As with all the release rates on the weekend of 8 and 9 January, this directive is consistent with three possibilities: that the dam was operated in strategy W1, with the dominant objective of keeping some bridges open; that it was operated in strategy W3 with a primary objective of avoiding urban inundation; and that whatever the objectives, no strategy was consciously chosen. It does not point to any one conclusion about the state of mind of the engineers at the time.

Somerset directive 3

At 11.30 am on 8 January, Mr Ayre issued a gate directive to the dam operators at Somerset Dam. That gate directive reads:[227]

> Somerset Dam is expected to peak at around mid-day at about EL 100.48 m. As we have exceeded EL 100.45 m (fixed crest level), but Wivenhoe Dam is still rising we will need to implement Strategy S2.
>
> This strategy is aimed at maximising the benefits of the mitigation storage in both Somerset and Wivenhoe dams. Consequently we will endeavour to follow the target line as defined in the manual.
>
> - Please open Sluice M to 100% at 12:00.
>
> Please confirm this gate operation by fax once you have completed the opening.

Counsel for Seqwater submitted that the language of the directive 'suggests a flood engineer who is watching for changes in key levels under the manual, who is appreciating that reaching the level of 100.45 mandates the use of a different strategy (namely strategy S2)'.[228] It showed, it was submitted, that 'Mr Ayre was a man who was conscious that a change in lake levels on Somerset triggered a need for a different strategy for that dam';[229] and that he was paying careful attention to the manual, lake levels and the regulation of release rates.[230] It was argued that the reference to strategy S2 was significant, because it is a strategy concerned with significant flood events that are dominated by rainfall upstream of Wivenhoe Dam. Other evidence suggested that strategy W3 was used for such events.[231] The argument appears to be that the 'adoption' of strategy S2 indicated recognition that the event was one to which strategy W3 should be applied. Counsel for Mr Ayre and SunWater[232] and for Mr Malone[233] made submissions to similar effect.

There are three strategies for flood mitigation operation at Somerset Dam: S1, S2 and S3.[234] They are markedly different from the W strategies used at Wivenhoe Dam. Strategy S1 is used when Somerset Dam is expected to exceed its full supply level (99.0 metres) but Wivenhoe Dam is not; its focus is on minimising disruption to rural life upstream of Somerset Dam. It is obvious that S1 should have had no application in the January 2011 flood event; Wivenhoe Dam was above full supply level for the entire event. Strategy S2 is used when Somerset Dam exceeds its full supply level and Wivenhoe Dam's level is between full supply level (67.0 metres) and 75.5 metres (the level of the first fuse plug[235]). There are a number of actions within strategy S2 depending on the situation at both dams; the level of 100.45 metres at Somerset is a trigger point for the implementation of some of those actions. Strategy S3 is used when Wivenhoe Dam is expected to exceed 75.5 metres and it is expected that a fuse plug will be initiated.[236] It is obvious that S3, also, could not properly have been used in the January 2011 flood event.

Mr Ayre gave oral evidence about the directive. He agreed he composed the message in it,[237] and said that he included reference to the strategy because one of the Somerset Dam operators had asked what was going to happen at the dam.[238] He was receiving lake levels every hour and recognised at the time that the dam had 'just exceeded the fixed crest level' (100.45 metres).[239] He said his plan at that time was to optimise the flood mitigation benefits of both dams to maximise the protection of downstream areas.[240]

The directive indicates on its face that Mr Ayre was aware of the level of Somerset Dam at the time he wrote the directive. However, Mr Ayre's statement in oral evidence that the lake level had just exceeded 100.45 metres when he issued the directive was inaccurate; in fact, the level had exceeded 100.45 metres at 8.00 am that morning, risen to 100.46 metres, and then fallen back to 100.45 metres at 11.00 am.[241]

The directive does not indicate that Mr Ayre had clear knowledge of, or was paying attention to, the manual. If the manual were complied with in respect of the Somerset Dam strategies, S2 would have been in force from the declaration of the flood event to the end of it. The manual does not (contrary to the terms of the directive) link the lake level's exceeding 100.45 metres with the implementation of strategy S2. The directive does suggest that Mr Ayre knew that 100.45 metres was a trigger level for a different release strategy from Somerset.

A reading of the manual negates the last point made by counsel for Seqwater, that the implementation of S2 at this time indicates recognition of a flood event dominated by upper Brisbane River flows, an event which would involve the use of W3. According to the manual, S2 would be used with strategy W1, W2, W3 and W4A. Only in W4B would the strategy at Somerset change, to S3. The use of S2 says nothing about the W strategy that was in operation at that time, except to exclude W4B.

This directive does not show that Mr Ayre was operating the dam in strategy W3, or, for that matter, in W1 or W2, on 8 January 2011.

Gate operations spreadsheets

Counsel for Seqwater put some emphasis on the gate operations spreadsheets. He submitted that the data Mr Ayre entered in the gate operations spreadsheet he was using during his shift ('SDWD-201101080900') and his 'without forecast' model run 10 (completed at 2.00 pm on 8 January) indicated that he was acutely aware of the level of the lake, the releases and the peak flows at Lowood and Moggill.[242] Similarly, it was inherently probable that Mr Ruffini appreciated the significance of the data in the gate operations spreadsheet and model run that he completed during his shift.[243]

There is no doubt that the gate operations spreadsheets being used at the time by Mr Ayre and Mr Ruffini contained information relevant to choice of strategy. Whether they appreciated the significance of that information to strategy choice, or used it to determine which strategy they were operating, are different issues, which must be assessed in the context of the evidence as a whole. See *16.6 Evidence of strategy choice: the flood operations engineers*.

Mr Malone's forecast scenario

Mr Malone sent an email at 11.02 am on 9 January that included predictions as to what could be expected if the forecast heavy rainfall eventuated over the following days. That email states:[244]

> **Forecast Rainfall**
>
> The forecast for the next few days is for heavy rainfall, particularly for period 10pm Sunday to 10pm Monday with totals between 200-300mm. The areas mostly heavily impacted will be the North Pine, Somerset and Leslie Harrison catchments with less rain in the upper Brisbane. http://www.bom.gov.au/jsp/watl/rainfall/pme.jsp
>
> The rain contracts to the area around North Pine for the period 10pm Monday to 10pm Tuesday with totals in the order of 100 to 150mm.
>
> The interactive model at http://www.bom.gov.au/australia/charts/viewer/index.shtml shows the heaviest falls during the next 48 hours are likely to be overnight Sunday/Monday and overnight Monday/Tuesday.
>
> The QPF for the period 24 hours to 9am show totals between 40-60mm for both North Pine and Somerset/Wivenhoe catchments. Note that this is only half the period of the above forecast durations.
>
> **Recorded Runoff**
>
> To date recorded inflows to the dams since 02/01/2011 have been
>
> | | |
> |---|---|
> | North Pine | 23,000ML |
> | Somerset | 120,000ML |
> | Wivenhoe | 380,000ML (including Somerset outflow) |
>
> Presently, the conversion rate between rainfall and runoff is about 0.45 for Wivenhoe, 0.60 for North Pine and 0.75 for Somerset.
>
> **Expected Runoff**
>
> Based on the approximate runoff conversion rates and the forecast rainfall, estimated runoff volumes (ML) generated could be the order of:

Catchment	Monday	Tuesday	Wednesday	Three Day Total
North Pine	10,000-20,000	35,000-55,000	25,000-35,000	70,000-110,000
Somerset	50,000-100,000	200,000-300,000	75,000-150,000	325,000-550,000
Wivenhoe	125,000-250,000	250,000-500,00	125,000-250,000	500,000-1,000,000

> The lower limit of the inflow to Somerset and Wivenhoe will be similar to the October 2010 flood while the upper limit is similar to the February 1999 floods. However, the starting level of the dams is much higher than in these historical events.
>
> This points to continued flood operations for Somerset and Wivenhoe until at least the weekend of 15/16 Jan and maybe a shorter time for North Pine.

It should be noted that these estimates are based upon forecast rainfall which may or may not eventuate.

Terry Malone
Duty Engineer
Flood Operations Centre

(emphasis in original)

Mr Malone gave evidence that the figures did not cause him to 'ramp up' releases significantly; it would have been irresponsible to do so, because there was no rainfall on the ground and sometimes forecast events 'just don't come off'.[245] Counsel for Seqwater submitted that this document should be taken to indicate that Mr Malone recognised that this was a significant flood because of the foreshadowed inflows into the dam and the reference to the October 2010 and February 1999 events.[246] The document does establish that Mr Malone was aware that, if forecast rainfall eventuated, a significant flood would ensue; but it says nothing about what strategy was being applied at the time.

Change to two engineers' being on shift together

From the shift starting at 7.00 pm on 9 January until after the peak of the event had passed, there were two flood engineers on each shift. Counsel for Seqwater submitted that this change in staffing reflected the seriousness with which the event was being treated by the engineers.[247] Mr Ayre said in his interview with Commission staff that one of the reasons that the flood engineers decided to do shifts in pairs was because they recognised that in larger flood events, more people were going to be requiring information from the flood operations centre because more people would be affected.[248] The Commission accepts the submission of counsel for Seqwater. The decision to have two engineers on shift together was, obviously, recognition by the flood engineers that the event was increasing in magnitude.

Releases from Wivenhoe Dam

The releases from Wivenhoe Dam during the relevant period were as follows.

Figure 16(b)

Date/Time	Release (m^3/s)	Date/Time	Release (m^3/s)
08/01/2011 04:00	719	09/01/2011 08:00	1334
08/01/2011 05:00	773	09/01/2011 09:00	1333
08/01/2011 06:00	825	09/01/2011 10:00	1332
08/01/2011 07:00	879	09/01/2011 11:00	1332
08/01/2011 08:00	927	09/01/2011 12:00	1384
08/01/2011 09:00	980	09/01/2011 13:00	1385
08/01/2011 10:00	1031	09/01/2011 14:00	1386
08/01/2011 11:00	1085	09/01/2011 15:00	1388
08/01/2011 12:00	1138	09/01/2011 16:00	1394
08/01/2011 13:00	1189	09/01/2011 17:00	1398
08/01/2011 14:00	1239	09/01/2011 18:00	1404
08/01/2011 15:00	1240	09/01/2011 19:00	1411
08/01/2011 16:00	1241	09/01/2011 20:00	1419
08/01/2011 17:00	1242	09/01/2011 21:00	1428
08/01/2011 18:00	1242	09/01/2011 22:00	1440
08/01/2011 19:00	1242	09/01/2011 23:00	1450
08/01/2011 20:00	1242	10/01/2011 00:00	1462
08/01/2011 21:00	1242	10/01/2011 01:00	1473
08/01/2011 22:00	1242	10/01/2011 02:00	1539
08/01/2011 23:00	1242	10/01/2011 03:00	1605
09/01/2011 00:00	1241	10/01/2011 04:00	1672

Date/Time	Release (m^3/s)	Date/Time	Release (m^3/s)
09/01/2011 01:00	1240	10/01/2011 05:00	1740
09/01/2011 02:00	1286	10/01/2011 06:00	1806
09/01/2011 03:00	1285	10/01/2011 07:00	1875
09/01/2011 04:00	1285	10/01/2011 08:00	1944
09/01/2011 05:00	1336	10/01/2011 09:00	2015
09/01/2011 06:00	1335	10/01/2011 10:00	2031
09/01/2011 07:00	1334	10/01/2011 11:00	2044

That data shows that releases were increased from 773 m^3/s at 5.00 am on 8 January, just after Mr Ruffini had issued Wivenhoe directive 3, to around 1240 m^3/s by 2.00 pm on that day. Releases were maintained at that level for 11 hours, until 1.00 am on 9 January. A further gate directive increased releases to around 1330 m^3/s, a level that was maintained from 5.00 am to 11.00 am on 9 January. The releases were slowly increased over 1400 m^3/s by 6.00 pm and continued a gradual progression through the 1400s. From 2.00 am on 10 January, the releases started to increase faster, exceeding 1700 m^3/s at 5.00 am, 1900 m^3/s at 8.00 am and 2000 m^3/s at 9.00 am.

Counsel for the Fernvale Residents submitted that the release rates provided no evidence of a transition to strategy W3 at 8.00 am on 8 January 2011. On his contention, it was not until releases exceeded 1900 m^3/s, at 8.00 am on Monday 10 January, that the release rates indicated unequivocally that the strategy being used was not W1.[249] Counsel for the Mid-Brisbane River Irrigators submitted that the release strategies used over the weekend of 8 and 9 January and through to the morning of 10 January were W1 strategies.[250]

Counsel for Seqwater's submissions in respect of releases from Wivenhoe Dam contained two strands. The first was that the release rates, on their face, indicated that strategy W3 was invoked or that the primary consideration at the time was the protection of urban areas from inundation. On this point, it was contended that the release rates set out in the situation report issued at 12.16 pm on 8 January (with flows in the mid Brisbane River maintained at 1600 m^3/s) were consistent with considering urban inundation, given Mr Ayre's evidence that in the October and December 2010 floods, it was at this flow that low lying areas in Brisbane started to be affected by flooding.[251] By 4.00 pm on 9 January, the engineers had decided upon a gate opening sequence which would result in releases above 2000 m^3/s, the maximum release rate of W1.[252] (In fact, it appears that model run 19, which is relied upon by Seqwater for this argument, is an inaccurate reconstruction.[253] The contemporaneously saved gate operations spreadsheets do not indicate a release rate above 2000 m^3/s until a spreadsheet named 'SDWD-201101091900' which was saved at 8.29 pm, 9 January 2011.[254])

Counsel for Seqwater also submitted that the releases on 8 and 9 January were considerably greater than the naturally occurring peak flows at Lowood and Moggill, making the releases inconsistent with the use of strategy W2.[255]

The second strand of the submissions relied on the evidence of the experts who peer reviewed the Seqwater flood event report and Mr Babister as to the appropriateness and reasonableness of the releases made. Counsel for Mr Malone,[256] Mr Ruffini and the State of Queensland,[257] and Mr Ayre and SunWater[258] also made submissions relying on the expert evidence as to the consistency of the releases made, and the model runs performed, by the engineers with the operation of the dam in W3, as well as on the evidence of Mr Ayre[259] and Mr Tibaldi[260] that they considered the releases consistent with the use of W3.[261] In particular, counsel for Mr Malone submitted that the fact there was no 'jump' in releases at 8.00 am on 8 January did not mean there was no transition from W1 to W3; to have radically increased releases at that time would have been irresponsible.[262] Counsel for Mr Ayre and SunWater also pointed out that Mr Cooper, an expert engaged by the SEQ Water Grid Manager to review the operators' performance on 11 January 2011, held the view that the operators had taken appropriate decisions.[263]

The experts unanimously agreed that the release rates chosen by the flood engineers were appropriate for being in W3 and holding the primary consideration of the protection of urban areas from inundation. But none of them said that the releases were inconsistent with operation in W1; indeed, one of them, Mr Roads, said they were consistent. No expert said that the releases were inconsistent with the primary consideration of preventing the submergence of bridges. That was obvious. Strategy W1 has a maximum release rate of 1900 m^3/s.[264] Strategy W3

has a maximum release rate of 4000 m^3/s and no minimum release rate. Until releases exceeded 1900 m^3/s at 8.00 am on 10 January, the release rates were consistent with both W1 and W3. The plan to increase releases over 1900 m^3/s is first evidenced in a contemporaneous gate operations spreadsheet titled 'SDWD-201101091900',[265] which is the subject of a flood event log entry at 7.00 pm on 9 January; shortly after, calls were made to councils, Seqwater's chief executive officer and the dam safety regulator advising that, given the rainfall, high releases from Wivenhoe, with the prospect of damaging flooding, were likely to be necessary.[266]

Releases at the rates adopted over the weekend of 8-9 January achieved the objective of minimising disruption to rural life, because they allowed the Fernvale and Mt Crosby Weir bridges to remain open. At those rates, though, they also achieved the objective of protecting against urban inundation. Both objectives were relevant whether the dam was being operated in either W1 or W3 (or for that matter, W2 or W4) but it is impossible to say from the level of releases which objective was being treated as the primary one.

The release rates are intractably neutral as to whether the flood engineers were operating the dam in W1, or W3, or outside of any strategy and concentrating only on objectives.

16.7.2 Situation report at 5.53 pm on 8 January 2011

At 5.53 pm on 8 January 2011, Mr Ayre sent a situation report from the Duty Engineer email account.[267] That situation report relevantly states, under the heading 'Forecast Scenario – Based upon mid-range rainfall forecasts':

> Assessments have been undertaken to determine possible increases to releases given the high likelihood of significant inflows in the next few days. The interaction with runoff from the Bremer River and Warrill Creek catchment is an important consideration as **the event magnitude will require the application of Wivenhoe Dam flood operation strategy W2** (Transition strategy between minimizing downstream impacts and maximizing protection to urban areas).
>
> Projections based upon the forecast rainfalls suggest flows of up to 1,200 m3/s will emanate from the Bremer River catchment. If similar rainfall magnitudes occur in the Upper Brisbane and Stanley Rivers then increased releases may be required from both Somerset Dam and Wivenhoe Dam. Preliminary projections suggest that such a forecast will extend the release duration until next Saturday 15 January, but mid-Brisbane River flows will be kept to a maximum of 1,800 m3/s. However, if falls are greater than those forecast releases from Wivenhoe Dam may need to adversely impact Mt Crosby Weir Bridge (1,900 m3/s) and possibly Fernvale Bridge (2,100 m3/s) but will be maintained below 3,500 m3/s.
>
> (emphasis added)

Natural meaning

On their face, the words 'the event magnitude will require the application of Wivenhoe Dam flood operation strategy W2', read in context, appear to be intended to communicate that the next strategy would be W2 and that this would be a move to a higher strategy. On that reading, it would follow that Mr Ayre's understanding was that the strategy in place at the time he wrote the situation report was W1. If that was the case, there was a breach of the manual.

Recent explanation

Mr Ayre's evidence was that this passage meant something different.

Mr Ayre's most recent explanation, on 3 February 2012, for this entry was:

> It is possible that based on the forecast rainfall and the temporal distribution of that forecast rainfall, current release rates will drive the lake level down below the threshold limit, back into W1, and then with the rainfall that was coming through on the Sunday and the Monday, you would be back up into the range again. However, this time the forecasted peaks in the Lockyer and the Bremer will be much higher than what they were previously.[268]

In essence, Mr Ayre's 3 February 2012 explanation was that the strategy in use on the afternoon of 8 January 2011 was W3, but the first paragraph under the heading flagged the possibility that there would be a move from W1 to W2 after the strategy had changed from W3 to W1 as a result of a fall in the lake level.[269] Mr Ayre's evidence in February 2012 was initially that the dam would be back in W2 on 'Sunday night, Monday'.[270] He was later asked

whether he was 'saying that there was a possibility that you might get into W2 the following Tuesday' and replied 'Possibility'.[271] And finally when he was asked, 'if the rainfall came with the inflows on Tuesday or Wednesday increasing the lake level, if it goes back above 68.5, you're back in either strategy two or three?' Mr Ayre responded, '[y]es, that's correct.'[272]

Mr Ayre's evidence was that what he had written:

> was predominantly a heads-up, I suppose, more internally for John Tibaldi, but it was basically to give people an idea that there was certainly more rain coming, but the current strategy could – adopted – sorry, adapt to it relatively straightforward. The W2 reference is pretty meaningless, I suppose, for most people in that context.[273]

The entry was, Mr Ayre acknowledged, a 'bit cryptic'.[274]

Explanation in March and April 2011

Mr Ayre appeared before the Commission over the days from 11 April 2011 to 13 April 2011. Asked during that appearance about the reference to W2 in the situation report, he said, 'That was an error on my behalf.'[275] In further evidence, Mr Ayre made these statements:

> I was certainly contemplating, at the time I wrote that, that we were in transition between strategy W1 and W3.[276]
>
> I do acknowledge that I had inadvertently recorded strategy W2 at that point in time but recognise that that wasn't correct, we had transitioned into W3 earlier in the day.[277]

Asked, 'What you thought at the time you wrote it was that you were still applying the W2 strategy?', Mr Ayre responded, 'At the time I would have otherwise I wouldn't have put it in the situation report.'[278]

Mr Ayre provided a supplementary statement, signed on 29 March 2011,[279] in which he said:

> One important point to note from this situation report is the information under the heading 'Forecast Scenario - Based on mid-range forecasts'. The models that I used in preparing the projections I refer to were based on 72 hour rainfall forecasts (I note that the 72 hour forecast models were included in Appendix K of the Wivenhoe and Somerset Dams Flood Report 2011). The information contained in this section was included to make the regional councils aware that:
>
> (a) If the forecast rainfall eventuated the flows could be limited to 1,800m3/s and Fernvale Bridge and Mt Crosby Weir Bridge could remain open;
>
> (b) If more than the forecast rainfall eventuated then Fernvale Bridge and Mt Crosby Weir Bridge would be closed; and
>
> (c) The model projections were that downstream flow would still be maintained below 3,500m3/s (which is the W&S Manual reference to 3,500m3/s at Lowood).[280]

Submissions in favour of recent explanation

Counsel for Mr Ayre and SunWater,[281] Mr Malone,[282] Mr Ruffini and the State of Queensland,[283] Seqwater,[284] and Mr Tibaldi[285] submitted that Mr Ayre's explanation given in the February 2012 hearing should be accepted. It was argued[286] that there was contemporaneous documentation consistent with Mr Ayre's recent explanation. Mr Ayre had conducted modelling at about 3.00 pm on 8 January 2011.[287] At that time, the three day forecast assessment showed a continuous drop in the inflows at Wivenhoe Dam until about the morning of 10 January 2011.[288] On the morning of 10 January 2011, the inflows would drop below 200 m^3/s, but would then rise to just under 1400 m^3/s on the evening of 11 January 2011.

Mr Ayre agreed with the proposition that, if 1250 m^3/s continued to be released from Wivenhoe Dam, but the inflows, as predicted, dropped significantly, there was 'a good likelihood that the lake level would fall back below 68.5'.[289] If the flow from the Bremer River later reached 1200 m^3/s, as foreshadowed in the situation report, it was possible that the releases from Wivenhoe Dam might be reduced to allow the peak to pass and then 'piggy-back' on that downstream peak.[290]

By this process of reasoning, the strategy would drop back to W1 once the lake level dropped below 68.5m and then change to W2 when the lake level rose, but releases would be kept under the downstream natural peak while the 'piggy-back' technique was used.

Counsel for Mr Ayre and SunWater submitted that modelling contained in Attachment 34 of Exhibit 524 was consistent with Mr Ayre's evidence that 'the lake level would fall below 68.5'.[291] Attachment 34 of Exhibit 524 contains many modelling spreadsheets. The spreadsheet to which Counsel for Mr Ayre and SunWater was referring seems to be 'SDWD-201101081500-Forecast72hr'.[292] That spreadsheet appears to be the model run by Mr Ayre on the afternoon of 8 January 2011 based on a three day forecast.

Counsel did not advert to a particular worksheet in that spreadsheet, titled 'WivenhoeEL'. It showed a projected lake level for Wivenhoe Dam based on a three day forecast. It projected the lake level falling below 68.5m at about midday on Sunday, 9 January 2011, and then rising again above 68.5m on about the evening of Tuesday, 11 January 2011. That worksheet supports Mr Ayre's evidence that he was anticipating that the lake level would fall below 68.5m and then subsequently rise again above 68.5m. But it says nothing about the release strategy being employed either on the evening of Saturday, 8 January 2011 or throughout the next week.

Counsel for Mr Ruffini and the State of Queensland submitted that '[t]he model runs as examined by the peer reviewers were consistent with the notion of a change from W3 to W2 after transitioning from W1'.[293] The footnote to that assertion refers to evidence given by Professor Apelt, Mr Roads and Mr Shannon. The evidence does not support the assertion.

Professor Apelt, after agreeing to a series of propositions setting out the logic of Mr Ayre's February 2012 explanation said, 'I can see that as a possible interpretation. It would have helped if they had written it a bit more clearly.'[294]

Mr Roads was also taken through a series of propositions setting out the logic of Mr Ayre's recent explanation.[295] He was then asked:[296]

> Mr O'Donnell: And on that understanding, you would not see that situation report as inconsistent with the author operating – consciously operating under W3 as at the time the situation report is written?
>
> Mr Roads: Yeah. It will take a little bit longer to get my head around everything but certainly everything you're saying makes sense.

As with Professor Apelt and Mr Roads, Mr Shannon was taken through a series of propositions setting out the logic of Mr Ayre's recent explanation and showing that it was not inconsistent with modelling.[297] Mr Shannon was ultimately asked:[298]

> Mr O'Donnell: And therefore the concept of transition to W2 could be something some days ahead, Tuesday or Wednesday; not something the flood engineer is contemplating doing on the Saturday or soon after the Saturday?
>
> Mr Shannon: This is all speculative.
>
> Mr O'Donnell: Yes?
>
> Mr Shannon: What they might be considering.
>
> Mr O'Donnell: That's right. But you see it's consistent with the flood engineer thinking that he is then operating the dam – that is, on the Saturday – under W3. If the inflows continued to fall to the dam, the level would drop back below 68.5; maybe on Tuesday or Wednesday it might rise above 68.5; and at that time they could transition to W2. Does that make sense to you?
>
> Mr Shannon: That's possible, yes. I couldn't imagine that that's at the forefront of somebody's mind. When they are dealing with a flood and they are thinking at the forefront of their mind that – what might happen in three days' time. First of all, they need to think about what's happening here and now.

Counsel for Mr Ayre and SunWater also relied on the evidence of the experts, but put the proposition less strongly, submitting only that the experts, 'when confronted with the objective facts that were prevailing at the time and available to Mr Ayre through his modelling … could understand the reference in the 5.53pm Situation Report in its proper context'.[299] In addition to the evidence of Professor Apelt, Mr Shannon and Mr Roads, Counsel for Mr Ayre and SunWater relied upon the evidence of Mr McDonald.

As with the other experts, Mr McDonald was taken through the various propositions involved in Mr Ayre's recent explanation. Mr McDonald was then asked if he thought it was a fair interpretation that, 'putting the model together with the Situation Report', the relevant part of the situation report was speaking of a possible move to W2, if the rate of inflows increased with further rain on 11 January 2011, after a fall to W1 from W2 or W3.[300] Mr McDonald's response was, 'you may be right, that may have been what was in the mind of the author but it's not confirmed by explicit language that that is so'.[301] Mr McDonald was asked if 'it might be consistent that it's contemplating the transition to W2, some days hence, if there is fresh rainfall as per this model'.[302] Mr McDonald said that was a possibility.[303] Pressed on the point, Mr McDonald ultimately said, 'It's not entirely clear where you are coming from. But anyway, the proposition you put is possibly what the author had in mind.'[304]

The evidence of the peer reviewers is of very limited assistance. At best it amounts to saying that they could follow the logic of the proposition now put as to what the situation report meant. They gave their evidence in ignorance of Mr Ayre's earlier statements about the situation report; quite properly, because Mr Ayre's credibility was not a matter for them.

Difficulties with Mr Ayre's recent explanation

Mr Ayre's recent explanation cannot be accepted, for a number of reasons.

Firstly, it is utterly inconsistent with the explanation Mr Ayre gave for the entry in his evidence in April 2011: that the entry was a mistake, made in the belief he was in W2 because he was contemplating that he was in transition between W1 and W3. That account cannot be reconciled with his explanation on 3 February 2012 that he knew strategy W3 was being used on the afternoon of 8 January 2011, but was intending through the situation report to give a 'heads-up' or the 'idea' that the dam might be operated through a W3-W1-W2 series of changes.

When challenged, on 3 February 2012, about the inconsistency, Mr Ayre said that he thought he might 'have been confused by that line of questioning' (in April 2011) and that 'it was a confusion between what the current situation was or what we were talking about in that forecast scenario'.[305] In particular, Mr Ayre attempted to explain his answer on 12 April 2011 that 'I had inadvertently recorded strategy W2 at that point in time but recognise that that wasn't correct, we had transitioned into W3 earlier in the day' as the result of confusion as to whether he was being asked about what he was doing at the time the situation report was written or what he was planning by way of future operation:[306]

> Mr Ayre: Again, it was the context of were we talking about the future operation or the point - or what we were actually implementing at the time.
>
> Mr Callaghan: Well, I'm sorry, but the question is did you think that you were applying strategy W2?
>
> Mr Ayre: Well, I was applying strategy W2 in the forecast scenario, yes.

There is no doubt that in April 2011, Mr Ayre was explaining the words in the situation report as a mistake. His attempt, in his evidence given in February 2012, at a far more elaborate explanation which did not involve any such error cannot be accepted.

Counsel for Mr Ayre and SunWater submitted that Mr Ayre gave his answers on 12 April 2011 without having had his attention drawn to 'those model results [that] indicated that the lake level would fall below 68.5m, and be followed by another peak in a few days time'.[307] Counsel for Seqwater made a similar submission.[308] That is not a logical explanation for Mr Ayre's answers on 12 April 2011 and it is not the explanation now advanced by Mr Ayre. Mr Ayre says that he was confused. He does not say that he had forgotten the modelling that he had performed. Indeed, as counsel for Mr Ayre and SunWater also submitted, Mr Ayre appears to have been conscious when giving his evidence on 12 April 2011 of the modelling he had performed on the afternoon of 8 January 2011, because he referred to that modelling in another part of evidence.[309]

Secondly, it is not credible that Mr Ayre would, in a situation report intended to inform others, launch into an obscure and complicated hypothesis of projected strategy use. The use of strategy W3 was not something which commonly occurred in his experience,[310] but instead of recording it, or of alerting the reader to the next strategy which might be applicable (on Mr Ayre's February 2012 evidence, strategy W1) he alluded only to a strategy which might become applicable after both of those had run their course.

Thirdly, Mr Ayre's explanation depends on his having appreciated that he was operating in strategy W3 but that there would have to be a strategy change to W1 as the lake level dropped, followed by adoption of strategy W2. His evidence, however, was that on 8 January 2011 he saw no need to distinguish between W2 and W3:

(a) 'I can't record [sic] with clarity - there was nothing at that point in time that I needed to distinguish between Strategy W2 or W3.'[311]

(b) 'I was conscious that we weren't in W1. I knew we had transitioned. I wasn't necessarily - I can't recall right now whether at 8 o'clock on Saturday the 8th of January I was consciously aware that we were in W3. I know we'd transitioned out, but there was nothing happening at that time that meant that I needed to differentiate between strategy W2 or W3.'[312]

(c) 'Well, all through the day I guess the volume that we had to manage was effectively the same. There was no additional rainfall on the catchment, so there was no real decision to be made necessarily once I put that gate sequence in place. Nobody asked me what strategy we were in, so I guess I didn't really need to actually know at that point, I suppose.'[313]

Mr Ayre's seventh and most recent statement also suggested that he did not, on the afternoon of 8 January 2011, distinguish between W2 and W3:

(a) 'Strategy labels are generally only attributed after the event as part of the reporting process.'[314]

(b) 'In selecting a target release rate of 1,250 m^3/s I was cognizant of the requirement to optimize protection of urban areas from flooding as is noted in strategies W2 and W3.'[315]

Fourthly, the account of strategy change that Mr Ayre now says he meant to communicate is simply not borne out by the terms of the situation report. It gives no clue as to the complicated reasoning process now said to be intended by it. As Mr Ayre himself said, 'The W2 reference is pretty meaningless, I suppose, for most people in that context.'[316]

Fifthly, the purpose and effect Mr Ayre attributed to the statement has changed. It was portrayed in his supplementary statement as a straightforward representation to the regional councils of what was to be expected in the scenarios that the forecast rainfall eventuated or that rainfall was in excess of what was forecast. In the first event, what is suggested in the supplementary statement is an outcome consistent with W1 – the limiting of flows to 1800 m^3/s and the keeping open of the Fernvale and Mt Crosby Weir bridges; in the second, the closure of the bridges but the maintaining of flows below 3500 m^3/s, with a reference to the manual prescription for W2 (as Mr Ayre confirmed when giving evidence in February 2011[317]). There was no hint then of any application of W3 or any 'heads-up' for Mr Tibaldi.

The only rational interpretation of the situation report is that Mr Ayre was speaking in it of a possible move, with an increase in the magnitude of the event, from the existing strategy to a higher one: W2.

Recent invention

Mr Ayre was asked, when he gave evidence in February 2012, when he had first advanced the explanation now given to anyone else.[318] He said that he did not have any recollection of when he had 'first described it to anyone' but believed that he had 'described that to the legal team when we were preparing statements' for the purpose of the hearings in 2011.[319] Asked if it appeared in any of his statements, he responded that '[i]t would be in the supplementary statement as such'.[320] The content of the supplementary statement has been dealt with above. It does not support the recent explanation; to the contrary.

Mr Ayre could have adduced evidence of any instance in which he had previously given his current account of the situation report. He has not done so. Counsel for Mr Ayre has provided written submissions to the Commission. Those submissions do not suggest that Mr Ayre had advanced this explanation at an earlier time.

The fact of Mr Ayre's willingness to invent an account to explain the 5.53 pm situation report weighs heavily against his credibility more generally.

16.7.3 Flood event log, 3.30 pm, 9 January

The flood event log records a conference between the four flood engineers at 3.30 pm on 9 January 2011, with Mr Ruffini, Mr Ayre and Mr Malone physically present and Mr Tibaldi joining by telephone.[321] There had been

no conference of the kind between all four engineers up to that point in the flood event. The 3.30 pm entry in the flood log reads:

> Duty Engineer Conference held at the FOC: Attended by RA, JR, TM with JT on conf phone. ***At this stage operating at the top end of W1 and the bottom end of W2.*** Storing approx. 300,000 Ml at present (above Wivenhoe) with an additional 500,000 Ml expected to flow into the dams from rainfall on the ground. The rainfall system is currently in the N-E part of the catchment and expected to travel south over the next 24-36 hours according to the BoM forecasts. This has the potential to significantly increase flows in Lockyer Ck & the Bremer River which potentially could close Fernvale Bridge and Mt Crosby Bridge and increase the risk of flooding in the Lower Brisbane. Releases from Wivenhoe Dam will be maintained at the current level of ~ 1,400 cumecs. If required, releases from Wivenhoe will be reduced to contain the flow in the Mid-Brisbane to 1,600 cumecs and 3,000 cumecs in the Lower Brisbane. At this stage it is anticipated that levels below 102.5 in Somerset and 72.5 in Wivenhoe can be attained.
>
> (emphasis added)

Evidence as to authorship and meaning

The entry has the initials 'NGA' as the person who made the entry.[322] 'NGA' refers to Neville Ablitt, a flood officer. Mr Ablitt gave evidence. He was the only flood officer rostered on for that shift.[323] He said that he would have created the entry and written a brief summary. The time, 3:30 pm, was probably inserted by him, as were the words 'Duty Engineer Conference held at the FOC: Attended by RA, JR, TM with JT on conf phone.' The remainder of the words in the entry were not his.[324]

Counsel for Mr Ruffini and the State of Queensland submitted that 'Mr Ablitt suggests that the entry may have been "cut and paste[d]" from another entry'.[325] That is wrong. The passage of Mr Ablitt's evidence footnoted by counsel relates to a different entry in the flood log.[326]

Mr Ablitt was a coherent and compelling witness. The Commission accepts his evidence. The only reasonable view is that the body of the text in the entry was written by one of the three flood engineers physically present at the conference.

Mr Tibaldi, who participated by telephone, said that his only recollection of the conference was that he held the belief that the lake levels were dropping and his impression was that 'I couldn't understand why they were getting concerned'.[327]

Mr Tibaldi had commented on the flood event log that appeared as Appendix M to Seqwater's March flood event report.[328] Those comments were made by 21 March 2011. Next to the 3.30 pm entry, Mr Tibaldi's comment was:

> Discussion on possible operational strategies over coming days. Numerous scenarios were possible.

That comment suggests that, at the time he made it, Mr Tibaldi had some recollection of this conversation, and did not take any issue with the content of the entry.

Mr Ayre described the statement that they were 'operating at the top end of W1 and the bottom end of W2' as 'a Ruffini-ism' and said that it 'was an expression that John Ruffini used, although I can't be exactly sure it was him'.[329] His explanation for what the statement meant was:

> I suppose what I took that to mean was we were achieving the top objective of strategy W1, that is to keep the high-level bridges open, and I took the bottom end of W2 to be meaning exactly the same thing, in reality; it is minimising disruption to downstream rural life. …
>
> I think all he was trying to describe was the phase that we'd been operating up to and that we were able to store water in the dam at that point and make releases in a manner that optimised the protection, but also had the benefit of keeping the high-level bridges open.[330]

Mr Ruffini had no recollection of using the words.[331] He initially speculated that the use of 'W1' and 'W2' might have been shorthand methods of referring to the discharge rates. Mr Ruffini was taken through the logic of that proposition and ultimately accepted that it 'doesn't seem to make sense'.[332]

Mr Ruffini had also previously commented on a draft of Appendix M in his 24 March 2011 statement.[333] His comment on the 3.30 pm entry was, 'I can't recall the exact words spoken at this meeting. The description provided is consistent with my recollection of the meeting.'[334] In his February 2012 evidence, he represented the effect of

the comment as, 'I said I didn't remember the details of what was spoken at that meeting but, you know, basically the general thrust of it was probably okay';[335] but as the comment itself makes plain, he accepted the content of the entry in considerably stronger terms than that.

Mr Malone could not recall anyone speaking during the conference about being 'at the top end of W1 and bottom end of W2'.[336] However, he said that he could 'quite understand why it was stated'.[337] The relevant questions and answers were as follows:[338]

> Mr Malone: ...[T]he statement is correct. ... It doesn't say we are not operating under strategy 3. It says we are operating at a particular point.
>
> Mr Callaghan: You'd just better explain that for us?
>
> Mr Malone: At this stage, we are operating at the top end of W1 and the bottom end of W2. It says we are operating at a particular point. It doesn't say we are operating under strategy W1 or W2.
>
> Mr Callaghan: So, that should be read to interpret, 'Even though we are in three, we are at one and end of two,' is that the way we should read it?
>
> Mr Malone: If you look at the levels ... and the releases at that particular point, that was the condition – those conditions might also satisfy the top end of W1 or the bottom end of W2.
>
> Mr Callaghan: Well, quite, they might, but-----
>
> Mr Malone: But it doesn't say that you're operating under strategy W2.
>
> Mr Callaghan: Well, under, okay?
>
> Mr Malone: It says 'at'.
>
> Mr Callaghan: It's all in the prepositions, is it?
>
> Mr Malone: Well, if we're being very precise, yes.

All of the answers given about the entry were speculative; none of the flood engineers admitted to recalling the statement, let alone having made or recorded it.

Natural meaning

The natural meaning of the entry is that, during their discussion, one or more of the flood engineers identified that the dam operations were then on the cusp, or point of transition, between strategies W1 and W2 (not W3).

Submissions against natural meaning

Counsel for Mr Ayre and SunWater submitted that it was never put to any of the flood engineers that the entry means that 'they were at the point of change from W1 to W2'.[339] Each of the flood engineers was questioned at length as to what they could recall about the entry, which was nothing, and given an opportunity to hypothesise as to what the entry means. To the extent that there is any doubt, the Commission accepts that none of the flood engineers gave evidence consistent with the natural meaning.

Counsel for Seqwater submitted that, '[t]he meaning of the entry is obscure'.[340] Counsel for Mr Malone submitted that the entry could not be sensibly advanced as evidence supporting the submissions made by counsel assisting because it was 'an exercise in conjecture to ascribe meaning to the entry' and 'it was not demonstrated that any of the engineers authored it'.[341]

Interpreting the entry only entails difficulty if it is to be construed as meaning something other than what it says. When Mr Tibaldi and Mr Ruffini reviewed it almost a year ago, neither suggested that it was inaccurate or should be understood as meaning anything other than what it said on its face.

Counsel for Mr Ruffini and the State of Queensland submitted that the statement 'operating at the top end of W1 and the bottom end of W2' could not be a statement relating to the strategy because the uncontradicted evidence 'is that the dam can only operate in one strategy at a time'.[342] Counsel for Mr Ayre and SunWater made a similar submission and pointed to evidence from Mr McDonald and Mr Shannon to the effect that they understood that the statement should not be read literally.[343] Counsel for Seqwater[344] and counsel for Mr Tibaldi[345] also made this submission.

Counsel for Mr Ruffini and the State of Queensland made a further submission pointing to matters that suggest that, objectively, the manual required that strategy W3 be used at that time.[346] Counsel for Mr Ayre and SunWater made a similar submission in these terms:[347]

> ... because the lake level was in excess of 68.5 (it was 68.61) there was never any belief that they were still in W1. They were and they knew they were in W3 because of the lake levels and the release rates were greater than the natural peak flows at low-level Moggill.

Counsel for Mr Ayre and SunWater also submitted:

> that the 3.30pm conference was a clear recognition that flows that *would* impact upon urban areas were now in contemplation. Indeed, that entry in the event log refers to the fact that it was anticipated that a level below 72.5m in Wivenhoe Dam can be achieved. This is well within the range of W3, and towards the top of that range. … The 3.30pm conference is simply a recognition that the engineers knew that combined flows would likely have to be increased to the upper limit of strategy W3.[348]

The Commission accepts that the flood engineers plainly recognised at the 3.30 pm conference that Fernvale Bridge and Mt Crosby Weir Bridge might have to be closed as a consequence of further rainfall.

But the remainder of the submissions amount to an assertion that the flood engineers were operating in W3 because the Wivenhoe Dam lake level and anticipated releases were within the range of W3. The difficulty is that the submissions effectively identify the strategy that the manual required and assume that the flood engineers were following it. They do not assist in answering the question because their starting point is to assume the answer.

Counsel for Mr Ayre and SunWater submitted that the best explanation for the use of W1 and W2 in the entry is as 'a shorthand description... in terms of the objectives that were still able to be achieved'.[349] This is essentially the explanation given by Mr Ayre in evidence.

It is a strange explanation. On this view, instead of saying 'At this stage still keeping Fernvale and Mt Crosby Weir open while protecting against urban inundation', somebody used the same number of words, intending to say the same thing but expressed it imprecisely and opaquely in order to convey something entirely different from the natural meaning of what was said. They did so using, as shorthand for particular ideas, technical words with which they were supposedly very familiar but otherwise never used.

Counsel for Seqwater submitted for a different interpretation: the 'more likely construction of the entry is that it is referring to ***release rates***'.[350] Counsel for Mr Tibaldi made a similar submission.[351] That was the interpretation initially advanced by Mr Ruffini and then abandoned because it did not make sense to him.[352] The difficulty with this interpretation is that while the reference to 'the top end of W1' might be understood to refer to the maximum release rate permissible under W1, 'the bottom end of W2' means nothing. There is no minimum release rate in W2. It makes no sense to refer to W2 if the strategy is in fact W3. This is also not a credible interpretation.

Conclusion

The only satisfactory and reasonable interpretation is that the words mean what they say. They record the recognition by one or more of the flood engineers in their conference on the afternoon of Sunday, 9 January 2011 that they were at a point of transition out of W1 and into W2. That reading is consistent with the evidence that suggests that Mr Tibaldi,[353] Mr Ayre[354] (though in his evidence this year he appeared to suggest that this was a trap into which others might fall)[355] and Mr Malone (though he denied he was confused about the implementation of W2),[356] at least, may have thought at the time that the progression between strategies W1, W2 and W3 was linear, with W2 a necessary transition between W1 and W3. The reference to W2 is also consistent with what follows: the prospect that the flows from the Lockyer and the Bremer would increase significantly, requiring that releases from Wivenhoe would be reduced to contain the flow downriver,[357] as the flood engineers indicated was their practice in W2.

The statement is unlikely to have been a mere passing observation; it was significant enough for a flood engineer to record it in the flood event log, an indication that it was regarded as representing the current state of affairs in the operation of the dam.

16.7.4 Situation Report at 9.04 pm, telephone conference at 9.30 pm, and emails from Mr Spiller at 11.07 pm on 9 January 2011

The situation report issued (by Mr Malone) at 9.04 pm on 9 January 2011 has already been discussed (see *16.7.1 Documents from which no inference as to strategy can be drawn).* Relevantly for these purposes, it contained this statement:

> The objective for dam operations will be to minimise the impact of urban flooding in areas downstream of the dam and, at this stage, releases will be kept below 3,500m3/s and the combined flows is [sic] the lower Brisbane will be limited to 4,000m3/s. This is below the limit of urban damages in the City reaches.[358]

As noted above, this is the first situation report that mentioned protection of the urban environment.

The flood event log[359] shows that Mr Drury spoke to Mr Ayre at 9.10 pm. At 9.18 pm, Mr Drury sent an email to, among other people, Daniel Spiller, then acting chief executive of the SEQ Water Grid Manager.[360] The email attached Technical Situation Report W34, which was based on the 9.00 pm situation report and included the statement excerpted above.

At 9.30 pm on 9 January 2011, a telephone conference was held between, among other people, Mr Spiller, Mr Drury and Debra-Lee Best, then acting Director-General of DERM.[361] Mr Drury did not recall the 9.30 pm telephone conference.[362] Mr Spiller initially said in his evidence that his recollection was that during this teleconference Mr Drury had indicated that there had been a change in objectives to protect against urban inundation and this 'was the genesis and the introduction to the teleconference'.[363]

However, other answers given by Mr Spiller were less clear about whether Mr Drury had mentioned a change in strategy from protecting rural areas to protecting against urban inundation, as opposed to simply identifying the primary objective as the latter. He believed what was said to be consistent with what was in the emails and technical situation reports he had received from Mr Drury and the summaries he had subsequently sent out. [364]

Ms Best took notes of that teleconference.[365] Her notes relevantly record against Mr Drury's name, 'have to start releasing large', 'looking at urban inundations' and 'will impact on bridges'.[366]

The flood event log shows that Mr Drury called and spoke with Mr Ayre at 10.20 pm in the flood operations centre. The entry relevantly records, 'A teleconference with Water Grid Manager and DERM was completed. Explained 9.00 pm situation report. Water Grid Manager will be distributing media release in the morning regarding closure of bridges.'

At 11.07 pm that evening, Mr Spiller sent an email to a number of people, including the Minister, Mr Robertson, and copied to recipients that included Mr Drury, that stated:

> To date, the primary objective for this event has been managing to prevent inundation of the Mt Crosby Weir and Fernvale Bridges.
>
> With the forecast volumes, this primary objective is being changed to minimizing the risk of urban inundation.[367]

The inference is open on the evidence that Mr Drury told Mr Spiller and Ms Best in the 9.30 pm teleconference, that there had been a change of objective to protecting against urban inundation. However, given the uncertainty of some of Mr Spiller's answers on the point, the Commission is not prepared to draw that inference.

16.7.5 Mr Drury's email to Mr Spiller on the morning of 10 January 2011

On the morning of 10 January 2011, at 8.13 am, Mr Spiller sent an email to Mr Drury asking:

> Are you now operating under release strategy W2 or W3? [368]

At 8.23 am, Mr Drury answered:

> W2[369]

Mr Drury was asked about this statement in evidence:

> Ms Wilson: Where did you get that information from?

Mr Drury: That would have been what I thought at the time.

Ms Wilson: So you just made that up?

Mr Drury: I didn't make it up. I assume at the time I just thought that was what we were still on and to be honest it might have been from an earlier report or it may have been what I thought at the time.[370]

Mr Drury was asked a number of times during the course of his evidence what the basis of his understanding was for the statement that the strategy in operation was W2. He said repeatedly that it was 'what [he] thought at the time'.[371]

It was suggested by counsel for SunWater[372] that Mr Drury came to the view expressed in the email, that W2 was in operation, on the basis of information contained in a situation report he had received from the flood operations centre. That is unlikely. None of the situation reports referred to strategy W2, with the exception of Mr Ayre's situation report issued at 5.53 pm on 8 January, and it was by then more than 36 hours old. Mr Drury's evidence about his knowledge of flow rates and releases did not suggest he would have been able to draw the inference about the strategy from information in the situation reports. And it seems improbable that he would have answered the question by guessing, when he could readily have learned the answer from the flood engineer on duty.

On the other hand, Mr Drury's evidence was that he could not recall having checked with anyone what strategy was being used,[373] 'asking anyone or ringing' the flood operations centre.[374] Given his apparently complete lack of recall on the subject, the Commission is not prepared to draw the inference that he obtained the information from a flood engineer.

16.7.6 Teleconference at 8.30 am on 10 January 2011

Representatives of the SEQ Water Grid Manager and representatives of Seqwater had a teleconference at 8.30 am on 10 January 2011.

Mr Lee Hutchison, from the SEQ Water Grid Manager, prepared minutes of the teleconference[375] which refer to W2 and W3. Mr Hutchison prepared those minutes 'contemporaneously using a computer in the Emergency Room'. He said that he 'used the same language as that used by the participants'.[376] He 'would not have used terms like 'W2' and 'W3' in the Minutes unless they were specifically mentioned by someone'; but he could not recall who used the terms, or the context in which they used them.[377]

Mr Spiller said in his third statement that he clarified on the morning of 10 January 2011 that the strategy being used was W2 both in his email exchange with Mr Drury 'and during a subsequent teleconference that morning in which he and Mr Peter Borrows, the CEO of Seqwater, were involved'.[378]

In his evidence, Mr Spiller said that he did not recall who in particular had spoken about W2 and W3 during the teleconference, only that they had been discussed.[379]

Mr Dennien also took part in the teleconference. He said that he had no specific recollection of the term 'W2' being used during the meeting, but had read the minutes after the meeting and did not have any issue with them.[380] He agreed with the proposition put to him by counsel for Seqwater that what the minutes reflected, when they mentioned W2 and W3, was not any reference to strategy but a discussion to the effect that flows in the order of 3500 m^3/s could be tolerated, but that flows above that would risk flooding homes. In fact the subject of strategy was not, he agreed, actually raised in the meeting; it was really about release rates.[381]

Mr Drury could not recall the teleconference.[382]

Mr Peter Borrows, the CEO of Seqwater, and two other employees of Seqwater also participated in the conference. Mr Borrows denied any discussion of the operating strategies.[383] Mr Stan Stevenson of Seqwater made some notes of the conference which contain no reference to operating strategies;[384] he had no independent recollection of the teleconference.[385]

Mr Paul Bird of Seqwater also took notes which do not refer to any operating strategies.[386] Although he had no independent recollection of the teleconference, he did not believe, given the absence of reference to any of the 'W' terms in his notes, that there was any discussion involving them.[387]

Mr Michael Lyons, from the SEQ Water Grid Manager, recalled 'that the 'W' term was used during the teleconference' but could not 'recall who used that term or in what context'.[388]

Counsel for Seqwater submitted that there was 'no foundation for a finding that Mr Borrows or Mr Drury mentioned W2 or W3 during this meeting';[389] no contemporaneous document recorded either doing so. While the Commission is of the firm view, given the evidence of the Water Grid Manager personnel, that the 'W' strategies were discussed, that submission is accepted.

Given the uncertainty about who referred to the W2 and W3 strategies in the 8.30 am teleconference, and in what context, the evidence does nothing to establish which of the strategies was in use in the operation of the dam, or the state of mind of the four flood engineers in relation to them.

16.7.7 Mr Allen's email to Mr Cooper at 10.57am on 12 January 2011

At 10.22 am on the morning of 12 January 2011, Mr Cooper sent an email to Mr Allen attaching his draft report into compliance with the manual at Wivenhoe.[390]

Mr Cooper's draft report relevantly stated:

> Until the last day or so, Wivenhoe Dam has been below EL74.0 and accordingly, would be operating under Strategy W1...
>
> Over the last couple of days, the storage level in Wivenhoe Dam has increased to above EL 74.0... This situation would demand strategy W3 for Wivenhoe Dam...[391]

Mr Allen replied to Mr Cooper at 10.57 am, saying:

> Just a couple of comments after a very quick read of your report.
>
> 2nd page: Strategy W1 applies until the reservoir exceeds 68.5 and then it moves into W2 or W3. For the last day or so before yesterday's big rise, it would have been in W2. It moved into W4 at about EL 73.5 …[392]

Mr Allen said in evidence that this email was his understanding at the time, but he did not know where he had got it from. He had not made his own assessment[393] and had not turned his mind to which of the W strategies might have been employed.[394] Consequently, what he said to Mr Cooper must have in turn been based on something he had received or been told.[395] He identified as possible sources of the information the technical situation reports, [396] information he 'could get on the internet',[397] 'stuff provided by Seqwater'[398] or telephone conversations with people at the flood operations centre.[399]

It was suggested to Mr Allen by counsel for Seqwater that he must have drawn an inference as to the strategy being used based on information contained in the technical situation reports.[400] Mr Allen accepted that this was possible, but said that he could not recall where he 'got the W2 from'.[401]

The flood event log records:

a. A telephone call from somebody at the flood operations centre to Mr Allen at 7.15 pm on 9 January 2011.
b. A telephone call from somebody at the flood operations centre to Mr Allen at 9.00 pm on 10 January 2011.
c. A telephone call at 8.10 am on 11 January 2011 between Mr Tibaldi and Mr Allen.
d. A telephone call at 4.41 pm on 11 January 2011 from Mr Allen to somebody at the flood operations centre.

Counsel for Mr Tibaldi submitted that there was no evidence that Mr Allen had been told by a flood engineer at the flood operations centre that W2 was in operation.[402] Counsel for Seqwater submitted that Mr Allen's email when it said 'it would have been in W2' rather than 'it was in W2', used the language of supposition, the inference being that the supposition was Mr Allen's own.[403]

However, it is difficult to accept either that Mr Allen was relying on supposition that the strategy was W2, or that his understanding was the product of inference from the technical situation reports or information obtained from the internet. His evidence was that he had not made his own assessment.[404] He had been asked by the Water Grid Manager to liaise with Mr Cooper;[405] he presumably knew that Mr Cooper's report was a report for the Premier as to compliance with the Wivenhoe manual; and he subsequently recommended that it be cited in Seqwater's briefing note to the Minister.[406] He could have been under no misapprehension as to the significance of Mr Cooper's report.

It is unlikely that he would have lightly given Mr Cooper information so vital to his conclusions without checking with the flood engineers, with whom he was in regular contact.

It is more probable than not that Mr Allen gained his understanding that the dam 'would have been in W2' from one of the flood engineers.

Submission by the State of Queensland

Counsel for the State of Queensland submitted that, for it to be accepted that a strategy other than W3 was implemented from the morning of 8 January 2011, it was necessary that two things be established:[407] first, that the contemporaneous documents represented 'the true state of affairs at the relevant time indicated in those documents'; second, 'that the dam was being operated in accordance with those statements'. They went on to submit that '[i]f the documents do not contain statements made or adopted by all four flood engineers, then, the first part of the allegation [that the contemporaneous documents represented the true state of affairs at the relevant time] fails'.[408]

The last proposition is plainly wrong. It can be dealt with briefly. At some relevant times, only one flood engineer was on duty and present in the flood operations centre. If that flood engineer prepared a contemporaneous document that recorded the current operational strategy, that would be clear evidence of the state of affairs at the relevant time. The value of the evidence would not be diminished by the fact that the other three engineers, who were not on duty and did not prepare the document, did not adopt the document as correct.

16.7.8 Conclusion on contemporaneous documents

None of the contemporaneous documents supports the contention that the flood engineers began operating under the W3 strategy at 8.00 am on Saturday, 8 January 2011. Instead:

a. Mr Ayre's reference to W2 as a possible future and higher strategy on the afternoon of 8 January 2011 is evidence that no transition had been made from strategy W1.

b. The 3.30 pm entry for the flood engineers conference on 9 January 2011 referring to being at the top of W1 and the bottom of W2 shows that the flood engineers then believed they were operating under W1, on the cusp of moving to W2.

c. Mr Allen's understanding, expressed in the email to Mr Cooper, that strategy W2 would have been in place before strategy W4 came into effect, supports the view that at least one of the flood engineers with whom he was in communication believed that strategy to have been applied.

16.8 The first attempts to record strategy choice

Between 15 and 17 January 2011, three documents were prepared which purported to record the strategies used in the January 2011 flood event and the timing of their adoption: Mr Malone's Summary of Manual, the Strategy Summary Log and the briefing note to the Minister. The time at which the documents were produced is significant: it was only days after the relevant strategy choices were made. It was also a time at which the flood operations centre was still operating; the engineers had been working for days with little sleep and under considerable pressure.[409]

Each of these documents records a different version of strategy choice and timing, but all three record that strategy W2 was engaged during the January 2011 flood event. By contrast, the March flood event report recorded that there were only two changes in W strategy: the transition from W1 to W3 and from W3 to W4; W2 was skipped entirely. One might reasonably expect the engineers to have had a clear recollection of both, at least in mid-January 2011. It is surprising, then, that conflicting and apparently erroneous records were prepared so soon after the January 2011 flood event.

16.8.1 Mr Malone's Summary of Manual document

The first of the three documents, a Microsoft Word document with the file name Summary of Manual[410] appears to be the earliest written account of the strategies used at Wivenhoe Dam in the January 2011 flood event. It was written by Mr Malone,[411] who forwarded it to the other flood engineers as an attachment to an email, in which he advised that Mr Borrows, the chief executive officer of Seqwater, had asked for a two page summary of the manual. In that email, he asked for comments before the document was passed on to Mr Drury. The email ends with the sentence, in bold red font, 'JT bring out the red pen!'[412] That was a reference to Mr Tibaldi, with his penchant for thorough review of documents.[413]

The document attached to the email is titled Summary of Manual of Operational Procedures for Flood Mitigation at Wivenhoe and Somerset Dam. The summary seems to have been created between 11.30 am on 15 January, when the flood event log records that Mr Drury rang the flood operations centre to request a summary of the manual, which 'Terry'[414] (Mr Malone)[415] was to 'provide after checking with all duty engineers', and 1.02 pm on the same day, when Mr Malone sent the email attaching the document to Mr Ruffini, Mr Tibaldi, Mr Ayre and Mr Drury.

The flood event log also records that at 1.10 pm Mr Allen telephoned about the summary and was told by Mr Malone that it was with the other engineers for checking before issuing.[416] At 1.15 pm, according to the log, Mr Drury rang with questions on the summary.[417]

The Summary of Manual gives an overview of the Wivenhoe manual and includes a précis of the W strategies. Importantly, incorporated into that précis of strategies are the times at which the different W strategies were 'exceeded' during the January flood event. The relevant entries are:[418]

> *The Flood Operations Centre was mobilised at 8am Saturday 6 January 2011.*
>
> ...
>
> [W1] *was exceeded at 8am Saturday 6 January 2011.*
>
> ...
>
> [W2] *was exceeded approximately 6pm Saturday 8 January 2011.*
>
> ...
>
> [W3] *was exceeded approximately 9am Tuesday 11 January 2011.*
>
> (italics in original)

Accepting the reference to W1's being exceeded on 6 January as a typographical error for 8 January,[419] the chronology differs from all other versions of when strategy changes took place.

Mr Malone said that the Summary of Manual was his understanding, at that time, of the way in which the dam had been operated. As to the first of the entries for strategy change, he had not been on duty on 8 January; it was clear to him, looking at the lake level, that W1 had been exceeded at 8.00 am that day, and no-one had decided at that stage that W2 had been skipped. The reference to W2's being exceeded at approximately 6.00 pm on 8 January might have emanated from a situation report by Mr Ayre (presumably the one at 5.53 pm) or from the fact that W2 was described as a transition from W1 to W3.[420] He was not on duty for those periods, hence his request for the other engineers to review the document.[421] His next shift was from 7.00 am to 7.00 pm on 9 January 2011, when, he said, he understood W3 to be in place.[422]

Feedback on Mr Malone's summary

Mr Malone confirmed that his email was an invitation for feedback on the document, but he did not recall receiving any. He expected, he said, any comments to be sent on to Mr Drury, and also anticipated that Mr Tibaldi would 'mould' the document.[423] Mr Malone said he did not know when the document was sent to Mr Borrows.[424]

Mr Ayre had some recall of Mr Malone's mentioning that he was preparing such a document; he knew that a report was being prepared, but could not recall for whom.[425] He remembered receiving the email Mr Malone sent at 1.02 pm, but not the attached document.[426] He could not recall if he had provided the information on when W1 was 'exceeded' to Mr Malone; it was possible[427] (although Mr Malone's evidence was that he reached that conclusion on the basis of the lake level).[428]

Mr Ruffini (who was not on duty until the evening of 15 January) said he had 'no real recollection' of Mr Malone's preparing the summary or of seeing or going through the document.[429]

Mr Tibaldi did not recall the email, although he accepted that it had certainly been sent to him. He did not recall the summary although he imagined he would have read it; the email message was a request to him to review it. He had no recollection of the day at all.[430]

Mr Drury accepted that he had made the telephone call to the flood operations centre asking for the summary. He had no recall of its purpose other than that he might have made the request so that Mr Borrows could have a short summary of the manual prior to a teleconference being held at 2.00 pm that day.[431] Mr Drury could not remember the questions he rang to ask at 1.15 pm;[432] Mr Malone had no recollection of this conversation with Mr Drury.[433]

Mr Navruk was the flood officer on duty at the time Mr Malone received the request to provide the Summary of Manual, at the time Mr Malone drafted it and at the times the follow up calls from Mr Drury and Mr Allen were received. Mr Navruk accepted he made the entries in the flood event log that recorded communications about the summary,[434] but had no recollection of having seen the document.[435]

Further circulation

Mr Drury was unable to say whether, at the time he received Mr Malone's summary, he regarded it as consistent with his understanding of the strategies engaged during the flood event.[436] His evidence was completely unclear as to whether or when he had sent it on to Mr Borrows. Mr Borrows had no recollection either of having requested[437] the Summary of Manual, or having seen it,[438] and there is no documentary evidence that he did.[439]

Mr Allen had some recall of seeing the document, or something like it.[440] He had no real recall of the call he was recorded as making at 1.10 pm, but suggested its purpose might have been to check that information of the kind in the summary was available for his later review.[441]

Conclusions on the Summary of Manual

The Summary of Manual was Mr Malone's 'best work' in making 'a record of the strategies which were employed'[442] as he understood them at the time, for the information of Seqwater's senior management. He had some concerns, he said, that parts of it might not be correct, but did not express them to anyone; what he did instead was send it to the other engineers for review.[443]

The document is significant as the first written record of the strategies used and when they became applicable. It records, accurately, that the flood operations centre was mobilised at 8.00 am on 6 January 2011, a time when Mr Malone was on duty. It records that strategy W3 was in place from, approximately, 6.00 pm on 8 January over a period which includes Mr Malone's shift between 7.00 am and 7.00 pm on 9 January 2011, and is consistent, in respect of Mr Malone's shift, with what appears in the March flood event report. The time it gives (approximately 9.00 am on 11 January 2011) for the exceeding of W3 is later than that given in the March flood event report, which says that the decision was made to transition to strategy W4 at 8.00 am;[444] but the word 'approximately' conveys some lack of precision. The summary's real divergence from the March flood event report is in showing strategy W2 as in effect from 8.00 am till 6.00 pm on 8 January, a period when, it must be said, Mr Malone was not on shift.

The summary raises the question why, if the unavailability of W2 was as obvious as was suggested in other evidence, Mr Malone could not have speedily established that fact by looking at the flow data. More importantly, Mr Malone's means of compiling it was, apparently, not to ask the other engineers directly about what had occurred during their shifts but to attempt a reconstruction for those parts before seeking their comments. That suggests, at least, a lack of confidence that clear answers would be forthcoming. Moreover, not only did Mr Malone not know that W2 was bypassed (as it was said to be in the March flood event report), but, at the time, he believed that none of the engineers did. That is in a context in which the four of them had conferred on 9 January about objectives and release strategies and they had been working two to a shift from that evening. It is evidence that Mr Malone, at any rate, did not think there had been any clear and conscious adoption of, or adherence to, strategy, and that this document was an early exercise in reconstruction of the flood event.

16.8.2 Strategy Summary Log

The second of the strategy record documents produced on 15 January is an Excel spreadsheet entitled Strategy Summary Log.[445] As its name suggests, the document purports to record the times at which different operational strategies were engaged at Wivenhoe Dam. It shows the following:

- Strategy W1 was engaged at or around 7.00 am on 6 January 2011[446]
- Strategy W2 was engaged at or around 3.30 pm on 9 January 2011[447]
- Strategy W3 was transitioned to at or around 7.15 pm and was engaged by 9.04 pm on 9 January 2011[448]
- Strategy W4 was engaged between 6.12 am and 12.00 pm on 11 January 2011.[449]

The times of the changes in operating strategies indicated in this document differ from all other versions.

The documentary record

It seems that the Strategy Summary Log was created by 'saving as' a version of the flood event log on the evening of 15 January 2011. It was saved onto the shared network space for the flood operations centre in the same electronic folder as the flood event log.

The points of transition are highlighted in the document in bright yellow. Entries in the flood event log which did not relate to choice of strategies were deleted from it.

Identical copies of the Strategy Summary Log were forwarded as attachments to emails on four occasions:

- At 6.57 pm on 15 January 2011, the Strategy Summary Log was emailed from the Duty Engineer address to Mr Tibaldi by a person who signed off as 'Rob'.[450]
- At 7.51 pm on 15 January 2011, Mr Tibaldi emailed the Strategy Summary Log to the Duty Engineer email address.[451]
- At 1.03 pm on 17 January 2011, the Strategy Summary Log was emailed from the Duty Engineer address to Mr Allen and Mr Drury.[452]
- At 6.06 pm on 17 January 2011, the email sent to Mr Allen and Mr Drury, including attachments, was forwarded from the Duty Engineer address to Mr Ruffini's email address.[453]

The creation and circulation of the Strategy Summary Log

The evidence as to how the Strategy Summary Log came into existence and was circulated was extraordinarily limited; most witnesses denied any recall of it.

Mr Tibaldi said he had no recollection of the document or the emails sent to and from him on 15 January 2011. He accepted that the 6.57 pm email appeared to have been sent to him and assumed that he would have opened the email and looked at the attachment at the time.[454] He also accepted that it appeared that he had sent an email attaching the Strategy Summary Log at 7.51 pm that evening to the then Duty Engineer, Mr Ruffini.[455]

Mr Tibaldi acknowledged that on the same evening, 15 January 2011, he was working on preparing part of a brief for the Minister (discussed further in section 16.8.3 below).[456] It is possible, given the timing, that the Strategy Summary Log was drafted to assist in preparing that brief, which included a summary of the strategies used and the times at which they were employed. They differed, however, from those in the Strategy Summary Log.

Mr Ruffini accepted that an email attaching the Strategy Summary Log was sent to him.[457] He could not recall viewing the document or discussing it, but said that given that the email had been sent to him he could not 'imagine' that he would not have opened it and at least glanced at it.[458] He denied any involvement in the preparation or review of the document.[459]

Mr Ruffini accepted that the email attaching the Strategy Summary Log was sent from the duty engineer account to Mr Drury and Mr Allen at the time that Mr Ruffini was on duty, but had no recollection of sending the document himself.[460] He thought it unlikely that he would have sent the document to Mr Drury or Mr Allen unless one of them had requested it.[461]

Mr Ayre was the only witness able to recall anything about the creation of the Strategy Summary Log. He was, at times, unclear as to whether the evidence he gave was of an actual recollection of events or an after the event reconstruction. He assumed that the Strategy Summary Log was created in the time between Mr Drury's arrival at 'about' 5.30 pm and 7.00 pm, when the email first attaching it had been sent.[462] (The flood event log records that Mr Drury arrived at 5.00 pm.[463]) He said that he did not believe he had created the spreadsheet and could not recall who had,[464] although it was possible he might have done some work on it, copying the flood event log and making suggestions about how to proceed.[465]

Mr Ayre's fullest explanation of the origin of the document was that one of the flood officers, told to do a high level filter of the flood event log on 15 January 2011, had created the separate spreadsheet titled Strategy Summary Log, stripped out the information that did not relate to strategy and made an assessment of the strategies used based on the remaining information, but ignoring release rates, lake levels and naturally occurring flows.[466] Mr Ayre went into detail:[467]

> At the time we simply said, 'Here's a copy of the manual. Have a go at allocating what your interpretation is of the strategy at that given time.'

When asked whether that was an actual recollection, Mr Ayre said that this was 'probably a reconstruction' of events.[468]

Mr Ayre rejected the suggestion that he might have been the person who inserted the strategies after a flood officer had done an initial edit of the document.[469] He pointed to the inclusion of strategy W4B in the spreadsheet, which he said all duty engineers knew had never been engaged.[470] (Strategy W4B relates to the situation where the initiation of the fuse plugs at Wivenhoe Dam is possible.[471])

Mr Ayre suggested that Mr Navruk or Mr Pokarier was probably the author of the Strategy Summary Log.[472] At one point Mr Ayre suggested that he delegated the task of creating the Strategy Summary Log to one of Mr Navruk, Mr Pokarier, or, possibly, Mr Drury.[473] When questioned further on this point Mr Ayre was unsure as to whether it was he, Mr Tibaldi or Mr Drury who had given the instruction to the flood officer,[474] but was relatively confident that it was one of the three.[475] The document was then sent to Mr Tibaldi to assist him with preparing the briefing for the Minister.[476] Mr Ayre's understanding of the arrangement was that Mr Tibaldi would review the document.[477]

Mr Ayre explained that the Minister's office had requested that the briefing for the Minister focus on what had occurred on 11 January 2011 and that, accordingly, this was the focus of the flood engineers' work.[478] For this reason, apparently, the work of considering the timing of strategies other than W4 was delegated to a flood officer or Mr Drury.[479] Mr Ayre accepted that this process was flawed, but said that at the time there were not enough resources or time to do a comprehensive report and that it would have been grossly unfair to make the already exhausted flood engineers work through the night to verify all aspects of the work that was done.[480]

Mr Ayre gave inconsistent accounts about whether the 'Rob' who sent the 6.57 pm email attaching the Strategy Summary Log was he or Mr Drury. On 30 January 2012, Mr Ayre provided a statement to the Commission saying that he sent the email,[481] but then gave another statement on 1 February 2012 stating that he no longer believed this to be true.[482] Mr Ayre explained that he changed his explanation when he learned that his assumption, at the time he wrote his 30 January 2012 statement, that he had been the only 'Rob' in the flood operations centre at the time the email was sent, was incorrect.[483] In oral evidence Mr Ayre said that he had no specific recollection[484] and simply did not know whether or not he had sent the email.[485]

Mr Ayre had some recollection that 'a document like' the Strategy Summary Log was discussed amongst the engineers at a meeting, looking at it on a computer screen, and that they reached the conclusion that it contained errors in the attribution of the times at which strategies were employed. Mr Ayre was unsure if the document discussed was in fact the Strategy Summary Log.[486] He said this meeting occurred while the flood engineers were working on the flood event report.[487]

Mr Malone had no recollection of seeing the Strategy Summary Log and was unable to explain its purpose.[488] There is no evidence to suggest that Mr Malone was the author of the Strategy Summary Log or that he received a copy of it.

The only assistance Mr Malone could provide the Commission was to comment that he had seen Mr Drury working on a computer in the flood operations centre at the time the Strategy Summary Log was probably written.[489] The document seemed to Mr Malone unlike something Mr Ayre would have written; he believed Mr Ayre's practice was to write his name and position on all emails; and he thought Mr Ayre would have sent the document to all of the flood engineers, not just Mr Tibaldi.[490]

Mr Drury accepted that he was in the flood operations centre at around the time the Strategy Summary Log was probably created.[491] He said he had no recollection of seeing it, and 'certainly didn't create the document'.[492] When asked why he would not have been its author, he explained that he was only at the flood operations centre for two hours to work on the brief to the Minister, would not have known how to create the document, had no need to create it and would not have known where to find the flood event log that likely formed the base of the document.[493] Questioned further, Mr Drury accepted that if he had been provided with the relevant information and had sufficient time to do the work he could have created the document.[494]

Mr Drury said that he had no recollection of sending the email signed 'Rob' that attached the Strategy Summary Log and pointed to the fact he had sent an email from another email account (suggesting that he was using a

different computer) around the time that email was sent.[495] Mr Drury acknowledged that he had been sent an email that attached the Strategy Summary Log, but said he had no recollection of opening or looking at the email.[496]

Mr Allen was sent an email attaching the Strategy Summary Log on 17 January 2011. Mr Allen gave evidence that he recalled having seen the document and the yellow lines that referred to W strategies[497] some time in the period 15 to 17 January 2011.[498]

Mr Borrows had no recollection of ever seeing the Strategy Summary Log.[499]

Mr Navruk was the flood officer on duty at the time the Strategy Summary Log was probably created on 15 January 2011. He finished his shift at 7.00 pm,[500] a few minutes after the first email circulating the Strategy Summary Log was sent.

Mr Navruk said that he believed he had not created the document but could not rule out having assisted in its creation.[501] He did not recall having worked on the document, but thought that creating a copy of the flood event log and removing some of the rows was the type of task a flood engineer might have asked him to do.[502] Mr Navruk said he might have made such modifications and then provided the document to someone else, but that he 'certainly didn't add any of the strategies'.[503] Mr Navruk commented that if he had been asked to perform the task of assigning strategies, he would have done it by reference to lake levels to determine when W1 was exceeded[504] (which was not, apparently, the approach of the author of the Strategy Summary Log).

Mr Navruk said that if he did assist in the creation of the document, he must have done so at the request of one of the three flood engineers at the flood operations centre at that time or Mr Drury.[505]

Mr Van Blerk was the flood officer on duty at the times of the 1.03 pm and 6.06 pm emails that circulated the Strategy Summary Log on 17 January 2011.[506] Mr Van Blerk had no recollection of having seen the Strategy Summary Log[507] and said that he did not send either of the emails.[508]

None of the other flood officers recalled having seen the Strategy Summary Log or having sent an email that attached it.[509]

Conclusions on Strategy Summary Log

Mr Ayre was the only witness before the Commission who vouchsafed any knowledge of the likely origin and use of the Strategy Summary Log. His account as to who had actually sent it to Mr Tibaldi on the evening of 15 January 2011 varied. The email forwarding the document was signed 'Rob'; it was, presumably, sent by either Mr Drury or Mr Ayre, the only two 'Robs' with access to the email account from which the email was sent at that time. Emails tendered showed that Mr Ayre sometimes signed off with his full name and title but on other occasions simply used 'Rob'. Mr Drury consistently denied sending the email and pointed to his having sent an email from another address at around that time. In contrast, Mr Ayre's account was relevantly inconsistent and disclosed at least some knowledge of the document's creation.

It is extremely probable that Mr Ayre was the sender of the email. The forwarding of the document was consistent with his understanding that Mr Tibaldi was to review it.[510] That would account for why it was not sent to the other flood engineers. The fact that it was intended for a single recipient, in whose company Mr Ayre had been in the flood operations centre that afternoon and with whom he understood there to be an arrangement for its review, may explain why he did not think it necessary to sign the email more formally.

The question of who actually authored the Strategy Summary Log is more difficult to resolve. Mr Ayre was the only person who admitted to any recollection as to the origin of the document, but he, tentatively, attributed authorship to either a flood officer or Mr Drury, possibly acting under his instructions. Mr Drury was firm in saying that he had no recollection of having been involved. None of the flood officers knew anything of it, although Mr Navruk did not categorically rule out the possibility that he might have assisted in creating it.

It may be unlikely, given the reference in the document to strategy W4B, that Mr Ayre was actually its author. However, he conceded involvement in its creation. It is probable, given his position as the senior flood engineer for the flood event, that he took the lead in giving the directions for its production. What is telling is that the document needed to be prepared in the way it was. There were only two significant strategy transitions. The fundamental question was at what time each occurred, and in respect of the move from strategy W1, whether the change was from W2 or W3. All that needed to be ascertained was what happened when, and at what time, each strategy was exceeded. It should have been simple, if Mr Ayre's recall as to the actual timing of the change from

W1 was uncertain, to confirm it by looking at when the lake level exceeded 68.5 metres; there ought to have been no doubt in his mind that there was then a transition, and it was to W3. Given the pressures of which Mr Ayre spoke – the lack of resources and the fact that the flood operations centre was still managing the flood event[511] – it is inexplicable that he did not volunteer the information as to the change of strategy to W3 at 8.00 am on 8 January, if indeed he was in possession of it. The second curious aspect is that Mr Ayre apparently sent the spreadsheet to Mr Tibaldi for review without any check of it. If Mr Ayre had made a decision to bypass W2 a week earlier, even a cursory glance at the Strategy Summary Log would have revealed how wrong the document was.

It is also significant that Mr Tibaldi recirculated the document to Mr Ruffini an hour later and that someone, probably Mr Ruffini, then sent it to Mr Drury and Mr Allen on 17 January and subsequently forwarded the email to Mr Ruffini's personal address. Neither Mr Tibaldi nor Mr Ruffini admitted to any recollection of having seen the document. The evidence before the Commission does not show that all recipients of the Strategy Summary Log read it, but it is reasonable to infer that at least those who chose to recirculate the document had some understanding of its contents.

Seqwater, in its written submission to the Commission, suggested that the inference to be drawn (despite Mr Tibaldi's lack of recollection) was that he would have recognised the document's errors and discarded it on the evening of 15 January.[512] On the other hand, it was also submitted that there was a real prospect that the effect of the Strategy Summary Log was to confuse Mr Tibaldi, affecting his drafting of the brief to the Minister.[513] But if, as Seqwater suggested, Mr Tibaldi did place some weight on the Strategy Summary Log in his drafting of the brief to the Minister so as to become confused by it, that evidences further a lack of contemporary knowledge of the strategies implemented in the January 2011 flood event.

Mr Ayre said that there was an oral discussion amongst the engineers about a document that may have been the Strategy Summary Log, in which they concluded that it contained errors in the times it attributed to strategies W1 to W4 coming into effect.[514] None of the other engineers admitted to any recollection of the document at all, let alone a considered discussion of its contents. If Mr Ayre's account of this conversation is truthful, it is remarkable that no one else remembered it.

The Commission concludes that Mr Ayre was involved at least to the extent of giving instructions for the preparation of the document. Had he, at the time of its preparation, any clear understanding of what strategy he had operated the dam in on 8 January 2011, he would have ensured that, at least, was reflected in it. The document is strong evidence to the contrary. The inference is drawn that the Strategy Summary Log was an early attempt at reconstruction of the flood event, against a background in which Mr Ayre could not himself have identified changes in strategy during the flood event and had no confidence that the other engineers could.

16.8.3 The brief for the Minister

Towards the end of the January 2011 flood event, the then Minister for Natural Resources, Mines and Energy and Minister for Trade, Mr Stephen Robertson, requested a briefing note about the flood event and Wivenhoe Dam operations during it. He asked for it to be provided to him on 16 January 2011 in advance of an emergency Cabinet meeting on 17 January 2011.[515]

That briefing note was provided to the Minister by the chief executive of the SEQ Water Grid Manager, Mr Barry Dennien, through the Director-General of DERM, Mr John Bradley, on 16 January 2011.[516] The briefing note had five attachments. Relevantly for the Commission's purposes, Attachment A was a ministerial briefing note from Seqwater; Attachment D was the Flood Mitigation Manual compliance review by Mr Brian Cooper, and Mr Cooper's curriculum vitae.[517]

Attachment A, Seqwater's ministerial briefing note, provided information to the Minister about five topics: background information on Wivenhoe dam, flood operations at the dam, the Wivenhoe and Somerset dams flood mitigation manual, the regulatory context for the manual and the flood event report. The last section said that it was Seqwater's intention to produce a comprehensive flood event report in accordance with its obligation under the Wivenhoe manual, and attached a report titled 'January 2011 Flood Event'. Attachment A explained that the January 2011 Flood Event report should be used '…in the short term…as the basis for communications and discussion'[518] until the comprehensive report was available.

The January 2011 Flood Event report appears to be the first account of the choice and timing of strategies used at Wivenhoe Dam during the January 2011 flood event produced for scrutiny by external agencies. Although the

text of Attachment A explains that the January 2011 Flood Event report may be superseded by the comprehensive report, it also makes clear an intention that some reliance be placed on the January 2011 Flood Event report.

An account of the W strategies used in the January 2011 flood event is contained in a table under the heading 'Event Decision Making'. The text above the table explains that 'the following table contains a summary of the key decision points associated with the current event'. An extract of the table appears below.[519]

Figure 16(c)

DATE AND TIME	FLOOD EVENT MILESTONE
15:00 07/01/2011 (Friday)	Wivenhoe releases commence, with operational strategy W1 in use. Rainfall for the next four days is estimated to be between 140mm and 300mm, with a forecast for rain easing on Tuesday 11 January 2011. All bridges downstream of the dam with the exception of Fernvale Bridge and Mt Crosby Weir Bridge are expected to be inundated for a number of days.
06:00 09/01/2011 (Sunday)	Moderate to heavy rain periods forecast until Tuesday, but both Wivenhoe and Somerset dam levels were falling slowly, with Somerset at 1.27 m AHD above FSL and Wivenhoe 1.58 m AHD above FSL.
15:30 09/01/2011 (Sunday)	Following significant rain during the day a meeting of Duty Engineers is held. The QPF issued at 16:00 indicates 50mm to 80mm over the next 24 hours. Based on this forecast, it is anticipated that dam levels can be held to a maximum of 3.50 m AHD above FSL in Somerset and 5.5 m AHD above FSL in Wivenhoe. However, by 19:00 it was apparent that both Fernvale Bridge and Mt Crosby Weir Bridge would be inundated by the combined dam releases and Lockyer Creek flows and that the operational strategy had progressed to W2.
06:30 10/01/2011 (Monday)	Rainfall continued during the night and based on rainfall on the ground it was apparent the operational strategy had progressed to W3.
06:30 10/01/2011 (Monday)	Rainfall continued during the day but based on rainfall on the ground, operational strategy W3 remained in use. However it was apparent that any further heavy rain would result in progression of the operational strategy to W4.
08:00 11/01/2011 (Tuesday)	Rainfall continued during the night with isolated heavy falls in the Wivenhoe Dam catchment area and based on rainfall on the ground it was apparent the operational strategy would soon progress to W4 with Wivenhoe Dam exceeding 8.00 m AHD above FSL. The objective now was to limit outflows and subsequent flood damage to urban areas, while ensuring the structural safety of the dam.
11:00 11/01/2011 (Tuesday)	Rapid inflows were experienced in Wivenhoe Dam, with the dam rising almost a metre in eight hours. Releases were increased until the dam level stabilised in accordance with Strategy W4. Computer models were not reflecting actual dam inflows due to intense point rainfalls in the immediate catchment around the dam. Falls are estimated to be similar to those experienced at both Toowoomba and Upper Lockyer the previous day and are falling outside and between existing rain gauges.

The language used in the table clearly suggests that the W strategies referred to were actually employed at the times indicated. The changes in strategy are presented as events that actually occurred.

Production of the brief

The brief to the Minister, including Attachment A and the January 2011 Flood Event report, was prepared on relatively short notice.

The flood event log records a teleconference between Mr Malone, Mr Ayre, Mr Tibaldi, Mr Drury, Mr Allen, Mr Borrows, Mr Bradley and Mr Robert Reilly (general manager of the Office of the Water Supply Regulator, DERM) at 2.00 pm on 15 January 2011 to discuss a report for the Minister by close of business on Sunday 16 January 2011.[520] The discussion points for the teleconference, which were emailed to the Duty Engineer email account at 2.21 pm stated that one objective was preparation for a public inquiry. Seqwater and DERM were listed as

responsible for providing information on the development of the manual, including the 'four strategies'. Seqwater was also listed as responsible for providing information about the operation of the dam during the event.[521]

Mr Drury gave evidence that it was left to the flood operations centre and him to put together the brief to the Minister.[522] The flood event log records Mr Drury arriving at the flood operations centre at 5.00 pm.[523] Mr Malone, Mr Ayre and Mr Tibaldi had been there since the 2.00 pm teleconference.[524] (Mr Malone was the duty engineer on shift.[525]) Mr Ruffini was on shift from 7.00 pm that evening until 7.00 am on 16 January.

Mr Drury, Mr Ayre, Mr Tibaldi and Mr Malone had a discussion about what each of them would do to prepare the briefing note.[526] None of them could recall exactly what each did. The evidence suggests that:

- Mr Tibaldi wrote the text of the 'January 2011 Flood Event Report'[527] including the table of 'Event Decision Making'. A comparison of the draft versions of the brief that were circulated suggests that he completed the table between 6.34 pm on 15 January, when he sent a version to Mr Drury that did not include the table[528] and 9.10 pm on 15 January, when he sent a draft to Mr Borrows, Mr Drury, Mr Ruffini, Mr Malone, his own Seqwater email account and the Duty Engineer email account.[529] As Mr Tibaldi has no memory of 15 January 2011[530] there is no evidence of how he went about creating this document.
- Mr Drury was involved in pulling together parts of the 'front of the briefing note' to provide 'a bit of a summary of the manual'.[531] He says he did not discuss the use of strategies with any of the flood engineers at any time during the production of the briefing note.[532]
- Mr Malone did some modelling work to produce the graphs that appear on page 4 of Attachment A.[533]
- Mr Ayre spent time gathering background documents[534] and adding comments and annotations of gate directives to a gate operations spreadsheet relevant to the morning of 11 January 2011.[535]
- Mr Ruffini was not involved in preparing the briefing note during the evening of 15 January because he was the duty engineer.[536]

The flood engineers' awareness of the briefing note

At 9.10 pm on 15 January 2011 Mr Tibaldi sent a draft version of the 'January 2011 Flood Event Report' section of the briefing note by email to Mr Ruffini, Mr Malone and the Duty Engineer email.[537] Another draft was sent to the Duty Engineer account and Mr Ayre's and Mr Ruffini's work accounts at 6.42 am on 16 January 2011.[538] A further draft was then sent to the same recipients at 8.17 am on 16 January 2011.[539] The drafts attached to those emails all included a table identical to that which appeared in the final briefing note. The Duty Engineer email account was also sent copies of later versions of the whole briefing note, by Mr Allen at 11.58 am on 16 January[540] and by Mr Borrows at 3.59 pm[541] and 4.28 pm[542] on 16 January. At 8.30 am on 16 January 2011, Mr Borrows, Mr Tibaldi, Mr Drury and Mr Malone met to discuss the brief being prepared for the Minister.[543]

Mr Ayre said he could not recall reading the version of the ministerial briefing note which was sent at 9.10 pm.[544] It was not sent to his personal address, and while Mr Tibaldi sent the email to the Duty Engineer account, Mr Ayre was not on shift until 7.00 am the following day.[545] Mr Ayre was on shift on 16 January 2011, and subsequent drafts were sent to his SunWater email account and the Duty Engineer account that day. Mr Ayre said he was concentrating on operating the dams during his shift.[546] He later said that he had read a draft of the brief at some stage, but said that when he reviewed that draft he focussed on the section of the report that related to the releases made on the morning of Tuesday 11 January 2011 and was unlikely to have read the rest.[547]

The Commission's conclusion is that Mr Ayre must in fact have read the brief on 15 or 16 January 2011, or, at least, as he suggested, at some later stage. He accepted that it was not lengthy,[548] and he had access to it in more than one email account. Mr Ayre was the senior flood operations engineer for the flood event;[549] he had been personally involved in determining the strategies employed in the event; and he had been specifically requested to be at the 2.00 pm teleconference where the request was made for the brief to the Minister to be prepared.[550] The briefing note was destined for the Minister; it was an important document.

Mr Malone said that he had a minor role in the production of the material for the Minister;[551] he was concentrating on operating the dam, as he was on shift until 7.00 pm on 15 January 2011.[552] He could not recall seeing a copy of the brief at the time.[553] Mr Malone recalled meeting with Mr Borrows, Mr Tibaldi and Mr Ayre on 16 January 2011 about the briefing note, but said that even at that stage he did not familiarise himself with the briefing note.[554]

He acknowledged, however, that he wanted to make sure that the parts he provided were correct and that he had an interest in the other parts; he 'could have' read it.[555] Again, the Commission regards it as more probable than not that he did.

Mr Ruffini said that he never saw a draft of the briefing note.[556] He said he was not involved in discussions with Mr Tibaldi, Mr Malone or Mr Ayre about it;[557] he was exhausted and had many other pressing concerns including from his full time role at DERM.[558] He accepted that he was sent the document four times, but said he never opened it.[559] No firm conclusion can be reached that he did.

Others' awareness of the briefing note

Drafts of the brief to the Minister were circulated to many persons involved in the agencies with an interest in the operation of Wivenhoe Dam: Seqwater, SEQ Water Grid Manager, DERM and the Minister's office. In evidence, some said they had not opened or read the document. The state of the evidence for each person is as follows:

- Mr Robertson said he read the 'January 2011 Flood Event Report' section of the briefing note.[560]
- Mr Smith had no recollection of ever receiving the briefing note.[561]
- Mr Dennien said he read the Seqwater section of the briefing note, but did not read the table of event decision making in any detail.[562]
- Mr Spiller said he would have read through the entire document when he received it by email from Mr Borrows at 4.28pm on 16 January 2011.[563]
- Mr Borrows said he read the Seqwater contribution to the briefing note in its entirety.[564]
- Mr Pruss said he read the briefing note and glanced through the attachments. He recalled the fact that there was a table which detailed when each strategy had been used.[565]
- Mr Drury said he glanced through the final briefing note, but would not have gone through the details or questioned any of the data or information inserted by the flood engineers.[566]
- Mr Bradley, then Director-General of DERM, received several versions of the ministerial briefing note, and was involved in its preparation.[567] He forwarded the preliminary draft of the briefing note to the Minister's office at 10.33 pm on Sunday 16 January 2011, and met with the Minister the following morning when the report was tabled.[568]

Conclusions on the Minister's briefing note

The account given in the briefing note of the choices and times of W strategies used in January 2011 is inconsistent with those that appear in the Summary of the Manual document, the Strategy Summary Log and, as will be explored in section 16.10, various drafts of the March 2011 flood event report.

A striking feature of the account given in the briefing note is that the dam is shown as having been operated in strategy W1 until after the duty engineer's conference held at 3.30 pm on 9 January 2011, when the transition from W1 to W2 is said to have been 'apparent' by 7.00 pm. (See *16.6 Evidence of strategy choice: the flood operations engineers* and *16.7 Objective evidence as to strategy choice on 8 and 9 January 2011*). The move between strategies represented in it also suggests a view of the strategies as being a linear progression between W1, W2 and W3.

Mr Tibaldi said he was not surprised that the table in the briefing note was 'wrong', given the circumstances in which it was created, noting that it was written in two hours and that at the time of writing it he had not slept for a long time.[569] He said that to reflect accurately when strategies had been employed, he would have to complete the exercise he did to create the March flood event report (a thorough consideration of all the objective evidence), which he did not do to produce this document.[570] Mr Tibaldi said he had initially doubted that he had been responsible for writing the brief until shown documents that, he accepted, showed he did.[571] He was not operating at a level where he could write something of the nature of a briefing note for a Minister.[572] Mr Drury gave evidence that he knew the engineers were 'pretty tired'.[573]

But fatigue and stress simply cannot explain the perception that the dam was still being operated in strategy W1 until the evening of 9 January, or that strategy W2 had then been engaged. Mr Tibaldi knew the importance of, and need for accuracy in, the report, as an account to the Minister of what had happened. The only reasonable conclusion is that Mr Tibaldi gave the version of events he did because that was his best recollection and understanding of what occurred.

Again, Mr Malone and Mr Ayre were undoubtedly tired and busy. But it must have been obvious to them that one purpose (perhaps the sole purpose) of Mr Tibaldi's circulating the drafts was to seek feedback and comment on their contents. The importance of accuracy in a report to the Minister was also obvious. It might be understandable if they had overlooked a minor error in the time attributed to a particular strategy being engaged, but it is simply not credible that neither noticed the claims that strategy W1 remained in place until the evening of 9 January or that strategy W2 was used, when, according to the March 2011 report and the flood engineers' evidence to the Commission, a deliberate decision had been made to bypass W2 and move to W3 on 8 January. The conclusion must be that they did not differ from the contents of the report, or else that they did not know themselves what had actually occurred, at least until the implementation of W4 on Tuesday 11 January.

The other aspect worthy of mention is this: if the flood engineers believed the account in the March flood event report to be correct, it is remarkable that at no stage did Mr Tibaldi, who had prepared the summary, or Mr Ayre or Mr Malone, who must have read it, attempt to notify anyone of the errors in the document.

16.8.4 Conclusions from Summary of Manual, Strategy Summary Log and the brief for the Minister

All three of the documents discussed, the Summary of Manual, the Strategy Summary Log and the table Mr Tibaldi prepared for the ministerial brief, came into existence over the three days from 15 January 2011 to 17 January 2011. The purpose of the first two documents is unclear; the Summary of Manual may, as Mr Drury suggested, have been prepared for Mr Borrows' assistance at a telephone conference, while it is likely, given the timing of the Strategy Summary Log's production, that it was intended to assist with the preparation of the brief for the Minister, although not to become part of it. All the flood engineers had the opportunity to review all three, although none admitted to doing so.

Collectively, the documents evidence a process of putting together a record of strategy choice in the flood event. They were brought into existence at a time when it was apparent that there would be considerable scrutiny of strategy choices by Seqwater itself and more widely. It is a striking feature of all three that, despite what should have been the recency of those choices, the simple means of documenting them from the flood engineers' recollections was not adopted. Instead, in each case there was a reconstruction, none tallying with what was eventually to be represented as the definitive account, the March flood event report. In no case did the document prepared give any hint that it was a reconstruction rather than the product of memory or contemporary record. The conclusion must be that at least the three flood engineers involved in their creation did not themselves have a clear understanding of what strategies were adopted and when, or have any confidence that the other flood engineers did.

16.8.5 Another record - Mr Ayre's gate operations spreadsheet comments

To his sixth statement, Mr Ayre exhibited documents relevant to the March flood event report. One of those documents was an Excel spreadsheet titled 'SDWD-201101190700-RAComments'.[574] Mr Ayre said in that statement that he compiled the document as his own 'aide'. He said he 'dated [the] document as 19 January 2011 at 7.00am in the file name'. He did not believe he gave the document to any of the other flood engineers and could not recall whether he referred to it when reviewing any parts of the March flood event report.[575] The properties of the spreadsheet indicate that it was created and last modified on 19 February 2011 at 11.27:55 am, and last printed on 13 January 2011 at 2.15:00 pm.

In hard copy, the document appears almost identical to a gate operations spreadsheet. However, when viewed electronically, the presence of comments can be seen by red triangles in the top right hand corner of certain cells in the spreadsheet. Those comments can be viewed by hovering the cursor over the cell or selecting 'Comments' in the 'View' menu in Excel. The comments appear as small text boxes next to the cells they are attached to, and indicate who wrote them. Most have 'Rob Ayre' as the author. Of particular interest was the fact that they suggested that strategy W2 was engaged at 5.00 am on 8 January by Wivenhoe directive 3 'as Level > 68.5' and that it remained in force at the time of the flood engineers' conference on 9 January. Another annotation was, 'Revise strategy to transition into W3 due to heavy rain in UB and Stanley'; a later comment suggested that strategy W3 was 'adopted' at 9.00 pm on 9 January.

Mr Ayre was asked to provide a written response as to the significance of the comments in the document, and did so, through his solicitors.[576] He confirmed that the spreadsheet was meant as an aide; to the best of his recollection, it was likely that he had made the annotations to it after 19 January 2011. The spreadsheet was a working document, a starting point in the course of his personal review of the flood event, and was not intended as an official final account. It was explained that in working on it Mr Ayre reviewed some, but not all, of the data, and then inserted the comments at various points 'to enable him to see, in a preliminary way, the progression of the event in timeline form'.[577]

There is no evidence that any of the other flood engineers were ever shown or made aware of the spreadsheet. But like the strategy summary log and the ministerial briefing note, the spreadsheet is consistent with Mr Ayre's having believed, in the weeks following the flood event, that strategy W2 had been used on the weekend of 8-9 January.

16.9 Another record: Mr Cooper's report

During the flood event, on 11 January 2011, the Premier instructed the South East Queensland Water Grid Manager to arrange an urgent independent review of the operation of Wivenhoe Dam.[578] Mr Brian Cooper, a dams engineer, was engaged that day to:[579]

a. review the operation of Wivenhoe Dam, including controlled releases, for compliance against the Flood Mitigation Manual for the period commencing on or about 13 December 2010 to 11 January 2011 (Flood Event); and

b. advise on whether the decisions and actions taken during the Flood Event regarding the operation of Wivenhoe Dam were prudent and appropriate in light of the Flood Mitigation Manual's requirements and the circumstances of the Flood Event.

Mr Cooper's review was based on the information in the technical situation reports. Mr Cooper provided his report on 12 January 2011.[580] He concluded:[581]

> The strategies as set out in the [manual] have been followed, allowing for the discretion given to making variations in order to maximise flood mitigation effects. The actions taken and decisions made during the Flood Event appear to have been prudent and appropriate in the context of the available knowledge available to those responsible for flood operations and the way events unfolded.

The report formed part of the briefing given to the Minister on 17 January 2011 (see *16.8.3 The brief for the Minister*). It is of particular interest in the context of the Commission's investigation because it contains the statement that 'for the last day or so before yesterday's big rise, Strategy W2 would be in place'.[582]

As discussed in section *16.7 Objective evidence as to strategy choice on 8 and 9 January 2011*, it is evident that Mr Allen was the source of Mr Cooper's belief that strategy W2 would have been in force.

Each of the flood engineers received and read Mr Cooper's report. Mr Malone said he read Mr Cooper's report during the flood event.[583] The evidence indicates he received it on 15 January 2011, while he was the engineer on duty. At 1.31 pm that day, Mr Allen sent Mr Cooper's report to the Duty Engineer email address attached to an email addressed to 'Terry'.[584] It said, 'Terry… This should be what you want'; suggesting some prior discussion between Mr Allen and Mr Malone about Mr Cooper's report. The email was forwarded from the Duty Engineer account to Mr Malone's email address 10 minutes later.[585]

Mr Malone did not recall details of the report when he gave evidence on 11 February 2012. He did recall, though, that 'there were some questions' about the content of the report as to 'the application of strategies'. Nothing, however, caused him to raise any concerns about the report; he saw 'nothing' in the report that was 'untoward' or that 'stood out' as requiring his attention. He did discuss the report with Mr Tibaldi when he read it and pointed out that it seemed Mr Cooper had not interpreted the manual correctly. He said that when the report 'came in' he and Mr Tibaldi 'looked at it'. He thought Mr Tibaldi had taken the 'lead role' in raising issues with Mr Cooper's report; any errors, he said, were 'set straight' by the writing of the March flood event report.[586]

Mr Tibaldi has no memory of the period around 15 January.[587] He said, however, that he knew nothing of Mr Cooper's report during the January flood event, but received it in February 2011, when he was writing the flood event report.[588] He also said that he read it when it was provided to him. As to the content of the report, Mr Tibaldi recalled that he thought Mr Cooper's 'use of strategies' was incorrect, but he did not express dissent or do anything to correct the error, because he was in the process of writing his own report.[589]

On the basis of Mr Malone's evidence, though, it seems Mr Tibaldi received and read the report at the time Mr Malone received the report. Mr Tibaldi was probably also aware of Mr Cooper's report through his involvement in the preparation (on 15 January) of the briefing for the Minister.

Mr Cooper's report may have been discussed at the teleconference about the briefing to the Minister, which occurred at 2.00 pm on 15 January 2011 (not long after Mr Allen sent the report to Mr Malone), in which Mr Tibaldi participated, with Mr Malone, Mr Ayre, Mr Bradley, Mr Drury, Mr Allen, Mr Borrows and Mr Reilly.[590] In 'discussion points' for the teleconference, which Mr Spiller sent to the Duty Engineer email address on 15 January 2011 at 2.21 pm, there is a reference to whether a more comprehensive report should be obtained from Mr Cooper.[591] Mr Bradley, who convened the teleconference, said that Mr Cooper's report was a topic of discussion.[592]

At 5.07 pm on 15 January 2011, Mr Drury sent an outline of the 'ministerial brief' to the Duty Engineer email address.[593] The outline indicated that the brief would contain a section about Mr Cooper's 'Flood Mitigation Manual compliance review', for which the SEQ Water Grid Manager was assigned responsibility. The outline also indicated that the section on Seqwater's report to the chief executive would (or should) 'Reflect Brian Cooper's compliance review'.[594]

At 2.03 am on 17 January 2011, Mr Borrows sent Mr Drury, Mr Pruss and the Duty Engineer email address copies of the final ministerial brief, the final draft of the Seqwater briefing note for distribution, the Seqwater flood event report and Mr Cooper's report (and other documents).[595] The email was addressed to 'Jim, John & Rob'; 'John' was, presumably, Mr Tibaldi, who was then on shift.[596] The final version of the briefing note, with Mr Cooper's report, was sent to Mr Tibaldi (and others) again at 2.32 pm that day.[597]

Mr Ayre and Mr Ruffini were also aware of Mr Cooper's report. Mr Ayre said he saw Mr Cooper's report about a week or two after Mr Cooper delivered it, 'when we were producing the report'. When he read it, he said, he 'recognised' that some of Mr Cooper's descriptions of the use of strategies 'perhaps' were not as he 'recollected the event'.[598] He did not express that view, however, because he considered it would be addressed in the flood event report.[599] Mr Ruffini said he received a copy of Mr Cooper's report and he 'probably' read it. He could not recall when he received it or any of its details (except that 'the focus was on the top end, the W4 issues'). He did not have any recollection of whether or not he disagreed with Mr Cooper's report.[600]

The evidence establishes that all four flood engineers were aware of the content of Mr Cooper's report. The contention of Mr Malone, Mr Tibaldi and Mr Ayre that there was no need to raise the reference to the use of strategy W2 as an error, because the March flood event report would give a correct account, cannot be accepted. This was a report, prepared at the Premier's request, which was relied on to confirm that the dam had been properly managed, and it did so on what must have been, on the flood engineers' account, a completely wrong premise. It is not credible that they would say nothing of the mistake, simply because they knew a different account would eventually be produced. It is far more likely that they did not react to the report either because they still believed that strategy W2 had been applied, or because they were in a state of uncertainty about it.

16.10 The March 2011 flood event report

When the flood events at Wivenhoe and Somerset dams ended on 19 January 2011, Seqwater turned its attention to the need for a flood event report, as section 2.9 of the Wivenhoe manual required. The manual requires the report to contain 'details of the procedures used, the reasons therefore [sic] and other pertinent information'.[601] The March flood event report says that it is the document which satisfied that requirement.[602] As discussed further below in section *16.11.6 Seqwater's systems and procedures for the creation of the flood event report*, Seqwater management determined that it would be the flood engineers who would write the report.

16.10.1 The role of the flood engineers

Mr Tibaldi wrote most of the report, and in particular sections 2 (Flood Event Summary) and 10 (Flood Management Strategies and Manual Compliance),[603] which contain the account of the use of each of the W strategies. He said he became the primary author by default: he and Mr Malone were Seqwater employees, so it was appropriate that they worked full time on the report; Mr Ruffini and Mr Ayre were employed by DERM and SunWater respectively.[604] Mr Tibaldi said he started work on the report on 24 January 2011[605] and was working on it up until the end of February 2011.[606]

Although Mr Tibaldi undertook the primary role in writing the report, all of the flood engineers were involved in its creation. Mr Malone agreed that it was a collective exercise in that all were contributing;[607] he wrote parts 5, 6, 8 and 9.[608] He also provided data to Mr Tibaldi to use for his parts of the report,[609] and advised him on the analysis of the data.[610] In his evidence in April 2011, Mr Ayre called it a 'team effort'; all of the engineers had contributed to the sections on the compliance of the operations with the manual.[611] He wrote parts 5 and 7.[612] Mr Ruffini gave evidence that there was a 'fair bit' of discussion amongst the three hydrologists (him, Mr Malone and Mr Ayre) about the hydrology issues to be contained in the report.[613]

Mr Tibaldi and Mr Malone were in the flood operations centre full time from 24 January to write their sections of the report.[614] Mr Ruffini was not often in the flood operations centre while the report was being written; he had other responsibilities in his full time role with DERM.[615] There are different accounts of Mr Ayre's presence in the flood operations centre. Mr Tibaldi's recollection was that Mr Ayre was in the flood operations centre only occasionally, and that he was not available to assist because of his responsibilities with SunWater.[616] Mr Ayre, however, said that he was 'taken offline' from his usual job at SunWater to assist in the production of the flood event report;[617] he still had some responsibilities to SunWater but was operating out of the flood operations centre for a large portion of his time.[618] Mr Malone said that Mr Ayre was in the flood operations centre 'on and off'.[619]

The general process adopted was that as drafts of any part of the report were 'fairly complete', their author would make them available, usually in hard copy,[620] to the other flood engineers for review and comment.[621] Mr Tibaldi said that he did not give his draft sections of the report to the other flood engineers until he thought they were in a suitable state for distribution.[622] When Mr Ayre and Mr Ruffini visited the flood operations centre, he would show them drafts.[623] The other flood engineers would review Mr Tibaldi's drafts and make comments in writing or in person. Sometimes, according to Mr Malone, all four engineers met; on other occasions they would meet Mr Tibaldi alone.[624]

Toward the end of the process, all of the flood engineers were given the option to sign a document stating that they agreed with the contents of the March flood event report. Mr Ruffini signed it;[625] Mr Ayre[626] and Mr Malone[627] did not. Mr Ayre said he did not agree with some parts of the report, giving the full supply level section as an example.[628] Mr Malone said that he did not sign the report because he did not feel he had enough time to vet it.[629] Both Mr Malone and Mr Ayre said they felt no difficulty in reporting any concerns they had with the content of the report.[630]

By the end of the process, all the flood engineers had the opportunity to review and comment upon all parts of the March flood event report. In their evidence to this Commission, each of them supported its accuracy.[631]

16.10.2 Mr Tibaldi's methodology

In his statement to the Commission, Mr Tibaldi said that he looked at source data available to him in the flood operations centre to prepare drafts of the report;[632] that data would have included the situation reports,[633] lake levels, release rates,[634] technical situation reports, directives and the flood event log.[635] He said he completed the drafts for distribution to the other flood engineers primarily using that data. He thought he would have had conversations with the other flood engineers during the drafting process, but could not remember them.[636] He did not recall any discussion about which data he would be relying on.[637]

Mr Tibaldi could not have written the report entirely from his own personal recollections of what occurred: he was on leave for the first 60 hours of the flood event and on duty for only 96 of the 324 hours in the flood event, and was only on two shifts prior to the time at which strategy W4 was applied.[638] He also said that when he started to prepare the report, he did not have a clear recollection of events that occurred during the flood event.[639]

Mr Tibaldi agreed that he did not ask for, or have reference to, the personal recollections of the other flood engineers during his production of the draft report to be circulated to the others.[640] Mr Ayre and Mr Ruffini, he said, had other commitments and were not available (although Mr Ayre's evidence, as already noted, was that he was operating out of the flood operations centre for a large part of the time). His view was that it was necessary to 'start with the facts';[641] it was not a good process for the flood engineers to be 'sitting around sort of throwing in ideas' for him to draft into the report.[642] The flood event was an emotional time; all the flood engineers had suffered from lack of sleep. Questioned about the possibility of asking the other engineers for their recall, Mr Tibaldi said he had not given it much thought at the time, but he queried how they would remember what happened.[643] The best process, he said, was to write the flood event summary and give it to the other flood engineers to test themselves

against.[644] Specifically, he said that he did not believe he had asked Mr Ayre, who was the flood engineer on shift at 8.00 am on 8 January, whether he transitioned to W3 at that time.[645] Mr Tibaldi accepted that the report was a reconstruction.[646] He described what he was doing in several ways:

- reconstructing the transitions between strategies W1, W2, W3 and W4 with the benefit of the data[647]
- 'attributing strategy labels'[648]
- drawing an inference as to which strategy applies from the objective circumstances[649]
- 'tr[ying] to match the strategy transitions against the data'[650]
- finding out which strategies were 'applicable' at each stage of the flood event by reference to the data, including lake level and release rates[651]
- writing down, based on the facts, what he believed to have occurred[652]
- trying to write down what actually occurred.[653]

Mr Tibaldi said he believed he was creating an account of what actually happened.[654] As will become evident, his reasoning process was inherently flawed: it started from the assumption that the flood engineers complied with the manual, and then worked back to ascertain what strategy transitions must have occurred to be consistent with that assumption; rather than setting out what did, in fact, occur, and then allowing conclusions to be drawn as to whether there was compliance with the manual. The March flood event report, in consequence, was not, as it purported to be, a report satisfying the requirement of section 2.9 of the manual to produce a report of the procedures used during the event.

Constructing strategy transitions: 24 January to 1 February 2011

The methodology applied in preparing the report is evident from an examination of the drafts of the flood event summary (which became section 2 of the report) which Mr Tibaldi created between 24 January and 1 February 2011. Mr Tibaldi said in evidence that he developed a picture of what had occurred as he looked at more data.[655] He said he wrote down his initial thoughts and considerations to accept or reject as he tested them against the available information.[656] He frequently emailed drafts from the Duty Engineer email account at the flood operations centre to his Seqwater email account. The drafts illustrate the evolution of his view of when the strategy transitions were made.

The draft was first sent by Mr Tibaldi at 4.35 pm on 24 January 2011 and shows:[657]

- the transition to W2 occurred at some time between 3.00 pm on 7 January 2011 and 2.00 pm on 8 January 2011[658]
- the transition to W3 occurred at some time between 7.00 pm on 9 January 2011 and 1.00 am on 10 January 2011[659]
- the transition to W4 occurred at some time between 4.00 am on 11 January 2011 and 10.00 am on 11 January 2011.[660]

The draft sent by Mr Tibaldi at 4.37 pm on 25 January 2011 changes the time period in which the transition from W2 to W3 occurred to between 2.00 pm on 9 January 2011 and 7.00 pm on 9 January 2011,[661] an earlier time than that recorded in the 24 January 2011 draft.

These two drafts show that, at the start of the process, Mr Tibaldi thought that W2 had been used during the flood event.

A draft sent by Mr Tibaldi at 3.41 pm on 28 January 2011 was the first draft that connected the transition from W1 to W2 with the lake level's exceeding 68.5 metres, in that it included the words 'Transition from Strategy W1 to W2 once it becomes apparent that the Wivenhoe Dam level is likely to exceed 68.5 metres'.[662] It identified the time period during which the transition occurred as between 9.00 am on 7 January 2011 and 3.00 pm on 7 January 2011, but showed the actual lake level over that period as below 68.5 metres. The entry suggests that Mr Tibaldi either did not appreciate the significance of the lake level to strategy choice or based the timing of the transition on the predicted, rather than actual, lake level. As to the latter, Mr Malone's modelling on 7 January showed the lake level *with forecast rainfall* at 68.5 metres at 9.00 am and at 68.9 metres at 3.00 pm, again with forecast rainfall.[663] But given the flood engineers' uniform disavowal of reliance on forecast rainfall as a basis for strategy change, it

seems unlikely that Mr Tibaldi acted on that data; and in giving evidence he specifically said that in his draft he assumed changes on the basis of actual, not predicted lake levels.[664]

At 4.22 pm on 31 January 2011 Mr Tibaldi sent a draft indicating that W2 had been bypassed, the first draft to do so.[665] On this draft, the transition from W1 to W3 took place between 3.00 pm on 7 January and 2.00 pm on 8 January 2011.[666] Between earlier drafts and this draft, Mr Tibaldi must have realised from the data that the conditions of W2 were not satisfied during the event (at least, according to the flowchart) (see *'Discovery' of the bypassing of W2*, below), or realised that the attempt to fit W2 into a sequence of strategy changes was futile. While Mr Tibaldi changed that part of the draft to indicate that W2 was bypassed, this version was not consistently changed to reflect that bypassing: on later pages, it shows W2 as in force at 1.00 am on 9 January 2011,[667] and the transition from W2 to W3 as occurring at 7.00 pm on 9 January 2011.[668]

The later drafts attached to Mr Tibaldi's statement all reflect the final report: a transition from WI to W3 at 8.00 am on 8 January.[669]

Mr Tibaldi's statement also attaches what appears to be the first draft[670] of section 10 of the March flood event report (Flood Management Strategies and Manual Compliance). It was sent at 4.21 pm on 31 January 2011, one minute before the draft of the flood event summary discussed in the last paragraph. It says that it was not possible to meet the intent of W2 so W3 was adopted for use at 8.00 am on 8 January 2011.[671]

'Discovery' of the bypassing of W2

Examination of the drafts confirms that Mr Tibaldi changed his views about when the flood engineers moved out of strategy W1, and whether, when they did, they transitioned to W2 or to W3.

Mr Tibaldi said he believed that he recorded W2 as being used in early drafts because the strategy selection flowchart in the manual required the transition from W1 to W2 when the maximum flow at Lowood is expected to be below 3500 m^3/s and the maximum flow at Moggill is expected to be below 4000 m^3/s.[672] Both those conditions were met when the lake level exceeded 68.5 metres, the trigger for a transition from strategy W1 to W2 or W3, at 8.00 am on 8 January. He considered that the flowchart did not allow a transition to W3 in those circumstances.[673] On the other hand, he regarded the amount of water being released from the dam at the time the lake level exceeded 68.5 metres as too high for strategy W2.[674] To bring the flow at Moggill and Lowood within the limits he considered permissible under W2 at 8.00 am on 8 January 2011 would have required a significant reduction of releases from Wivenhoe,[675] which clearly had not occurred.

Consequently, Mr Tibaldi concluded that the dam was not being operated under strategy W2 at 8.00 am on 8 January 2011;[676] and since the lake level had exceeded 68.5 metres, it must have been operating in W3.[677] It is clear that this reasoning carried with it the assumption that the manual was complied with. The possibility that a flood engineer could have thought he was in W2 but released water in excess of what that strategy allowed was not contemplated, nor was the possibility that an engineer might simply have carried on his existing mode of operating the dam regardless of the change in the lake level.

Mr Tibaldi's conclusion that the releases from the dam indicated it was being operated in W3 from 8.00 am on 8 January gave rise to what he described as 'a dilemma'.[678] He was concerned that the flowchart had not been followed by the flood engineers.[679] He recognised that the manual's flowchart (which he had inserted into the manual when preparing Revision 7) was inconsistent with the conditions for use of strategy W2.[680] In the end, he decided that there was no non-compliance with the intent of the manual because reducing releases from Wivenhoe Dam to the amount he regarded as allowed by W2 would not have been a sensible course.[681]

In his eleventh statement on 1 February 2012, Mr Tibaldi said that he had discussed the possible breach of the flowchart with Mr Allen, Director, Dam Safety at DERM.[682] Mr Tibaldi agreed that he must have explained to Mr Allen, in general terms, that he was writing the report and that he was trying to work out which strategy had been applicable.[683] He said he did not go into detail because Mr Allen would be one of the people judging the report.[684] He recalled in his statement that Mr Allen said words to the effect 'just give us the facts John, and this is what you will be judged on'.[685]

When he gave evidence, Mr Allen could not recall any conversation with Mr Tibaldi about the transition to, or use of, W2,[686] but did not rule it out.[687] He could remember Mr Tibaldi asking him what he should put in the report, to which he said he replied 'everything'.[688]

In his statement, Mr Tibaldi said he could recall raising this issue only with Mr Allen.[689] In oral evidence, however, Mr Tibaldi said he was fairly certain he would have raised it with Mr Ayre when discussing an advanced draft with him, because it was a 'big issue in [his] mind'.[690] Mr Tibaldi said that he would not have raised the problem early in the drafting process because he was concerned that the error (being the inconsistency between the flowchart and the conditions of W2 in the manual) was his, and he was waiting until his thoughts had developed on the point.[691]

Mr Ayre, in his statement dated 30 January 2012, said that while he was in the flood operations centre and working on the report, Mr Tibaldi had told him of his realisation from the data that the 'criteria of W2 could not technically have been achieved'.[692] Mr Ayre said that he agreed with Mr Tibaldi.[693] He could not recall whether other flood engineers were involved in that discussion.[694]

In oral evidence, Mr Ayre gave more detail: he was in the flood operations centre with Mr Tibaldi and Mr Malone; Mr Tibaldi was looking at something on his computer screen and said words to the effect of 'we didn't implement strategy W2';[695] Mr Ayre looked at what Mr Tibaldi was looking at on the screen and agreed with him.[696] It was, Mr Ayre said, a matter of recognising that the release at that time was in excess of the naturally occurring peak flow at Lowood and Moggill.[697]

Mr Malone said that he was not aware of any difficulties Mr Tibaldi had in respect of W2 in writing the report.[698] Mr Ruffini thought Mr Tibaldi had mainly talked through his difficulties with the concept of W2 with Mr Ayre.[699]

16.10.3 Other flood engineers' involvement in and adoption of sections 2 and 10

The evidence of the flood engineers is that each of them knew that Mr Tibaldi was constructing the report from the data and not from personal recollections.[700] Additionally, they each had the opportunity to review drafts of sections 2 and 10 of the report and make comments. Mr Tibaldi said that he thought all drafts distributed to the other flood engineers would have shown the transition from strategy W1 to strategy W3 at 8.00 am on 8 January 2011;[701] the others were not asked to review the early drafts which said that W2 had been used during the event. Certainly, none of the drafts attached to the statements of the other three flood engineers indicated that W2 had been engaged.

None of the flood engineers raised any concern with those parts of sections 2 and 10 of the draft report that stated that the transition from W1 to W3 had been made at 8.00 am on 8 January 2011. The evidence in respect of each of them follows.

Mr Ayre

Mr Tibaldi said that he would have discussed with Mr Ayre the process by which he was producing the report, because Mr Ayre was a senior flood operations engineer.[702] Mr Ayre said in oral evidence that he was aware of the way in which Mr Tibaldi was describing which strategies were applicable in the event.[703] This is consistent with Mr Ayre's seventh statement, in which he asserted that strategy labels were 'generally only attributed after the event as part of the reporting process'.[704] In respect of the March flood event report, he said:[705]

> 92. The statements made in Section 10 of the Flood Event Report were made on the basis of a rigorous assessment of all available and necessary information that is relevant to make such a judgment.
>
> 93. The attribution of times at which the various strategies were applied was based upon a comprehensive set of modeling information which had been compiled for the report with corroboration of the Flood Engineer or Engineers involved.
>
> 94. It became apparent during that assessment that earlier interpretations of the attributions of the times that various strategies were applied were in error.

Mr Ayre gave evidence that the retrospective application of strategy labels was the usual practice when compiling flood event reports.[706]

Mr Ayre said that his practice was to make handwritten notes on hard copy drafts of the report provided to him for review and then provide verbal feedback to the draft's author.[707] He received an early draft of section 2 of the report which did not cover the whole of the flood event; it ended with the period from 3.00 pm on 7 January to 2.00 pm on 8 January.[708] No transition out of W1 was shown in that period[709] or elsewhere in the draft. He made handwritten notes on a draft he received on 2 February. That draft showed a transition from W1 to W3, bypassing

W2, at 8.00 am on 8 January 2011.[710] Mr Ayre was able to produce two drafts of the Executive Summary and four drafts of section 2 that he had received; he also recalled reviewing sections 10 and 19.[711]

Mr Ayre said in evidence that he did his own 'forensics' on the account given of those parts of the event that he was familiar with.[712] He said he would have had no difficulty in expressing disagreement with any part of the report.[713] In the end, Mr Ayre did not dissent from the proposition put in draft reports given to him by Mr Tibaldi that the transition from W1 to W3 had taken place at 8.00 am on 8 January 2011.[714] He said that he was satisfied with the way the report had articulated that W2 had not been engaged during the flood event.[715]

Mr Ayre accepted that that there was no ambiguity in the phrase 'W3 was adopted for use' in the March flood event report. He agreed that the report purported to be a record of what happened at the time.[716] He said in his first statement to the Commission,[717] and confirmed in his sixth[718] statement, that he considered the report to be an 'accurate record' of the January 2011 flood event. He confirmed that again in oral evidence.[719]

Mr Malone

Mr Tibaldi said that he must have had some conversations with Mr Malone, who was also in the flood operations centre, about the parts of the report he, Mr Tibaldi, was writing; but he could not recall specific conversations.[720] Mr Malone might have seen some of his early drafts, but he could not recall.[721]

Mr Malone was asked about his knowledge of Mr Tibaldi's approach to the creation of the report:

> Mr Malone: He was going through the logs and everything, like trying to make sure it was all - he gleaned that was - that's what happened.
>
> Mr Callaghan: Well, it's what should have happened, isn't it?
>
> Mr Malone: No.
>
> Mr Callaghan: He was going back and making sure that the log read the way it should have happened?
>
> Mr Malone: No. No, the log wasn't changed.
>
> Mr Callaghan: No. Well, he was writing the report to indicate that strategies were changed at a time when the manual suggested they should have been changed?
>
> Mr Malone: No, I don't see it that way.
>
> Mr Callaghan: You don't see it that way?
>
> Mr Malone: I see it as that's the times they were implemented.
>
> Mr Callaghan: That's the times that they should have been implemented?
>
> Mr Malone: No, that's the times they were implemented.
>
> Mr Callaghan: Okay. Didn't you just tell me a little while ago that you weren't even sure at the time, no-one was really sure about when W2 or W3 was in play?
>
> Mr Malone: That's true.
>
> Mr Callaghan: There's absolutely no doubt in the March flood event report, is there, that W2 was bypassed?
>
> Mr Malone: That's what it says.
>
> Mr Callaghan: Yes. That's what the March flood event report records very clearly, but that's not the state of mind of anyone at the time, was it?
>
> Mr Malone: Not directly, no.[722]

Mr Malone said that towards the completion of the report, he took home a hard copy of the whole report to read. He identified a number of duplications and inconsistencies in the report which he discussed with Mr Tibaldi.[723] Nothing suggests, however, that Mr Malone raised any concern about the accuracy of those parts of the report that indicated that W2 was bypassed, and that there had been a transition from W1 to W3 at 8.00 am on 8 January 2011. That is so notwithstanding that Mr Malone was not sure himself, and thought that none of the other flood engineers were sure, whether W2 or W3 was in place at that stage.[724]

Mr Malone said he was 'quite happy' with the March flood event report, and would have had no difficulty with expressing dissent had he not been.[725] In his first statement to the Commission, he said he had read 'the majority' of the report and considered it a 'fair and reasonable reflection' of the January 2011 flood event.[726] He endorsed it as an accurate account of the flood event in his evidence before the Commission.[727] Mr Malone denied that he would

have been party to a flood report that asserted that W3 had been in use over the weekend of 8-9 January if that were not so.[728] He accepted that the headings in part 10 conveyed that the strategies described were actually used in the periods referred to. The words 'Strategy W3 was adopted for use at 08:00 on Saturday 8 January 2011' stated 'what occurred at the time'.[729]

Mr Ruffini

Mr Tibaldi said that he imagined he would have discussed the process of producing the report with Mr Ruffini when he visited the flood operations centre, but he could not recall specific conversations.[730] He agreed that as a matter of logic, he would have discussed with Mr Ruffini how he was writing the report.[731]

Mr Ruffini said that he understood that Mr Tibaldi was looking at the available information 'going back … to scratch' to work out what strategies matched with it, before asking the other flood engineers to confirm that whether his work matched up with their recollections.[732] Mr Ruffini gave evidence that he read drafts of sections 1, 2, 10 and 19 of the March flood event report in the flood operations centre.[733] He said he would look at what Mr Tibaldi had written, check whether the data were right and then by reference to the manual try to remember what he was doing and thinking during the flood event to see if what Mr Tibaldi had recorded was correct.[734] He also said that when he reviewed what Mr Tibaldi had prepared, he would look at the spreadsheets and other things he was using at the time to come up with his own assessment of whether he believed the draft was accurate.[735]

Mr Ruffini told Mr Tibaldi that the draft report did match up with his recollection,[736] but also gave this evidence:

> Mr Callaghan: Is that Mr Tibaldi asked you whether this matched your recollection and-----?
>
> Mr Ruffini: Words to that effect, yeah. He just asked us to confirm the accuracy of what he had written and as I said, I looked at the material, I looked at, you know, the spreadsheets that I had been using and things like that and said, 'Yeah, that matches my' – you know, jogging my memory.[737]

Mr Ruffini said towards the end of the review process he had saved versions of the report from the flood operations centre computers onto a data stick to take home to review.[738] He annexed two such versions to his statement, one of which included track changes, which might, he thought, have been made by him.[739] Mr Ruffini said he reviewed and endorsed the accuracy of sections 2, 10 and 19 of the March flood event report.[740] He identified sections 2 and 10 of the report as 'critical bits'; parts that he had gone through 'pretty well'.[741]

16.11 Conclusions: the dam operations strategies

16.11.1 The strategies used

The situation report issued by Mr Ayre at 5.53 pm on 8 January and the note of the flood engineers' conference at 3.30 pm on 9 January are strong contemporaneous evidence that the dam was not being operated in W3 over Saturday 8 and Sunday 9 January 2011. (See *16.7 Objective evidence as to strategy choice on 8 and 9 January 2011*.) Taken with Mr Allen's belief, they point to a conclusion that if any strategy was in contemplation it was W1, and that so far as the need for a higher strategy was recognised on the afternoon and evening of 9 January, the strategy initially identified was W2.

Reference has previously been made to submissions that each engineer, because he was highly experienced, knew the contents of the manual and had before him on his shifts the data about lake levels and flows, must have known at all times which strategy he was operating the dam in.[742] (See *16.6 Evidence of strategy choice: the flood operations engineers*.) Effectively, the argument was that because the engineers should have known and applied the relevant strategy, they must have known and applied the relevant strategy.

But if that were so, Mr Tibaldi should not have been in such uncertainty that he produced a summary for the Minister which indicated that the transition from W1 occurred on the evening of 9 January and a draft of the March flood event report which had it happening before 3.00 pm on 7 January. Mr Ayre should not have been in any doubt about whether he was operating the dam in W2 or W3 on 8 January, since the difference in release rates between the two was said to be so marked. It should have been a moment's work for Mr Malone in preparing the Summary of Manual to have looked at a spreadsheet and see that the flows from Wivenhoe were such relative to those from the Lockyer and Bremer that the dam could not have been operated in W2 on 8 January.

In short, the flood engineers should easily have been able to say, on this topic so integral to their role, with familiarity with the strategies so inculcated in them, which strategies they had operated the dam in on any given day; after all, on their account, only two were applicable. And for those shifts they had not themselves performed, they should have been able to establish rapidly by reference to lake level when transitions must have occurred, and by reference to respective Wivenhoe and downstream tributary flows that their colleagues had never engaged strategy W2.

The evidence, however, suggests otherwise. Mr Tibaldi wrote drafts in which a transition from strategy W1 to W2 occurred at a time when the lake level did not exceed 68.5 metres, and it took a number of drafts for him to realise that W2 should not have been engaged at all; Mr Malone and Mr Tibaldi and the creator of the Strategy Summary Log all thought W2 had been engaged when they wrote their accounts between 15 and 17 January. Mr Ayre, as he conceded in evidence, did not see any need to distinguish between strategy W2 and W3 on 8 January. None saw a need to correct references to the application of W2, either in their own documents or in Mr Cooper's report, notwithstanding that, on their version of events, that material had misrepresented the operation of the dam to Seqwater management and the responsible Minister.

The Commission has drawn its conclusions from the contemporaneous documentary evidence, the engineers' evidence given orally and by way of statement, and the attempts subsequent to the event to document strategy choices. That evidence, taken as a whole, points overwhelmingly to the findings which follow.

On 8 January, Mr Ayre made no conscious change to the strategy in which the dam had been operating when he took over his shift: strategy W1. He did contemplate the possibility of a strategy change over the following days: to strategy W2. There was no change of strategy between his shift and the engineers' conference, when the fact that the flood event was increasing in seriousness was discussed. The prospect of higher flows from the Lockyer and Bremer was recognised, as was the possibility of reducing releases from Wivenhoe to contain the flows. It was then acknowledged that the dam operations were on the cusp between W1 and W2 (not W3).

That night, though, at about 7.00 pm, it was recognised that the release rate from Wivenhoe would have to be elevated. No actual strategy change was documented; at best, it can be said that the actions taken were consistent with strategy W3.

It follows that Wivenhoe Dam was operated in breach of the manual from 8.00 am on 8 January 2011 until the evening of 9 January 2011.

16.11.2 The engineers' states of mind about strategy changes

In the days after the event, the engineers – or at least Mr Ayre, Mr Tibaldi and Mr Malone – remained under the impression that strategy W2 had in fact been engaged. Attempts to document the move out of strategy W1 were dogged by confusion: Mr Malone recognised in his Summary of Manual that the lake level meant there had to be a transition at 8.00 am on 8 January, but chose to record W2 as the applicable strategy for the balance of that day. Mr Ayre was involved in the creation of and circulation of the Strategy Summary Log, and must have been aware of its contents. It largely accords with what his 8 January situation report and the flood event log entry for the 9 January conference suggest: that the dam was operated in the lowest of the strategies until the engineers' conference, when strategy W2 was engaged, with recognition of a move to W3 as events developed from 7.00 pm on the night of 9 January.

Mr Tibaldi's summary for the ministerial brief also conveys no change of strategy until after the engineers' conference, but on his version the change by 7.00 pm on the evening of 9 January is to W2; it is only on the following day that the transition to W3 is recorded, as resulting from rain overnight. In preparing his first drafts for the March flood event report Mr Tibaldi continued to record the application of W2, on 7 January; consistent with either a belief that it had been engaged, or a belief that it should have been. In the first two of the drafts, he emailed to himself the change to W3 occurs on the afternoon or evening of 9 January; consistent with a recognition of how the flood event had escalated in seriousness that day. It took some days for the notation of a change of strategy at 8.00 am on 8 January to emerge, but it was, on the first iteration in evidence, to W2. The first draft showing the bypassing of W2 had the move to W3 in broad bounds: somewhere over a 23 hour period between 7 and 8 January.

It is quite clear that none of the three engineers had any belief, at the time he made his contribution to the documents referred to in the preceding paragraphs, that strategy W3 had been adopted and applied – whether as an automatic process or by conscious choice – from 8.00 am on 8 January. That formulation was a product of Mr

Tibaldi's reconstruction of what strategies should have been applied after a long and laborious process of puzzling through the data and what the manual required.

It was submitted, however, that the engineers had no intent to mislead when the March flood event report was produced and published. Counsel for Seqwater's submission was as follows. The determination of whether the flood engineers deliberately misled by way of the flood event report must rest on what they understood by the meaning of the words in the report.[743] All of the flood engineers honestly held the view that the manual 'dictated an automatic transition' from W1 to W3 at 8.00 am on 8 January 2011 and that the only role of the flood engineer on duty was to use that strategy, not select it. What followed was that the engineers would not have thought that the words of the flood event report were misleading. When the March flood event report said 'strategy W3 was adopted for use…' it simply meant that the flood engineer started to use W3 at that time.[744] That expression was to be contrasted with the use of the word 'decided' in respect of the decision to move to strategy W4 on 11 January 2011.[745]

Counsel for Seqwater also relied on the evidence of the experts, Mr Apelt and Mr Shannon, to contend that it was not inappropriate or dishonest for the flood engineers to retrospectively apply strategy labels after the event.[746] Mr Shannon had said that he would not be too concerned if the engineer operating the dam did not have a strategy label at the front of his mind, but was concentrating on the requirements of the manual according to the lake level.[747] Professor Apelt gave evidence that although the flood engineers had to know the conditions they were operating in and the requirements of the manual for those conditions,[748] it was possible for them to apply strategy labels from the objective data after the event. On that basis, counsel submitted, Mr Tibaldi's methodology would not have been dishonest even if it had not involved any review by the other flood engineers.[749]

Counsel for Seqwater submitted that while the report might have been a reconstruction in the form it took when it was sent to the other flood engineers for review, it lost that character once each flood engineer had confirmed that it matched their recollections of the event; it became the record of their actual recollections.[750] There was no reason for Mr Tibaldi to doubt the truth of each engineers' confirmation of the draft report.[751] (Counsel for Mr Malone made a similar submission.[752]) Counsel for Mr Ruffini, Mr Allen and the State of Queensland submitted that the report was not misleading or an ex post facto reconstruction; it was a recounting of what occurred based on contemporaneous records, which refreshed the authors' memories.[753]

The general aspects of those submissions will be dealt with before the state of mind of each flood engineer is considered in turn. First, the meaning of the flood manual has already been discussed at length in *16.3 The manual requires a choice of strategy*: it plainly requires conscious adoption of and recognition of strategy. Second, the March flood event report, as set out in *16.5 The March flood event report: a record of strategy choice* did portray adoption of strategies. The real question is whether the flood engineers did believe, at the time the report was produced, that there had been any transition to W3 on 8 January, automatic or otherwise; and, since the report also purported to show operation of the dam in accordance with strategy W3 throughout 8 and 9 January, the engineers' respective states of mind in that regard are also in issue. The evidence of the experts cannot assist as to what those states of mind actually were.

What follows are what the Commission considers to be the only conclusions which can reasonably be drawn about each engineer's state of mind.

16.11.3 Engineers' states of mind

Mr Ayre

Mr Ayre understood that the manual required a conscious choice of strategy, requiring the exercise of judgment involving a number of factors. He was on shift when the transition to W3 should have occurred. His evidence suggested no recognition of a move to W3: he saw no reason that day to distinguish between W2 and W3. The situation report he issued at 5.53 pm indicated that he considered he had yet to move to a higher strategy, and that it would be W2. His recent invention of an elaborate explanation for that document, placing a different construction on it from that which it plainly bore, could only be consistent with a late realisation of its damaging effect. Mr Ayre was physically present at the 9 January engineers' conference. He was the senior flood engineer for the event; he must have been alive to what was being said: that the dam was operating at the higher end of W1 and on the cusp of W2, which was consistent with his perceptions of the previous day. At no stage did he seek to correct any of the accounts produced after the event which gave versions of strategy adoption contrary to that in the March flood event report.

Mr Ayre knew how the March flood event report was produced and recognised that it purported to be a record of what happened. His confirmation of Mr Tibaldi's entry as to the bypassing of strategy W2 was, on his own account, the result of checking the data, not any independent memory. In the circumstances, he could not have believed it to represent what had actually occurred. Yet he stated that he considered the report to be an 'accurate record' of the January 2011 flood event.

Mr Tibaldi

Mr Tibaldi was not on duty when the supposed transition to W3 was said to have occurred. His next shift was from 7.00 pm on 8 January till 7.00 am the following morning; during it he made no record of strategy. He was not able to say what was in his mind about strategy during that shift; if he had turned his mind to it, he said, he would have been able to see that he was not operating in strategy W1 because the lake level was too high, and he was not in strategy W2 because the Wivenhoe releases were too high. But he does not seem to have been able to identify strategies from those features in the attempts he made to record strategy use after the event. According to the summary he prepared for the ministerial briefing note, he was operating the dam in W1 during his 8-9 January shift; his first drafts of the March flood event report have W2 applying. He could not have made those entries if he had any belief he was operating the dam in W3 during that shift.

Mr Tibaldi said that he would have read Mr Ayre's 5.53 pm situation report during his shift. He was on the telephone for the 3.30 pm teleconference on 9 January, at which it was said that the dam was operating at the top end of W1 and the bottom end of W2. Both of those circumstances might have alerted him to the fact that the dam was not being operated in W3 on shifts other than his own. However, it is not possible to say that he did appreciate the significance of the situation report entry, and given that he joined the conference by mobile telephone, one could not conclude with any confidence that he heard and registered the reference to the relevant strategies.

However, it is evident that it was Mr Tibaldi himself who through the reconstruction of events eventually realised that the transition to W3 should have been made at 8.00 am on 8 January. He could not sincerely have believed that Mr Ayre's adoption of his proposition that W2 had been bypassed then was the product of any actual memory which fortuitously coincided with his conclusion. On Mr Ayre's evidence, he accepted the correctness of what Mr Tibaldi said after looking at the data on Mr Tibaldi's computer screen. Sections 2 and 10 of the March flood event report were worded so as to convey that that they gave an account of decisions actually made; Mr Tibaldi could have had no illusion that what he represented was such an account. Nonetheless, he gave evidence that the report was a 'fair and accurate account' of the flood event.[754]

Mr Malone

Mr Malone was not on duty in the 36 hours between 7.00 pm on 7 January and 7.00 am on 9 January. Accordingly, he had no direct knowledge of what strategy Mr Ayre had used to operate the dam on 8 January. He accepted that he probably read Mr Ayre's 5.53 pm situation report when he received it by email, but as with Mr Tibaldi, one cannot draw the conclusion that he appreciated the significance of what was contained in the 'Forecast Scenario' section.

However, Mr Malone was physically present at the 3.30 pm conference on 9 January; importantly, it occurred on his shift at a time when the increasing severity of the conditions was becoming obvious. It is not credible that he was unaware of the observation made about the point at which the dam was then operating; and it is entirely inconsistent with any belief that at that stage of his shift it was in W3.

Mr Malone prepared the first chronology of events, in the Summary of Manual. It clearly was an educated guess. When he prepared it, Mr Malone did not think any of his colleagues had worked out that W2 had been 'skipped'. It is significant that, rather than asking them directly for their recollections, he chose to construct an account and then send it to them for comment.

Mr Malone was involved in meetings about, and provision of information for, the ministerial briefing note and very probably read Mr Tibaldi's summary for it, in draft or final form. Although it indicated that the dam was operated in W1 during his shift on 9 January, progressing to W2 at its end, he took no issue with it. Nor did he raise any concern about Mr Cooper's report, delivered on 12 January, despite its reference to the dam's having been operated in W2 'for the last day or so before yesterday's big rise'.

Mr Malone said he understood the March flood event report to represent that it was an account of strategies actually used. He knew the way Mr Tibaldi had prepared it and that different versions of strategy adoption (including his own) had previously been given. He agreed that, at least on his understanding, the part of the report that stated that W2 was bypassed was not reflective of the state of mind of anyone at the time.[755] He must have had, at the least, a strong suspicion that it was not a genuine account of conscious strategy choices.

Mr Ruffini

Mr Ruffini's shift on 8 January finished just before the lake level rose to the point at which W2 or W3 had to be applied. He did not purport to have any actual recollection of recognising the pending strategy change; what he did was to offer an account of what he 'would have' been thinking by looking back at the relevant data.

Mr Ruffini was physically present at the 3.30 pm conference on 9 January at which the current operating status of the dam was raised. He has previously said that the description in the flood event log entry was consistent with his recollection of the meeting. It seems probable that he would have been attentive to the reference to W1 and W2; he was to come on shift in a couple of hours. By the time he did come back on duty, at 7.00 pm, a dramatic change in approach to the dam's operation, consistent with strategy W3, was under way.

Mr Ruffini received, attached to emails, some documents in the 15 to 17 January period which, if read, would have alerted him to the fact that there were versions of the event being given which ultimately did not accord with what was contained in the March flood event report: Mr Malone's Summary of Manual, the Strategy Summary Log, which it appears he actually forwarded to Mr Drury and Mr Allen; Mr Tibaldi's draft summary for the ministerial briefing note; and the draft briefing note itself. However, he was not himself involved in preparation of any of the documents. Mr Ruffini does not impress as a highly organised individual; the possibility certainly exists that he did not read with any attention the documents his colleagues sent him concerning summaries and briefs with which he was not directly concerned.

Mr Ruffini knew that Mr Tibaldi was preparing the draft report as a reconstruction from the data, but also understood him to be confirming with the other flood engineers the accuracy of what he had written.

The degree of probability that Mr Ruffini knew from his attendance at the 9 January flood engineers' conference that the dam had not been operated in W3 before the evening of 9 January is not such as to justify the ultimate finding that he did know that fact; or that he was aware that the March flood event report misrepresented the choices of strategy.

16.11.4 Knowledge of each other's actions and state of mind

The conclusion has been reached that Mr Tibaldi and Mr Ayre knew, and that Mr Malone had a basis for suspecting, that the March flood event report was misleading. This gives rise to the further question about what each knew about the others' state of mind.

The actual engagement of strategies by the flood operations centre, if there was any, was known only to the flood engineers. They worked together closely and shared a belief that they performed well during the flood event. At no stage, in any of the statements, interviews or testimony provided up until February 2012, did any of Mr Ayre, Mr Tibaldi or Mr Malone mention any aspect of the 'alternative' strategy documentation contained in the Summary of Manual document, the Strategy Summary Log, the ministerial brief or drafts of the March flood event report despite their involvement in the preparation of those documents. Indeed, there was a striking unanimous and collective collapse of memory about them. All of them supported the accuracy of the flood event report and provided an account of what they had done in the event consistent with the report. Had any one of them mentioned any of those documents or suggested in any way at any time that there was an alternative history of strategy selection, the misleading nature of that report might have been exposed.

The inference was open that the concealment of the true nature of the March flood event report was a joint effort to which each was a party: each of them[756] was given an opportunity to respond to it.

Counsel for Seqwater submitted that a case of collusion between the flood engineers could not be sustained unless the evidence established that Mr Tibaldi designed his methodology for the creation of the flood event report dishonestly to deceive the Commission and each of the flood engineers knew that, and knew the report was not accurate.[757] They submitted Mr Tibaldi honestly believed that his methodology was the most reliable approach.[758]

Counsel for Mr Malone put forward a number of conclusions that he said was necessary to sustain the inference of collusion between the flood engineers: that the flood engineers ignored the manual; that they were prepared to engage in serious criminal conduct to cover it up; that they executed a cover up despite having achieved a near perfect outcome and that they must not have realised the lake level had exceeded 68.5 metres for at least 31 hours.[759] Those conclusions, it was suggested, were so far-fetched as to militate against drawing the inference that the flood engineers colluded.

Counsel for Mr Ayre submitted that if there was a finding that there was collusion between flood engineers to mislead by way of the flood event report, it should nonetheless be found that Mr Ayre was not part of that collusion. They pointed to the facts that Mr Ayre is not employed by Seqwater; that he gave a full account of his actions in his voluntary statement in March 2011 including accounts of the 5.53 pm, 8 January situation report and the 3.30 pm, 9 January teleconference; that he provided the full event log to the Commission and included a copy of it in his supplementary statement.[760]

The question of motive can be dealt with at the outset. Even if it is the case that the engineers achieved a 'near perfect outcome',[761] the evidence does not suggest that they were especially confident about that at the time they presented the report; such confidence could only ever be enjoyed after reviews of the kind that have taken place. More importantly, whatever confidence they enjoyed about the manner in which releases had been managed, they must have known they were vulnerable if asked detailed questions about deployment of strategies: there was no record of such a thing. The significant efforts generated between 15 and 17 January to document such strategy selection betray an awareness that this particular aspect of compliance with the manual was something which would, after this event, be examined as never before. And they knew that in this regard, their efforts were deficient. There was, in this circumstance, an obvious motive to present something which conveyed that which would ordinarily be expected of engineers, that is, a document which was accurate and precise, and which demonstrated compliance with the manual. The March flood event report appears to be just such a document.

There are several things that may have motivated the three engineers to present the false flood report, including a wish to protect their professional reputations from the damage that would be caused by a disregard of the manual, or the maintenance of Seqwater's immunity under the *Water Supply (Safety and Reliability) Act*.

Mr Ayre, Mr Malone and Mr Tibaldi each had a level of understanding that the report was misleading. Each of them, in his own way, contributed to acceptance of the report. It is more difficult to discern what each knew about the others' level of understanding about the accuracy of the report. There is no direct evidence that any of the flood engineers actually discussed with any of the others their knowledge as to the truth of the flood event report or their plans to support the flood event report to the Commission. Some evidence, however, establishes links which lead to a conclusion of shared understanding between Mr Tibaldi and Mr Ayre.

Mr Tibaldi and Mr Ayre

Mr Tibaldi and Mr Ayre were both involved, between 15 and 17 January, in attempts to provide an account of strategies. At the very least, each must have known at this time that the task was not straightforward. Mr Ayre gave evidence about a discussion involving all four flood engineers about the 'errors' in a document resembling the Strategy Summary Log.[762] One major difficulty, of course, was the question of W2. This very issue was the subject of conversation between Mr Tibaldi and Mr Ayre when Mr Tibaldi was drafting the report. Certainly by then, and in probability, much earlier, there was a shared understanding between these two that there was no certainty about when strategies were engaged – in particular, what happened when they moved out of W1. And by no later than this stage, Mr Ayre knew what Mr Tibaldi was doing about it: that his method was a reconstruction which would, as the drafts he later received showed, betray no confusion as to what happened when.

When Mr Tibaldi pointed out to Mr Ayre that W2 had been by-passed and Mr Ayre agreed, he did so not through any personal belief in the correctness of the proposition but as a result of looking at the data Mr Tibaldi was examining on his computer screen. It must have been obvious to both that they were engaging in a recreation of events divorced from what had actually occurred. After Mr Tibaldi had included the bypassing of strategy W2 and the transition to W3 at 8.00 am on 8 January in the draft he distributed to the other engineers, and Mr Ayre had approved that draft without raising concerns about that section, both must have shared the understanding that it was intended to present an account which indicated a precise and manufactured account of engagement of strategies.

Their continued support for the flood event report, by giving sworn evidence as to its accuracy and evidence consistent with the account given in it, assisted in the acceptance of the flood event report as such a record. Such acceptance was awarded by this Commission, Seqwater and the government. Mr Tibaldi and Mr Ayre each assisted the other's presentation of the report; if either had expressed any reservation or qualification, the façade of precision could not have been maintained.

Counsel for Mr Ayre argued that the 'full account' of his actions given in evidence pointed away from his involvement in any combined effort to produce a false flood event report. However, the accounts given up until February 2012 were not anything like 'full'. They were bereft of any hint of such ideas that strategy labels were only applied after the event, or that there might be times when there was no reason to choose between W2 and W3.

The evidence leads inevitably to the conclusion that, in addition to their own knowledge about the misleading nature of the March flood event report, Mr Tibaldi and Mr Ayre were each aware of the other's state of mind in this regard.

Mr Malone

Mr Malone must also have known that the March flood event report represented a state of affairs that did not happen. He understood that none of the flood engineers could produce an accurate account of the flood event during the period 15 to 17 January. Beyond that state of mind, though, the evidence does not demonstrate that he must have been a party to any shared understanding of the kind which existed between Mr Tibaldi and Mr Ayre.

16.11.5 Referral to the Crime and Misconduct Commission

The evidence is such as to warrant a recommendation that the appropriate law enforcement agency investigate the conduct of Mr Malone, Mr Tibaldi and Mr Ayre. Given that the relevant parties were public officials at the time of the events, and given the Commission's obligations under section 38 of the *Crime and Misconduct Act 2001*,[763] the Crime and Misconduct Commission is the appropriate agency. The Commission makes no finding as to whether the evidence before it establishes any offence or official misconduct: it is not appropriate for it to do so for a variety of reasons, not least of which is that the Commission's Terms of Reference do not charge it with the responsibility of investigating whether any criminal offence or official misconduct has been committed in respect to matters arising out of the January 2011 flood event and Wivenhoe Dam. That the evidence before the Commission resulted in there being evidence going to the states of mind of the engineers about the accuracy of the March flood event report was merely a by-product of the Commission's seeking to ascertain what actually happened in the operation of Wivenhoe Dam during the January 2011 flood event.

Recommendation

16.1 The Crime and Misconduct Commission should investigate whether the conduct of Mr Tibaldi, Mr Ayre and Mr Malone relating to:

- preparation of documents surrounding the January 2011 flood event, including the 17 January 2011 brief to the Minister, the 2 March 2011 flood event report, and statements provided to the Commission
- oral testimony given to the Commission

evidences offence/s against the Criminal Code, and/or official misconduct under the *Crime and Misconduct Act 2001* committed by any, or all, of them.

16.11.6 Seqwater's systems and procedures for the creation of the flood event report

The obligation to create a flood event report is imposed by the manual.[764] In revision 7, the version of the manual in force at the time of the January 2011 flood event, that responsibility is imposed on Seqwater.[765] (In previous versions the responsibility was on the Senior Flood Operations Engineers.[766]) The report must be submitted to

the 'Chief Executive', who is defined as the Director-General of the Department of Environment and Resource Management.[767] Because the obligation is imposed on Seqwater as a corporate entity, it is the responsibility of Seqwater management to ensure that a full, complete and accurate report is prepared. More generally, Seqwater's board and chief executive officer are responsible for systems, processes and governance arrangements within Seqwater.[768]

Mr Borrows, Seqwater's chief executive officer, acknowledged that at the time of the January 2011 flood event there was no system in place for the creation of flood event reports.[769] Similarly, as far as Mr Borrows was aware, there was no process for formal or informal debriefs of staff following flood events to capture their observations and lessons learned.[770]

Following the January 2011 flood event Seqwater management recognised that a process would have to be designed to ensure that the flood event report was produced within the time allowed:[771] six weeks. In the past, Seqwater had contracted the preparation of flood event reports to SunWater.[772] Mr Borrows noted that the report 'took on a different form and function to…the previous ones'.[773] Mr Pruss, then Seqwater's Executive General Manager – Water Delivery, commented that compared to previous reports, the report for the January 2011 flood event 'was a wholly different beast; so we had to really develop a process on the go.'[774] This recognition was appropriate and important.

The main step taken by the Seqwater board and Mr Borrows to impose structure on the report's preparation[775] was to remove Mr Pruss from his usual duties and dedicate him to developing a governance structure and process for the writing of the report.[776] In Mr Borrows' view, Mr Pruss' role involved, perhaps among other things:

- ensuring that the report was delivered by the mandated deadline[777]
- ensuring that a rigorous analysis was done of the contents[778]
- leading a working group with internal and external participants to develop the governance structure for the report.[779]

Mr Pruss explained that he volunteered for the process of organising the flood event report.[780] Mr Pruss understood his role as building a governance process around the writing of the flood event report. It was intended to be a facilitative and supportive role directed to ensuring that approvals were given at the right time and that interested parties could become involved.[781] It included managing the timetable for scoping, drafting, reviewing and editing the report.[782] Somewhat surprisingly, none of the processes that were devised were recorded in writing.[783]

Considerable resources were dedicated to Mr Pruss' task. The overall team involved in the production of the report seems to have been sizeable. Mr Pruss was dedicated to assisting in governance processes for the report and he was assisted by a 'small administrative and advisory team'.[784] Mr Pruss also involved technical experts, a legal team and a communications team.[785]

However, it is a matter of some concern that, while resources were dedicated to ensuring that the report would be delivered in a timely manner, relatively little support was given to the flood engineers, who were actually writing the report. Their role was, plainly, the most significant part of the report writing. Mr Pruss appears to have recognised this; he explained that he understood that:[786]

> what the engineers were doing was collating the information, producing the report, doing the quality check, doing the data checks on the information and getting it to us in a form that we could then start to put some shape around.

Little or no thought seems to have been given to whether the engineers needed assistance with their function. When asked, Mr Pruss said he gave no thought to allocating a person to assist the flood engineers in their task.[787]

No consideration was given to the risk of self-bias by the engineers in their reporting – the peer reviewers were seen as a sufficient check against this possibility.[788] Nor does it seem to have occurred to Seqwater to review the contents of the March flood event report against advice earlier given. On any view, it is incumbent on Seqwater to inform the Queensland Government, as soon as practicable, if it has provided information that is later found to be inaccurate. At the very least, Seqwater should have been able to advise the Queensland Government, at the time that it sent the March flood event report to DERM, that it was different, in significant respects, from the briefing note provided in January 2011.

A grave concern is that Mr Pruss did not make any enquiries about the methodology being used by the engineers in preparing the report. Mr Borrows said that he was not aware that Mr Tibaldi's methodology for preparing the report was to assess the data and work out what strategies were used during the event by reference to that data.[789] Mr Pruss said that he did not ask any questions of Mr Tibaldi about how he was going about recording the strategies shown in the report and whether they were by reference to actual recollections or a reconstruction from the data.[790] It is surprising that the March flood event report did not include an explanation of the methodology used in compiling its key sections; it is alarming that methodology was not discussed at all by Seqwater management.

Measures should be put in place to ensure that proper support and oversight mechanisms are put in place around both the substantive and procedural aspects of drafting large flood event reports. Seqwater was right to recognise that the January 2011 flood event report was a different 'beast' from any previously tackled; it should have understood that this meant careful thought would need to be given not only as to how the process should be managed, but also as to how the substance of the report was going to be compiled.

The Commission is not well placed to make recommendations about precisely which mechanisms should be put in place; this is principally a matter for Seqwater management. However, there does appear to be good reason for Seqwater to consider if the mechanisms it has in place are effective. Seqwater should consider engaging consultants with expertise in the production of large reports following significant events.

Recommendation

16.2 Seqwater should ensure that proper support and oversight mechanisms are put in place around both the substantive and procedural aspects of drafting flood event reports. Seqwater should consider engaging consultants with expertise in the production of reports following significant events to advise on these mechanisms. Measures to be considered should include:

- ensuring appropriate systems are in place to ensure the recollections of flood engineers and other parties are recorded immediately after the event, perhaps by engaging an external party to interview the flood engineers and other parties
- ensuring that a methodology for writing the report is set out clearly in advance, in writing, and that the final report includes a statement of that methodology
- putting in place systems to ensure that members of senior management have sufficient understanding of both the methodology and process by which the report is prepared to allow themselves to be satisfied that these are appropriate.

16.12 Knowledge of government officials about the March flood event report

16.12.1 Peter Allen, Director, Dam Safety

Mr Allen, DERM's Director, Dam Safety, reviews the flood event reports which Seqwater produces under the Wivenhoe and North Pine flood mitigation manuals.[791] There is no legal requirement for a review, but Mr Allen considers it part of his duties as dam safety regulator.[792] He gave evidence that the size of the task of reviewing the March flood event report will require him to involve others; he will remain responsible.[793]

Prior to the publication of that report on 2 March 2011, Mr Allen:

- had a personal understanding of the strategies which had been employed during the event (see *16.7 Objective evidence as to strategy choice on 8 and 9 January 2011*)[794]
- knew that Mr Cooper had indicated in his review that the strategies used included W2, prior to the triggering of W4[795]
- knew that an account of the strategies used during the flood event had been given to the Minister as part of a ministerial briefing note on 16 or 17 January 2011[796]

- knew that there was, in the Strategy Summary Log, an account of the strategies used during the flood event[797]
- knew that there was, in the Summary of Manual document prepared by Mr Malone, an account of the strategies used.[798]

Awareness of the methodology for the March flood event report

Mr Allen did not see, and was not involved in preparing, the drafts of the March flood event report; he first saw the report itself when it was provided to DERM in March 2011.[799] He gave evidence that he might have visited the flood operations centre 'on the odd occasion' while Mr Tibaldi was writing the report.[800]

When asked whether he was aware that Mr Tibaldi was looking back at the data to work out which strategies had been used, Mr Allen said he 'expected' him to do so in order to write the report, since there was no time to record strategies during the event;[801] but he did not believe he was ever told that by Mr Tibaldi.[802]

Mr Tibaldi's evidence was that he had spoken to Mr Allen in general terms about the 'dilemma' he was in, in relation to whether the flowchart in the manual had been complied with if the flood engineers had bypassed strategy W2 upon transitioning out of W1.[803] (See *16.10.2 Mr Tibaldi's methodology.*) Mr Allen did not recall that discussion, although he accepted it was possible that it occurred.[804] The Commission finds that it did.

Mr Allen was aware of the practice of retrospectively applying strategy labels when producing an account of a flood event; it was the process followed in the past.[805] He said that he had 'no issue' with that process because 'the data is there on record'.[806] He agreed that the process of the retrospective application of strategy labels meant that the report would be an account of what the primary consideration of the engineer 'ought to have been' rather than what it was.[807] Mr Allen said that it was inevitable that a report would be that, unless the flood engineers wrote down their primary consideration at the time.[808]

Awareness of inconsistent accounts

The report was delivered to DERM on 2 March 2011. Mr Allen had not, by the time he gave evidence on 10 February 2012, read the report in full, but he had read 'the bulk' of it.[809] It was apparent to him that the report suggested that strategy W2 was bypassed and strategy W3 adopted at 8.00 am on 8 January 2011.[810] He agreed that he was aware that the March flood event report would be relied on as a record of what actually happened.[811]

Mr Allen said he did not do a comparison between his prior knowledge of the strategies used, as communicated by him to Mr Cooper, and what appeared in the March flood event report.[812] He gave evidence that he did not cross-check the March flood event report against the brief to the Minister, the Strategy Summary Log or the Summary of Manual document, but considered he would have to do so when he was making an assessment of the report.[813] He said he would reconcile the differences by going through the documents in detail and discussing them with others,[814] and would raise them in his report and with his Director-General now that the issue had been raised with him.[815]

Mr Allen has had significant experience in the operation of Wivenhoe Dam and with the manual. After he had expressed a belief that W2 was used during the event, and had seen three earlier accounts that said the same, it is not credible that he did not appreciate the significance of a report which indicated that it was bypassed. He must have realised that the strategies documented were not consonant with his own previous understanding of what strategies were used, Mr Cooper's report or the various accounts he had seen between 15 and 17 January 2011. Notwithstanding, he did nothing to bring the discrepancies to the attention of his superiors at DERM or the responsible Minister.

Delay in review of flood event report

Mr Allen said in his statements to the Commission that he expected the review of the March flood event report to be finalised by June 2012.[816] He had not had sufficient time to devote to a detailed review of the report as a result of his continuing dealings with the Commission and his implementing the recommendations contained in its interim report.[817] When it was put to him that the Commission had not required anything of him between 17 May and 1 August 2011, he said that he was doing modelling to try and understand the event.[818] Asked about his time between September and November 2011, he said he had been busy with the Wivenhoe Dam and Somerset Dam Optimisation Study.[819]

Counsel for the State and Mr Allen submitted that it was reasonable for Mr Allen to have delayed his review until after the Commission's final report was published.[820] They pointed to a letter from Mr John Bradley, then Director-General of DERM, to the Commission dated 2 March 2011 stating that DERM did not intend to proceed with the review until after the Commission's interim report and asking for the Commission's confirmation that that approach was acceptable.[821] But DERM was advised by the Commission in response that it was 'entirely a matter for the Department as to what course it [took] in relation to its review'.[822] It was Mr Allen's, and DERM's, decision not to complete the review before the 2011/2012 wet season.

The decision by Mr Allen to delay the review until after the Commission's final report, and the acquiescence of his superiors at DERM to that course, is unfortunate. It has meant, as Mr Allen accepted in cross-examination, that any dam safety issues which arise from the review will not be dealt with before the end of the 2011/2012 wet season.[823]

Independence from flood engineers

In his evidence, given in Commission hearings in May 2011 and in February 2012, Mr Allen said that he felt he was able to independently review the flood event report.[824] Against Mr Allen's view is the evidence that:

- He knows all of the flood engineers fairly well;[825] he considers them all friends or acquaintances.[826]
- He operated the dam with some of them in flood events in the 1990s.[827]
- He received situation reports from, and had telephone contact with, the flood engineers during the event. From that contact, Mr Allen developed views of what was occurring during the flood event, as he indicated in his email to Mr Cooper.[828]
- He has acquiesced over many years to the production of flood event reports which retrospectively applied strategy labels to what occurred.[829]
- He has done nothing to act upon the inconsistency between the March flood event report and other accounts, of which he must have been aware shortly after he received the March report.

Counsel for Mr Allen urged against a finding that he could not independently review the flood event report. They pointed to his reporting of concerns about the flood capacity of North Pine Dam[830] as evidence that he has previously reported issues relating to dams which the flood engineers operated.[831] The focus in performing the review, they submitted, is dam safety,[832] which entails an examination of the operation and performance of the dam during a flood event.[833] That assessment is founded on the objective data; it does not involve the application of strategy labels or issues of credit.[834]

The point made about the focus of the review to be undertaken is accepted. Notwithstanding, the consideration of how the dam was operated must involve an examination of how the flood engineers exercised their powers; and a failure to appreciate what those powers were (because of a failure to recognise the appropriate strategy) must be relevant in that regard. Given his involvement to date and his relationship with the four flood engineers, it would not be appropriate for Mr Allen to undertake the task.

Recommendation

16.3 The Department of Environment and Resource Management should ensure that an independent and appropriately qualified person immediately starts the task of reviewing the March flood event report to ensure that the review is completed before the start of the 2012/2013 wet season.

16.12.2 Knowledge of Seqwater management

Mr Borrows, Seqwater's chief executive officer, has ultimate responsibility for the management of Seqwater's operations,[835] a role that includes risk management.[836] Mr Pruss, who in January 2011 was Seqwater's Executive General Manager – Water Delivery, had overall management responsibility for the operation of Wivenhoe and Somerset dams.[837]

Mr Borrows and Mr Pruss both received copies of conflicting accounts of the strategies used in the January 2011 flood event. They each received[838] and read[839] copies of the brief to the Minister on 16 January 2011; Mr Borrows attended the meeting with the Minister to discuss the brief.[840] Neither identified the discrepancies between the account of strategies used in the Minister's brief and the March flood event report, or between the report and any other account with which they had been provided.

It is unfortunate that neither identified these discrepancies. Both had a sufficient level of knowledge and closeness to the operations such that it is reasonable to think they might have noticed them. Mr Borrows was generally familiar with the W strategies and had read the manual prior to the January 2011 flood event.[841] Mr Pruss was responsible for overseeing the drafting of the March flood event report; the account of the strategies used and how they complied with the manual must have been regarded as a critical part of that report.

On balance, their failure to identify the differences should not be characterised as anything more than unfortunate. Neither Mr Pruss nor Mr Borrows was an expert in dam operations,[842] nor did they profess to be closely involved with the substance of the March flood event report. To the extent they bear any responsibility for the different accounts not being identified, it is because of the deficiencies in the processes for which they were responsible, rather than the adequacy of their personal reviews of the documents (as to which, see *16.10 The March 2011 flood event report* and *16.13 Peer reviews of the March report*).

16.12.3 Knowledge of the Premier, the responsible Minister and the Directors-General

The Premier and the Director-General of the Premier and Cabinet

The Honourable Anna Bligh MP was the Premier of Queensland during the January 2011 flood event. Mr Ken Smith was the Director-General of the Department of the Premier and Cabinet, the department responsible for providing support and advice to the Premier and her Cabinet.[843] Mr Smith, as the Director-General of the Department of the Premier and Cabinet, was also the chair of the State Disaster Management Group in December 2010 and January 2011.[844]

The Premier and Mr Smith both provided statements to the Commission in response to Requirements obliging them to explain their understandings of the strategies in use at Wivenhoe Dam during the January 2011 flood event and of the subsequent accounts of the strategies used.[845] Both attached over 300 pages of contemporaneous documents relevant to the January 2011 flood event to their statements. Mr Smith gave oral evidence to the Commission on 10 February 2012.[846]

Among the documents the Premier and Mr Smith each received in January 2011 were a small number that expressly referred to the choice of strategies or changes in the primary objectives at Wivenhoe dam during the flood event.

- At 11.07 pm on 9 January 2011, Mr Smith received an email from Mr Spiller that said the primary objective of the dam operations was changing from the inundation of bridges to minimizing the risk of urban inundation.[847] At 5.44 am on 10 January 2011 Mr Smith forwarded that email to a number of people, including the Premier.[848] The language of the email can be read as suggesting a change in strategy at that time to strategy W3. (See *16.7 Objective evidence as to strategy choice on 8 and 9 January 2011*.)
- At 9.46 am on 10 January 2011, Mr Smith received an email from Mr Spiller that referred to strategy W2's being in use.[849] The Premier and Mr Smith also received emails and a diary icon that included text drawn from that email, including the reference to W2.[850]
- On 13 January 2011, Mr Smith received a copy of a report prepared by Mr Brian Cooper, dated 13 January 2011.[851] The Premier also received a copy of that report.[852] Mr Cooper's report said that:

  > Until the last day or so, Wivenhoe Dam... would be operating under Strategy W1.
  >
  > [and]
  >
  > ... for the last day or so before yesterday's big rise, Strategy W2 would be in place.

The Premier and Mr Smith had access to the March flood event report and to the Commission's interim report, both of which recorded that strategy W2 had not been engaged. They were, therefore, in a position where they had an opportunity to identify the discrepancies between these accounts and the reports they had received in January 2011.

Mr Smith said that he did not identify the differences in the accounts.[853] While, in January 2011, he was aware that the manual existed, he did not understand it in sufficient detail to know that it referred to operational strategies W1 to W4.[854] He said that he did not read the March flood event report in 'great detail'.[855] He said that he did read the Commission's interim report, including the description of strategy changes.[856] When asked, Mr Smith accepted that there were differences in the accounts he had received, but said that he had not crosschecked the contents of the interim report against previous accounts he had seen.[857]

The Premier said she had been aware that 'alternative views and questions' were raised in the media about the operation of the dam from as early as 12 January 2011.[858] She did not refer to any discrepancies she had identified from a comparison of different accounts she had seen, although she said that her understanding of the flood operations strategies in use in January 2011 had been 'further informed' by the Commission's interim report.[859] The Premier does not appear to have been aware of the discrepancies between different accounts aside from those raised in the media.

It is unsurprising that the Premier and Mr Smith did not identify the discrepancies. Their positions did not require any sophisticated level of knowledge of the manual. They each received large volumes of material relating to the December 2010/January 2011 floods, most of which was unrelated to the choice of operational strategy at Wivenhoe Dam. They depended upon receiving accurate information from others, and could not reasonably have been expected to scrutinise the different documents they received for inconsistencies.

The responsible Minister and the Directors-General of DERM

The Honourable Stephen Robertson MP was the Minister for Natural Resources, Mines and Energy at the time of the January 2011 flood event. Through the course of the January 2011 flood event, three different people acted as the Director-General of DERM:

- Mr John Bradley was the Director-General of DERM in January 2011. He was on leave from 25 December 2010 until the afternoon of 11 January 2011.[860]
- Ms Debbie Best, a Deputy Director-General within DERM, was acting Director-General from the time Mr Bradley went on leave on 25 December 2010 until Mr Wall returned from leave on the morning of 10 January 2011.[861]
- Mr Terry Wall, Associate Director-General of DERM, was on leave until 10 January 2011. He was acting Director-General of DERM from his return on 10 January 2011 until midday on 11 January 2011 when Mr Bradley returned.[862]

Mr James Reeves is the current Director-General of DERM. He took up this role on 29 August 2011.[863]

Mr Robertson, Mr Bradley, Ms Best, Mr Wall and Mr Reeves all provided statements to the Commission in response to requirements obliging them to explain their understandings of the strategies in use at Wivenhoe Dam during the January 2011 flood event and of the subsequent accounts of those strategies.[864] Mr Robertson gave oral evidence to the Commission on 9 February 2012.[865]

Mr Robertson said that his understanding of the strategies in use at Wivenhoe dam during the January 2011 flood event was based on the documents he received in January 2011.[866] At the time, he appreciated that the manual contained four W strategies and, in general terms, that these strategies were triggered in different circumstances and had different primary objectives.[867]

Mr Robertson received a number of documents that referred to the strategies used at Wivenhoe Dam during the January 2011 flood event:

- At 11.07 pm on 9 January 2011 Mr Robertson received an email from Mr Spiller that referred to the primary objective of the dam operations changing from preventing the inundation of bridges to minimizing the risk of urban inundation.[868] Mr Robertson explained in oral evidence that he did not connect the change described in that email to a change in terms of the W strategies.[869]
- At 9.46 am on 10 January 2011, Mr Robertson received an email from Mr Spiller that referred to strategy W2's being in use.[870] Mr Robertson also received other emails around this time that used the same language as Mr Spiller's email, including the reference to W2.[871] Mr Robertson said that, at the time, he would have understood, on the basis of these emails, that Wivenhoe Dam was operating in strategy W2.[872]

- On or around 13 January 2011, Mr Robertson read a copy of Mr Cooper's report.[873] That report said:

  > Until the last day or so, Wivenhoe Dam….would be operating under Strategy W1.
  >
  > [and]
  >
  > ... for the last day or so before yesterday's big rise, Strategy W2 would be in place.

- On 17 January 2011, Seqwater and SEQ Water Grid Manager presented a briefing note to the Minister.[874] As set out in *16.8.3 The brief for the Minister*, an attachment to the brief provided an account of strategy changes that conflicts with that given in the March 2011 flood event report.
- On or around 2 March 2011, Mr Robertson received a copy of the March flood event report.[875]

Mr Robertson said that he did not notice the differences between the accounts he received.[876] He assumed the information in the brief he received on 17 January 2011 was correct, but commented that, if he had turned his mind to it at the time, he would not have been surprised if that information differed from what ultimately appeared in the March flood event report. In his experience, initial information given in briefing notes quite regularly changed upon a more detailed review.[877]

Mr Robertson explained:

> I didn't cross-reference this document with previous documents that - I think you need to appreciate that by the time these documents get to me as minister they pass through numerous hands, so my expectation is that by the time a document is provided to me it has gone through appropriate quality control at the various levels of the organisations or the department. So to think that I would then sit down and cross-reference this document against previous briefings, that's just not the way it happens.[878]

Mr Bradley said his understanding, in January 2011, of the strategies in use at Wivenhoe Dam was based entirely on the documents he received, such as technical situation reports.[879] A number of documents that he received referred to the strategies used:

- On 12 January 2011 Mr Bradley received a copy of a preliminary version of a report by Mr Cooper.[880] That report said:

  > Until the last day or so, Wivenhoe Dam... would be operating under Strategy W1.[881]

- On 13 January 2011 Mr Bradley received the final version of Mr Cooper's report.[882] That report said:

  > Until the last day or so, Wivenhoe Dam... would be operating under Strategy W1.
  >
  > [and]
  >
  > ... for the last day or so before yesterday's big rise, Strategy W2 would be in place.

- Mr Bradley was involved in co-ordinating the drafting of the brief to the Minister that was tabled on 17 January 2011.[883] As set out in *16.8.3 The brief for the Minister*, an attachment to the brief provided an account of strategy changes that conflicts with that given in the March flood event report.

Mr Bradley said he had received a copy of the March flood event report[884] and was aware of the Commission's interim report.[885] He was, therefore, in a position where he had an opportunity to identify the discrepancies between these accounts. Mr Bradley explained in his statement that, until he saw media reports on 23 January 2012, he was not aware of any contention that the March report (and by, implication, the Commission's interim report) might not be factually accurate or that it contradicted the information provided to the Minister in the brief.[886]

Ms Best said that she understood in January 2011 that the manual contained a range of strategies and that the strategies 'escalated in level of response'.[887] A number of documents she received referred to the strategies used:

- At 11.07 pm on 9 January 2011 Ms Best received an email from Mr Spiller that referred to the primary objective of the dam operations changing from the inundation of bridges to minimising the risk of urban inundation.[888] This language might be taken to be suggestive of a change in strategy at that time to strategy W3. (See *16.7 Objective evidence as to strategy choice on 8 and 9 January 2011*.)
- At 9.46 am on 10 January 2011 Ms Best received an email from Mr Spiller that referred to strategy W2's being in use.[889] Ms Best also received other emails around this time that used the same language as Mr Spiller's email, including the reference to W2.[890]

- On 14 January 2011 Ms Best was forwarded a copy of the final version of Mr Cooper's report.[891] That report said:

  > Until the last day or so, Wivenhoe Dam....would be operating under Strategy W1.
  >
  > [and]
  >
  > ... for the last day or so before yesterday's big rise, Strategy W2 would be in place.

Ms Best said in her statement that she had peripheral involvement with the briefing note prepared for the Minister, which consisted of assisting a colleague to obtain a copy of the attachments to the report.[892] The attachment Ms Best provided in evidence related to Mr Cooper's report, suggesting that she may have thought this was the briefing note. However, it is clear from other material that Ms Best did in fact receive at least a draft copy of the brief to the Minister.[893] Ms Best said that she did not have a detailed knowledge of either the brief for the Minister or the March flood event report.[894] She said she did not become aware of any differences between these documents until 31 January 2012 when she was asked to prepare her statement in response to the Requirement from the Commission, and had been aware of possible differences only since she saw media reports on 23 January 2012.[895]

Mr Wall was only acting as Director-General for a short period of time during the flood event. He said his understanding of the strategies used in January 2011 was based entirely on the documents he received, only one of which contained an express reference to a strategy (a Technical Situation Report W39 that referred to strategy W4).[896] Mr Wall subsequently read the Commission's interim report.[897] He did not become aware of any suggestion that that account might not be accurate until he saw media reports on 23 January 2012.[898]

Mr Reeves explained he had no understanding of which flood operations strategies were used at Wivenhoe Dam during the flood event until he read the Commission's interim report.[899] He first became aware of allegations of inconsistencies of accounts as to the choice of strategies in media reports on 23 January 2012.[900]

It is unremarkable, for the same reasons given in relation to the Premier and Mr Smith, that none of Mr Robertson, Mr Bradley, Ms Best, Mr Wall or Mr Reeves identified the discrepancies between the accounts of the strategies used in the January 2011 flood event. While some of them, particularly Mr Robertson and Mr Bradley, did have access to a number of different accounts that meant they had the opportunity to identify the discrepancies, it is unreasonable to expect that they should have.

16.12.4 Knowledge of officers of the SEQ Water Grid Manager

The South East Queensland Water Grid Manager is a statutory body that is responsible for the management of the water grid – the infrastructure that supplies bulk water – in South East Queensland.[901] The South East Queensland Water Grid Manager was responsible for co-ordinating communications relating to floodwater releases during the January 2011 flood event.[902] One aspect of this function was to distribute Technical Situation Reports, which were provided to it by Seqwater.[903] These Technical Situation Reports were distributed to a number of interested parties, including state government ministers, directors-general of government departments and members of disaster management groups.[904]

Mr Barry Dennien is the chief executive officer of the South East Queensland Water Grid Manager. He held this position at the time of the January 2011 flood event, but was on leave from 25 December 2010 to 9 January 2011.[905] Mr Daniel Spiller was the Director of Operations from 7 to 12 January 2011, and was acting chief executive officer in the period that Mr Dennien was on leave.[906]

Mr Dennien and Mr Spiller each provided statements to the Commission in response to Requirements that obliged them to detail their understanding of the strategies in use during the January 2011 flood event.[907] Mr Dennien said he understood that:[908]

- the transition from strategy W1 to strategy W2 occurred on the evening of 9 January 2011
- the transition from strategy W2 to strategy W3 occurred sometime in the afternoon or evening of 10 January 2011
- the transition from strategy W3 to strategy W4 occurred on the morning of 11 January 2011.

Mr Spiller said he understood:[909]

- the transition from strategy W1 to strategy W2 occurred on the evening of 9 January 2011

- the transition from strategy W2 to strategy W3 occurred around midday on 10 January 2011
- the transition from strategy W3 to strategy W4 around midday on 11 January 2011.

Mr Dennien and Mr Spiller emphasised that their understanding of the strategies used was based on less information than they considered necessary to make a proper assessment of the strategies.[910] Mr Dennien's understanding of the strategies used was primarily derived from the descriptions of the objectives given in the technical situation reports;[911] Mr Spiller's was based on a mixture of the technical situation reports and email and telephone communications.[912] Neither of them had any direct communication with the flood operations centre during the flood event,[913] except in relation to drafting the briefing note for the Minister.[914]

Mr Spiller and Mr Dennien would sometimes seek clarification from Seqwater personnel, such as Mr Drury, on how to interpret the information in the technical situation reports.[915] Mr Spiller explained that the further detail sought was generally about release strategies rather than the W strategies.[916] On one occasion, in an email sent at 8.13 am on 10 January 2011, Mr Spiller asked Mr Drury whether release strategy W2 or W3 was in place; Mr Drury replied that it was W2.[917] (See *16.7 Objective evidence as to strategy choice on 8 and 9 January 2011*.)

Mr Dennien and Mr Spiller both took part in a teleconference at 8.30 am on 10 January 2011 in which strategies W2 and W3 were raised. Mr Spiller recalled that strategies W2 and W3 were spoken about by Mr Drury and Mr Borrows and that the meeting proceeded on the basis that the dam was being operated in strategy W2 at that time, but was unable to recall any further detail.[918] Mr Dennien said (not necessarily very logically) that the strategies were discussed in connection with release rates.[919] (See *16.7 Objective evidence as to strategy choice on 8 and 9 January 2011*.)

It is clear, both from their statements and their oral evidence, that Mr Dennien's and Mr Spiller's accounts of the strategies in use at Wivenhoe are educated interpretations of the descriptions of the dam operations given by others; they are not based on any first hand knowledge. Their interpretations do not assist the Commission in understanding the strategies that were actually in use beyond what the documents relied on by Mr Dennien and Mr Spiller show.

However, because Mr Dennien and Mr Spiller each had a relatively clear perception of what was occurring, they each had some opportunity to identify that other accounts – including the brief to the Minister, the March flood event report and the Commission's interim report – diverged from their own understanding.

Mr Dennien said that he 'skimmed' the table of event decision making in the Seqwater section of the briefing note but did not read it in any detail.[920] His evidence on 8 February 2012 was that he had only read the March flood event report 'a couple of weeks ago'.[921] He had read the Commission's interim report but did not look in detail at the sequence of events in relation to strategy adoption set out in that report.[922]

Mr Spiller formed a view from the information he received during the flood event about the strategies that were employed at the dam (see *16.7 Objective evidence as to strategy choice on 8 and 9 January 2011*). That understanding was different from the account given in the ministerial briefing note.[923] Mr Spiller said that he was confident that he would have read the entire briefing note prepared for the Minister.[924] He did not notice the discrepancy between the strategy changes recorded in the briefing note and the understanding he formed during the event.[925] His evidence was that he 'had a very cursory view of the March report'.[926] He could not specifically recall having read the part of the March report that recorded a change to W3 at 8.00 am on 8 January 2011.[927] His evidence was that he had noticed some inconsistency between the findings in the Commission's interim report and his understanding as to strategy changes.[928] However, he had attributed this inconsistency to his lack of specific knowledge, and thought in any event that the interim report had highlighted ambiguity about the transition to W3.[929]

There is no evidence that Mr Dennien had any real appreciation of the discrepancy between the information about strategy which was emerging from some quarters of Seqwater during the January 2011 flood event and what appeared in the final report. Mr Spiller had, evidently, paid greater attention to what Seqwater was communicating during the flood event and to the March flood event report. He did recognise a discrepancy between the two, but had not sufficient confidence in his own perception to raise any issue. That is not remarkable. His expertise was not in dam operation, his knowledge of the manual strategies was relatively superficial, and, most importantly, it was not the role of Water Grid Manager personnel to supervise Seqwater. Neither man should be criticised for failing to detect (in Mr Dennien's case) or act on (in Mr Spiller's case) the inconsistencies between Seqwater's accounts.

16.13 Peer reviews of the March report

In its first submission to the Commission, Seqwater advised that it had engaged four experts to review the operational decisions made during the January 2011 flood event.[930] Three of those reviewers' reports (those prepared by Professor Colin Apelt, Mr Greg Roads and Mr Leonard McDonald) were then provided;[931] a fourth, by Mr Brian Shannon, was forwarded on 4 April 2011 with a supplementary submission.[932]

The peer reviewers addressed two questions:

1. Were the releases of water from Wivenhoe Dam and Somerset Dam during the January 2011 Flood Event in accordance with the Wivenhoe manual?
2. Based on the information contained in the March 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?

Each of the experts concluded that the operation of the dam complied with the manual,[933] although two of them raised some possible issues of non-compliance.[934] These depended, however, on particular interpretations of the manual.

Mr Babister, asked by the Commission to review the March flood event report and the reports of the peer reviewers, other than Mr Shannon's, noted that the reviews had found that the dam releases did accord with the manual, and that the possible non-compliance issues were attributable to ambiguity in the manual.[935] He did not take issue with the reviewers' opinions.

The four peer reviewers' reports became evidence and the Commission accepted the opinions expressed in them. Given the questions raised as to the veracity of the March flood event report, the Commission has had occasion to examine the process by which those opinions were formed.

Seqwater had no established process for obtaining peer reviews, or at least none of which Mr Borrows was aware.[936] Instead, it was an aspect of the process put in place for the production of the March flood event report, for which Mr Pruss had responsibility (see section *16.11.6 Seqwater's systems and procedures for the creation of the flood event report*). Mr Pruss also facilitated the peer review process. The Commission's examination of the process revealed a number of deficiencies in it.

The reviews were completed in a short time period so that Seqwater could present the results to the Commission within its timeframe for submissions.[937] Professor Apelt, Mr Roads and Mr Shannon were given about a month to complete their reviews. They did the bulk of their work on draft versions of the March flood event report, which was published on 2 March 2011. Seqwater had requested the reviewers' reports by 10 March 2011. Mr McDonald only received a copy of the final report on 4 March 2011, but he said he found the task 'reasonably tractable'.[938] He met the 10 March 2011 deadline.

The time constraints meant that the reviewers were unable to review all relevant material. Mr Roads said Mr Tibaldi indicated to him that it would not be possible to review the entire report in the time available and that he should review only certain sections of the report (which he did).[939] Mr McDonald did not closely consider the appendices because of the limited time available.[940]

The methodology by which Mr Tibaldi prepared the Seqwater report – and concluded that the transition to W3 occurred at 8.00 am on 8 January 2011 – was not explained to the peer reviewers.[941] It is evident that it should have been.

Each of the peer reviewers proceeded on the premise that there was a transition to strategy W3 at 8.00 am on 8 January 2011.[942] Mr McDonald said that he worked on the basis that the statements in the March report, particularly those in section 2, were accurate and matched the content in the appendices.[943] He did not attempt to compare them.[944]

The question with which the Commission is now concerned – whether the flood engineers operated the dam in strategy W3 from 8.00 am on 8 January 2011 – was not considered by the peer reviewers. As Mr Roads put it:

> the expert reviewers were asked to determine whether 'the release of water from Wivenhoe Dam and Somerset Dam during the January 2011 flood [event] was in accordance with the Manual...' We were not asked to determine whether the documentation or even whether the flood operators' mindset was in compliance.[945]

The peer reviewers were not briefed with all relevant information. They were not given the situation report sent on 8 January 2011 at 5.53 pm, which was omitted from the March flood event report. Professor Apelt and Mr Roads received draft versions of the report which did not contain the flood event log entry on 9 January 2011 for the flood engineers' conference at 3.30 pm; the entry does appear in Appendix M of the March report. Because Mr Shannon disposed of the draft he received when he was given the final report, it is not known whether it also omitted the log entry. It is likely, though, that he received the same draft material as Professor Apelt and Mr Roads.

The omission of that information, although curious, appears to have occurred through inadvertence; the result of administrative error.[946] It may not point to systemic weakness, but a lack of rigour in providing all relevant documents has the potential to compromise any review process as a whole.

Mr Shannon and Mr Roads said that they did not have any regard to the flood event log in Appendix M, or to the situation reports in Appendix E.[947] Mr Roads focussed on the modelling in Appendix A and sections 2, 9 and 10 of the report.[948] Mr Shannon assumed that the information in the appendices was reflected in the body of the report;[949] he did not look at the appendices in any detail.[950] Professor Apelt did refer to the situation reports and flood event log, but focussed mainly on the model results,[951] the executive summary and sections 2, 9, 10 and 19.[952] Mr McDonald, who only got a copy of the final report, did not closely examine the appendices because of the limited time he had to complete his review.[953] He read and studied the executive summary and sections 1 to 5, 9, 10 and 11.[954] He did not notice the 9 January entry for the flood engineers' conference in the flood event log in Appendix M; none of the reviewers did.

When the final report was released on 2 March 2011, Seqwater did not bring to the attention of the experts any differences between the drafts and the final report, such as the inclusion of the log entry on 9 January 2011.[955] Mr Shannon said that he reviewed the final report when he was given it and satisfied himself that there was no material difference between it and the draft on which he had relied; but he had only a cursory look at the appendices.[956] Professor Apelt similarly said that he looked at the published report to see if it altered his assessment, and satisfied himself that the contents were 'essentially the same'.[957]

Three of the peer reviewers said that had they seen one or both of the situation reports and the entry about the flood engineers' conference in the course of their reviews, that material would, given the apparent inconsistency with the proposition that the dam was operated in strategy W3 from 8.00 am on 8 January 2011, have caused them to ask further questions of Seqwater.[958] Mr Roads said he would have sought clarification about the entry for the conference,[959] but – because of his view of the proper interpretation of the manual (with which the Commission does not agree) – he did not regard it or the situation report as relevant to the question of compliance.[960]

Each of the peer reviewers has maintained his view that the releases made from the dam were appropriate in the circumstances the flood engineers faced.[961] While important, that is not to the point now being considered. The releases,[962] even if appropriate, do not of themselves determine the strategy under which the dam was being operated;[963] and those made on 8 and 9 January 2011 were consistent with the operation of the dam under either of strategy W1 or W3.[964]

Independence is essential to a credible review process. There are real concerns about Seqwater's approach in this case. Mr Borrows and Mr Pruss appeared to regard the peer reviewers as one of the external resources made available to assist in drafting the March flood event report.[965] In some instances, no clear distinction was made between the report's preparation and its review. Two of the peer reviewers attended meetings about the production of the report. Professor Apelt was present at the first meeting that was held about the preparation of the report (on 3 February 2011).[966] He said he attended as an observer only, so that he could be brought up to speed.[967] There is no record of what was discussed at the meeting, but Mr Pruss indicated that it was a planning meeting for the completion of the report.[968] It appears that issues relating to the content of the report were discussed at a second meeting Professor Apelt attended (on 8 February 2011).[969] Professor Apelt said he was there again as an observer.[970] Again, there is no record of what was discussed at this meeting, but a note Mr Ayre took indicates that there was some discussion about the flood event summary in section 2 of the report, and the need to show that the flood engineers had satisfied the Wivenhoe manual.[971]

The content of the report was evidently discussed at a meeting Mr Shannon attended on 18 February 2011. Mr Shannon raised an issue about the exercise of discretion and compliance with the manual.[972] A note of the meeting indicates that Mr Shannon made a suggestion to the effect of 'if you did step outside [the] manual, show you did what was necessary'.[973] Mr Pruss said he was 'comfortable' that Mr Shannon was 'challenging' the flood engineers in

this way.[974] That might have been useful, but it raises the possibility that Mr Shannon may have been contributing – even if only in an indirect way – to a report he was engaged to review. It does not appear that any thought was given to the risk that the value of an independent peer review might thus be weakened.

Mr Pruss did not recognise the problems associated with the merging of the process of production of the report and the process of reviewing it. He and Professor Apelt differed as to the scope of the latter's role. Both were asked, in evidence, to comment on an email Mr Pruss's assistant had sent Professor Apelt (on 7 February 2011) thanking him for his availability to 'assist Seqwater with the report and submission for the Commission of [Inquiry]'.[975] Professor Apelt had no doubt in his mind. He denied that he had given that assistance to Seqwater; he said, 'it would be quite ridiculous for me to help construct [the report] and then review it'.[976] Mr Pruss, on the other hand, had a different view. He said the email was consistent with his general understanding of Professor Apelt's engagement.[977] There was, it seems, some lack of clarity, at least from Seqwater's perspective, as to Professor Apelt's role in the process.

An exchange of emails between Mr Roads and Mr Malone (to which the other flood engineers were party) on 17 January 2011, before he was engaged by Seqwater, is also relevant in examining Seqwater's approach to the independence of the review. Mr Malone sent Mr Roads an email thanking him for his 'supportive comments' reported in *The Australian* newspaper.[978]

The article reported Mr Roads as saying that 'the experts operating Wivenhoe Dam were among the best in Australia and would have done everything by the book'; that while he agreed earlier releases of water would have created more capacity for flood storage in Wivenhoe and a lower river peak in Brisbane, the flood engineers had no way of anticipating the severity of the weather; and that he agreed that the questions about the dam's performance should be examined and the subject of an inquiry.[979]

In his reply to Mr Malone's email, Mr Roads said the journalist was 'very selective' in his reporting of Mr Roads' comments; it looked to him as though the flood engineers had done 'a great job'. He also said in the email:[980]
'I advised Barton [Maher][981] yesterday that you guys will need to get on the front foot with [the journalist]. It shouldn't be me!'

The Commission does not suggest that Mr Roads' approach to the review was anything other than professional or objective. But it does raise a question as to the wisdom of Seqwater's engaging for the review process someone who had already expressed a view on the operation of the dams.

Recommendation

16.4 Seqwater should ensure that any future peer review process:

- is co-ordinated by someone independent of those who wrote the report
- entails the provision of all relevant information to the peer reviewers
- permits sufficient time for the review
- documents all contact between those whose actions are under review and the reviewers.

16.14 The effect of releases from Wivenhoe Dam on flooding in the Brisbane River

The consequences of the operation of Wivenhoe and Somerset dams were not able to be examined fully by the time of publication of the Commission's interim report: see section 2.9.2 of that report. The Commission had engaged Mr Mark Babister of WMAwater, a firm of consultant water engineers, to review and assess a hydrodynamic model of the Brisbane River prepared by Sinclair Knight Merz, another firm of engineering consultants, on behalf of Seqwater. The model was then used by Mr Babister to assess the effect of releases of water from Wivenhoe Dam during the January 2011 flood event and to identify the likely effect of different release strategies. The results of this work by Mr Babister were received by the Commission shortly before the printing of the interim report; they could not be analysed in detail in that report.[982]

Mr Babister's report[983] on the modelling was published on the Commission's website and written submissions from any interested party were invited in response. Seven substantive submissions were received.[984] At the request of the Commission, Mr Babister prepared a response to these submissions, which was provided to the interested parties[985]

along with a supplementary report prepared by Mr Babister responding to additional questions raised by the Commission.[986] Three further submissions in reply were provided to the Commission.[987]

When the Commission's additional hearings were convened in February 2012, the Commission asked Mr Babister to undertake additional modelling. The part of the Wivenhoe manual with which the Commission was concerned in these hearings was that which demands the selection of an overall strategy. Each strategy contains a 'primary consideration' and sets an upper limit for the amount of water that may be released while that strategy is in place. The primary consideration informs the considerable discretion of the flood engineers in choosing the amount of water to be released from the dams.[988] The exercise of that discretion will involve judgment calls.[989] Mr Babister prepared a report[990] expanding on the work he had previously done to focus on the likely effect of different applications of strategy W3. He was called as a witness and cross-examined on his modelling.[991]

The modelling has allowed the Commission to come to some conclusions as to the mitigatory effect of the dams, the contribution of Wivenhoe Dam releases to flooding in Brisbane and the possible consequences had the flood engineers adhered to the operating strategies in the manual.

16.14.1 Modelling work done for the Commission

The Sinclair Knight Merz model was calibrated[992] against the flood heights actually recorded in the January 2011 flood.[993] Mr Babister concluded that, subject to certain limitations, it was fit for purpose to address the questions posed to him by the Commission.[994]

It is important to note that, like any model, while the Sinclair Knight Merz model is a useful tool for understanding real-world events, it does not depict exactly what would occur during a flood. For example, the model has not been calibrated for the parts of the river upstream of the Mt Crosby Weir and treats all tributary inputs above this point as a single aggregated value into the model.[995] Limitations in the model need to be recognised and the results interpreted in light of them.

One significant issue relevant to the calibration of the model, and therefore its accuracy, was a discrepancy between the two gauges located on opposite sides of the Brisbane River at the Port Office. The maximum river height recorded in January 2011 by the gauge operated by Seqwater was 4.46 metres Australian Height Datum,[996] whereas the gauge operated by Maritime Safety Queensland recorded a maximum river height of 4.27 metres.[997]

Seqwater made enquiries about the reasons for the discrepancy and concluded that its gauge reading was correct.[998] Mr Babister concluded that the reading at the Seqwater gauge should be preferred for the purposes of calibrating the model, on the basis that it was verified by manual inspection of the gauge during the flood.[999] The Commission agrees that this was the appropriate figure to use for the purpose of the modelling. It is worth noting that using the other gauge for calibration might affect the results of the modelling. It is undesirable that such a discrepancy exists between data points that could be used in the modelling of this historic event; it should be conclusively resolved.

Recommendation

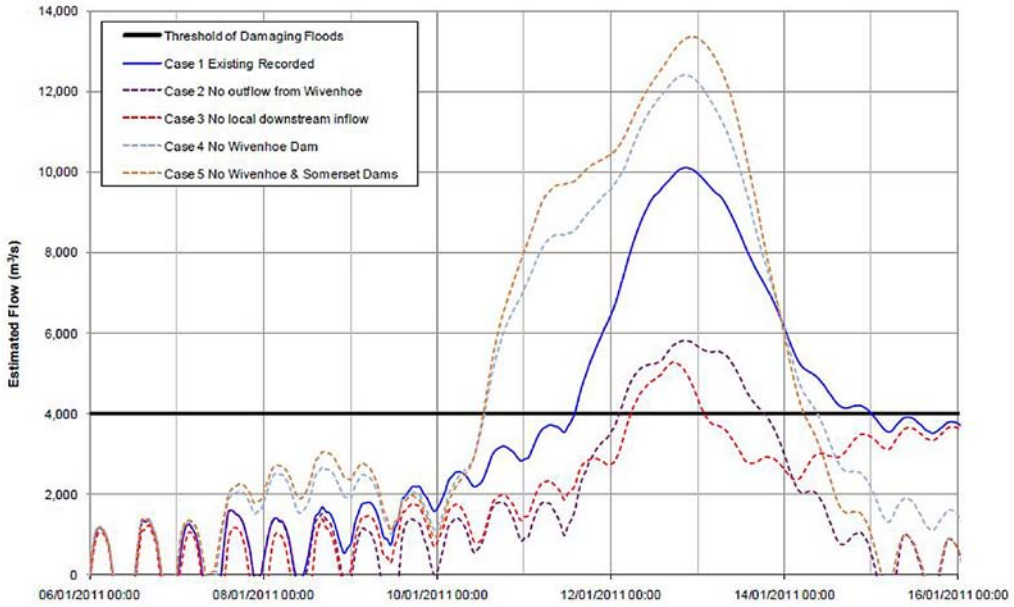
16.5 The Queensland Government should resolve the discrepancy in recorded peak river height for the January 2011 flood of the Brisbane River between the Brisbane City and Port Office gauges.

16.14.2 The effect of the operation of Wivenhoe Dam in January 2011

Mitigatory effect of the dams

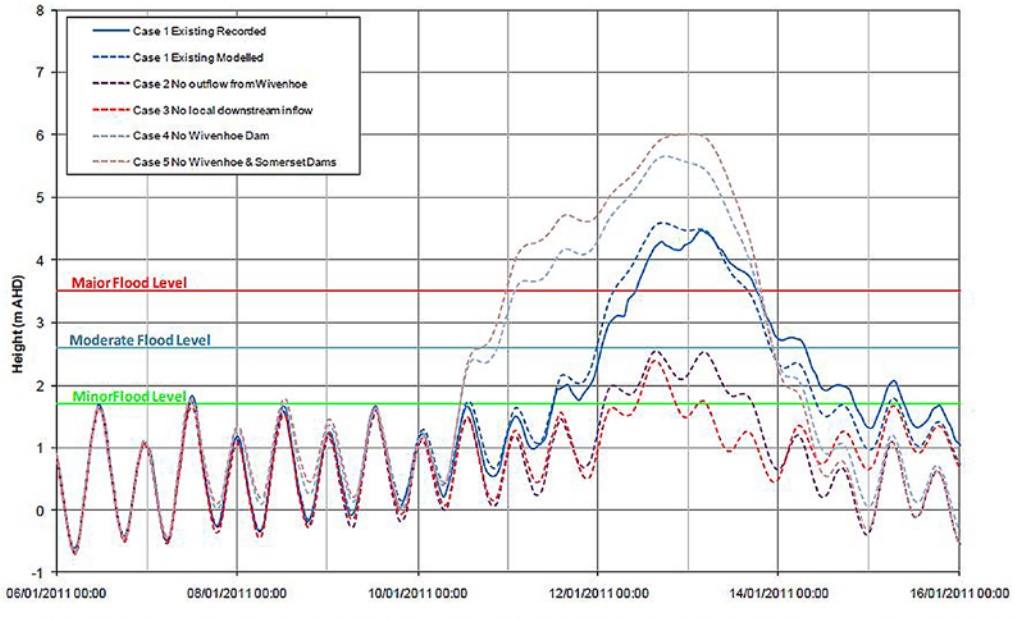
Sinclair Knight Merz, commissioned by Seqwater, modelled the effects on both flow and river height of the flood at the Brisbane Port Office gauge if Wivenhoe Dam had not been built, and if both Wivenhoe and Somerset dams had not been built. The results of modelling those scenarios are indicated by case 4 and 5, respectively, on the graphs of peak flow and peak river height at the Port Office gauge.

Figure 16(d)



Comparison of flow hydrographs for the January 2011 event at the Brisbane Port Office under different scenarios
Source: Sinclair Knight Merz, Joint Calibration of a Hydrologic and Hydrodynamic Model of the Lower Brisbane River, Version 3, 5 August 2011 [p59].

Figure 16(e)



Comparison of level hydrographs for the January 2011 event at the Brisbane Port Office under different scenarios
Source: Sinclair Knight Merz, Joint Calibration of a Hydrologic and Hydrodynamic Model of the Lower Brisbane River, Version 3, 5 August 2011 [p59].

The graphs show that the presence of Wivenhoe and Somerset dams had a mitigatory effect on the January 2011 flood of the Brisbane River;[1000] the flood would have been worse in Brisbane if there were no dams.

Relative contribution of dam releases and other sources of floodwater to flooding in Brisbane

While flooding would have been worse in the absence of the dams, it is not disputed by any party that releases from Wivenhoe Dam contributed significantly to flooding downstream of Wivenhoe, in combination with tributary inflows from Lockyer Creek, the Bremer River and other catchments. The Commission asked Mr Babister to use the Sinclair Knight Merz model to analyse the extent to which flooding in the Brisbane River was caused by releases from Wivenhoe and Somerset dams.

Quantifying the relative contributions of the different sources to the flooding in the Brisbane River is complicated. The flows from different sources interact at the point they converge and are affected by the relative timing of peak flows and backwatering effects.[1001] The difficulty in modelling this interaction accurately is a limitation of the model.[1002] A precise measure of the contribution of dam releases to the river height, volume or flow can only be made by reference to a particular time and location.[1003]

Peak flow is the value with the most direct bearing on peak river height.[1004] Subject to considerable qualification, Mr Babister's modelling concludes that the flows from the Wivenhoe Dam and non-Wivenhoe Dam sources were roughly equivalent contributors to the peak flow in the Brisbane River from Moggill to Brisbane in January 2011.[1005]

The modelling also considered the relative contributions of different sources to flood volume. For the period between 9.00 am on 6 January 2011 and 3.00 am on 13 January 2011 (the time of the peak recorded at the Port Office gauge) releases from Wivenhoe Dam made up approximately half of the total flood volume at the Port Office.[1006] This figure does not imply that half of the flooding in Brisbane was caused by Wivenhoe releases; it is useful only to indicate the relative contribution of one source of water at a particular location and at a particular time.[1007] By 19 January 2011, releases of water from Wivenhoe Dam amounted to approximately 65 per cent of the total flood volume at the Port Office.[1008] The larger part of the water released from Wivenhoe Dam was released after the flood peak at the Port Office; this figure indicates only the total contribution to flood volume, not to the flood peak.[1009]

Dam releases and flooding in the Bremer River

The Commission also asked Mr Babister to use the Sinclair Knight Merz model to consider the extent to which water released from Somerset and Wivenhoe dams coincided with peak flows from the Bremer River. Mr Babister's report concludes that the peak flow from Wivenhoe Dam releases at the confluence of the Brisbane and Bremer rivers occurred almost simultaneously with the Bremer River peak flow.[1010] Significant backwatering occurred within the lower Bremer River to a distance of approximately 15 kilometres upstream of the confluence of the Brisbane River. (See 2.3.2, part 5 of this report for more detail on the backwater effects of the Brisbane River on the Bremer River.) Ipswich flood behaviour is sensitive to this backwatering and it is likely that this effect and the coincidence of flood peaks contributed to the flooding that occurred at Ipswich. The exact additional flood height at Ipswich due to dam releases could not be calculated using the Sinclair Knight Merz model.[1011]

16.14.3 Effects of different release strategies

Modelling of the effects of implementing different release strategies

The Commission asked Mr Babister to model the effects of a number of different gate opening strategies and show the effect such strategies would have on the maximum river heights in the Brisbane River relative to the way in which the dam was operated during January 2011.

Mr Babister concluded, in light of the information available at the time, that, allowing for the limits of the strategies in the Wivenhoe manual, the flood engineers achieved close to the best possible flood mitigation result for the January 2011 flood event.[1012]

Seven modelled scenarios and their effects relative to a modelled version of the events of January 2011 are set out in Figure 16(f) below. A negative value indicates a lower river height, a positive value a higher river height. The locations shown are four river height gauges located on the Brisbane River.

Figure 16(f)

#	Scenario	Moggill	Jindalee	Oxley	Brisbane
Jan 2011	The modelled maximum river heights of the January 2011 flood that actually occurred, calibrated against the measurements actually recorded (although the results are not identical to the recorded measurements). This is the base scenario against which all other scenarios were compared.[1013]	17.6m	13.1m	8.3m	4.6m
1	The transition to strategy W4 at Wivenhoe Dam occurred at 8.00 pm on 9 January 2011, rather than at 8.00 am 11 January 2011. (8.00 pm on 9 January 2011 was the first time that the real time flood model used by the operators of Wivenhoe Dam predicted, including forecast rainfall, that the level of Wivenhoe lake would exceed 74.0 metres, the trigger point for Strategy W4 being implemented.[1014]) This scenario assumed that the gates were opened quickly until the storage level of the dam began to fall.[1015]	+0.3m	+0.3m	+0.3m	+0.2m
2	The transition to strategy W4 at Wivenhoe Dam occurred at 8.00 pm on 9 January 2011, rather than at 8.00 am 11 January 2011. This scenario assumes dam releases were quickly increased to between 3500 m^3/s to 4000 m^3/s, but the lake level was allowed to continue to rise until it reached 74.0 metres, at which point the gates were opened until the storage level of the dam began to fall.[1016]	-0.9m	-0.8m	-0.5m	-0.3m
3	The storage level in Wivenhoe Dam was 75% of full supply level prior to the onset of the flood and the manual in force in January 2011 applied.[1017]	-0.7m	-0.6m	-0.5m	-0.3m
4	The storage level in Wivenhoe Dam was 75% of full supply level prior to the onset of the flood and the manual in force in January 2011 was amended so that the trigger levels for Strategies W1, W2 and W3 were reduced by 25%. Strategy W4 was still triggered at 74.0 metres.[1018]	-1.3m	-1.2m	-0.9m	-0.6m
5	The storage level in Wivenhoe Dam was 75% of full supply level prior to the onset of the flood and the manual was amended so that the trigger levels for Strategies W1, W2 and W3 were reduced by 25%. W4 was not triggered at 74.0 metres: outflows were only slightly increased to make use of additional storage space.[1019]	-1.8m	-1.6m	-1.3m	-0.8m
6	The releases from Wivenhoe Dam were increased to the upper allowable limit of Strategy W3 as soon as it was triggered and the manual in force in January 2011 applied.[1020]	-0.7m	-0.6m	-0.5m	-0.3m
7	Strategy W3 was invoked at 8.00 am on 8 January 2011 and the gates were opened as fast as permitted by the manual to produce a dam release to produce a predicted total flow at Moggill of 4000 m^3/s, excluding forecast rainfall, using only information available at the time.[1021]	-1.3m	-1.3m	-0.9m	-0.6m

#	Scenario	Moggill	Jindalee	Oxley	Brisbane
8	Strategy W3 was invoked at 8.00 am on 8 January 2011 and the gates were opened as fast as permitted by the manual to maintain a dam release of 4000 m^3/s.[1022]	-1.0m	-0.8m	-0.6m	-0.3m
9	An optimised release strategy, assuming complete foreknowledge of all inflows into the dam and ignoring the restriction imposed by the manual in force in January 2011 on the maximum flow permitted in Strategy W3.[1023]	-0.9m	-0.8m	-0.6m	-0.4m

All except one of these scenarios show a reduction in the river height relative to what happened in January 2011. A strategy that might provide flood mitigation in one flood may not work in different conditions, so this cannot be used as a firm guide for how future floods should be approached.[1024] For example, a strategy that might be effective during a flood large enough to trigger the W4 strategy may be detrimental in moderate sized floods.[1025]

In any event, these scenarios are not realistic as possible outcomes of the January 2011 flood event. By way of illustrating that point, scenarios 1 and 2 rely on the use of forecast rainfall and, as this Commission found in its interim report, it is not possible to articulate a method by which lake levels could be predicted with any precision or strategies confidently changed on the basis of rainfall forecasts;[1026] scenarios 3, 4 and 5 assume the dam was at 75 per cent of full supply level; scenarios 6, 7, 8 and 9 would only have been implemented with a level of information that was not available at the time of the floods. A number of the scenarios assume that the manual then in force, version 7, was ignored. That manual has since been amended and is presently the subject of a long term review: see section 17.1 below. (A number of other scenarios modelled by Mr Babister are not shown above because they were based on different conditions to those experienced in the January 2011 flood event or are further examples of scenarios that could only be achieved with an unrealistic level of foresight or without regard to the manual then in force.)

The modelling indicates, however, that even without changes to the Wivenhoe manual, a reduction in lake level to 75 per cent of full supply level would have meant that peak river heights were lower than experienced in the January 2011 flood event: 70 centimetres lower at the Moggill gauge, 30 centimetres lower at the Port Office gauge.[1027] If the operating strategies in the manual had also been amended, as shown in scenario 4 above, it is likely that peak river heights would have been even less: 130 centimetres lower at the Moggill gauge, 60 centimetres lower at the Port Office gauge. They may have been still lower if other assumptions also changed as, for example, in scenario 5. The modelling clearly indicates that the application of the W strategies is material to the outcome of most scenarios.

It is important to note that even at these lower river heights, major flooding would still have been experienced in Brisbane. The Bureau of Meteorology defines a major flood as one which peaks above 15.5 metres at Moggill and 3.5 metres at Brisbane city[1028] (the Port Office gauge). Scenario 4, which involved an initial lake level of 75 per cent of full supply level and W strategy trigger levels reduced by 25 per cent, resulted in a modelled height of 16.3 metres at Moggill and 4.0 metres at the Port Office.

Modelling was also conducted to approximate what would have occurred if the present version of the Wivenhoe manual, Revision 9, had been in force during the January 2011 flood event and the initial lake level had been 75 per cent of full supply level.[1029] This indicated that the result would not have been significantly different from the results of scenario 3.

The scenarios of maximum release under W3 from 8.00 am on 8 January 2011

Scenarios 7 and 8 were prepared by Mr Babister in his February 2012 report. They represent the outer limit of what the flood engineers could have done had they been in W3 from 8.00 am on 8 January 2011 and immediately increased releases to the maximum allowable under that strategy.[1030]

As may be expected, both of those scenarios show some decrease in flood heights downstream: 130 centimetres at the Moggill gauge and 60 centimetres at the Port Office gauge in scenario 7; 100 centimetres at the Moggill gauge and 30 centimetres at the Port Office gauge in scenario 8. However, as also may be expected with outer limit scenarios, neither scenario is realistic.[1031] The new scenarios entail releasing water from the dam and substantially raising flood levels long before it was known that there was going to be a major flood.[1032] Between

11.00 am on 8 January 2011 and 1.00 pm on 9 January 2011, both of these strategies would have involved dam outflows almost double the peak dam inflow observed until that point. That, as Mr Babister observed, would have entailed Wivenhoe Dam operating as a flood amplification dam rather than a flood mitigation dam.[1033] Mr Babister concluded that the two scenarios were not practical; indeed they were highly risky.[1034] If, for example, further rainfall did not eventuate, the early release of such large quantities of water would have made the flooding significantly worse.

The results of the modelling must be taken in context with Mr Babister's acknowledgment that the 'models do have some uncertainty in them'.[1035] The model results are purely illustrative. They do not demonstrate the outcomes for the infinite range of possibilities that exist.[1036]

The consequences of the failure to engage W3 from 8.00 am on 8 January 2011

It is unfortunate that there has been a conflation in some media reporting of two separate issues: whether there was non-compliance with the manual strategies and whether it caused unnecessary flooding. The Commission has found the first (see *16.11 Conclusions: the dam operations strategies*.) As to the second, Mr Babister's perception was that the flood engineers managed Wivenhoe Dam so that its flood mitigation effect was 'very close' to the maximum achievable within the constraints of the manual.[1037] That may well be right. The problem is that the possibility exists that because the engineers failed to consider the releases open to them within the parameters of the correct W strategy, an opportunity may have been lost for earlier releases.

The evidence was uniformly to the effect that the pattern of releases adopted on Saturday 8 January was appropriate: the lake level was only just over 68.5 metres and showed every sign of dropping; higher releases would have been risky and unwarranted. The picture is not so clear for Sunday 9 January, when the rainfall returned. Mr Tibaldi described how conditions that day developed. Referring to the 'massive amount of rainfall', particularly in the Stanley River catchment, he explained that its imminence was not obvious at the start of the day:

> So what you've got to realise is you don't have that snapshot at 8 a.m. all you've got is, well, it's raining and I've got a 30 to 50 millimetre forecast. But as it progresses through the day, you know, you become aware that this is getting big and, you know, you just come to that – you're in transition. You are thinking about the bridges but then all of a sudden as you progress through the day you see, well, this just can't continue. We've got to ramp up releases.

The real question is whether the steps taken to do so would have come sooner had the engineers had a clear appreciation that they were operating in W3, and whether they should on that day have been moving earlier to minimise urban inundation rather than continuing to operate so as to keep the bridges open until the evening of 9 January 2011.

The possibility that the engineers moved too late was acknowledged by Mr Roads, who said that while on Sunday morning, 9 January 2011, the flood engineers were 'pretty much releasing what they should have been', by Sunday afternoon 'it's starting to get touch and go really... in hindsight you look back at it and say Sunday afternoon maybe [they] should have taken down the bridges a bit earlier'.[1038]

Mr Babister initially said that 'the more practical or realistic options if you were going to have higher releases, is to start some time after midday or somewhere between midday and 1600 hours. That's when it would be realistic on the 9th to increase flows above what was released';[1039] although he subsequently modified that view to say that the 'only area' that there was 'some argument they probably could have released slightly higher flows' was after 4.00 pm that afternoon.[1040] The scenario of higher releases on the afternoon of 9 January, Mr Babister said, was most closely reflected in scenario 9 of Figure 16.1; but it was 'an adventurous risk-taking approach' because it relied on confidence in the rainfall forecast.[1041]

Mr Shannon's view was that given the 'frightening' inflow by 2.00 pm on 9 January and the predicted lake level it would be 'extraordinary' not to have put the closure of the bridges in train by then, in accordance with the intention of W3.[1042] And Mr Tibaldi volunteered in evidence that 'decid[ing] to ramp up earlier for this event... would have reduced flood damage'.[1043] Mr Ayre agreed.[1044]

There is, it is obvious, plenty of scope for argument about whether adherence to the manual strategies would have made a difference to the way in which the flood engineers actually operated the dam; but the possibility certainly exists that they would have responded more quickly to the developing conditions of 9 January had their mindset

been one of applying strategy W3. Ascertaining the practical result of acting more quickly also is subject to the uncertainties inherent in the modelling; but again, the possibility exists of at least some improvement in the flooding outcome for Brisbane and Ipswich.

(Endnotes)

1 Term of Reference 2(f). See Appendix 1 for the Commission's full terms of reference.

2 GHD, Report for Investigation of Options to increase the flood mitigation performance of Wivenhoe Dam, December 2011.

3 Exhibit 24, January 2011 Flood Event Report on the operation of Somerset Dam and Wivenhoe Dam, 2 March 2011.

4 Exhibit 51, Statement of John Tibaldi, 25 March 2011 [p5: para 21]; Exhibit 1078, Statement of John Ruffini, 30 January 2012 [p3: para 19; p4: para 25; p4: para 29]; Transcript, John Ruffini, 6 February 2012, Brisbane [p5450: line 11]; Exhibit 17, Statement of Robert Ayre, 23 March 2011 [p31: para 154]; Exhibit 1048, Statement of Robert Ayre, 30 January 2012 [p5: para 29]; Exhibit 1049, Statement of Robert Ayre, 1 February 2012 [p18: para 95]; Transcript, Robert Ayre, 4 February 2012, Brisbane [p5292: line 49]; Exhibit 45, Statement of Terrence Malone, 25 March 2011 [p7: para 25]; Transcript, Terrence Malone, 11 February 2012, Brisbane [p6094: line 20-38].

5 Submission of Seqwater, 11 March 2011 [para 188].

6 Submission of Seqwater, 11 March 2011, Attachment 29.

7 Exhibit 407, WMA Water, Report to the Queensland Flood Commission of Inquiry, Final Report, May 2011 [p1].

8 Exhibit 407, WMA Water, Report to the Queensland Flood Commission of Inquiry, Final Report, May 2011 [p48: para 167].

9 Hedley Thomas, 'What the floods inquiry didn't hear: Wivenhoe 'breached the manual", The Australian, 23 January 2012, online edition available at: www.theaustralian.com.au/national-affairs/what-the-floods-inquiry-didnt-hear-wivenhoe-breached-the-manual/story-fn59niix-1226250814487.

10 Exhibit 1034, Queensland Government Gazette, Volume 359, Number 15, Commissions of Inquiry Amendment Order (No.1) 2012, 25 January 2012.

11 Closing submissions on behalf of Seqwater, 17 February 2012 [p20: para 164]; Closing submissions on behalf of John Tibaldi, 16 February 2012 [p5: para 2.10].

12 Closing submissions on behalf of Seqwater, 17 February 2012 [p20: para 164].

13 Exhibit 21, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam,* Revision 7, November 2009.

14 Exhibit 21, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam,* Revision 7, November 2009 [p3: para 1.4].

15 See *17.1 Longer term review of the Wivenhoe and North Pine manuals* and *17.2 Review and approval of flood mitigation manuals.*

16 Exhibit 21, M*anual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam,* Revision 7, November 2009 [p3: para 1.3].

17 Exhibit 21, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam,* Revision 7, November 2009 [p3: para 1.3].

18 Exhibit 21, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam,* Revision 7, November 2009 [p10: para 3.3].

19 Exhibit 21, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam,* Revision 7, November 2009 [p4: section 1.7].

20 Closing submissions on behalf of Robert Ayre and SunWater, 16 February 2012 [p18: para 46].

21 Closing submissions on behalf of Seqwater, 17 February 2012 [p10: para 28-29; p12: para 32].

22 Closing submissions on behalf of Mr Tibaldi, 16 February 2012 [p7: para 3.1 – p8: para 3.7].

23 Closing submissions on behalf of Terrence Malone, 16 February 2012 [p5: para 13].

24 Closing submissions on behalf of John Ruffini, Peter Allen and the State of Queensland, 16 February 2012 [p24: para 86-87].

25 Exhibit 21, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam,* Revision 7, November 2009, [p1: para 1.1].

26 Exhibit 21, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam,* Revision 7, November 2009 [p4: para 1.7].

27 Exhibit 21, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam,* Revision 7, November 2009 [p1: para 1.1].

28 Exhibit 21, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 7, November 2009 [p9: para.3.1].

29 Exhibit 21, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 7, November 2009 [p13: para 5.2].

30 Exhibit 21, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 7, November 2009 [p5].

31 Exhibit 21, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 7, November 2009 [p6].

32 See, for example, the evidence of Mr Tibaldi, Transcript, 15 April 2011, Brisbane [p440: lines 33-53, p449: lines 20-30]; Transcript, Robert Ayre, 12 April 2011, Brisbane [p163: lines 1-20]; Transcript, Robert Ayre 13 April 2011, Brisbane [p245: line 50 – p246 line 15]; Transcript, John Ruffini 14 April 2011, Brisbane [p350: lines 40-55]; Transcript, Terrance Malone, 15 April 2011, Brisbane [p384: lines 33-45].

33 Exhibit 21, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 7, November 2009 [p23: para 8.4].

34 Exhibit 21, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 7, November 2009 [p23].

35 Transcript, John Tibaldi, 15 April 2011, Brisbane [p441: lines 13-33].

36 Exhibit 21, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 7, November 2009 [p24].

37 Exhibit 21, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 7, November 2009 [p26-27].

38 Exhibit 21, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 7, November 2009 [p27].

39 Exhibit 21, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 7, November 2009 [p28].

40 Closing submissions on behalf of Seqwater, 17 February 2012 [p17: para 41-42].

41 John Tibaldi, Transcript, 2 February 2012, Brisbane [p5052: line 57 – p5053: line5].

42 John Tibaldi, Transcript, 2 February 2012, Brisbane [p5055: line 28-30].

43 John Tibaldi, Transcript, 2 February 2012, Brisbane [p5107: line 45 – p5108: line 2].

44 John Tibaldi, Transcript, 2 February 2012, Brisbane [p5114: line 20-30].

45 John Tibaldi, Transcript, 2 February 2012, Brisbane [p5154: lines 20-30].

46 Robert Ayre, Transcript, 3 February 2012, Brisbane [p5250: line 58 – p5251: line 12].

47 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5220: lines 36- 37].

48 Robert Ayre, Transcript, 3 February 2012, Brisbane [p5209: lines 42-45].

49 Robert Ayre, Transcript, 3 February 2012, Brisbane [p5289: lines 30-45].

50 Robert Ayre, Transcript, 4 February 2012, Brisbane [p5210: lines 10-15].

51 Terence Malone, Transcript, 5 February 2012, Brisbane [p5374: lines 1-10].

52 John Ruffini, Transcript, 6 February 2012, Brisbane [p5443: line 30-40].

53 John Ruffini, Transcript, 6 February 2012, Brisbane [p5443: line 40 – p5445: line 8].

54 John Ruffini, Transcript, 6 February 2012, Brisbane [p6089: line 35 – p6090: line 15].

55 Colin Apelt, Transcript, 8 February 2012, Brisbane [p5734: lines 15-35].

56 Gregory Roads, Transcript, 8 February 2012, Brisbane [p5767: line 35 – p5768: line 15].

57 Gregory Roads, Transcript, 8 February 2012, Brisbane [p5777: lines 1-10].

58 Gregory Roads, Transcript, 8 February 2012, Brisbane [p5778: lines 1-10].

59 Gregory Roads, Transcript, 8 February 2012, Brisbane [p5797: lines 20-24].

60 Gregory Roads, Transcript, 8 February 2012, Brisbane [p5797: line 45 – p5798: line 55].

61 Brian Shannon, Transcript, 9 February 2012, Brisbane [p5819: line 26].

62 Brian Shannon, Transcript, 9 February 2012, Brisbane [p5839: lines 35-45].

63 Brian Shannon, Transcript, 9 February 2012, Brisbane [p5839: line 55 – p5840: line 7].

64 Brian Shannon, Transcript, 9 February 2012, Brisbane [p5841: lines 10-46].

65 Mark Babister, Transcript, 9 February 2012, Brisbane [p5839: lines 35-45].

66 Leonard McDonald, Transcript, 7 February 2012, Brisbane [p5561: lines 25-38].

67 Closing submissions on behalf of Seqwater, 17 February 2012 [p10: para 29].

68 Exhibit 21, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 7, November 2009 [p22: para 8.4].

69 Closing submissions on behalf of Seqwater, 17 February 2012 [p12: para 33 – p13: para 37].

70 Closing submissions on behalf of Seqwater, 17 February 2012 [p9: para 23].

71 Colin Apelt, Transcript, 8 February 2012, Brisbane [p5732: line53 – p5733: line 2].

72 Gregory Roads, Transcript, 8 February 2012, Brisbane [p5768: lines 25-26 and 48-50; p5771: lines 13-15 – p5733: line 2].

73 Gregory Roads, Transcript, 8 February 2012, Brisbane [p5775: lines 21-23].

74 Gregory Roads, Transcript, 8 February 2012, Brisbane [p5805: lines 7-9].

75 Brian Shannon, Transcript, 9 February 2012, Brisbane [p5824: lines 36-38].

76 Brian Shannon, Transcript, 9 February 2012, Brisbane [p5825: lines 6-10].

77 Brian Shannon, Transcript, 9 February 2012, Brisbane [p5825: lines 15-20].

78 Brian Shannon, Transcript, 9 February 2012, Brisbane [p5848: lines 24-35].

79 Leonard McDonald, Transcript, 7 February 2012, Brisbane [p5562: lines 47-50].

80 Leonard McDonald, Transcript, 7 February 2012, Brisbane [p5563: lines 2-13].

81 Closing submissions on behalf of Seqwater, 17 February 2012 [p9: para 24].

82 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5069: line 31]. See also [p5072: line 9]; [p5068: line 11], although, his view given in evidence, is that there was no requirement for the engineer operating the dam to actually turn their mind to the strategy which was applicable at any given time: [p5079: line 45].

83 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5070: lines 18-48].

84 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5072: lines 9-12].

85 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5077: line 18].

86 Transcript, John Tibaldi, 15 April 2011, Brisbane [p440: lines 13-33].

87 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5213: line 12]. See also [p5214: line 57] where Mr Ayre accepted that the manual requires the adoption of a strategy at the time of the event so there could be no mistake as to what the primary consideration was.

88 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5213: line11].

89 Exhibit 17, Statement of Robert Ayre, 23 March 2011 [para 316].

90 Transcript, Robert Ayre, 13 April 2011, Brisbane [p205: line 1].

91 Transcript, Robert Ayre, 13 April 2011, Brisbane [p230: lines 19-25].

92 Exhibit 1049, Statement of Robert Ayre, 1 February 2012 [para 28-29].

93 Transcript, Terrence Malone, 4 February 2012, Brisbane [p5296: lines 39-59].

94 Transcript, Terrence Malone, 4 February 2012, Brisbane [p5297: lines 12-15].

95 Transcript, Terrence Malone, 5 February 2012, Brisbane [p5374: lines 1-18].

96 Transcript, Terrence Malone, 5 February 2012, Brisbane [p5329: lines 43-44].

97 Transcript, John Ruffini, 6 February 2012, Brisbane [p5422: lines 3-27].

98 Exhibit 21, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 7, November 2009, section 2.9 [p8]

99 Exhibit 21, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 7, November 2009, section 2.9 [p8]

100 Exhibit 24, Seqwater, *January 2011 Flood Event Report on the operation of Wivenhoe Dam and Somerset Dam*, 2 March 2011.

101 Submission of Seqwater, 11 March 2011 [p48: para 187].

102 Exhibit 24, Seqwater, *January 2011 Flood Event Report on the operation of Somerset Dam and Wivenhoe Dam*, 2 March 2011 [p iii].

103 Exhibit 24, Seqwater, *January 2011 Flood Event Report on the operation of Somerset Dam and Wivenhoe Dam*, 2 March 2011 [p223].

104 Exhibit 24, Seqwater, *January 2011 Flood Event Report on the operation of Somerset Dam and Wivenhoe Dam*, 2 March 2011 [p iv].

105 Exhibit 24, Seqwater, *January 2011 Flood Event Report on the operation of Somerset Dam and Wivenhoe Dam*, 2 March 2011 [p iv].

106 Exhibit 24, Seqwater, *January 2011 Flood Event Report on the operation of Somerset Dam and Wivenhoe Dam*, 2 March 2011 [p9].

107 Exhibit 24, Seqwater, *January 2011 Flood Event Report on the operation of Somerset Dam and Wivenhoe Dam*, 2 March 2011 [p9].

108 Exhibit 24, Seqwater, *January 2011 Flood Event Report on the operation of Somerset Dam and Wivenhoe Dam*, 2 March 2011 [p41].

109 Exhibit 24, Seqwater, *January 2011 Flood Event Report on the operation of Somerset Dam and Wivenhoe Dam*, 2 March 2011 [p186].

110 Exhibit 24, Seqwater, *January 2011 Flood Event Report on the operation of Somerset Dam and Wivenhoe Dam*, 2 March 2011 [p187-195].

111 Exhibit 24, Seqwater, *January 2011 Flood Event Report on the operation of Somerset Dam and Wivenhoe Dam*, 2 March 2011 [p217].

112 Exhibit 51, Statement of John Tibaldi, 25 March 2011 [p1: para 4].

113 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5077: line 50 – p5078: line 15].

114 Exhibit 42, Statement of John Ruffini, 24 March 2011[p12: para 63].

115 Exhibit 43, Transcript of Interview of John Ruffini 29 March 2011 [p45: lines 9-16].

116 Transcript, John Ruffini, 6 February 2012, Brisbane [p5413: lines 25-45].

117 Transcript, John Ruffini, 5 February 2012, Brisbane [p5385: line 50].

118 Transcript, John Ruffini, 6 February 2012, Brisbane [p5390: lines 30-50].

119 Transcript, John Ruffini, 6 February 2012, Brisbane [p5391: lines 8-40].

120 Transcript, John Ruffini, 6 February 2012, Brisbane [p5392: line 10 – p5393: line 5].

121 Transcript, John Ruffini, 6 February 2012, Brisbane, [p5393: line 55; p5394: lines 1-10; p5394: lines 15-17; p5394: lines 25-30; p5394: lines 35-48; p5395: lines 17-20; and p5395: lines 43-50].

122 Transcript, John Ruffini, 6 February 2012, Brisbane [p5394: lines 4-25].

123 Transcript, John Ruffini, 6 February 2012, Brisbane [p5394: line 48 – p5395: line 30].

124 Transcript, John Ruffini, 6 February 2012, Brisbane [p5395: line 49 – p5396: line 5].

125 Transcript, John Ruffini, 6 February 2012, Brisbane [p5396: lines 46-58].

126 Closing submissions on behalf of John Ruffini, Peter Allen and the State of Queensland, 16 February 2012 [p9: para 19]. Closing submissions on behalf of Seqwater, 17 February 2012 [p17: para 41-42].

127 Closing submissions on behalf of John Ruffini, Peter Allen and the State of Queensland, 16 February 2012 [p12: para 33].

128 Email 3 February 2012, attachment to Closing submissions on behalf of John Ruffini, Peter Allen and the State of Queensland, 16 February 2012 [p24: para 86-87].

129 Transcript, John Ruffini, 6 February 2012, Brisbane [p5457: lines 25-45].

130 Transcript, John Ruffini, 6 February 2012, Brisbane [p5398: lines 18-20].

131 Transcript, John Ruffini, 6 February 2012, Brisbane [p5446: line 42].

132 Transcript, John Ruffini, 6 February 2012, Brisbane [p5449: lines 15-25].

133 Transcript, John Ruffini, 6 February 2012, Brisbane [p5414: lines 1-4].

134 Transcript, John Ruffini, 6 February 2012, Brisbane [p5399: lines 1-25].

135 Transcript, John Ruffini, 6 February 2012, Brisbane [p5414: lines 29-47].

136 Transcript, John Ruffini, 6 February 2012, Brisbane [p5414: line 58 – p5415 line 10].

137 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5183: lines 7-15].

138 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5265: lines 16-21].

139 Exhibit 1035, Seqwater Flood Procedure Manual, January 2010.

140 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5179: lines 45-50].

141 Exhibit 17, Statement of Robert Ayre, 23 March 2011 [p84: para 384].

142 Exhibit 20, Statement of Robert Ayre, 11 April 2011 [p25: para 120].

143 Exhibit 18, Statement of Robert Ayre, 29 March 2011 [p12: para 34].

144 Exhibit 18, Statement of Robert Ayre, 29 March 2011 [p12: para 35].

145 Transcript, Robert Ayre, 12 April 2011, Brisbane [p155: lines 32-49].

146 Transcript, Robert Ayre, 12 April 2011, Brisbane [p156: lines 2-20].

147 Transcript, Robert Ayre, 13 April 2011, Brisbane [p201: lines 31-39].

148 Transcript, Robert Ayre, 11 April 2011, Brisbane [p81: lines 38-44].

149 Transcript, Robert Ayre, 13 April 2011, Brisbane [p193: lines 7-12].

150 Exhibit 1049, Statement of Robert Ayre, 1 February 2012 [p7: para 44].

151 Exhibit 1049, Statement of Robert Ayre, 1 February 2012 [p8: para 53].

152 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5183: lines 17-21].

153 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5209: lines 42-46].

154 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5210: lines 10-21].

155 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5220: lines 50-55].

156 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5190: lines 19-32].

157 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5273: lines 50-60].

158 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5207: lines 48-60].

159 Robert Ayre, 3 February 2012, Brisbane [p5208: lines 2-6].

160 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5220: lines 10-21].

161 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5266: line 47 – p5267: line 23].

162 Exhibit 1049, Statement of Robert Ayre, 1 February 2012 [p5: para 28].

163 Closing submissions on behalf of Robert Ayre and SunWater, 16 February 2012 [p26: para 12].

164 Closing submissions on behalf of Terrence Malone, 16 February 2012 [p10: para 34]; Closing submissions on behalf of John Ruffini, Peter Allen and the State of Queensland, 16 February 2012 [p22: para 77]; Closing submissions on behalf of Seqwater, 17 February 2012 [p16: para 38(l)]; Closing submissions on behalf of John Tibaldi, 17 February 2012 [p16: para 4.36].

165 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5208: lines 14-19].

166 Transcript, Terrence Malone, 11 February 2012, Brisbane [p6099: lines 38-43].

167 Exhibit 1146, Seqwater October-December 2010 Flood Events, report on the operation of Somerset and Wivenhoe Dam [p119, 121]

168 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5050: line 39-53].

169 Exhibit 51, Statement of John Tibaldi, 25 March 2011 [p8: para 34].

170 Exhibit 51, Statement of John Tibaldi, 25 March 2011 [p11: para 62].

171 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5072; line 21 – p5073: line 45; p5074: lines 45-48].

172 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5072: line 47].

173 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5051: lines 22-23].

174 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5051: line 54 – p5052: line 3].

175 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5052: lines 7-22].

176 Transcript, Terrence Malone, 15 April 2011, Brisbane [p379: lines 45-55].

177 Transcript, Terrence Malone, 4 February 2012, Brisbane [p5299: line 5].

178 Transcript, Terrence Malone, 5 February 2012, Brisbane [p5355: line 55 – p5356: line 2].

179 Transcript, Terrence Malone, 4 February 2012, Brisbane [p5300: lines 28-38].

180 Transcript, Terrence Malone, 4 February 2012, Brisbane [p5309: line 55 – p5310: line 6].

181 Transcript, Terrence Malone, 4 February 2012, Brisbane [p5329: lines 20-25].

182 Transcript, Terrence Malone, 11 February 2012, Brisbane [p6095: line 5 – p6096: line 35].

183 Transcript, Terrence Malone, 11 February 2012, Brisbane [p6094: lines 35-40].

184 Transcript, Terrence Malone, 11 February 2012, Brisbane [p6099: lines 1-10, 45]; Transcript, Terrence Malone, 11 February 2012, Brisbane [p6100: line 20].

185 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5049: line 19].

186 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5049: line 28].

187 This situation report appears in Exhibit 1046 only by way of a flood event log entry signalling it was sent. The actual situation report was not included in the batch of situation reports attached to the report in Appendix E.

188 Exhibit 24, Seqwater, *January 2011 Flood Event Report on the operation of Somerset Dam and Wivenhoe Dam,* 2 March 2011, Appendix E [p13-14].

189 Closing submissions on behalf of Seqwater, 17 February 2012 [p26: para 84].

190 Closing submissions on behalf of Seqwater, 17 February 2012 [p30: para 100].

191 Exhibit 24, Seqwater, *January 2011 Flood Event Report on the operation of Somerset Dam and Wivenhoe Dam,* 2 March 2011, Appendix E, [p17-18].

192 Exhibit 24, Seqwater, *January 2011 Flood Event Report on the operation of Somerset Dam and Wivenhoe Dam,* 2 March 2011, Appendix E, [p19-20].

193 Exhibit 24, Seqwater, *January 2011 Flood Event Report on the operation of Somerset Dam and Wivenhoe Dam,* 2 March 2011, Appendix E [p21-22].

194 Closing submissions on behalf of Fernvale Residents, 16 February 2012 [p9: para 41 – p12: para 43].

195 In fact, counsel was in error: the situation report of 9.04pm, 9 January describes the current objective as to minimise the impact of urban flooding in areas downstream of the dam. The point made – that there was no specification of that objective in earlier situation reports over the weekend of 8/9 January – is, however, unaffected.

196 This point was also made in Submission of the Fernvale Residents to the Queensland Floods Commission of Inquiry, 28 June 2011 [p10: para 48].

197 Closing submissions on behalf of Terrence Malone, 16 February 2012 [p9: para 28].

198 Closing submissions on behalf of Robert Ayre and SunWater, 16 February 2012 [p50: para 147].

199 Closing submissions on behalf of Robert Ayre and SunWater, 16 February 2012 [p51: para 148(c)].

200 Closing submissions on behalf of Robert Ayre and SunWater, 16 February 2012 [p50-52: para 148].

201 Closing submissions on behalf of John Ruffini, Peter Allen and the State of Queensland, 16 February 2012 [p23: para 83; p25: para 89].

202 Closing submissions on behalf of Fernvale Residents, 16 February 2012 [p4: para 17].

203 Exhibit 24, Seqwater, *January 2011 Flood Event Report on the operation of Somerset Dam and Wivenhoe Dam,* 2 March 2011, Appendix E [p10-11].

204 Exhibit 21, Seqwater, *Manual of Operational Procedures at Wivenhoe and Somerset Dam*, Version 7, November 2009 [p22].

205 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5229: line 3].

206 See Transcript, Robert Ayre, 3 February 2012, Brisbane [p5228: line 13]; Transcript, Terrence Malone, 5 February 2012, Brisbane [p5333: line 33; 5367: line 3]; Transcript, John Ruffini, 6 February 2012, Brisbane [p5421: line 14; p5449: line 2].

207 Closing submissions on behalf of Seqwater, 17 February 2012 [p38: para 123].

208 Closing submissions on behalf of Robert Ayre and SunWater, 16 February 2012 [p69: para 240-241].

209 Closing submissions on behalf of Robert Ayre and SunWater, 16 February 2012 [p68: para 233].

210 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5190: line 18; p5209: line 41 - p5213: line 9].

211 Exhibit 24, Seqwater, *January 2011 Flood Event Report on the operation of Somerset Dam and Wivenhoe Dam,* 2 March 2011, Appendix L [p4].

212 Closing submissions on behalf of Seqwater, 17 February 2012 [p21: para 58 – p25: para 79]; Closing submissions on behalf of John Tibaldi, 17 February 2012 [p10: para 4.7 – p11: para 4.12]; Closing submissions on behalf of Robert Ayre and SunWater, 16 February 2012 [p32: para 88 – p33: para 89]; Closing submissions on behalf of Terrence Malone, 16 February 2012 [p12: para 41; p13: para 46]; Closing submissions on behalf of John Ruffini, Peter Allen and the State of Queensland, 16 February 2012 [p10: para 22 - p11: para 31].

213 Closing submissions on behalf of Seqwater, 17 February 2012 [p40: para 136].

214 The gate openings were directed by Wivenhoe directive 3 and Wivenhoe directive 4, see: Exhibit 24, Seqwater, *January 2011 Flood Event Report on the Operation of Somerset Dam and Wivenhoe Dam*, Appendix L [p4-5].

215 See Exhibit 524, Attachment 34, Full time-series sets and spreadsheets used to create the values and graphs contained in Appendix A to the *January 2011 Flood Event Report on the Operation of Somerset Dam and Wivenhoe Dam* and the document named 'Appendix A1', 'SDWD-201101071200' in folder titled 'Operational_Versions' last modified at 3.17 pm, 7 January 2011.

216 See Exhibit 524, Attachment 34, Full time-series sets and spreadsheets used to create the values and graphs contained in Appendix A to the *January 2011 Flood Event Report on the Operation of Somerset Dam and Wivenhoe Dam* and the document named 'Appendix A1', 'SDWD-201101071200' in folder titled 'Operational_Versions'. The difference is that in Mr Malone's planned gate openings on the morning of 8 January, gate 3 is opened from 3.5 to 4.0 metres at midnight, 8 January; Mr Ruffini directed this gate opening at 8.00 am on 8 January. Mr Ruffini opened a different gate at midnight and so the outflows remained almost identical despite the change in time.

217 See Exhibit 524, Attachment 34, Full time-series sets and spreadsheets used to create the values and graphs contained in Appendix A to the *January 2011 Flood Event Report on the Operation of Somerset Dam and Wivenhoe Dam* and the document named 'Appendix A1', 'SDWD-201101071200', 'SDWD-201101071800', 'SDWD-201101080900' in folder titled 'Operational_Versions'.

218 See Exhibit 524, Attachment 34, Full time-series sets and spreadsheets used to create the values and graphs contained in Appendix A to the *January 2011 Flood Event Report on the Operation of Somerset Dam and Wivenhoe Dam* and the document named 'Appendix A1', 'SDWD-201101071200' in folder titled 'Operational_Versions'.

219 Transcript, Terrence Malone, 5 February 2012, Brisbane [p5361: line 41].

220 Closing submissions on behalf of Seqwater, 17 February 2012 [p23-24: para 69-74].

221 Closing submissions on behalf of John Tibaldi, 16 February 2012 [p11: para 4.11-4.12].

222 Closing submissions on behalf of Terrence Malone, 16 February 2012 [p12: para 40-42].

223 Closing submissions on behalf of John Ruffini, Peter Allen and the State of Queensland, 16 February 2012 [p10: para 22; p11: para 25].

224 See Exhibit 524, Attachment 34, Full time-series sets and spreadsheets used to create the values and graphs contained in Appendix A to the *January 2011 Flood Event Report on the Operation of Somerset Dam and Wivenhoe Dam* and the document named 'Appendix A1', 'SDWD-201101071800', in folder titled 'Operational_Versions'.

225 Closing submissions on behalf of Robert Ayre and SunWater, 16 February 2012 [p25: para 62].

226 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5269: line 21; p6118-6119].

227 Exhibit 24, Seqwater, *January 2011 Flood Event Report on the operation of Somerset Dam and Wivenhoe Dam,* 2 March 2011, Appendix L [p66].

228 Closing submissions on behalf of Seqwater, 17 February 2012 [p14: para 38(d)].

229 Closing submissions on behalf of Seqwater, 17 February 2012 [p16: para 38(l)].

230 Closing submissions on behalf of Seqwater, 17 February 2012 [p42: para 144].

231 Closing submissions on behalf of Seqwater, 17 February 2012 [p43: para 147].

232 Closing submissions on behalf of Robert Ayre and SunWater, 16 February 2012 [p50-51: para 148(b)].

233 Closing submissions on behalf of Terrence Malone, 16 February 2012 [p16: para 57].

234 Exhibit 21, Seqwater, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam,* Revision 7, November 2009 [p38-41].

235 For information about fuse plugs, see section *2.2.9 Fuse plugs* of the Commission's interim report.

236 Exhibit 21, Seqwater, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam,* Revision 7, November 2009 [p41].

237 Transcript, Robert Ayre, 11 February 2012, Brisbane [p6120: line 1].

238 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5233: line 17].

239 Transcript, Robert Ayre, 11 February 2012, Brisbane [p6120: line 4].

240 Transcript, Robert Ayre, 11 February 2012, Brisbane [p6120: lines 21-40].

241 Exhibit 24, Seqwater, *January 2011 Flood Event Report on the operation of Somerset Dam and Wivenhoe Dam,* 2 March 2011 [p170].

242 Closing submissions on behalf of Seqwater, 17 February 2012 [p42: para 142].

243 Closing submissions on behalf of Seqwater, 17 February 2012 [p30: para 95].

244 Exhibit 430, Statement of Robert Drury, 6 May 2011, RD-5 [p200-201].

245 Transcript, Terrence Malone, 5 February 2012, Brisbane [p5364: line 8].

246 Closing submissions on behalf of Seqwater, 17 February 2012 [p31-32: para 103-107].

247 Closing submissions on behalf of Seqwater, 17 February 2012 [p47: para 168].

248 Exhibit 44, Transcript of Interview by Commission Staff with Robert Ayre, 30 March 2011 [p14: line 29].

249 Closing submissions on behalf of Fernvale Residents, 16 February 2012 [p3: para 11].

250 Closing submissions on behalf of the Mid-Brisbane River Irrigators, 16 February 2012 [p5: para 30-38].

251 Closing submissions on behalf of Seqwater, 17 February 2012 [p14: para 38(e)].

252 Closing submissions on behalf of Seqwater, 17 February 2012 [p15: para 38(h); p49: para 182].

253 Some of the model run spreadsheets are reconstructions: Exhibit 1058, Letter from Allens Arthur Robinson to QFCI dated 29 April 2011; Exhibit 1059, Letter from Allens Arthur Robinson to QFCI enclosing Appendix A1, dated 6 April 2011; Exhibit 1060, Appendix A1, attached to letter dated 6 April 2011 [p1]. The properties of the spreadsheet for model run 19 indicate that it was created on 5 April 2011. There are two reasons why the reconstruction is likely to be inaccurate. First, the gate opening sequences in this model run are radically different from those in the operational spreadsheets saved around the time of the model run. The gate opening sequence in model run 19 has a maximum number of increments of 50 and a maximum outflow of over 2 700 m^3/s, whereas the contemporaneously saved spreadsheets from around that time - 'SDWD-201101091200' (last saved at 1.28 pm, 9 January), 'SDWD-201101091400' (last saved at 5.16 pm, 9 January) and 'SDWD-201101091600' (last saved at 5.37 pm, 9 January) - all indicate maximum increments of 30 or 27 and maximum outflow under 1 650 m^3/s. Secondly, the gate sequence in model run 19 appears to be the same as that in model run 21 (conducted at 7.00 pm on 9 January) which is reflected in the contemporaneously saved spreadsheet from that time - 'SDWD-

201101091900' - which was saved at 8.29 pm, 9 January 2011.

254 Exhibit 524, Attachment 34, Full time-series sets and spreadsheets used to create the values and graphs contained in Appendix A to the *January 2011 Flood Event Report on the Operation of Somerset Dam and Wivenhoe Dam* and the document named 'Appendix A1', 'SDWD-201101091400', 'SDWD-201101091600', 'SDWD-201101091800', 'SDWD-201101091900' in folder titled 'Operational Versions'.

255 Closing submissions on behalf of Seqwater, 17 February 2012 [p16: para 38(k)].

256 Closing submissions on behalf of Terrence Malone, 16 February 2012 [p12: para 43; p20: para 69].

257 Closing submissions on behalf of John Ruffini, Peter Allen and the State of Queensland, 16 February 2012 [p26: para 93].

258 Closing submissions on behalf of Robert Ayre and SunWater, 16 February 2012 [p47-48: para 142].

259 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5278-5281].

260 Transcript, John Tibaldi, 3 February 2012, Brisbane [p5140: line 22].

261 Closing submissions on behalf of Robert Ayre and SunWater, 16 February 2012 [p47: para 139; p47: para 141].

262 Closing submissions on behalf of Terrence Malone, 16 February 2012 [p15: para 54].

263 Closing submissions on behalf of Robert Ayre and SunWater, 16 February 2012 [p48: para 142(c)], perhaps by reference to Transcript, Brian Cooper, 8 February 2012, Brisbane [p5712: line 7].

264 Exhibit 21, Seqwater, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam,* Revision 7, November 2009 [p24].

265 Exhibit 524, Attachment 34, Full time-series sets and spreadsheets used to create the values and graphs contained in Appendix A to the *January 2011 Flood Event Report on the Operation of Somerset Dam and Wivenhoe Dam* and the document named 'Appendix A1', 'SDWD-201101091900' in folder titled 'Operational Versions'.

266 Exhibit 23, Original and Unredacted Flood Event Log, 19 January 2011.

267 Exhibit 1047, Situation report, 8 January 2011 at 5.53 pm.

268 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5223: line 28].

269 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5185: line 28].

270 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5188: line 57].

271 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5223: line 46].

272 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5276: line 41].

273 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5223: line 38].

274 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5225: line 41].

275 Transcript, Robert Ayre, 12 April 2011, Brisbane [p172: line 14].

276 Transcript, Robert Ayre, 12 April 2011, Brisbane [p172: line 21].

277 Transcript, Robert Ayre, 12 April 2011, Brisbane [p172: line 33].

278 Transcript, Robert Ayre, 12 April 2011, Brisbane [p172: line 47].

279 Exhibit 18, Supplementary Statement of Robert Ayre, 29 March 2011.

280 Exhibit 18, Supplementary Statement of Robert Ayre, 29 March 2011 [p20: para 51].

281 Closing submissions on behalf of Robert Ayre and SunWater, 16 February 2012 [p54: para 157].

282 Closing submissions on behalf of Terrence Malone, 16 February 2012 [p22: para 76-80].

283 Closing submissions on behalf of John Ruffini, Peter Allen and the State of Queensland, 16 February 2012 [p30: para 117].

284 Closing submissions on behalf of Seqwater, 17 February 2012 [p46: para 164].

285 Closing submissions on behalf of John Tibaldi, 17 February 2012 [p22: para 5.12].

286 Closing submissions on behalf of Rober Ayre and SunWater, 16 February 2012 [p55: para 158]; Closing submissions on behalf of Seqwater, 17 February 2012 [p46: para 162].

287 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5274: line 18].

288 Exhibit 24, Seqwater, *January 2011 Flood Event Report on the operation of Somerset Dam and Wivenhoe Dam*, Appendix K [p224]; Transcript, Robert Ayre, 4 February 2012, Brisbane [p5274: line 33].

289 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5276: line 16].

290 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5275: line 16].

291 Closing submissions on behalf of Robert Ayre and SunWater, 16 February 2012 [p96: para 392; p55: para 164].

292 Exhibit 524, Attachment 34, Full time-series sets and spreadsheets used to create the values and graphs contained in Appendix A to the *January 2011 Flood Event Report on the Operation of Somerset Dam and Wivenhoe Dam* and the document named 'Appendix A1', 'SDWD-201101081500-Forecast72hr' in folder titled 'Operational Versions'.

293 Closing submissions on behalf of John Ruffini. Peter Allen and the State of Queensland, 16 February 2012 [p30: para 116].

294 Transcript, Colin Apelt, 8 February 2012, Brisbane [p5741: line 23].

295 Transcript, Greg Roads, 9 February 2012, Brisbane [p5805: line 43].

296 Transcript, Greg Roads, 9 February 2012, Brisbane [p5809: line 2].

297 Transcript, Greg Roads, 9 February 2012, Brisbane [p5849: line 4].

298 Transcript, Greg Roads, 9 February 2012, Brisbane [p5854: line 6].

299 Closing submissions on behalf of Robert Ayre and SunWater, 16 February 2012 [p58: para 177].

300 Transcript, Leonard McDonald, 7 February 2012, Brisbane [p5574: line 38].

301 Transcript, Leonard McDonald, 7 February 2012, Brisbane [p5574: line 52].

302 Transcript, Leonard McDonald, 7 February 2012, Brisbane [p5575: line 1].

303 Transcript, Leonard McDonald, 7 February 2012, Brisbane [p5575: line 3].

304 Transcript, Leonard McDonald, 7 February 2012, Brisbane [p5575: line 12].

305 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5189: line 26].

306 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5190: line 8].

307 Closing submissions on behalf of Robert Ayre and SunWater, 16 February 2012 [p60: para 186].

308 Closing submissions on behalf of Seqwater, 17 February 2012 [p47: para 164(g)].

309 Transcript, Robert Ayre, 12 April 2011, Brisbane [p174: line 8].

310 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5208: line 14].

311 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5213: line 44].

312 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5220: line 49].

313 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5267: line 33].

314 Exhibit 1049, Seventh statement of Robert Ayre, 1 February 2012 [p5: para 28].

315 Exhibit 1049, Seventh statement of Robert Ayre, 1 February 2012 [p7: para 48].

316 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5223: line 37].

317 Transcript, Robert Ayre, 12 April 2011, Brisbane [p173: line 45].

318 Transcript, Robert Ayre, 11 February 2012, Brisbane [p6107: line 1].

319 Transcript, Robert Ayre, 11 February 2012, Brisbane [p6107: line 18].

320 Transcript, Robert Ayre, 11 February 2012, Brisbane [p6107: line 25].

321 Exhibit 23, Original and Unredacted Flood Event Log, 19 January 2011.

322 Exhibit 23, Original and Unredacted Flood Event Log, 19 January 2011; Exhibit 24, Seqwater, *January 2011 Flood Event Report on the operation of Somerset Dam and Wivenhoe Dam*, 2 March 2011, Appendix M: identifies 'Engineer 1' as the author of entry at 3:30pm on 9 January 2012. 'Engineer 1' is Mr Ayre. Mr Ayre says that this is an error: Exhibit 1048, Statement of Robert Ayre, 30 January 2012 [p16: para 121].

323 Exhibit 24, Seqwater, *January 2011 Flood Event Report on the operation of Somerset Dam and Wivenhoe Dam*, 2 March 2011 [p35].

324 Transcript, Neville Ablitt, 9 February 2012, Brisbane [p5862: line 22].

325 Closing submissions on behalf of John Ruffini, Peter Allen and the State of Queensland, 16 February 2012 [p31: para 120].

326 Transcript, Neville Ablitt, 9 February 2012, Brisbane [p5870: line 31].

327 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5058: line 52].

328 Exhibit 1141, Transcript of Interview with Chloe De Marchi, 7 February 2012 Exhibit 9, Attachment 'ENGINEER 4 – APPENDIX M – 01.doc' [p2].

329 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5193: line 29].

330 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5193: line 31].

331 Transcript, John Ruffini, 6 February 2012, Brisbane [p5404: line 38].

332 Transcript, John Ruffini, 6 February 2012, Brisbane [p5403: line 9].

333 Exhibit 42, Statement of John Ruffini, 24 March 2011, Annexure JLR-11.

334 Exhibit 42, Statement of John Ruffini, 24 March 2011, Annexure JLR-11 [p2].

335 Transcript, John Ruffini, 6 February 2012, Brisbane [p5402: line 30].

336 Transcript, Terrence Malone, 4 February 2012, Brisbane [p5301: line 10].

337 Transcript, Terrence Malone, 4 February 2012, Brisbane [p5301: line 13].

338 Transcript, Terrence Malone, 4 February 2012, Brisbane [p5301: line 19].

339 Closing submissions on behalf of Robert Ayre and SunWater, 16 February 2012 [p98: para 398].

340 Closing submissions on behalf of Seqwater, 17 February 2012 [p35: para 116(a)].

341 Closing submissions on behalf of Terrence Malone, 16 February 2012 [p22: para 76-80].

342 Closing submissions on behalf of John Ruffini, Peter Allen and the State of Queensland, 16 February 2012 [p33: para 129].

343 Closing submissions on behalf of Robert Ayre and SunWater, 16 February 2012 [p63: para 204].

344 Closing submissions on behalf of Seqwater, 17 February 2012 [p35: para 116(b)].

345 Closing submissions on behalf of John Tibaldi, 17 February 2012 [p23: para 6.5].

346 Closing submissions on behalf of John Ruffini, Peter Allen and the State of Queensland, 16 February 2012 [p33: para 130-132].

347 Closing submissions on behalf of Robert Ayre and SunWater, 16 February 2012 [p64: para 208].

348 Closing submissions on behalf of Robert Ayre and SunWater, 16 February 2012 [p66: para 224 – p67: para 226].

349 Closing submissions on behalf of Robert Ayre and SunWater, 16 February 2012 [p64: para 207].

350 Closing submissions on behalf of Seqwater, 17 February 2012 [p35: para 116(c)].

351 Closing submissions on behalf of John Tibaldi, 16 February 2012 [p23: para 6.6].

352 Transcript, John Ruffini, 6 February 2012, Brisbane [p5403: line 9].

353 Exhibit 1036, Statement of John Tibaldi, 1 February 2012 [p4: para 25-26].

354 Transcript, Robert Ayre, 11 April 2011, Brisbane [p81: line 38]; Transcript, Robert Ayre, 11 April 2011, Brisbane [p83: line 17]; Transcript, Robert Ayre, 12 April 2011, Brisbane [p172: line 21 – p173: line 38]; Transcript, Robert Ayre, 13 April 2011, Brisbane [p192: line 36]; Transcript, Robert Ayre, 13 April 2011, Brisbane [p193: line 7].

355 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5194: line 8].

356 Transcript, Terrence Malone, 11 February 2012, Brisbane [p6099: line 45]. See also Transcript, Terrence Malone, 11 February 2012, Brisbane [p6094: line 35].

357 The gate operations spreadsheet named 'SDWD-201101091400' and saved at 5.16 pm on 9 January 2011 shows that the inflows into the dam, during the period of 7.00 am to 7.00 pm on 9 January 2011, were going to be substantially outweighed by the flows in Lockyer Creek and the Bremer River at the time those flows and the dam releases would merge in the Brisbane River.

358 Exhibit 24, Seqwater, *January 2011 Flood Event Report on the operation of Somerset Dam and Wivenhoe Dam*, 2 March 2011 Appendix E [p21].

359 Exhibit 23, Original and Unredacted Flood Event Log, 19 January 2011.

360 Exhibit 1080, Third Statement of Daniel Spiller, 1 February 2012, Annexure B [p104].

361 Exhibit 1080, Third Statement of Daniel Spiller, 1 February 2012, Annexure B [p110]; Exhibit 1150, Statement of Debra-Lee Best, 9 February 2012 [p1: para 6].

362 Transcript, Robert Drury, 6 February 2012, Brisbane [p5479: line 10].

363 Transcript, Daniel Spiller, 8 February 2012, Brisbane [p5614: line 12].

364 Transcript, Daniel Spiller, 8 February 2012, Brisbane [p5416: line 1].

365 Exhibit 1150, Statement of Debra-Lee Best, 9 February 2012 [p1: para 3].

366 Exhibit 1150, Statement of Debra-Lee Best, 9 February 2012, Attachment DLB-23.

367 Exhibit 1080, Third Statement of Daniel Spiller, 1 February 2012, Annexure B [p116].

368 Exhibit 1080, Third Statement of Daniel Spiller, 1 February 2012, Annexure B [p167].

369 Exhibit 1080, Third Statement of Daniel Spiller, 1 February 2012, Annexure B [p169].

370 Transcript, Robert Drury, 6 February 2012, Brisbane [p5485: line 50].

371 Transcript, Robert Drury, 7 February 2012, Brisbane [p5543: line 11; p5488: line 13].

372 See, for example, Transcript, Robert Drury, 7 February 2012, Brisbane [p5578: line 33].

373 Transcript, Robert Drury, 6 February 2012, Brisbane [p5489: line 48].

374 Transcript, Robert Drury, 7 February 2012, Brisbane [p5540: line 58].

375 Exhibit 1150, Statement of Lee Hutchison, 10 February 2012, Annexure A.

376 Exhibit 1150, Statement of Lee Hutchison, 10 February 2012 [p3: para 10].

377 Exhibit 1150, Statement of Lee Hutchison, 10 February 2012 [p3: para 13, 14].

378 Exhibit 1080, Third Statement of Daniel Spiller, 1 February 2012 [p6: para 19].

379 Transcript, Daniel Spiller, 8 February 2012, Brisbane [p5649: line 32].

380 Transcript, Barry Dennien, 8 February 2012, Brisbane [p5659: line 6].

381 Transcript, Barry Dennien, 8 February 2012, Brisbane [p5684: line 38].

382 Transcript, Robert Drury, 6 February 2012, Brisbane [p5490: line 38].

383 Transcript, Peter Borrows, 10 February 2012, Brisbane [p5964: line 19].

384 Exhibit 1150, Statement of Stan Stevenson, 10 February 2012, Annexure SS-1.

385 Exhibit 1150, Statement of Stan Stevenson, 10 February 2012 [p1: para 3].

386 Exhibit 1150, Statement of Paul Bird, 10 February 2012, Annexure PB-1.

387 Exhibit 1150, Statement of Paul Bird, 10 February 2012 [p2: para 6].

388 Exhibit 1150, Statement of Michael Lyons, 10 February 2012 [p3: para 13].

389 Closing submissions on behalf of Seqwater, 17 February 2012 [p57: para 206].

390 Exhibit 1100, Statement of Peter Allen, 7 February 2012, Annexure PHA63 [p2].

391 Exhibit 1100, Statement of Peter Allen, 7 February 2012, Annexure PHA63 [p8].

392 Exhibit 1100, Statement of Peter Allen, 7 February 2012, Annexure PHA63 [p1].

393 Transcript, Peter Allen, 10 February 2012, Brisbane [p5911: line 43].

394 Transcript, Peter Allen, 10 February 2012, Brisbane [p5910: line 12].

395 Transcript, Peter Allen, 10 February 2012, Brisbane [p5911: line 48].

396 Transcript, Peter Allen, 10 February 2012, Brisbane [p5911: line 33].

397 Transcript, Peter Allen, 10 February 2012, Brisbane [p5910: line 36].

398 Transcript, Peter Allen, 10 February 2012, Brisbane [p5911: line 40].

399 Transcript, Peter Allen, 10 February 2012, Brisbane [p5910: line 56 – p 5911: line 5].

400 Transcript, Peter Allen, 10 February 2012, Brisbane [p5938: line 30].

401 Transcript, Peter Allen, 10 February 2012, Brisbane [p5938: line 36].

402 Closing submissions on behalf of John Tibaldi, 16 February 2012 [p26: para 7.7].

403 Closing submissions on behalf of Seqwater, 17 February 2012 [p59: para 211].

404 Transcript, Peter Allen, 10 February 2012, Brisbane [p5910: line 33; p5911: line 43].

405 Transcript, Peter Allen, 10 February 2012, Brisbane [p5932: line 35].

406 Exhibit 1068, Email from Peter Borrows to Rob Drury, John Tibaldi, Terry Malone, Paul Bird, 16 January 2011, 4.03 pm, Attachment titled 'Ministerial Briefing Note January 17 2011 Final Draft for distribution[1].doc' [p12].

407 Closing submissions on behalf of John Ruffini, Peter Allen and the State of Queensland, 16 February 2012 [p5: para 5].

408 Closing submissions on behalf of John Ruffini, Peter Allen and the State of Queensland, 16 February 2012 [p6: para 6].

409 See for example Mr Tibaldi's evidence of the difficult conditions: Transcript, John Tibaldi, 3 February 2012, Brisbane [p5060: line 18; p5161: line 13].

410 Exhibit 1050, Email from Duty Engineer (Terry Malone) to Mr Ruffini, Mr Tibaldi, Mr Ayre, Mr Malone and Mr Drury, 15 January 2011.

411 Transcript, Terrence Malone, 4 February 2012, Brisbane [p5303: line 43].

412 Exhibit 1050, Email from Duty Engineer (Terry Malone) to Mr Ruffini, Mr Tibaldi, Mr Ayre, Mr Malone and Mr Drury, 15 January 2011.

413 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5063: line 30]; Transcript, Terrence Malone, 4 February 2012, Brisbane [p5303: lines 48-50].

414 Exhibit 23, Flood Event Log [p32].

415 Transcript, Terrence Malone, 4 February 2012, Brisbane [p5303: line 37].

416 Exhibit 23, Flood Event Log [p32].

417 Exhibit 23, Flood Event Log [p32].

418 Exhibit 1050, Email from Duty Engineer (Terry Malone) to Mr Ruffini, Mr Tibaldi, Mr Ayre, Mr Malone and Mr Drury, 15 January 2011 [p3].

419 Transcript, Terrence Malone, 4 February 2012, Brisbane [p5305: line 18].

420 Transcript, Terrence Malone, 4 February 2012, Brisbane [p5305: line 55 – p5306: line 10].

421 Transcript, Terrence Malone, 4 February 2012, Brisbane [p5303: line 43].

422 Transcript, Terrence Malone, 5 February 2012, Brisbane [p5315: line 53; p5361: line 28].

423 Transcript, Terrence Malone, 4 February 2012, Brisbane [p5304: lines 8-45].

424 Transcript, Terrence Malone, 4 February 2012, Brisbane [p5306: line 21; p5307: line 1].

425 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5196: lines 9-60].

426 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5196: line 17].

427 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5196: line 43].

428 Transcript, Terrence Malone, 4 February 2012, Brisbane [p5305: line 40].

429 Transcript, John Ruffini, 6 February 2012, Brisbane [p5405: line 54; p5406: line 7].

430 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5063: lines 4-55].

431 Transcript, Robert Drury, 6 February 2012, Brisbane [p5494: line 50 – p5495: line 56].

432 Transcript, Robert Drury, 6 February 2012, Brisbane [p5499: line 13].

433 Transcript, Terrence Malone, 5 February 2012, Brisbane [p5319: line 22].

434 Transcript, Albert Navruk, 10 February 2012, Brisbane [p5971: line 7].

435 Transcript, Albert Navruk, 10 February 2012, Brisbane [p5970: line 24].

436 Transcript, Robert Drury, 6 February 2012, Brisbane [p5498: line 14].

437 Transcript, Peter Borrows, 10 February 2012, Brisbane [p5956: line 30].

438 Transcript, Peter Borrows, 10 February 2012, Brisbane [p5957: line 1; p5958: line 1].

439 Transcript, Robert Drury, 6 February 2012, Brisbane [p5497: line 13].

440 Transcript, Peter Allen, 10 February 2012, Brisbane [p5917: line 16].

441 Transcript, Peter Allen, 10 February 2012, Brisbane [p5916: line 31].

442 Transcript, Terrence Malone, 11 February 2012, Brisbane [p6092: lines 37-40].

443 Transcript, Terrence Malone, 11 February 2012, Brisbane [p6092: line 56 – p6093: line 9].

444 Exhibit 24, Seqwater, *January 2011 Flood Event Report on the Operation of Somerset Dam and Wivenhoe Dam*, 2 March 2011 [p23].

445 Exhibit 1051, Email from Duty Engineer (Rob) to John Tibaldi, 15 January 2011, 6:57pm, Attachment.

446 Exhibit 1051, Email from Duty Engineer (Rob) to John Tibaldi, 15 January 2011, 6:57pm, [p2].

447 Exhibit 1051, Email from Duty Engineer (Rob) to John Tibaldi, 15 January 2011, 6:57pm [p4].

448 Exhibit 1051, Email from Duty Engineer (Rob) to John Tibaldi, 15 January 2011, 6:57pm [p4].

449 Exhibit 1051, Email from Duty Engineer (Rob) to John Tibaldi, 15 January 2011, 6:57pm [p6-7].

450 Exhibit 1051, Email from Duty Engineer (Rob) to John Tibaldi, 15 January 2011, 6:57pm.

451 Exhibit 1052, Email from John Tibaldi to Duty Engineer with attachment, 15 January 2011, 7:51pm.

452 Exhibit 1076, Email from Duty Engineer to Rob Drury and Peter Allen, 17 January 2011, 1:03pm.

453 Exhibit 1077, Email from Duty Engineer to John Ruffini, 17 January 2011, 6.06pm.

454 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5065: line 12].

455 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5065: lines 25-33].

456 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5066: line 40].

457 Transcript, John Ruffini, 6 February 2012, Brisbane [p5407: line 49].

458 Transcript, John Ruffini, 6 February 2012, Brisbane [p5408: line 10].

459 Transcript, John Ruffini, 6 February 2012, Brisbane [p5410: line 53].

460 Transcript, John Ruffini, 6 February 2012, Brisbane [p5408: line 55].

461 Transcript, John Ruffini, 6 February 2012, Brisbane [p5409: line 1].

462 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5294: line 21].

463 Exhibit 24, Seqwater, *January 2011 Flood Event Report on the Operation of Somerset Dam and Wivenhoe Dam*, 2 March 2011, Appendix M [p103].

464 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5287: line 35]; Exhibit 1048, Statement of Robert Ayre, 30 January 2012 [p9: para 53].

465 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5293: line 18].

466 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5242: line 38; p5244: line 41; p5246: line 9].

467 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5246: line 9].

468 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5293: line 55].

469 Exhibit 1049, Statement of Robert Ayre, 1 February 2012 [p9: para 67]; Transcript, Robert Ayre, 11 February 2012, Brisbane [p6110: line 23].

470 Transcript, Robert Ayre, 11 February 2012, Brisbane [p6110: line 23]; Exhibit 1049, Statement of Robert Ayre, 1 February 2012 [p10: para 76].

471 Exhibit 21, Seqwater, Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam, Revision 7, November 2009 [p30].

472 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5243: line 19].

473 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5293: line 39].

474 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5293: line 45].

475 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5293: line 51].

476 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5243: line 23].

477 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5245: line 39].

478 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5246: line 8 – p5247: line 17].

479 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5293; line 39; p5245: line 17; p5246: line 8].

480 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5247: line 43]. In saying so Mr Ayre appears to have assumed that Strategy Summary Log was created for the purpose of the Minister's brief.

481 Exhibit 1048, Statement of Robert Ayre, 30 January 2012 [p9: para 53].

482 Exhibit 1049, Statement of Robert Ayre, 3 February 2012 [p9: para 66].

483 Transcript, Robert Ayre, 11 February 2012 [p5200: line 55].

484 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5245: line 30].

485 Transcript, Robert Ayre, 11 February 2012, Brisbane [p6109: line 45].

486 Exhibit 1048, Statement of Robert Ayre, 30 January 2012 [p9: para 53].

487 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5202: line 44].

488 Transcript, Terrance Malone, 4 February 2012, Brisbane [p5307: line 4].

489 Transcript, Terrance Malone, 4 February 2012, Brisbane [p5307: line 41].

490 Transcript, Terrance Malone, 4 February 2012, Brisbane [p5307: line 46].

491 Transcript, Robert Drury, 7 February 2012, Brisbane [p5605: line 13].

492 Transcript, Robert Drury, 7 February 2012, Brisbane [p5605: lines 1-56].

493 Transcript, Robert Drury, 6 February 2012, Brisbane [p5504: line 54].

494 Transcript, Robert Drury, 6 February 2012, Brisbane [p5504: line 54]; Transcript, Robert Drury, 7 February 2012, Brisbane [p5584: line 31; p5591: line 7].

495 Transcript, Robert Drury, 7 February 2012, Brisbane [p5505: line 20; p5603: line 24].

496 Transcript, Robert Drury, 7 February 2012, Brisbane [p5605: line 22].

497 Transcript, Peter Allen, 10 February 2012, Brisbane [5918: line 31].

498 Transcript, Peter Allen, 10 February 2012, Brisbane [p5919: line 24].

499 Transcript, Peter Borrows, 10 February 2012, Brisbane [p5958: line 4].

500 Transcript, Albert Navruk, 10 February 2012, Brisbane [p5966: line 15].

501 Transcript, Albert Navruk, 10 February 2012, Brisbane [p5975: line 37].

502 Transcript, Albert Navruk, 10 February 2012, Brisbane [p5976: lines 18, 27; p5977: line 37].

503 Transcript, Albert Navruk, 10 February 2012, Brisbane [p5976: line 27; p5977: line 37].

504 Transcript, Albert Navruk, 10 February 2012, Brisbane [p5983: line 2].

505 Transcript, Albert Navruk, 10 February 2012, Brisbane [p5976: line 48].

506 Exhibit 1139, Statement of Petrus Gerhardus Louw Van Blerk, 30 January 2012 [p2: para 6(c)].

507 Transcript, Petrus Gerhardus Louw Van Blerk, Brisbane, 11 February 2012 [p6030: line 53].

508 Transcript, Petrus Gerhardus Louw Van Blerk, Brisbane, 11 February 2012 [p6031: line 23].

509 Transcript, David Pokarier, 10 February 2012, Brisbane [p5987: line 37]; Transcript, Kim Hang, 10 February 2012, Brisbane [p6002: line 2]; Transcript, Richard Stephens, 10 February 2012, Brisbane [p5999: line 20]; Transcript, John West, 10 February 2012, Brisbane [p6007: line 23]; Transcript, Neville Ablitt, 9 February 2012 Brisbane [p5861: line 57]; Transcript, Mark Tan, Brisbane 11 February 2012 [p6037: line 37].

510 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5245: line 39].

511 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5247: lines 46-53].

512 Closing submissions on behalf of Seqwater, 17 February 2012 [p56: para 203(e)].

513 Closing submissions on behalf of Seqwater, 17 February 2012 [p56: para 203(f)].

514 Exhibit 1048, Statement of Robert Ayre, 30 January 2012 [p9: para 53].

515 Exhibit 11, Statement of Stephen Robertson, 1 April 2011, Annexure SR-12 [p1].

516 Exhibit 11, Statement of Stephen Robertson, 1 April 2011, Annexure SR-12 [p1]. Somewhat confusingly, parts of the brief are dated 16 January 2011 and others are dated 17 January 2011. Mr Bradley explained that a draft was provided on 16 January and the final version tabled on 17 January. Exhibit 1150, Statement

of John Bradley, 1 February 2012 [p4: para 21]. Nothing turns on this point.

517 Exhibit 11, Statement of Stephen Robertson, 1 April 2011, Annexure SR-12 [p1-2].

518 Exhibit 11, Statement of Stephen Robertson, 1 April 2011, Annexure SR-12, Attachment A [p12].

519 Exhibit 11, Statement of Stephen Robertson, 1 April 2011, Annexure SR-12, Attachment A, 'January 2011 Flood Event Report' [p7-9]. Rows prior to 7 January and after 11.00 am on 11 January have been removed.

520 Exhibit 23, Unredacted Flood Event Log, entry for 2.00pm, 15 January 2011.

521 Exhibit 1061, Email, Daniel Spiller to Duty Engineer, 15 January 2011, 2.21 pm titled 'FW: Cabinet in confidence – discussion points'.

522 Transcript, Robert Drury, 6 February 2012, Brisbane [p5499: lines 30-33].

523 Exhibit 23, Unredacted Flood Event Log, entry for 5.00pm, 15 January 2011.

524 Transcript, Albert Navruk, 10 February 2012, Brisbane [p5972: lines 28-56].

525 Exhibit 24, Seqwater, *January 2011 Flood Event Report on the Operation of Somerset Dam and Wivenhoe Dam*, 2 March 2011 [p35].

526 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5198: lines 30-33].

527 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5067: line 10].

528 Exhibit 1095, Email, John Tibaldi to Rob Drury titled 'Full document - JT Draft – 02', 6.34pm, 15 January 2011.

529 Exhibit 1053, Email, John Tibaldi to Peter Borrows, Rob Drury, John Ruffini, John Tibaldi, Terry Malone, Rob Drury, Duty Seq, 9:10pm, 15 January 2011.

530 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5064: line 17; p5066: line 40].

531 Transcript, Robert Drury, 6 February 2012, Brisbane [p5500: lines 1-39].

532 Transcript, Robert Drury, 6 February 2012, Brisbane [p5504: lines 7-30].

533 Transcript, Terrence Malone, 5 February 2012, Brisbane [p5324: line 15].

534 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5199: lines 20-50].

535 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5200: line 23]; Transcript, Robert Ayre, 11 February 2012, Brisbane [p6109: line 57 – p6110: line 21].

536 Transcript, John Ruffini, 6 February 2012, Brisbane [p5407: lines 20-50].

537 Exhibit 1053, Email, John Tibaldi to Peter Borrows, Rob Drury, John Ruffini, John Tibaldi, Terry Malone, Rob Drury, Duty Seq, 9:10pm, 15 January 2011.

538 Email, John Tibaldi to Duty Engineer, John Ruffini, Robert Ayre, 6.42am, 16 January 2011.

539 Email, John Tibaldi to Duty Engineer, John Ruffini, Robert Ayre, 8.17am, 16 January 2011.

540 Exhibit 1065, Email, Peter Allen to Sent to Rob Drury, Peter Borrows, Duty Seq, John Bradley, Barry Dennien, Daniel Spiller, Michael Lyons, Elaina Smouha, Peter Allen, Mike Foster, Bob Reilly, 11.58am, 16 January 2011.

541 Exhibit 1067, Email, Peter Borrows to recipients, including Bob Reilly, Rob Drury, Duty Seq, John Bradley, Barry Dennien, Dan Spiller, Peter Allen, 3.59pm, 16 January 2011.

542 Exhibit 1069, Email, Peter Borrows to recipients, including Bob Reilly, Rob Drury, Duty Seq, John Bradley, Barry Dennien, Dan Spiller, Peter Allen, 4.28pm, 16 January 2011.

543 Transcript, Terrence Malone, 5 February 2012, Brisbane [p5321: line 41].

544 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5203: line 20].

545 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5203: line 20].

546 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5203: line 52 – p5204: line 39]; Exhibit 1049, Seventh Statement of Robert Ayre, 1 February 2012 [p9: para 64].

547 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5204: line 36].

548 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5204: line 50].

549 Exhibit 17, Statement of Robert Ayre [p1:para 2]; Transcript Robert Ayre, 13 April 2011, Brisbane [p198: l 32]

550 Exhibit 23, Unredacted Flood Event Log, entry for 12.12pm, 15 January 2011.

551 Transcript, Terrence Malone, 5 February 2012, Brisbane [p5321: line 22].

552 Transcript, Terrence Malone, 5 February 2012, Brisbane [p5320: lines 33-54].

553 Transcript, Terrence Malone, 5 February 2012, Brisbane [p5308: line 43].

554 Transcript, Terrence Malone, 5 February 2012, Brisbane [p5321: line 51].

555 Transcript, Terrence Malone, 5 February 2012, Brisbane [p5322: lines 1-20].

556 Transcript, John Ruffini, 6 February 2012, Brisbane [p5411: line 55].

557 Transcript, John Ruffini, 6 February 2012, Brisbane [p5412: line 15].

558 Transcript, John Ruffini, 6 February 2012, Brisbane [p5412: line 20].

559 Transcript, John Ruffini, 6 February 2012, Brisbane [p5412: line 22 – p5413: line 15].

560 Transcript, Stephen Robertson, 9 February 2012, Brisbane [p5788: lines 29-45].

561 Transcript, Ken Smith, 10 February 2012, Brisbane [p6025: line 2].

562 Transcript, Barry Dennien, 8 February 2012, Brisbane [p5671: lines 21-50].

563 Transcript, Daniel Spiller, 8 February 2012, Brisbane [p5630: lines 18-36].

564 Transcript, Peter Borrows, 10 February 2012, Brisbane [p5959: line 5].

565 Transcript, James Pruss, 11 February 2012, Brisbane [p6050: line 50 – p6051: line 20].

566 Transcript, Robert Drury, 6 February 2012, Brisbane [p5504: line 39]; Transcript, Robert Drury, 7 February 2012, Brisbane [p5509: line 32].

567 Exhibit 390, Statement of John Bradley, 4 April 2011, Annexure JNB-30; Exhibit 1150, Statement of John Bradley, 1 February 2012 [p4: para 21].

568 Exhibit 1150, Statement of John Bradley, 1 February 2012 [p4: para 22].

569 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5067: line 32].

570 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5067: line 41].

571 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5066: line 46 – p5077: line 11].

572 Transcript, John Tibaldi, 3 February 2012, Brisbane [p5160: line 18].

573 Transcript, Robert Drury, 6 February 2012, Brisbane [p5580: line 9].

574 Exhibit 1048, Statement of Robert Ayre, 1 February 2012 [Exhibit 2, Folder 7].

575 Exhibit 1048, Statement of Robert Ayre, 1 February 2012 [p3-4: para 16].

576 Submission, Holding Redlich, 1 March 2012.

577 Submission, Holding Redlich, 1 March 2012 [para 6].

578 Exhibit 1098, Statement of Barry Dennien, 3 February 2012 [p3: para 9 – p4: para 16]; Exhibit 1150, Statement of Anna Bligh, 6 February 2012 [p3: para 8-9].

579 Exhibit 1098, Statement of Barry Dennien, 3 February 2012 [p5: para 19]; Annexure A [p157].

580 Exhibit 414, Report of Brian Cooper, 12 January 2011.

581 Exhibit 414, Report of Brian Cooper, 12 January 2011 [p3].

582 Exhibit 414, Report of Brian Cooper, 12 January 2011 [p2].

583 Transcript, Terrence Malone, 11 February 2012, Brisbane [p6095: lines 14-16].

584 Email, Peter Allen to Duty Engineer, 15 January 2011, 1.31 pm.

585 Email, Duty Engineer to Terry Malone, 15 January 2011, 1.41 pm.

586 Transcript, Terrence Malone, 11 February 2012, Brisbane [p6095: line 5 – p6096: line 35].

587 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5064: line 25; p5066: line 40].

588 Transcript, John Tibaldi, 11 February 2012, Brisbane [p6127: line 57 – p6128: line 10].

589 Transcript, John Tibaldi, 11 February 2012, Brisbane [p6128: lines 10-35].

590 Exhibit 23, Unredacted Flood Event Log, entry for 2.00 pm, 15 January 2011.

591 Exhibit 1061, Email, Dan Spiller to Duty Engineer, 15 January 2011, 2.21 pm. The reference is 'Get more comprehensive report from Brian Cooper?'

592 Exhibit 1150, Statement of John Bradley, 1 February 2012 [p4: para 21].

593 Exhibit 1062, Email, Rob Drury to Duty Engineer, 15 January 2011, 5.07 pm.

594 Exhibit 1062, Email, Rob Drury to Duty Engineer, 5.07 pm, 15 January 2011.

595 Exhibit 393, Statement of Peter Borrows, 1 April 2011, Attachment PB-12 (Email, Peter Borrows to Rob Drury, Jim Pruss and Duty Engineer, 2.03 am, 17 January 2011).

596 Exhibit 24, Seqwater *January 2011 Flood Event Report on the Operation of Somerset Dam and Wivenhoe Dam*, 2 March 2011 [p35]; Exhibit 1143, Key – register of names and positions.

597 Email, Peter Borrows to Paul Bird, Rob Drury and John Tibaldi, 17 January 2011, 2.32 pm.

598 He also said, 'in terms of the peak release on the Tuesday I think that was reasonable...', (Transcript, Robert Ayre, 11 February 2012, Brisbane [p6113: lines 1-4]).

599 Transcript, Robert Ayre, 11 February 2012, Brisbane [p6112: line 41 – p6113: line 15].

600 Transcript, John Ruffini, 11 February 2012, Brisbane [p6075: line 45 – p6077: line 11].

601 Exhibit 21, Seqwater, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam*, Revision 7, November 2009 [p8].

602 Exhibit 24, Seqwater, *January 2011 Flood Event Report on the Operation of Somerset and Wivenhoe Dam*, 2 March 2011 [p1].

603 Exhibit 1036, Statement of John Tibaldi, 1 February 2012 [p1: para 4]; Exhibit 55, Transcript of Interview with John Tibaldi, 29 March 2011 [p6: line 10]; Exhibit 1075, Statement of Terrence Malone, 1 February 2012 [p1: para 3 – p2: para 4]; Exhibit 1048, Statement of Robert Ayre, 30 January 2012 [p4: para 22].

604 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5023: line 44].

605 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5023: line 32].

606 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5023: line 20].

607 Transcript, Terrence Malone, 5 February 2012, Brisbane [p5326: line 32].

608 Exhibit 1075, Statement of Terrence Malone, 1 February 2012 [p2: para 4].

609 Exhibit 1036, Statement of John Tibaldi, 1 February 2012 [p3: para 15]; Exhibit 1075, Statement of Terrence Malone, 1 February 2012 [p3: para 8(a), 9].

610 Exhibit 1075, Statement of Terrence Malone, 1 February 2012 [p3: para 8(b); p4: para 12], Annexures TAM-1 and TAM-2.

611 Transcript, Robert Ayre, 12 April 2011, Brisbane [p106: lines 49-54].

612 Exhibit 1048, Statement of Robert Ayre, 30 January 2012 [p10: para 64, 71].

613 Transcript, John Ruffini, 11 February 2012, Brisbane [p6078: line 21].

614 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5023: line 40].

615 Exhibit 1036, Statement of John Tibaldi, 1 February 2012 [p2: para 8]; Exhibit 43, Transcript of Interview with John Ruffini, 29 March 2011 [p44: line 44]; Transcript, John Tibaldi, 2 February 2012, Brisbane [p5023: line 52].

616 Exhibit 1036, Statement of John Tibaldi, 1 February 2012 [p2: para 8]; Transcript, John Tibaldi, 2 February 2012, Brisbane [p5023: line 52].

617 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5283: line 27].

618 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5283: line 27].

619 Transcript, Terrence Malone, 5 February 2012, Brisbane [p5326: line 26].

620 Exhibit 1048, Statement of Robert Ayre, 30 January 2012 [p2: para 5].

621 Transcript, John Tibaldi, 3 February 2012, Brisbane [p5138: line 8].

622 Exhibit 1036, Statement of John Tibaldi, 1 February 2012 [p2: para 7; p7: para 38].

623 Exhibit 1036, Statement of John Tibaldi, 1 February 2012 [p2: para 8].

624 Transcript, John Tibaldi, 3 February 2012, Brisbane [p5205: line 39].

625 Transcript, John Ruffini, 11 February 2012, Brisbane [p6073: line 2].

626 Transcript, Robert Ayre, 11 February 2012, Brisbane [p6104: line 53].

627 Transcript, Terrence Malone, 11 February 2012, Brisbane [p6093: line 52].

628 Transcript, Robert Ayre, 11 February 2012, Brisbane [p6105: line 1].

629 Transcript, Terrence Malone, 11 February 2012, Brisbane [p6093: line 52].

630 Transcript, Terrence Malone, 11 February 2012, Brisbane [p6094: line 28]; Transcript, Robert Ayre, 11 February 2012, Brisbane [p6105: line 15].

631 Exhibit 51, Statement of John Tibaldi, 25 March 2011 [p5: para 21]; Transcript, John Tibaldi, 3 February 2012, Brisbane [p5134: line 49]; Exhibit 1078, Statement of John Ruffini, 30 January 2012 [p3: para 19; p4: para 25; p4: para 29]; Exhibit 17, Statement of Robert Ayre, 23 March 2011 [p31: para 154]; Exhibit 1048, Statement of Robert Ayre, 30 January 2012 [p5: para 29]; Exhibit 1049, Statement of Robert Ayre, 1 February 2012 [p18: para 95]; Exhibit 45, Statement of Terrence Malone, 25 March 2011 [p7: para 25].

632 Exhibit 1036, Statement of John Tibaldi, 1 February 2012 [p3: para 12].

633 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5036: line 40].

634 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5082: line 33].

635 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5083: line 3].

636 Exhibit 1036, Statement of John Tibaldi, 1 February 2012 [p3: para 17].

637 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5025: lines 55-56].

638 Exhibit 1036, Statement of John Tibaldi, 1 February 2012 [p3: para 16].

639 Exhibit 1036, Statement of John Tibaldi, 1 February 2012 [p1: para 5].

640 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5025: lines 28-50; p5076: lines 30-42].

641 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5076: line 35].

642 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5076: line 42].

643 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5076: line 49].

644 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5077: line 1].

645 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5084: line 11; p5085: line 34].

646 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5037: lines 25-47].

647 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5037: lines 25-47].

648 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5037: line 19].

649 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5119: line 12].

650 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5026: line 30].

651 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5035: line 22].

652 Transcript, John Tibaldi, 3 February 2012, Brisbane [p5159: line 26].

653 Transcript, John Tibaldi, 3 February 2012, Brisbane [p5159: line 46].

654 Transcript, John Tibaldi, 3 February 2012, Brisbane [p5159: line 46].

655 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5031: lines 19-50].

656 Exhibit 1036, Statement of John Tibaldi, 1 February 2012 [p3: para 19].

657 Exhibit 1036, Statement of John Tibaldi, 1 February 2012, Annexure JT-1, Item B.

658 Exhibit 1036, Statement of John Tibaldi, 1 February 2012, Annexure JT-1, Item B [p5].

659 Exhibit 1036, Statement of John Tibaldi, 1 February 2012, Annexure JT-1, Item B [p10].

660 Exhibit 1036, Statement of John Tibaldi, 1 February 2012, Annexure JT-1, Item B [p15].

661 Exhibit 1036, Statement of John Tibaldi, 1 February 2012, Annexure JT-1, Item E [p9].

662 Exhibit 1036, Statement of John Tibaldi, 1 February 2012, Annexure JT-1, Item M [p5].

Note that the lake level did not exceed 68.5 metres during this time period.

663 Exhibit 24, Seqwater, *January 2011 Flood Event Report on the Operation of Somerset and Wivenhoe Dam,* 2 March 2011, Appendix A [p3].

664 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5119: lines 17-33].

665 Exhibit 1036, Statement of John Tibaldi, 1 February 2012, Annexure JT-1, Item P.

666 Exhibit 1036, Statement of John Tibaldi, 1 February 2012, Annexure JT-1, Item P [p5].

667 Exhibit 1036, Statement of John Tibaldi, 1 February 2012, Annexure JT-1, Item P [p7].

668 Exhibit 1036, Statement of John Tibaldi, 1 February 2012, Annexure JT-1, Item P [p9].

669 Exhibit 1036, Statement of John Tibaldi, 1 February 2012, Annexure JT-1, Item Q-U.

670 It is named 'Flood MGt Strategies and Manual Compliance – 01. doc', and there are no other drafts attached to emails sent before it.

671 Exhibit 1036, Statement of John Tibaldi, 1 February 2012, Annexure JT-1, Item O [p12].

672 Exhibit 1036, Statement of John Tibaldi, 1 February 2012 [p4: para 25-26].

673 Exhibit 1036, Statement of John Tibaldi, 1 February 2012 [p4: para 25-26].

674 Exhibit 1036, Statement of John Tibaldi, 1 February 2012 [p4: para 26].

675 Mr Tibaldi produced a table of the range of estimated allowable releases under strategy W2 in his statement: Exhibit 1036, Statement of John Tibaldi, 1 February 2012 [p5-6].

676 Exhibit 1036, Statement of John Tibaldi, 1 February 2012 [p6: para 29; p7: para 36].

677 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5035: line 29; p5058: line 20].

678 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5035: lines 35-40].

679 Exhibit 1036, Statement of John Tibaldi, 1 February 2012 [p6: para 31].

680 See Exhibit 1036, Statement of John Tibaldi, 1 February 2012 [p7: para 32].

681 Exhibit 1036, Statement of John Tibaldi, 1 February 2012 [p7: para 31].

682 Exhibit 1036, Statement of John Tibaldi, 1 February 2012 [p7: para 33].

683 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5034: line 45 – p5035: line 26].

684 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5035: line 6].

685 Exhibit 1036, Statement of John Tibaldi, 1 February 2012 [p7: para 33].

686 Transcript, Peter Allen, 10 February 2012, Brisbane [p5920: line 36; 5939: line 26].

687 Transcript, Peter Allen, 10 February 2012, Brisbane [p5920: line 54].

688 Transcript, Peter Allen, 10 February 2012, Brisbane [p5920: line 16].

689 Exhibit 1036, Statement of John Tibaldi, 1 February 2012 [p7: para 33].

690 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5035: line 45].

691 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5036: lines 5-34].

692 Exhibit 1048, Statement of Robert Ayre, 30 January 2012 [p8: para 52].

693 Exhibit 1048, Statement of Robert Ayre, 30 January 2012 [p8: para 52].

694 Exhibit 1048, Statement of Robert Ayre, 30 January 2012 [p8: para 52].

695 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5207: line 40].

696 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5207: line 40].

697 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5207: line 55].

698 Transcript, Terrence Malone, 5 February 2012, Brisbane [p5328: line 10].

699 Transcript, John Ruffini, 6 February 2012, Brisbane [p5416: line 54].

700 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5209: line 13]; Exhibit 1049, Statement of Robert Ayre, 1 February 2012 [p17-18: para 92-94]; Transcript, Terrence Malone, 4 February 2012, Brisbane [p5309: line 31 – p5310: line 6]; Transcript, John Ruffini, 6 February 2012, Brisbane [p5414: line 6]

701 Exhibit 1036, Statement of John Tibaldi, 1 February 2012 [p7: para 38].

702 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5024: line 41].

703 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5209: line 7].

704 Exhibit 1049, Statement of Robert Ayre, 1 February 2012 [p5: para 28].

705 Exhibit 1049, Statement of Robert Ayre, 1 February 2012 [p17: para 92 – p18: para 94].

706 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5199: line 34]; Transcript, Robert Ayre, 4 February 2012, Brisbane [p5248: lines 11-31].

707 Exhibit 1048, Statement of Robert Ayre, 30 January 2012 [p2: para 5-6].

708 Exhibit 1048, Statement of Robert Ayre, 30 January 2012, Exhibit 6 [p4].

709 Exhibit 1048, Statement of Robert Ayre, 30 January 2012, Exhibit 6 [p4].

710 Exhibit 1048, Statement of Robert Ayre, 30 January 2012 [p7: para 43]; Exhibit 7 [p5].

711 Exhibit 1048, Statement of Robert Ayre, 30 January 2012 [p6: para 32-33; p7: para 42-45; p8: para 49; p9: para 55-56].

712 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5209: lines 7-11].

713 Transcript, Robert Ayre, 11 February 2012, Brisbane [p6105: lines 15-19].

714 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5220: line 11].

715 Transcript, Robert Ayre, 11 February 2012, Brisbane [p6116: lines 5-10].

716 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5209: line 18].

717 Exhibit 17, Statement of Robert Ayre, 23 March 2011 [p31: para 154].

718 Exhibit 1048, Statement of Robert Ayre, 30 January 2012 [p5: para 29].

719 Transcript, Robert Ayre, 4 February 2012, Brisbane [p5292: line 49].

720 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5024: line 29].

721 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5024: line 38].

722 Transcript, Terrence Malone, 4 February 2012, Brisbane [p5309: line 35; p5310: line 6].

723 Exhibit 1075, Statement of Terrence Malone, 1 February 2012 [p5-6: para 14(b)].

724 Transcript, Terence Malone, 2 February 2012, Brisbane [p5300: lines 20-40; p5309: line 51].

725 Transcript, Terrence Malone, 11 February 2012, Brisbane [p6094: lines 20-38].

726 Exhibit 45, Statement of Terrence Malone, 25 March 2011 [p7: para 25].

727 Transcript, Terrence Malone, 11 February 2012, Brisbane [p6094: lines 20-38]; Exhibit 45, Statement of Terrence Malone, 25 March 2011 [p7: para 25].

728 Transcript, Terrence Malone, 5 February 2012, Brisbane [p5369: line 12].

729 Transcript, Terrence Malone, 5 February 2012, Brisbane [p5327: line 51 – p5328: line 8].

730 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5024: line 48].

731 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5025: line 4].

732 Transcript, John Ruffini, 6 February 2012, Brisbane [p5414: line 6].

733 Exhibit 1078, Statement of John Ruffini, 30 January 2012 [p2: para 7; p2: para 13; p3: para 21; p4: para 27].

734 Transcript, John Ruffini, 6 February 2012, Brisbane [p5418: lines 35-58].

735 Transcript, John Ruffini, 6 February 2012, Brisbane [p5399: lines 17-47].

736 Transcript, John Ruffini, 6 February 2012, Brisbane [p5414: lines 29-41; p5449: lines 39-41].

737 Transcript, John Ruffini, 6 February 2012, Brisbane [p5414: line 53 – p5415: line 1].

738 Transcript, John Ruffini, 6 February 2012, Brisbane [p5458: lines 25-58].

739 Transcript, John Ruffini, 6 February 2012, Brisbane [p5458: line 40-58].

740 Exhibit 1078, Statement of John Ruffini, 30 January 2012 [p3: para 19; p4: para 25; p4: para 29].

741 Exhibit 43, Transcript of Interview with John Ruffini, 29 March 2011 [p45: line 11].

742 Closing submissions on behalf of Terrence Malone, 16 February 2012 [p10: para 34]; Closing submissions on behalf of John Ruffini,

Peter Allen and the State of Queensland, 16 February 2012 [p22: para 77]; Closing submissions on behalf of Seqwater, 17 February 2012 [p16: para 38(l)]; Closing submissions on behalf of John Tibaldi, 17 February 2012 [p16: para 4.36]; Closing submissions on behalf of Robert Ayre and SunWater, 16 February 2012 [p12: para 26].

743 Closing submissions on behalf of Seqwater, 17 February 2012 [p17: para 40].

744 Closing submissions on behalf of Seqwater, 17 February 2012 [p17: para 41 – p19: para 47; p74: para 267].

745 Closing submissions on behalf of Seqwater, 17 February 2012 [p17: para 43].

746 Closing submissions on behalf of Seqwater, 17 February 2012 [p69: para 254 – p73: para 259].

747 Closing submissions on behalf of Seqwater, 17 February 2012 [p69-70: para 255].

748 Closing submissions on behalf of Seqwater, 17 February 2012 [p71]; Transcript, Professor Apelt, 8 February 2012, Brisbane [p5749: line 20 – p5750: line 58].

749 Closing submissions on behalf of Seqwater, 17 February 2012 [p73: para 259].

750 Closing submissions on behalf of Seqwater, 17 February 2012 [p60: para 215; p64: para 234].

751 Closing submissions on behalf of Seqwater, 17 February 2012 [p64: para 235].

752 Closing submissions on behalf of Terrence Malone, 16 February 2012 [p30: para 110 – p31: para 111].

753 Closing submissions on behalf of John Ruffini, Peter Allen and the State of Queensland, 16 February 2012 [p34: para 136-138; p35: para 141-143].

754 Exhibit 51, Statement of John Tibaldi, 25 March 2011 [p5: para 21]; Transcript, John Tibaldi, 3 February 2012 [p5134: line 46].

755 Transcript, Terrence Malone, 4 February 2012, Brisbane [p5310: line 4].

756 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5080: line 7 – p5081: line 5]; Transcript, Robert Ayre, 3 February 2012, Brisbane [p5215: line 3 – p5216: line 2]; Transcript, Terrence Malone, 4 February 2012, Brisbane [p5309: line 23 – p5311: line 1; p5332: lines 37-47]. Letters including this proposition were sent to the lawyers for each engineer before his evidence concluded: Correspondence to Gadens (Terrence Malone), 9 February 2012; Correspondence to Holding Redlich (Robert Ayre), 6 February 2012, 9 February 2012; Correspondence to Dibbs Barker (John Tibaldi), 9 February 2012; Correspondence to Crown Law (John Ruffini), 9 February 2012.

757 Closing submissions on behalf of Seqwater, 17 February 2012 [p61: para 222].

758 Closing submissions on behalf of Seqwater, 17 February 2012 [p62: para 228 – p63: para 233].

759 Closing submissions on behalf of Terrence Malone, 16 February 2012 [p4: para 8 – p5: para 10].

760 Closing submissions on behalf of Mr Ayre and SunWater Limited, 16 February 2012 [p83: para 310].

761 Closing submissions on behalf of Terrence Malone, 16 February 2012 [p4: para 8].

762 None of the others admitted to such a meeting – see *16.8 The first attempts to record strategy choice*.

763 The section requires a public official who suspects that a matter may involve official misconduct to notify the Crime and Misconduct Commission.

764 Exhibit 21, *Manual of Operational Procedures at Wivenhoe and Somerset Dams*, Version 7, November 2009 [p8: section 2.9].

765 Exhibit 21, *Manual of Operational Procedures at Wivenhoe and Somerset Dams*, Version 7, November 2009 [p8: section 2.9].

766 Exhibit 34, *Manual of Operational Procedures for Flood Mitigation at Wivenhoe and Somerset Dams*, Version 6, December 2004 [p13: section 2.9].

767 Exhibit 21, *Manual of Operational Procedures at Wivenhoe and Somerset Dams*, Version 7, November 2009 [p2: section 1.2].

768 Section 15 and 31, *South East Queensland Water (Restructuring) Act 2007*.

769 Transcript, Peter Borrows, 10 February 2012, Brisbane [p5951: lines 2-4].

770 Transcript, Peter Borrows, 10 February 2012, Brisbane [p5949: line 56].

771 Transcript, Peter Borrows, 10 February 2012, Brisbane [p5951: line 9].

772 Transcript, Peter Borrows, 10 February 2012, Brisbane [p5950: line 28].

773 Transcript, Peter Borrows, 10 February 2012, Brisbane [p5951: line 53].

774 Transcript, James Pruss, 11 February 2012, Brisbane [p6052: line 10].

775 Transcript, Peter Borrows, 10 February 2012, Brisbane [p5951: line 9].

776 Transcript, Peter Borrows, 10 February 2012, Brisbane [p5947: line 15; p5951: line 35].

777 Transcript, Peter Borrows, 10 February 2012, Brisbane [p5947: line 15].

778 Transcript, Peter Borrows, 10 February 2012, Brisbane [p5951: line 41].

779 Transcript, Peter Borrows, 10 February 2012, Brisbane [p5952: line 9].

780 Transcript, James Pruss, 11 February 2012, Brisbane [p6051: line 48].

781 Transcript, James Pruss, 11 February 2012, Brisbane [p6053: line 1].

782 Transcript, James Pruss, 11 February 2012, Brisbane [p6053: line 14].

783 Transcript, James Pruss, 11 February 2012, Brisbane [p6053: line 30].

784 Transcript, James Pruss, 11 February 2012, Brisbane [p6055: line 55].

785 Transcript, James Pruss, 11 February 2012, Brisbane [p6055: line 55].

786 Transcript, James Pruss, 11 February 2012, Brisbane [p6056: line 23].

787 Transcript, James Pruss, 11 February 2012, Brisbane [p6056: line 29].

788 Transcript, James Pruss, 11 February 2012, Brisbane [p6056: line 48 – p5067: line 5].

789 Transcript, Peter Borrows, 10 February 2012, Brisbane [p5955: line 54].

790 Transcript, James Pruss, 11 February 2012, Brisbane [p6057: line 7].

791 Section *17.3 Review of flood event reports*, deals with the Commission's general findings and recommendations about review of flood event reports produced in accordance with flood mitigation manuals and emergency action plans.

792 Transcript, Peter Allen, 10 February 2012, Brisbane [p5904: line 5].

793 Transcript, Peter Allen, 10 February 2012, Brisbane [p5929: line 11].

794 Transcript, Peter Allen, 10 February 2012, Brisbane [p5911: lines 35-50].

795 Transcript, Peter Allen, 10 February 2012, Brisbane [p5930: lines 45-60].

796 Transcript, Peter Allen, 10 February 2012, Brisbane [p5915: line 3053].

797 Transcript, Peter Allen, 10 February 2012, Brisbane [p5918: lines 30-35].

798 Transcript, Peter Allen, 10 February 2012, Brisbane [p5917: lines 35-40].

799 Transcript, Peter Allen, 10 February 2012, Brisbane [p5919: line 56].

800 Transcript, Peter Allen, 10 February 2012, Brisbane [p5920: lines 1-11].

801 Transcript, Peter Allen, 10 February 2012, Brisbane [p5921: line 12].

802 Transcript, Peter Allen, 10 February 2012, Brisbane [p5923: line 43].

803 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5034: line 45 – p5035: line 26].

804 Transcript, Peter Allen, 10 February 2012, Brisbane [p5936: line 11].

805 Transcript, Peter Allen, 10 February 2012, Brisbane [p5923: line 54; p5928: line 55].

806 Transcript, Peter Allen, 10 February 2012, Brisbane [p5924: line 1].

807 Transcript, Peter Allen, 10 February 2012, Brisbane [p5924: line 10].

808 Transcript, Peter Allen, 10 February 2012, Brisbane [p5924: line 14].

809 Transcript, Peter Allen, 10 February 2012, Brisbane [p5924: line 19].

810 Transcript, Peter Allen, 10 February 2012, Brisbane [p5924: line 32].

811 Transcript, Peter Allen, 10 February 2012, Brisbane [p5939: line 5].

812 Transcript, Peter Allen, 10 February 2012, Brisbane [p5924: line 39; p5939: line 44].

813 Transcript, Peter Allen, 10 February 2012, Brisbane [p5927: line 10].

814 Transcript, Peter Allen, 10 February 2012, Brisbane [p5927: line 18].

815 Transcript, Peter Allen, 10 February 2012, Brisbane [p5927: lines 28-38].

816 Exhibit 1099, Statement of Peter Allen, 3 February 2012 [p3: para 12].

817 Exhibit 1128, Statement of Peter Allen, 12 September 2012 [p5: para 12(g)].

818 Transcript, Peter Allen, 10 February 2012, Brisbane [p5928: lines 20-34].

819 Transcript, Peter Allen, 10 February 2012, Brisbane [p5928: line 36]. For more on the Wivenhoe Dam and Somerset Dam Optimisation Study, see *17.1 Longer term review of the Wivenhoe and North Pine manuals*.

820 Closing submissions on behalf of John Ruffini, Peter Allen and the State of Queensland, 16 February 2012 [p36: para 148].

821 Closing submissions on behalf of John Ruffini, Peter Allen and the State of Queensland, 16 February 2012, Attachment.

822 Letter, Justice C E Holmes, Commissioner to Director-General, Department of Environment and Resource Management, 8 March 2011.

823 Transcript, Peter Allen, 10 February 2012, Brisbane [p5928: line 1].

824 Transcript, Peter Allen, 16 May 2011, Brisbane [p2090: line 11].

825 Transcript, Peter Allen, 17 May 2011, Brisbane [p2131: line 37].

826 Transcript, Peter Allen, 10 February 2012, Brisbane [p5929: line 33].

827 Transcript, Peter Allen, 10 February 2012, Brisbane [p5905: line 54].

828 Exhibit 1100, Statement of Peter Allen, 7 February 2012, Annexure PHA-63, Email from Peter Allen to Brian Cooper Consulting, 10.57 am, 12 January 2011.

829 Transcript, Peter Allen, 10 February 2012, Brisbane [p5923: line 54; p5928: line 55; p5929: line 1].

830 See Exhibit 397, Statement of Peter Allen, 4 April 2012 [p51: para 149 – p53: para 152].

831 Closing submissions on behalf of John Ruffini, Peter Allen and the State of Queensland, 16 February 2012 [p36: para 150].

832 Closing submissions on behalf of John Ruffini, Peter Allen and the State of Queensland, 16 February 2012 [p36: para 150].

833 Closing submissions on behalf of John Ruffini, Peter Allen and the State of Queensland, 16 February 2012 [p37: para 151].

834 Closing submissions on behalf of John Ruffini, Peter Allen and the State of Queensland, 16 February 2012 [p37: para 152-153].

835 Exhibit 393, Statement of Peter Borrows, 1 April 2011 [p1: para 3].

836 Transcript, Peter Borrows, 10 February 2012, Brisbane [p5944: line 29].

837 Exhibit 427, Statement of Jim Pruss, 4 April 2011 [p2: para 19].

838 Exhibit 393, Statement of Peter Borrows, 1 April 2011 [p6: para 46-47].

839 Transcript, Peter Borrows, 10 February 2012, Brisbane [p5958: line 27]; [p5959: line 4]; Transcript, Jim Pruss, 11 February 2012, Brisbane [p6050: line 31].

840 Exhibit 393, Statement of Peter Borrows, 1 April 2011 [p6: para 47].

841 Transcript, Peter Borrows, 10 February 2012, Brisbane [p5947: line 33].

842 Mr Borrows trained as a civil engineer. Exhibit 393, Statement of Peter Borrows, 1 April 2011 [p1: para 8]. Mr Pruss holds a Bachelor of Science: Exhibit 427, Statement of Jim Pruss, 4 April 2011 [p2: para 9].

843 Exhibit 1138, Statement of Ken Smith, 1 February 2012 [p1-2: para 4].

844 Exhibit 1138, Statement of Ken Smith, 1 February 2012 [p2: para 5].

845 Exhibit 1150, Statement of Anna Bligh, 6 February 2012; Exhibit 1138, Statement of Ken Smith, 1 February 2012.

846 Transcript, Ken Smith, 10 February 2012, Brisbane [p6010].

847 Exhibit 1138, Statement of Ken Smith, 1 February 2012, Attachment 5 [p1]; Transcript, Ken Smith, 10 February 2012, Brisbane [p6015: line 56].

848 Exhibit 1138, Statement of Ken Smith, 1 February 2012, Attachment 7 [p45]; Transcript, Ken Smith, 10 February 2012, Brisbane [p6016: line 30]; Exhibit 1150, Statement of Anna Bligh, 6 February 2012, AMB-03 [p1].

849 Exhibit 1138, Statement of Ken Smith, 1 February 2012, Attachment 5 [p3]; Transcript,

Ken Smith, 10 February 2012, Brisbane [p6017: line 35].

850 Exhibit 1138, Statement of Ken Smith, 1 February 2012, Attachment 4 [p1]; Attachment 8 [p1]; Exhibit 1150, Statement of Anna Bligh, 6 February 2012, AMB-05 [p33].

851 Exhibit 417, Statement of Barry Dennien, 5 April 2011, Annexure E [p1674]; Transcript, Ken Smith, 10 February 2012, Brisbane [p6022: line 24].

852 Exhibit 1150, Statement of Anna Bligh, 6 February 2012 [p3:para 9; AMB-05].

853 Exhibit 1138, Statement of Ken Smith, 1 February 2012 [p4: para 12].

854 Transcript, Ken Smith, 10 February 2012, Brisbane [p6011: line 21].

855 Transcript, Ken Smith, 10 February 2012, Brisbane [p6023: line 24].

856 Transcript, Ken Smith, 10 February 2012, Brisbane [p6023: line 47].

857 Transcript, Ken Smith, 10 February 2012, Brisbane [p6024: line 10].

858 Exhibit 1150, Statement of Anna Bligh, 6 February 2012 [p4: para 12].

859 Exhibit 1150, Statement of Anna Bligh, 6 February 2012 [p3: para 11].

860 Exhibit 1150, Statement of John Bradley, 2 February 2012 [p1: para 2-3].

861 Exhibit 1150, Statement of Debra-Lee Best, 1 February 2012 [p2, para 9].

862 Exhibit 1150, Statement of Terry Wall, 2 February 2012 [p1: para 2-3].

863 Exhibit 1150, Statement of James Reeves, 1 February 2012 [p1: para 2].

864 Exhibit 1115, Statement of Stephen Robertson, 1 February 2012; Exhibit 1150, Statement of John Bradley, 1 February 2012; Exhibit 1150, Statement of Debra-Lee Best, 1 February 2012; Exhibit 1150, Statement of Terry Wall, 2 February 2012; Exhibit 1150, Statement of James Reeves, 1 February 2012.

865 Transcript, Stephen Robertson, 9 February 2012 [p5780].

866 Exhibit 1115, Statement of Stephen Robertson, 1 February 2012 [p2: para 5-8]; Transcript, Stephen Robertson, 9 February 2012 [p5783: line 9].

867 Transcript, Stephen Robertson, 9 February 2012 [p5782: line 24].

868 Exhibit 1115, Statement of Stephen Robertson, 1 February 2012, Attachment B [p14]; Transcript, Stephen Robertson, 9 February 2012 [p5785: line 1].

869 Transcript, Stephen Robertson, 9 February 2012 [p5784: line 19].

870 Exhibit 1115, Statement of Stephen Robertson, 1 February 2012, Attachment B [p18]; Transcript, Stephen Robertson, 9 February 2012 [p5785: line 31].

871 Exhibit 1115, Statement of Stephen Robertson, 1 February 2012, Attachment B [p20]; Transcript, Stephen Robertson, 9 February 2012 [p5785: line 51].

872 Transcript, Stephen Robertson, 9 February 2012, Brisbane [p5785: line 45].

873 Transcript, Stephen Robertson, 9 February 2012, Brisbane [p5790: line 55].

874 Exhibit 11, Statement of Stephen Robertson, 1 April 2011 [SR-12]; Transcript, Stephen Robertson, 9 February 2012, Brisbane [p5787: line 56].

875 Transcript, Stephen Robertson, 9 February 2012, Brisbane [p5791: line 20].

876 Transcript, Stephen Robertson, 9 February 2012, Brisbane [p5791: line 29].

877 Transcript, Stephen Robertson, 9 February 2012, Brisbane [p5790: line 2-50].

878 Transcript, Stephen Robertson, 9 February, Brisbane 2012 [p5789: lines 20-30].

879 Exhibit 1150, Statement of John Bradley, 1 February 2012 [p1: para 6].

880 Exhibit 1150, Statement of John Bradley, 1 February 2012 [p2: para 12]; JNB-02: p53.

881 Exhibit 1150, Statement of John Bradley, 1 February 2012, JNB-02 [p56].

882 Exhibit 1150, Statement of John Bradley, 1 February 2012 [p2: para 12]; JNB-02.

883 Exhibit 1150, Statement of John Bradley, 1 February 2012 [p4: para 20].

884 Exhibit 1150, Statement of John Bradley, 1 February 2012 [p4: para 23].

885 Exhibit 1150, Statement of John Bradley, 1 February 2012 [p3: para 14].

886 Exhibit 1150, Statement of John Bradley, 1 February 2012 [p3: para 15-16].

887 Exhibit 1150, Statement of Debra-Lee Best, 1 February 2012 [p2: para 12].

888 Exhibit 1150, Statement of Debra-Lee Best, 1 February 2012, DLB-16: Email, Daniel Spiller to various, 9 January 2011, 11:07pm.

889 Exhibit 1150, Statement of Debra-Lee Best, 1 February 2012, DLB-15: Email, Daniel Spiller to various, 10 January 2011, 9:46am..

890 Exhibit 1150, Statement of Debra-Lee Best, 1 February 2012, DLB-17; Email, Lance McCallum to Debbie Best, 10 January 2011, 12:26pm.

891 Exhibit 1150, Statement of Debra-Lee Best, 1 February 2012, DLB-20: Email, Kathy Reilly to Debbie Best, 14 January 2011, 5:27pm.

892 Exhibit 1150, Statement of Debra-Lee Best, 1 February 2012 [p4: para 25]; DLB-20.

893 Exhibit 393, Statement of Peter Borrows, 1 April 2011, PB-12.

894 Exhibit 1150, Statement of Debra-Lee Best, 1 February 2012 [p4: para 21-22].

895 Exhibit 1150, Statement of Debra-Lee Best, 1 February 2012 [p4: para 23-24].

896 Exhibit 1150, Statement of Terry Wall, 2 February 2012 [p1: para 4-5].

897 Exhibit 1150, Statement of Terry Wall, 2 February 2012 [p2: para 8].

898 Exhibit 1150, Statement of Terry Wall, 2 February 2012 [p2: para 9-10].

899 Exhibit 1150, Statement of James Reeves, 1 February 2012 [p1: para 5-6].

900 Exhibit 1150, Statement of James Reeves, 1 February 2012 [p2: para 8].

901 Submission from South East Queensland Water Grid Manager, 11 March 2011 [p1: para 1]

902 Exhibit 1097, Statement of Barry Dennien, 1 February 2012 [p2: para 7].

903 Exhibit 1080, Statement of Daniel Spiller, 1 February 2012 [p2: para 8(a)].

904 Transcript, Daniel Spiller, 7 February 2012, Brisbane [p5611: line 29].

905 Exhibit 1097, Statement of Barry Dennien, 1 February 2012 [p2: para 5].

906 Exhibit 1080, Statement of Daniel Spiller, 1 February 2012 [p2: para 6-7].

907 Exhibit 1097, Statement of Barry Dennien, 1 February 2012; Exhibit 1080, Statement of Daniel Spiller, 1 February 2012.

908 Exhibit 1097, Statement of Barry Dennien, 1 February 2012 [p5: para 18].

909 Exhibit 1080, Statement of Daniel Spiller, 1 February 2012 [p4: para 15].

910 Exhibit 1097, Statement of Barry Dennien, 1 February 2012 [p4: para 15]; Exhibit 1080, Statement of Daniel Spiller, 1 February 2012 [p4: para 13-14].

911 Exhibit 1097, Statement of Barry Dennien, 1 February 2012 [p4: para 15].

912 Exhibit 1080, Statement of Daniel Spiller, 1 February 2012 [p5-6: para 16-23].

913 Exhibit 1097, Statement of Barry Dennien, 1 February 2012 [p3: para 11]; Exhibit 1080, Statement of Daniel Spiller, 1 February 2012 [p3: para 9].

914 Transcript, Daniel Spiller, 7 February 2012, Brisbane [p5609: line 38].

915 Exhibit 1080, Statement of Daniel Spiller, 1 February 2012 [p4: para 12]; Transcript, Daniel Spiller, 7 February 2012, Brisbane [p5610: line 13].

916 Transcript, Daniel Spiller, 7 February 2012, Brisbane [p5610: line 41; p5611: line 54].

917 Exhibit 1080, Statement of Daniel Spiller, 1 February 2012, Annexure B [p167-169]; Transcript, Daniel Spiller, 7 February 2012, Brisbane [p5617: lines 20-57].

918 Transcript, Daniel Spiller, 7 February 2012, Brisbane [p5618: line 1 – p5619: line 39].

919 Transcript, Barry Dennien, 8 February 2012, Brisbane [p5684: line 38].

920 Transcript, Barry Dennien, 8 February 2012, Brisbane [p5671: lines 40-50].

921 Transcript, Barry Dennien, 8 February 2012, Brisbane [p5672: line 10].

922 Transcript, Barry Dennien, 8 February 2012, Brisbane [p5672: line 32].

923 Exhibit 11, Statement of Stephen Robertson, 1 April 2011, SR-12.

924 Transcript, Daniel Spiller, 8 February 2012, Brisbane [p5630: line 32].

925 Transcript, Daniel Spiller, 8 February 2012, Brisbane [p5632: line 28].

926 Transcript, Daniel Spiller, 8 February 2012, Brisbane [p5631: line 38].

927 Transcript, Daniel Spiller, 8 February 2012, Brisbane [p5635: line 20].

928 Transcript, Daniel Spiller, 8 February 2012, Brisbane [p5637: line 28].

929 Transcript, Daniel Spiller, 8 February 2012, Brisbane [p5637: line 48].

930 Opening submission by Seqwater, 11 March 2011 [p49: para 188].

931 Opening submission by Seqwater, 11 March 2011, Attachment 29.

932 Supplementary submission by Seqwater, 4 April 2011, Attachment 27.

933 Exhibit 410, Review of Seqwater Document 'January 2011 Flood Event' by Colin Apelt, 9 March 2011; Exhibit 412, Report of Leonard McDonald, 'Flood event of January 2011 – Wivenhoe Dam water releases – compliance with manual', 10 March 2011; Exhibit 413, Report of Greg Roads, 'Review of the operation of Wivenhoe and Somerset Dams during the Jan 2011 Flood Event', 9 March 2011; Exhibit 411, Report of Brian Shannon, 'Review of Dam Operations Brisbane River Floods – January 2011'.

934 The issue Mr McDonald identified related to the decision not to implement strategy W2. He noted, though, there was in that respect 'some ambiguity in the Manual requirements' (Exhibit 412, Report of Leonard McDonald, 'Flood event of January 2011 – Wivenhoe Dam water releases – compliance with manual', 10 March 2011 [p1, 9]). Mr Roads identified two possible minor deviations: taking forecast rainfall into account, there could have been a transition to W4 at 10.00 am on 11 January 2011; and the timing of gate closures on 12 January 2011. Mr Roads noted that these deviations 'may be due to a lack of clarity in the manual rather than non-compliance' (Exhibit 413, Report of Greg Roads, Review of the operation of Wivenhoe and Somerset Dams during the Jan 2011 Flood Event, 9 March 2011 [p4-5]).

935 Exhibit 407, WMA Water, *Report to the Queensland Flood Commission of Inquiry, Final Report*, May 2011 [p48: para 167].

936 Transcript, Peter Borrows, 10 February 2012, Brisbane [p5959: line 43].

937 Submissions were due to the Commission by 11 March 2011. Exhibit 1044, Email from Jim Pruss to various: 'Reports', 7 March 2011, 9:17 am.

938 Transcript, Leonard McDonald, 7 February 2012, Brisbane [p5557: lines 45-48].

939 Transcript, Greg Roads, 8 February 2012, Brisbane [p5753: line 53; p5754: line 28; p5755: lines 25-26]; Exhibit 1110, Greg Roads – teleconference notes, 9 February 2011.

940 Transcript, Leonard McDonald, 7 February 2012, Brisbane [p5560: lines 30-47]. See also Transcript, Brian Shannon, 9 February 2012, Brisbane [p5817: lines 17-25].

941 Transcript, Greg Roads, 9 February 2012, Brisbane [p5761: lines 10-12]; Transcript, Leonard McDonald, 7 February 2012, Brisbane [p5562: lines 33-34]; Transcript, Colin Apelt, 8 February 2012, Brisbane [p5731: line 58 – p5732: line 3].

942 Transcript, Leonard McDonald, 7 February 2012, Brisbane [p5560: lines 5-7]; Transcript, Colin Apelt, 8 February 2012, Brisbane [p5727: line 55 – p5728: line 10]. Transcript, Brian Shannon, 9 February 2012, Brisbane [p5819: lines 34-36]. Mr Roads said he accepted 'that as the water level fell over the line [the flood operations engineers] were automatically in W3, whether they liked it or not' (Transcript, Greg Roads, 9 February 2012, Brisbane [p5768: line 44-46]). In his report, Table 3.1 sets out 'the date and time when Seqwater transitioned into each strategy'. It shows that strategy W3 was engaged at 8.00 am on 8 January 2011 (Exhibit 413, Report of Greg Roads, Review of the operation of Wivenhoe and Somerset Dams during the Jan 2011 Flood Event, 9 March 2011 [p2-4].

943 Transcript, Leonard McDonald, 7 February 2012, Brisbane [p5560: line 5; p5562: line 9; p5568: lines 49-52]; Exhibit 412, Report of Leonard McDonald, Flood event of January 2011 – Wivenhoe Dam water releases – compliance with manual, 10 March 2011 [p2].

944 Transcript, Leonard McDonald, 7 February 2012, Brisbane [p5560: lines 22-48].

945 Closing submissions on behalf of Greg Roads, 15 February 2012.

946 Exhibit 1141, Transcript of interview with Ms Chloe De Marchi with exhibits and index attached; Transcript, Chloe De Marchi, 11 February 2012, Brisbane [p6039-6049]; Exhibit 1142, McGrath Nichol Report – Transmittal Letter, Excel Document TRS-LTR4 MG; Exhibit 1144, Letter from QFCI to Allens Arthur Robinson, 7 February 2012; Exhibit 1145, Email from Allens Arthur Robinson to QFCI, 8 February 2012, 10.13 am.

947 Transcript, Greg Roads, 9 February 2012, Brisbane [p5767: line 37 – p5768: line 8; p5772: lines 43, 55]; Transcript, Brian Shannon, 9 February 2012, Brisbane [p5819: line 45; p5823: line 16].

948 Exhibit 413, Report of Greg Roads, Review of the operation of Wivenhoe and Somerset Dams during the Jan 2011 Flood Event, 9 March 2011 [p2]; Transcript, Greg Roads, 9 February 2012, Brisbane [p5761: line 1; p5762: line 8; p5767: line 37 – p5768: line 8].

949 Transcript, Brian Shannon, 9 February 2012, Brisbane [p5823: line 20].

950 Transcript, Brian Shannon, 9 February 2012, Brisbane [p5817: lines 19-28; p5822: line 4].

951 Transcript, Colin Apelt, 8 February 2012, Brisbane [p5721: line 40 – p5722: line 5].

952 Transcript, Colin Apelt, 8 February 2012, Brisbane [p5727: line 12]; Exhibit 410, Review of Seqwater Document 'January 2011 Flood Event' by Colin Apelt, 9 March 2011 [p2].

953 Transcript, Leonard McDonald, 7 February 2012, Brisbane [p5560: lines 30-47].

954 Exhibit 412, Report of Leonard McDonald, Flood event of January 2011 – Wivenhoe Dam water releases – compliance with manual, 10 March 2011 [p2]. See also Transcript, Leonard McDonald, 7 February 2012, Brisbane [p5562: lines 8-18; p5571: line 12].

955 Transcript, Colin Apelt, 8 February 2012, Brisbane [p5724: line 50]; Transcript, Greg Roads, 9 February 2012, Brisbane [p5765: line 1]; Transcript, Brian Shannon, 9 February 2012, Brisbane [p5817: line 12].

956 Transcript, Brian Shannon, 9 February 2012, Brisbane [p5817: lines 3-37].

957 Transcript, Colin Apelt, 8 February 2012, Brisbane [p5724: line 50]; Transcript, Greg Roads, 9 February 2012, Brisbane [p5722: lines 18-35]

958 Transcript, Leonard McDonald, 7 February 2012, Brisbane [p5561: lines 51-55; p5562: lines 19-31]; Transcript, Colin Apelt, 8 February 2012, Brisbane [p5729: lines 27-42; p5731: lines 36-56]; Transcript, Brian Shannon, 9 February 2012, Brisbane [p5824: lines 1-13].

959 Transcript, Greg Roads, 9 February 2012, Brisbane [p5771: lines 50-57].

960 Closing submissions on behalf of Greg Roads, 15 February 2012.

961 Transcript, Leonard McDonald, 7 February 2012, Brisbane [p5569: line 1 – p5572: line 5]; Transcript, Colin Apelt, 8 February 2012, Brisbane [p5734: line 37 – p5737: line 21]; Transcript, Greg Roads, 9 February 2012, Brisbane [p5799: lines 15-48; p5804: line 43 – p5805: line 41]; Transcript, Brian Shannon, 9 February 2012, Brisbane [p5847: line 30 – p5848: line 19].

962 Other than those associated with W4.

963 See, for example, Transcript, Colin Apelt, 8 February 2012, Brisbane [p5728: lines 40-50].

964 See, for example, Transcript, Greg Roads, 9 February 2012, Brisbane [p5770: line 10; p5802: lines 23-42].

965 Transcript, Peter Borrows, 10 February 2012, Brisbane [p 5951: lines 19-27; p5959: line 39]; Transcript, James Pruss, 11 February 2012, Brisbane [p6055: line 53 – p6066: line 2]. See also Transcript, James Pruss, 11 February 2012, Brisbane [p6056: line 47 – p6057: line 5].

966 Exhibit 1084, Meeting invite, organised by Jim Pruss, with attendees, and agenda attached – Technical Report Discussion, 3 February 2011; Transcript, Colin Apelt, 8 February 2012, Brisbane [p5716: lines 11-42]; Transcript, James Pruss, 11 February 2012, Brisbane [p6053: lines 1-43]; Transcript, Robert Ayre, 11 February 2012, Brisbane [p6113: line 20].

967 Transcript, Colin Apelt, 8 February 2012, Brisbane [p5716: lines 11-39]. Mr Shannon said the same thing of a meeting he attended on 18 February 2011 (Transcript, Brian Shannon, 9 February 2012, Brisbane [p5818: line 20]).

968 Transcript, James Pruss, 11 February 212, Brisbane [p6053: lines 14-33]. Mr Pruss also said one of the purposes of the meetings about the report, held on 8 February 2011, 18 February 2011 and 21 February 2011, was to '[get] everybody who need[ed] to be involved up to speed' (Transcript, James Pruss, 11 February 2012, Brisbane [p6057: line 28]).

969 Exhibit 1085, Meeting invite, organised by Brooke Foxover with attendees, and agenda attached – Technical Report Discussion, 8 February 2011; Transcript, Colin Apelt, 8 February 2012, Brisbane [p5719: lines 17-34]; Transcript James Pruss, 11 February 2012, Brisbane [p6054: lines 25-55]. See also Transcript, Robert Ayre, 11 February 2012, Brisbane [p6113: line 34].

970 Transcript, Colin Apelt, 8 February 2012, Brisbane [p5719: lines 17-35].

971 Exhibit 1147, Handwritten notes of Robert Ayre, provided to QFCI in a letter dated 9 February 2012 [p3]; Transcript, Robert Ayre, 11 February 2012, Brisbane [p6110: line 48].

972 Transcript, Brian Shannon, 9 February 2012, Brisbane [p5825: line 55 – p5826: line 56].

973 Exhibit 1088, Email from Chloe Cross to John Tibaldi with 18 Feb Meeting notes attached, 21 February 2011, 8.26 am; Transcript, Brian Shannon, 9 February 2012, Brisbane [p5826: line 53].

974 Transcript, James Pruss, 11 February 2012, Brisbane [p6055: lines 3-33].

975 Exhibit 1103, Email from Brooke Foxover to Colin Apelt, 7 February 2011, 5.16 pm.

976 Transcript, Colin Apelt, 8 February 2012, Brisbane [p5717: lines 39-50]. In his reply to the email, Professor Apelt did not respond to the point.

977 Transcript, James Pruss, 11 February 2012, Brisbane [p6055: line 50].

978 Exhibit 1071, Email from Greg Roads to Terry Malone, 17 January 2011, 9.11 am; Transcript, Greg Roads, 9 February 2012, Brisbane [p5773: line 50 – p5774: line 29].

979 Hedley Thomas, *The Australian*, 'Water releases before deluge too low: engineer', 17 January 2011: www.theaustralian.com.au/national-affairs/water-releases-before-deluge-too-low-dam-expert/story-fn59niix-1225989066171.

980 Exhibit 1071, Email from Greg Roads to Terry Malone, 17 January 2011, 9.11 am.

981 Mr Maher was Seqwater's Principal Engineer, Dams and Weirs.

982 Queensland Floods Commission of Inquiry, *Interim Report*, 2011 [p86].

983 WMAwater, *Review of Hydraulic Modelling Final Report*, July 2011.

984 BMT WBM, Technical Review of Hydraulic Modelling Reports by WMA Water (28 July 2011) and SKM (5 August 2011) specifically as they relate to Ipswich City – Supplementary Report prepared for Ipswich City Council, September 2011; Fernvale and Surrounding Communities Action Group, Submissions concerning further questions for Mark Babister, 30 August 2011; Mr Michael J O'Brien, An Avoidable Disaster – Submission in response to Hydraulic Modelling Reports, 31 August 2011; Mid Brisbane Rivers Irrigators Incorporation, Response to WMA Report, undated; Seqwater, Response to Mr Babister's Report, 1 September 2011 (which included an additional response as an addendum: SKM, Comments on Review of Hydraulic Modelling Final Report prepared by WMAwater for Queensland Flood Commission of Inquiry July 2011, 25 August 2011); Seqwater, Further response to Mr Babister's hydrodynamic modelling report, 21 November 2011.

985 Exhibit 1124, WMAwater, Response to Submissions Relating to WMAwater Report: *Review of Hydraulic Modelling* for the Queensland Floods Commission of Inquiry, 18 November 2011; Exhibit 1126, WMAwater, *Response to Seqwater submission 'Further response to Mr Babister's hydrodynamic modelling report'* dated 21 November 2011, 28 November 2011.

986 Exhibit 1125, WMAwater, Modelling of Additional Dam Release Scenarios – Addendum to *Review of Hydraulic Modelling Final Report*, 18 November 2011.

987 Mr Michael J O'Brien, Review of Hydraulic Modelling, 23 November 2011; Mr Michael J O'Brien, Review of Hydraulic Modelling, 25 November 2011; Mr Michael J O'Brien, Review of Hydraulic Modelling, 10 December 2011.

988 Transcript, Brian Cooper, 8 February 2012, Brisbane [p5708: lines 16-37]; Transcript, Colin Apelt, 8 February 2012, Brisbane [p5734: lines 37-44].

989 The type of judgment call that is involved is explained by Emeritus Professor Apelt. See Transcript, Colin Apelt, 8 February 2012, Brisbane [p5728: lines 43-55].

990 Exhibit 1127, WMAwater, RE: Clarification of Scenario C and Additional Modelling, 3 February 2012.

991 Transcript, Mark Babister, 10 February 2012, Brisbane [p5889: line 22].

992 Calibrate (with respect to a hydrologic and hydraulic model) means the checking of values derived from the model against physical measurements. This is achieved by adjusting parameters, within an acceptable range and in a consistent manner to best fit the physical measurements. See Glossary.

993 As the model has only been calibrated to the January 2011 flood event, it is not suitable for use in modelling any other event: WMAwater, *Review of Hydraulic Modelling Final Report*, July 2011, section 4.10 [p23: para 56 (f)].

994 WMAwater, *Review of Hydraulic Modelling Final Report, July 2011*, section 4.10 [p22-23: para 56].

995 WMAwater, *Review of Hydraulic Modelling Final Report, July 2011*, section 4.10 [p21: para 52; p23: para 56(d)].

996 In this chapter, all references to metres are references to Australian Height Datum unless otherwise stated.

997 Exhibit 1126, WMAwater, *Response to Seqwater submission 'Further response to Mr Babister's hydrodynamic modelling report'* dated 21 November 2011, 28 November 2011 [p6-7: para 24]; Transcript, Mark Babister, Brisbane, 26 October 2011 [p4421: line 45]; Exhibit 883, WMAwater, *Brisbane River 2011 Flood Event – Flood Frequency Analysis Final Report*, September 2011 [p10-11: para 46-47].

998 Exhibit 883, Statement of Terrence Malone, 20 October 2011 [p10: para 45].

999 Transcript, Mark Babister, 26 October 2011, Brisbane [p4422: line 32]; Exhibit 1126, WMAwater, *Response to Seqwater submission 'Further response to Mr Babister's hydrodynamic modelling report'* dated 21 November 2011, 28 November 2011 [p7: para 25, 27].

1000 WMAwater did not conduct an independent review of Sinclair Knight Merz's modelling of cases 4 and 5 and suggested a slightly different approach to modelling case 3, which it did consider. (WMAwater, *Review of Hydraulic Modelling Final Report*, July 2011, section 5 [p26-28: para 62-64].) The Commission therefore is not in a position to make a finding as to the precise accuracy of the figures represented in the graph. However, the graph does provide a useful indication of the effect of the dams on the January 2011 flood.

1001 WMAwater, *Review of Hydraulic Modelling Final Report*, July 2011, section 1.3 [p2: para 8(a)].

1002 WMAwater, *Review of Hydraulic Modelling Final Report*, July 2011, section 4.10 [p22: para 56(a)].

1003 Exhibit 1124, WMAwater, Response to Submissions relating to WMAwater Report *Review of Hydraulic Modelling Final Report*, 18 November 2011 [p2: para 8].

1004 Exhibit 1124, WMAwater, Response to Submissions relating to WMAwater Report *Review of Hydraulic Modelling Final Report*, 18 November 2011 [p2: para 6].

1005 WMAwater, *Review of Hydraulic Modelling Final Report*, July 2011, section 1.3 [p3: para 8(d)]; section 5 [p24 -p31]; section 7 [p40: para 93]; Seqwater, Response to Mr Babister's Report, 1 September 2011, section 2.1 [p3]; Exhibit 1124, WMAwater Response to Submissions relating to WMAwater Report *Review of Hydraulic Modelling*, 18 November 2011 [p2-3: para 8-10].

1006 WMAwater, *Review of Hydraulic Modelling Final Report*, July 2011, section 7 [p40: para 93]; Seqwater, Response to Mr Babister's Report, 1 September 2011, Annexure C; Exhibit 1124, WMAwater, Response to Submissions relating to WMAwater Report *Review of Hydraulic Modelling*, 18 November 2011 [p16: para 71].

1007 WMAwater, *Review of Hydraulic Modelling Final Report*, July 2011, section 7 [p40: para 93]; Exhibit 1124, WMAwater Response to Submissions relating to WMAwater Report *Review of Hydraulic Modelling Final Report*, 18 November 2011 [p2: para 8].

1008 Seqwater, Response to Mr Babister's Report, 1 September 2011, Annexure C [p11: para 6]; Exhibit 1124, WMAwater Response to Submissions relating to WMAwater Report *Review of Hydraulic Modelling Final Report*, 18 November 2011 [p16: para 71].

1009 WMAwater, *Review of Hydraulic Modelling Final Report Final Report*, July 2011, section 7 [p40: para 93].

1010 WMAwater, *Review of Hydraulic Modelling Final Report Final Report*, July 2011, section 1.3 [p3: para 8(e)]; section 5 [p28-31].

1011 WMAwater, *Review of Hydraulic Modelling Final Report*, July 2011, section 1.3 [p3: para 8(e)]; section 5 [p28-31].

1012 WMAwater, *Review of Hydraulic Modelling Final Report*, July 2011, section 1.3 [p4: para 16]; section 7.1 [p42: para 103]; Exhibit 1124, WMAwater, Response to Submissions relating to WMAwater Report *Review of Hydraulic Modelling Final Report*, 18 November 2011 [p16: para 67], Transcript, Mark Babister, Brisbane, 10 February 2012 [p5900: line 17].

1013 WMAwater, *Review of Hydraulic Modelling Final Report*, July 2011, section 6, table 5 [p32: para 67].

1014 Queensland Floods Commission of Inquiry, *Interim Report*, 2011, section 2.5.3 [p55].

1015 Exhibit 1125, WMAwater, Modelling of Additional Dam Release Scenarios – Addendum to *Review of Hydraulic Modelling Final Report*, 18 November 2011 [p3: para 11; p5: para 18].

1016 Exhibit 1125, WMAwater, Modelling of Additional Dam Release Scenarios – Addendum to *Review of Hydraulic Modelling Final Report*, 18 November 2011 [p3: para 12; p5: para 19].

1017 WMAwater, *Review of Hydraulic Modelling Final Report*, July 2011, section 6 [p32: para 66(c)].

1018 Exhibit 1125, WMAwater, *Modelling of Additional Dam Release Scenarios*, 18 November 2011 [p3: para 7, 13].

1019 Exhibit 1125, WMAwater, *Modelling of Additional Dam Release Scenarios*, 18 November 2011 [p3: para 14].

1020 WMAwater, *Review of Hydraulic Modelling Final Report*, July 2011, section 6 [p32: para 66(d)].

1021 Exhibit 1127, WMAwater, RE: Clarification of Scenario C and Additional Modelling, 3 February 2012 [p5: para 11(i)].

1022 Exhibit 1127, WMAwater, RE: Clarification of Scenario C and Additional Modelling, 3 February 2012 [p5: para 11(i)].

1023 WMAwater, *Review of Hydraulic Modelling Final Report*, July 2011, section 6 [p32: para 66(e)].

1024 WMAwater, *Review of Hydraulic Modelling Final Report*, July 2011, section 7 [p41: para 98].

1025 WMAwater, *Review of Hydraulic Modelling Final Report*, July 2011, section 7 [p41: para 98].

1026 Queensland Floods Commission of Inquiry, *Interim Report*, 2011, section 2.5.4 [p57].

1027 GHD, which was commissioned by the Queensland Government to perform a rapid assessment of options to increase the flood mitigation of Wivenhoe Dam, also modelled the effect of lowering the full supply level of Wivenhoe Dam to 75 per cent under different scenarios (for example, raising the dam wall and changing the applicable operating strategies): see its 'Report for Investigation of options to increase the flood mitigation performance of Wivenhoe Dam', December 2011. That report was provided to the Commission by the Minister for Finance, Natural Resources and the Arts on 20 December 2011; its results were not able to be included in the process conducted for the modelling performed by Mr Babister.

1028 www.bom.gov.au/hydro/flood/qld/networks/section4.shtml.

1029 Exhibit 1126, WMAwater, *Response to Seqwater submission 'Further response to Mr Babister's hydrodynamic modelling report'* dated 21 November 2011, 28 November 2011 [p5: para 18].

1030 In a very late submission (dated 12 February 2012), DHI Water and Environment Pty Ltd contended that the scenarios did not fully exploit the flood mitigation capabilities of Wivenhoe Dam. However, what DHI was proposing involved operation of Wivenhoe Dam outside the rules of the Wivenhoe manual. In a later still submission, on 15 February 2012, Nadia Guterres, a Water Engineer employed by Cardno, said that her analysis, based on publicly available information, had reached much the same conclusion as Mr Babister.

1031 Transcript, Mark Babister, 10 February 2012, Brisbane [p5891: lines 4-11].

1032 Transcript, Mark Babister, 10 February 2012, Brisbane [p5891: lines 10-13].

1033 Exhibit 1127, WMAwater, Clarification of Scenario C and Additional Modelling, February 2012 [p10: para 23].

1034 Transcript, Mark Babister, 10 February 2012, Brisbane [p5891: lines 28-32].

1035 Transcript, Mark Babister, 10 February 2012, Brisbane [p5892: lines 19-22]. The submission of 12 February 2012 from DHI Water and Environment Pty Ltd said that it, as developer of the MIKE11 river and flood modelling software, had identified a number of issues in relation to how the model has been developed and applied that limited its predictive capabilities, adding to the uncertainty associated with the model results.

1036 Transcript, Mark Babister, 10 February 2012, Brisbane [p5892: lines 10-16].

1037 Transcript, Mark Babister, 10 February 2012, Brisbane [p5900: lines 20-30].

1038 Transcript, Gregory Roads, 9 February 2012, Brisbane [p5773: lines 29-42].

1039 Transcript, Mark Babister, 10 February 2012, Brisbane [p5891: line 44 – p5892: line 8].

1040 Transcript, Mark Babister, 10 February 2012, Brisbane [p5899: lines 50-57].

1041 Transcript, Mark Babister, 10 February 2012, Brisbane [p5897: line 25 – p5898: line 20].

1042 Transcript, Brian Shannon, 9 February 2012, Brisbane [p5833: line 40 – p5835: line 30].

1043 Transcript, John Tibaldi, 2 February 2012, Brisbane [p5086: lines 52-54].

1044 Transcript, Robert Ayre, 3 February 2012, Brisbane [p5214: line 27].