

**Statement of Thomas Fenwick dated 31
January 2012**

**IN THE MATTER OF
THE QUEENSLAND FLOODS COMMISSION OF INQUIRY**

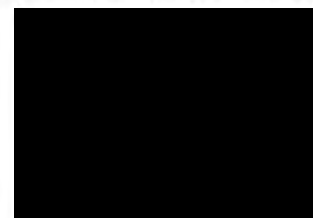
**A COMMISSION OF INQUIRY UNDER THE
COMMISSIONS OF INQUIRY ACT 1950**

**AND PURSUANT TO THE
COMMISSIONS OF INQUIRY ORDER (No. 1) 2011**

STATEMENT OF THOMAS DAVID FENWICK

On the 31st day of January 2012, I, **Thomas David Fenwick**, of C/- 240 Margaret Street, Brisbane, state on oath:


1. I am a member of the Board of the Queensland Bulk Water Supply Authority ("**Seqwater**").
2. This statement is provided to the Queensland Floods Commission of Inquiry pursuant to a "Requirement to Provide Statement" issued by the Commission dated 27 January 2012 (the *Requirement*).
3. The comments I make below relate only to the matters referred to in the Requirement, which I note relate only to the period 6 January 2011 to 2 March 2011.
4. During the period the subject of the requirement, I do not have a recollection of anyone suggesting to me that there was a possibility of non-compliance with the Manual.
5. In making the comment in the preceding paragraph, I have assumed that the Commission does not require me to outline my recollections of the numerous press reports which, almost immediately after the flood, suggested the flooding in Brisbane had resulted from poor management of Wivenhoe Dam. These press reports were discussed in a number of Board meetings I attended. However, my broad recollection of the discussions was that the issues raised in the press reports should be considered by Seqwater's technical staff. At no stage was it subsequently suggested to me during the period referred to in the Requirement that the consideration of those matters by Seqwater's technical staff had led to there being a possibility of non-compliance with the Manual.
6. The Requirement also requires me to outline any communications regarding a document sent by Mr Michael O'Brien. My recollection is that Mr O'Brien communicated with my fellow



Board member, Leeanne Bond. Peter Borrows sent me the correspondence Leeanne had received from Mr O'Brien. It is attached to this statement as Attachment TF1.

7. I do recall reading Mr O'Brien's document. I also remember reading a response document prepared by John Tibaldi, which I thought addressed the issues raised by Mr O'Brien. I believe that document is Attachment TF2 to this statement. At the time, it seemed to me to be a case of Mr O'Brien operating on incorrect information.
8. The only other discussion I recall regarding Mr O'Brien's document was a Board discussion as to the manner in which Seqwater should respond to Mr O'Brien. My recollection is that the Board decided not to engage directly with Mr O'Brien given the announcement of this Commission.

SWORN by Thomas David Fenwick on 31 January 2012 at Brisbane in the presence of:


Deponent


Solicitor

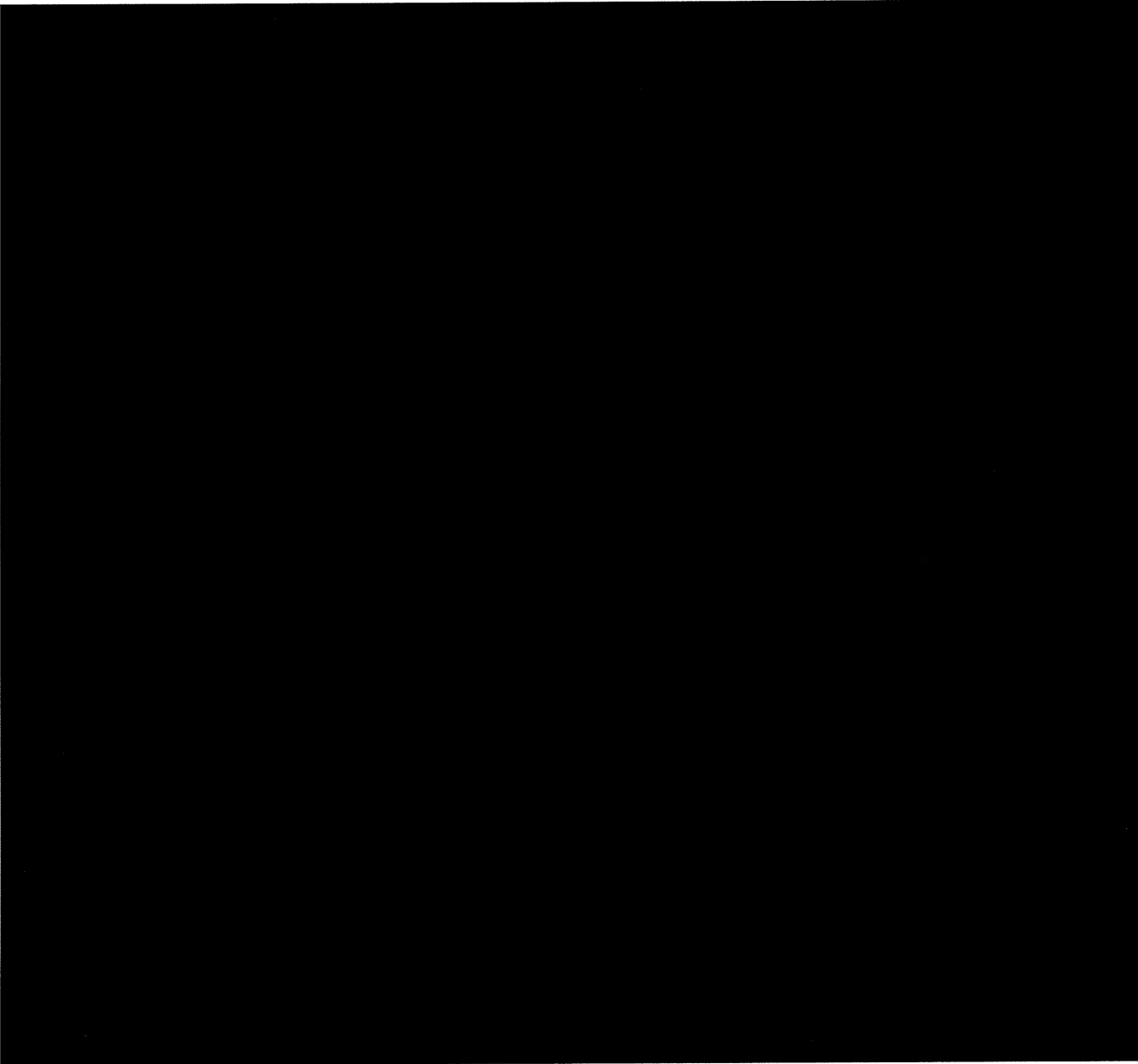
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**STATEMENT OF THOMAS DAVID FENWICK
INDEX OF ANNEXURES**

Annexure No.	Document	Date
TF1	Correspondence from Peter Burrows to Thomas Fenwick	17 February 2011
TF2	Response documents - John Tibaldi	January 2011

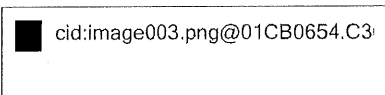


From: Peter Borrows
Sent: Monday, 17 January 2011 12:58 PM
To: Tom Fenwick
Subject: FW: Brisbane Flooding

As discussed Tom.

Regards, Peter.

Peter Borrows
Chief Executive Officer
Queensland Bulk Water Supply Authority *trading as Seqwater*



Ph 
Level 3, 240 Margaret St, Brisbane City QLD 4000

PO Box 16146, City East QLD 4002
Website | www.seqwater.com.au

cid:image008.png@01CB8736.F84905B0

From: Peter Borrows
Sent: Monday, 17 January 2011 11:15 AM
To: Duty Seq; John Tibaldi; Rob Drury
Cc: 'barry.dennier'; Peter Borrows
Subject: FW: Brisbane Flooding

John R, as discussed.

Regards, Peter.

Peter Borrows
Chief Executive Officer
Queensland Bulk Water Supply Authority *trading as Seqwater*

cid:image003.png@01CB0654.C3

PH
Level 3, 240 Margaret St, Brisbane City QLD 4000
PO Box 16146, City East QLD 4002
Website | www.seqwater.com.au

cid:image008.png@01CB8736.F84905B0

From: Hennessy, Phil A
Sent: Monday, 17 January 2011 10:55 AM
To: Peter Borrows
Subject: Fwd: Brisbane Flooding

Can you confirm our people are using the latest data

Phil Hennessy

Begin forwarded message:

From: "Leeanne Bond"
Date: 17 January 2011 10:41:55 AM GMT+10:00
To: "Peter Borrows" <phennessy>
Subject: FW: Brisbane Flooding
Reply-To: <lbond>

I rang Mick and asked if there had been another email that I missed as the newspaper article indicated that he had worked the weekend on it. He said he had updated his documents with more accurate references and he has now sent me the same version that he sent Hedley Thomas. He has also given me the backup data he used to reach his conclusion.

He said he is very angry as he believes that Brisbane would not have been flooded if action was

taken to increase releases on Sunday when the met data said there would be substantial rainfall. This is his key point.

He says releases should have been 300,000ML per day on Sunday, Monday and Tuesday and that would have allowed water to get away before the Lockyer waters reached Brisbane and flooding to be more like current inundation levels. He says even on Tuesday morning releases were only 212,000 indicating a slow response to the situation. that meant on Tuesday afternoon there was a sudden increase which caused the widespread flooding.

He is happy to talk to Seowater and I can give you his contact details (mobile [REDACTED] email [mick.obrien@\[REDACTED\]](mailto:mick.obrien@[REDACTED]) I've told him there are lots of operational issues (water treatment, buildings etc) so you might not get back to him straight away.

Leeanne Bond
Director
Breakthrough Energy Pty Ltd
PO Box 225, Wilston Qld 4051
Phone: [REDACTED]
mobile: [REDACTED]

From: [mick.obrien@\[REDACTED\]](mailto:mick.obrien@[REDACTED]) **On Behalf Of** Mick O'Brien
Sent: Monday, 17 January 2011 10:22 AM
To: Leeanne Bond
Subject: Brisbane Flooding

Leeanne, attached is an updated version of the paper that I sent through to you - called Rev 1A - Hedley Thomas has this.

A spreadsheet called Release, which is the data I collated from the web sites on the weekend so that I could confirm the release rates that I had pulled from newspapers.

And then a third spreadsheet which contains all the data plus some workings.

Thanks

Mick

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What went on in Brisbane?

Was this a natural disaster or a manmade disaster?

First a bit of a disclaimer – I am new to some of this river data and may not have interpreted it all correctly.

First a bit of background: -

- Somerset Dam has a Water Storage capacity of 379,849ML with an additional 524,000ML for flood storage. The dam is rated as 100% full when all the water storage capacity is full. Therefore when both the water storage capacity and flood storage are fully utilised, the dam would be at 238%.
- Wivenhoe has a Water Storage capacity of 1,165,238ML with an additional 1,450,000ML for flood storage. Similarly when both the water storage capacity and flood storage are fully utilised, the dam would be at 224%.
- Somerset is upstream of Wivenhoe and flood flows from Somerset are discharged into Wivenhoe.
- There is a river height monitor at Wivenhoe Dam: -Station Number: 540177 Name: Brisbane R at Wivenhoe Dam Hw # Owner: SEQWCO:143822

SEQWater operate a web site which gives levels in all dams, including Somerset and Wivenhoe; but interestingly, levels for Wivenhoe and Somerset were not updated between 08:00 11th ~~February~~ January and 09:00 13th ~~February~~ January during the peak of the emergency. Historical data now shown for this period on the SEQWater web site does not show any peak during this period and so are obviously incorrect.

I have therefore used the Wivenhoe Dam river height monitor as a proxy for the dam level during this period. There are some interesting disconnects between the river level data and the reported water levels in Wivenhoe: -

Information from media reports had Wivenhoe at a peak of 191% overnight for the night of 11th/12th; but generally at 190% through most of the emergency period.

The river height shows a height of 73.77m at the time SEQWater were reporting a Wivenhoe capacity of 175.9%. The river experienced a minor peak of 74.51m commencing at 14:57m Tue 11th falling substantially (to 74.19m around 17:45 Tue 11th) until peaking again at 74.85m between 18:00 and 19:23 on Wed 12th (compared to a reported peak in Wivenhoe during the night of 11th/12th). The river level fell gradually, and has continued to fall, from this peak.

The sequence of events for the current flooding event seems to be: -

- 06:30 Tue 04th, Wivenhoe first went above 100% (i.e. using the flood storage capacity).
- Wivenhoe was at 106.3% at 06:00 on Fri 7th; but there are no reported heights for Sat 8th or Sun 9th.
- Wivenhoe continued to rise, and at 09:00 on Mon 10th it was at 148.4% and it was reported that “managers scrambled to increase the release from 116,000ML to 170,000ML per day.
- At 0800/0900 Tue 11th Wivenhoe was at 175.9%, Somerset at 160.8%; total available capacity for flood storage in both dams stood at 858,642ML. This is the last available data from SEQWater. At this stage the River height at the dam was 73.77m.
- The river (and by assumption the Wivenhoe dam) continued to rise over the next six hours and reached an interim peak of 74.51m at 14:57 Tue 11th.

- At this time the river level started to fall quickly to 74.19m around 17:45 Tue 11th
- Media reports indicate that the discharge from Wivenhoe was increased from 344,000ML/d through 490,000ML/d (both reported by the Courier Mail) to an overnight peak of 645,000ML/d (reported in a media release by the Queensland Police Service).
- SEQWater reported that at 0730 on Wed 12th the releases from Wivenhoe were reduced temporarily to 215,000ML/d to allow Lockyer Creek peak to enter Brisbane River and would subsequently be increased to maintain a maximum flow through Moggill of 301,000ML/d.

Some additional data: -

- SEQWater report that there is a delay of approximately 36 hours between a release at Wivenhoe and a peak at the Brisbane City Gauge.
- It is likely that the rapid drop in the river level at Wivenhoe commencing around 14:57 Tue 11th was due to a substantial increase in the discharge rate from Wivenhoe (645,000ML/d?).
- At around the same time, 16:03 on Tue 11th the Courier Mail reported that Wivenhoe was at 190% and Somerset at 176%, indicating a total capacity for additional flood storage of 636,000ML.
- 36 hours from 14:57 Tue 11th is 02:57 Thu 13th which corresponds almost identically with the peak of 4.46m experienced at the Brisbane City Gauge.

Now for an attempt at interpretation of this sequence: -

- SEQWater were very slow to respond to the initial increase in levels at Wivenhoe and took 6 days before there was any real increase in rate of release from Wivenhoe to return the dam to proper flood management levels. Even though there is apparently a legislated requirement to manage this over 7 days.
- SEQWater then substantially over responded during the afternoon of Tue 11th increasing the discharge to 645,000ML/d(?). This was at a much higher rate than the current water inflows, resulting in a substantial drop in the level in Wivenhoe. This was even though there was approximately 636,000ML of capacity available for additional flood storage in Wivenhoe and Somerset.
- This substantial increase in the discharge from Wivenhoe was the cause (sole cause?) of the peak in the Brisbane River.
- Early on Wed 12th (07:30), SEQWater recognised that this discharge rate was excessive and reduced it substantially to 215,000ML/d. This discharge rate has been sufficient to ensure that the river level at Wivenhoe (and presumably the dam) did not continue to increase and indeed has allowed the level to gradually fall.
- Hindsight is a wonderful thing; but there are really two decisions that were taken which would seem to have little justification at the time they were made. These are: -
 - Not increasing releases from Wivenhoe between the 4th and the 10th when the dam levels were rising and there was no downstream flooding, and
 - The decision to substantially increase the discharge rate from Wivenhoe to a peak of 645,000ML/d on the afternoon/night Tue 11th.
- It is difficult to understand the justification for this increase in the discharge rate, especially as the decision was substantially reversed within about 12 hrs. In addition even if SEQWater had released at the low rate of 215,000ML/d (which is the rate it was reduced to at 07:30 Wed) rather than a maximum rate of 645,000ML/d for the whole time from 14:57 on Tues it would have used only 306,000ML of the available free capacity in both dams of apparently 859,000ML.

The serious questions are: -

- Why did SEQWater not allow the total available flood storage capacity of Wivenhoe to be utilised during this period?
- What justification was there for the substantial increase in discharge from Wivenhoe to 645,000ML/d when a release rate of 215,000ML/d has been demonstrably sufficient to stop the levels in Wivenhoe rising and while there remained substantial capacity in Wivenhoe for additional flood storage?
- Was this increase to 645,000ML/d the sole reason for the significant flooding in Brisbane?
- Why did it initially take SEQWater 6 days to respond to the gradually increasing water levels in Wivenhoe which reduced its flood control capacity?

Rev 1A Mick O'Brien 14th-16th January 2011

Wivenhoe Somerset					Wivenhoe	Somerset	
6/01/2011				Releases commenced during the evening of the 6th	Through Regulator Valve	Gate Operations will be required	Water is being released into Wivenhoe through a regulator valve
7/01/2011					Through Regulator Valve		Water is being released into Wivenhoe through a regulator valve. Release may be increased to utilise sluice gates later today or over the weekend
8/01/2011				Expected to reach 100,000ML/d by afternoon	Through one gate	At Wivenhoe Dam, all five gates are now open. Releases are expected to reach around 100,000 megalitres a day by this afternoon.	Water from Somerset Dam is being released into Wivenhoe Dam through one gate
9/01/2011				116,000ML/d	Through sluice gates	At Wivenhoe Dam, releases commenced during the evening of Thursday 6 January 2011, with all five gates opened by Saturday 8 January 2011. Releases have reached around 116,000	Water from Somerset Dam is being released into Wivenhoe Dam through the sluice gates.
10/01/2011	AM	154	158	172000	Through sluice gates	releases from the dam have been increased today from 116,000 megalitres per day to 172,000 megalitres per day	Water from Somerset Dam is being released into Wivenhoe Dam through the sluice gates
10/01/2011	PM	>140	>150		Through sluice gates	releases from the dam have been increased today from 116,000 megalitres per day to 170,000 megalitres per day	Water from Somerset Dam is being released into Wivenhoe Dam through the sluice gates
11/01/2011	AM	173	160	236,000 increased to 490,000 with peak of 645,000ML/d		Controlled releases through the five gates have been held at around 236,000 megalitres since early last night but will need to be increased further today	
11/01/2011	PM	190	176			Controlled releases through Wivenhoe's five radial gates have now been increased to around 490,000 megalitres per day	
12/01/2011	AM	190	190	205,000		Wivenhoe's five radial gates are currently releasing 205,000 megalitres per day, down from 370,000 megalitres and an overnight peak of 645,000 megalitres. After the expected downstream peak in the lower Brisbane River has passed, releases will need to be increased to 301,000 megalitres per day	
12/01/2011	PM	189	186	215000	123000	Wivenhoe's five radial gates continue to release 215,000 megalitres per day. This is considerably down from an overnight peak of 645,000 megalitres	discharging 123,000 megalitres per day into Wivenhoe Dam via a sluice gate
13/01/2011	8:30	187	174	215000	121000	Wivenhoe Dam is at 187 per cent, and is dropping gradually with controlled releases through all five gates of 215,000 megalitres per day	inflows of 121,000 megalitres per day via a sluice gate from Somerset Dam
13/01/2011	17:30	186	167	228000	120000	with controlled releases through all five gates of 228,000 megalitres per day	120,000 megalitres per day via a sluice gate from Somerset Dam
14/01/2011	8:00	179	151	301000	118000	Releases have been graduated to 301,000 megalitres per day in a 7 day strategy designed to draw down the flood storage compartment with no noticeable effects downstream	111,800 megalitres per day being released into Wivenhoe via the sluice gates
14/01/2011	16:00						
14/01/2011	18:00	172	140	301000	111800	Releases have been graduated to 301,000 megalitres per day in a 7 day strategy designed	dropping steadily with 111,800 megalitres per day
15/01/2011	15:30						
15/01/2011	9:30	163	129	301000	79000	Releases continue at around 301,000 megalitres per day	about 79,000 megalitres per day being released into Wivenhoe via the sluice gates
15/01/2011	18:00	154	121	301000	79000	Releases continue at around 301,000 megalitres per day	with about 79,000 megalitres per day being released into Wivenhoe via the sluice gates

Date & Time	Wivenhoe Capacity		Somerset Capacity		Release Rate		Comment	Sources
	ML	%	ML	%	Wivenhoe ML/d	Somerset ML/d		
Fri 31-Dec-10		112.7%		100.0%	No Report	No Report		www.seqwater.com.au/public/dam-levels
Sat 01-Jan-11					No Report	No Report	No dam level reports available on SEQWater site	
Sun 02-Jan-11					No Report	No Report	No dam level reports available on SEQWater site	
Mon 03-Jan-11					No Report	No Report	No dam level reports available on SEQWater site	
Tue 04-Jan-11		102.1%		102.9%	No Report	No Report		www.seqwater.com.au/public/dam-levels
Wed 05-Jan-11		102.4%		103.2%	No Report	No Report		www.seqwater.com.au/public/dam-levels
Thu 06-Jan-11		103.2%		103.8%	Releases commenced during the evening of the 6th			www.seqwater.com.au/public/dam-levels
Fri 07-Jan-11		106.3%		107.2%	No Report	Through Regulator Valve		www.seqwater.com.au/public/dam-levels
Sat 08-Jan-11					Expected to reach 100,000ML/d by afternoon		No dam level reports available on SEQWater site	www.watergrid.com.au
Sun 09-Jan-11					116,000	Through sluice gates	No dam level reports available on SEQWater site	www.watergrid.com.au
Mon 10-Jan-11		148.4%		154.7%	116,000 increased to 172,000	Through sluice gates		www.watergrid.com.au
Tue 11-Jan-11		175.9%		160.0%	236000 increased to 490,000 with a peak of 645,000 overnight	No Report		www.seqwater.com.au/public/dam-levels
Wed 12-Jan-11		188.5%		189.7%	215,000	No Report		www.watergrid.com.au
Thu 13-Jan-11	2172604	186.5%	651026	171.4%	228,000	123,000		www.seqwater.com.au/public/dam-levels
Fri 14-Jan-11	2085584	179.0%	559552	147.3%	301,000	111,800		www.seqwater.com.au/public/dam-levels
Sat 15-Jan-11		163.0%		129.0%	301,000	79,000		www.watergrid.com.au
Sun 16-Jan-11							No reports from either SEQWater or WaterGrid	www.watergrid.com.au

Dam	Water Storage Capacity (ML)	Flood Storage Capacity (ML)	Total Capacity (%)
Somerset	379849	524000	237.9%
Wivenhoe	1165238	1450000	224.4%

JANUARY 2011 FLOOD EVENT QUESTIONS AND ANSWERS

Why did Seqwater not allow the total available flood storage capacity of Wivenhoe to be utilised during this period?

- Wivenhoe Dam is not designed to overtop. If it did, the dam would fail and the resulting damage and loss of life would be at least 100 to 1,000 times greater than that currently being experienced.
- To ensure that this never occurs, the dam has been designed with fuse plugs that automatically open when it reaches more than 200% of full supply volume.
- Once triggered, the rate of release through these plugs cannot be varied.
- The plugs continue to release water at this rate until the dam reaches full supply level.
- The fuse plugs would take four to six months of dry weather to repair, and severely restrict the capability to manage further flood events during this period.
- Flood operations were managed to ensure a buffer below 200% to allow for possibilities of further extensive inflows to ensure that the dam does not fail.

What justification was there for the substantial increase in discharge from Wivenhoe to 645,000ML/d when a release rate of 215,000ML/d has been demonstrably sufficient to stop the levels in Wivenhoe rising and while there remained substantial capacity in Wivenhoe for additional flood storage?

At the peak of the event a discharge rate of 215,000ML/d would not have been sufficient to stop the levels in Wivenhoe rising.

The reasons why the remaining flood storage capacity in Wivenhoe Dam was not used at the peak of the event are contained in the answer to the previous question.

Was this increase to 645,000ML/d the sole reason for the significant flooding in Brisbane?

The Bureau of Meteorology has stated that, even at their peak, outflows from Wivenhoe Dam contributed slightly more than half the flood arriving in Brisbane (Courier Mail, 14 January). Seqwater agrees with this assessment.

Based on the fact that the current event was one meter lower than the 1974 event, BOM and Seqwater have agreed that the flow in the Lower Brisbane River at the peak of the event was in the order of 690,000ML/d. Accordingly outflows from Wivenhoe Dam contributed around 350,000ML/d to the total flow at this time. The difference between this flow and the peak outflow from Wivenhoe Dam during the event is due to attenuation effects along the length of the river as would be expected in such an event.

Why did it initially take SEQWater 6 days to respond to the gradually increasing water levels in Wivenhoe which reduced its flood control capacity?

Seqwater responded immediately to increases in storage level by commencing releases from Wivenhoe Dam at the commencement of the flood event. When managing a flood event using Wivenhoe Dam, the primary objectives in order of importance are:

- 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. Primarily this involves minimising inundation of the seven bridges below the dam upstream of Moggill.

The most recent four flood events (commencing October 2011), demonstrate the importance of following these objective to minimise overall downstream flood impacts.

Why did Seqwater permit the flood storage capacity to build up so much over the weekend?

Seqwater commenced releases from Wivenhoe Dam at the start of the flood event on 7 January 2011. When managing a flood event using Wivenhoe Dam, the primary objectives in order of importance are:

- 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. Primarily this involves minimising inundation of the seven bridges below the dam upstream of Moggill.

The most recent four flood events (commencing October 2011), demonstrate the importance of following these objective to minimise overall downstream flood impacts.

Why did Seqwater not release significantly greater volumes on Friday, Saturday and Sunday, prior to the freak rainfall event on Monday over the Toowoomba escarpment?

No agency or person was able to forecast the freak rainfall event on Monday over the Toowoomba escarpment prior to it occurring. Therefore it was not possible to ramp up releases to cater for this freak event before it actually occurred.

What does Seqwater say to the suggestion that its strategy to limit the releases on the weekend meant its storage buffer was limited, necessitating a massive outflow on Tuesday of 645,000 megalitres?

The peak outflow that occurred for three hours of 645,000 ML/d (total volume of 80,625 megalitres) does not reflect the impact at Brisbane due to the attenuation effects of the river. The Bureau of Meteorology has stated that, even at their peak, outflows from Wivenhoe Dam contributed slightly more than half the flood arriving in Brisbane (Courier Mail, 14 January). Seqwater agrees with this assessment.

Based on the fact that the current event was one meter lower than the 1974 event, BOM and Seqwater have agreed that the flow in the Lower Brisbane River at the peak of the event was in the order of 690,000ML/d. Accordingly outflows from Wivenhoe Dam contributed around 350,000ML/d to the total flow at this time. The difference between this flow and the peak outflow from Wivenhoe Dam during the event is due to attenuation effects along the length of the river as would be expected in such an event.

What does Seqwater say to the suggestion that this 645,000 megalitres release was responsible for more than 80 per cent of the peak flow rate (which you advised me last Friday was about 9000 cubic metres per second in Brisbane)?

The Bureau of Meteorology has stated that, even at their peak, outflows from Wivenhoe Dam contributed slightly more than half the flood arriving in Brisbane (Courier Mail, 14 January). Seqwater agrees with this assessment.

Based on the fact that the current event was one meter lower than the 1974 event, BOM and Seqwater have agreed that the flow in the Lower Brisbane River at the peak of the event was in the order of 690,000ML/d. Accordingly outflows from Wivenhoe Dam contributed around 350,000ML/d to the total flow at this time. The difference between this flow and the peak outflow from Wivenhoe Dam during the event is due to attenuation effects along the length of the river as would be expected in such an event.

What does Seqwater say to the suggestion that its delay in responding to the increasing water levels at Wivenhoe forced its management to take rash action on Tuesday, which produced the flood in Brisbane?

No rash action was taken at any time during the flood event in managing releases from Wivenhoe Dam. Wivenhoe dam reduced flood levels in Brisbane by up to 2.5 metres in Brisbane city and a metre from the BOM peak flood level forecast. This was achieved by following carefully considered objectives and procedures.

Seqwater commenced releases from Wivenhoe Dam at the start of the flood event on 7 January 2011. When managing a flood event using Wivenhoe Dam, the primary objectives in order of importance are:

- 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. Primarily this involves minimising inundation of the seven bridges below the dam upstream of Moggill.

The most recent four flood events (commencing October 2011), demonstrate the importance of following these objective to minimise overall downstream flood impacts.