

IN THE MATTER OF
THE QUEENSLAND FLOODS COMMISSION Exhibit Number: _____

A COMMISSION OF INQUIRY UNDER THE
COMMISSIONS OF INQUIRY ACT 1950

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

SECOND STATEMENT OF TERRENCE ALWYN MALONE

On the 11th day of April 2011, I, Terrence Alwyn Malone of 240 Margaret St, state on oath:

1. I am employed by Queensland Bulk Water Supply Authority (*Seqwater*) in the position of Principal Hydrologist, Water Delivery.

Impact of increased releases on Sunday, 9 January 2011

2. I am aware of a suggestion that if Wivenhoe releases were increased to 3,000m³/s at midnight on Sunday, 9 January 2011 the peak of the flood in the lower Brisbane River (Moggill) would have been significantly lower.
3. I have since undertaken a modelling analysis to investigate this suggestion and I make the following comments:
 - (a) A gauging or flow measurement was undertaken by a joint Seqwater and Department of Environment and Resource Management hydrographic team on the evening of 12 January 2011 from Jindalee Bridge, just downstream of Moggill. In practice, the peak flow at Jindalee is the same as that at Moggill. The flow measured at this location around the peak of the event was about 9,800m³/s.
 - (b) A hydrologic model of the catchment adopting the Wivenhoe actual release hydrograph gives 9,300m³/s at Jindalee, which is reasonably consistent with the magnitude and timing of the measured peak.
 - (c) For modelling purposes, the outflow from Wivenhoe Dam was modified as indicated in the graph below. Releases were increased from 1,450m³/s at 0900 Sunday, 9 January 2011 to 3,000m³/s at 0000 Monday, 10 January 2011 and continued to be increased until 1500 Tuesday, 11 January 2011. I note that these releases would be contrary to the manual but they have been adopted for modelling purposes.

Filed on behalf of: Queensland Bulk Water Supply Authority trading as Seqwater

Allens Arthur Robinson
Lawyers
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Brisbane QLD 4000

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Ref MGI:120128021

mgib A0117175214v1 120128021



- (d) Under this scenario, at 1500 Tuesday, 11 January 2011 the water level in the dam would have reached EL 74.0m AHD and strategy W4 would have been invoked. Under the current manual, releases would then have been increased up to 5,000m³/s, at which time the modelling shows that water levels would have stabilised.
- (e) The release strategy would then have reverted to that adopted during the January 2011 flood event.
- (f) The modelled release of water from Wivenhoe dam is shown in Figure 1. The reduction in peak discharge from Wivenhoe dam is apparent by comparing the peak of the solid blue line (which is the actual release during the 2011 flood event) with the peak of the dotted blue line (which is the modelled scenario I have outlined above). The volume under the solid blue and dotted blue lines is the same (that is, 2,650,000ML).

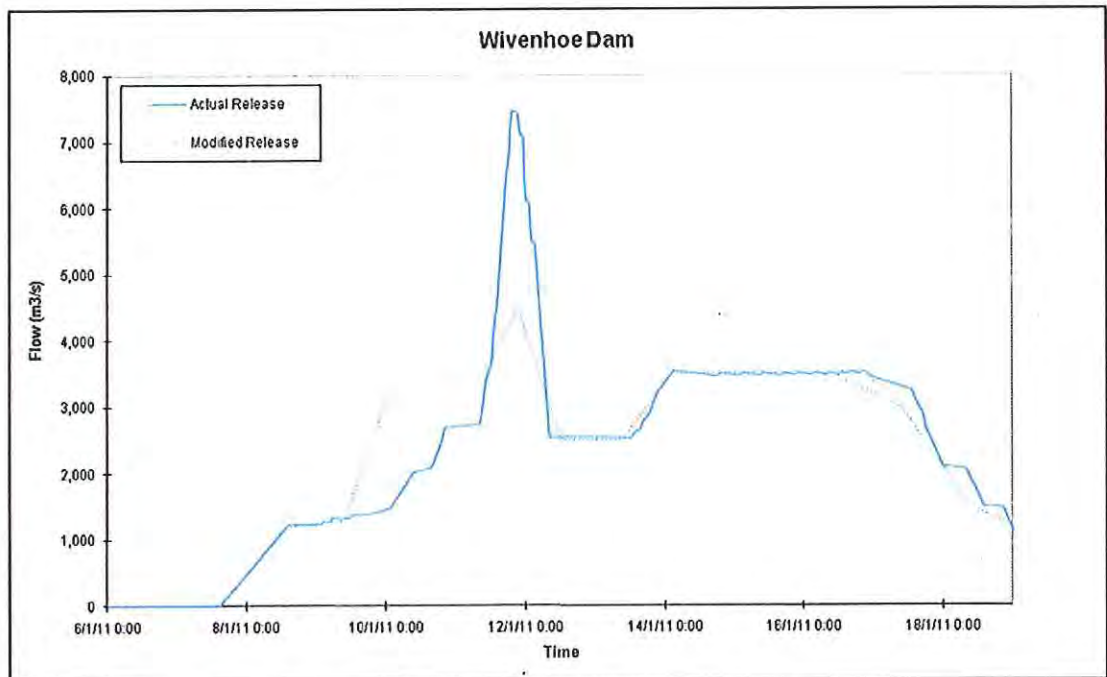


Figure 1

- (g) The modelled impact of this modified release strategy upon the flow at Moggill is shown in Figure 2. I note that the reduction in peak flow is only small, but the onset of damaging flows of 4,000m³/s as set out in the manual is earlier and lasts for about 12 hours longer.

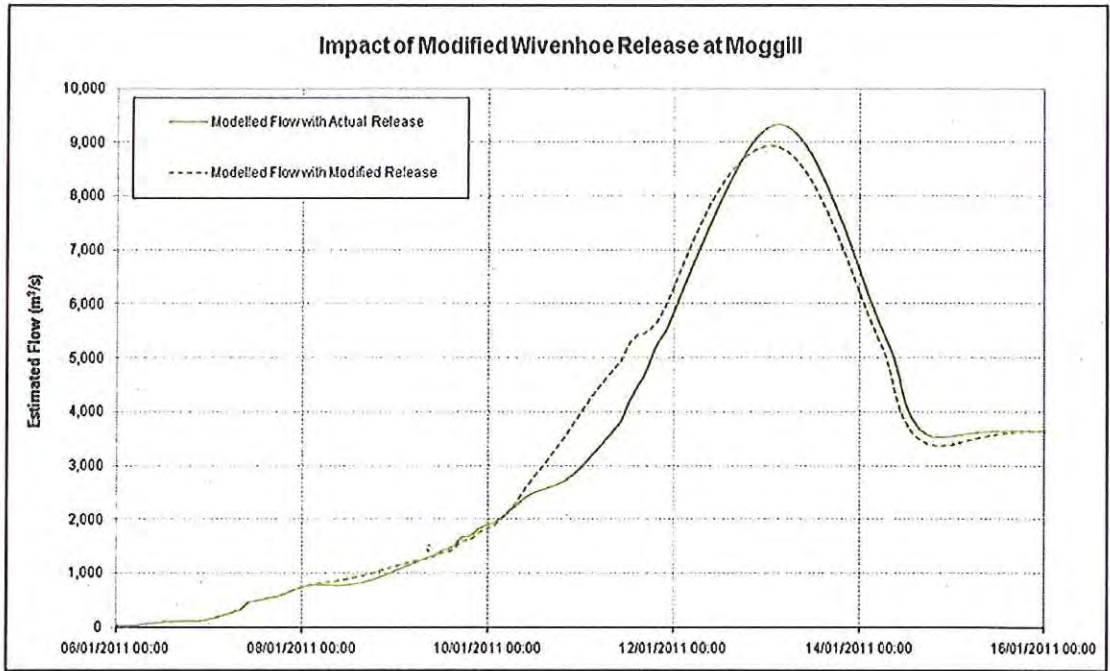


Figure 2

(h) Figure 3 below shows that the modelled impact of releasing earlier from Wivenhoe dam as has been suggested would have had minimal impact on the peak height at the Brisbane Port Office gauge.

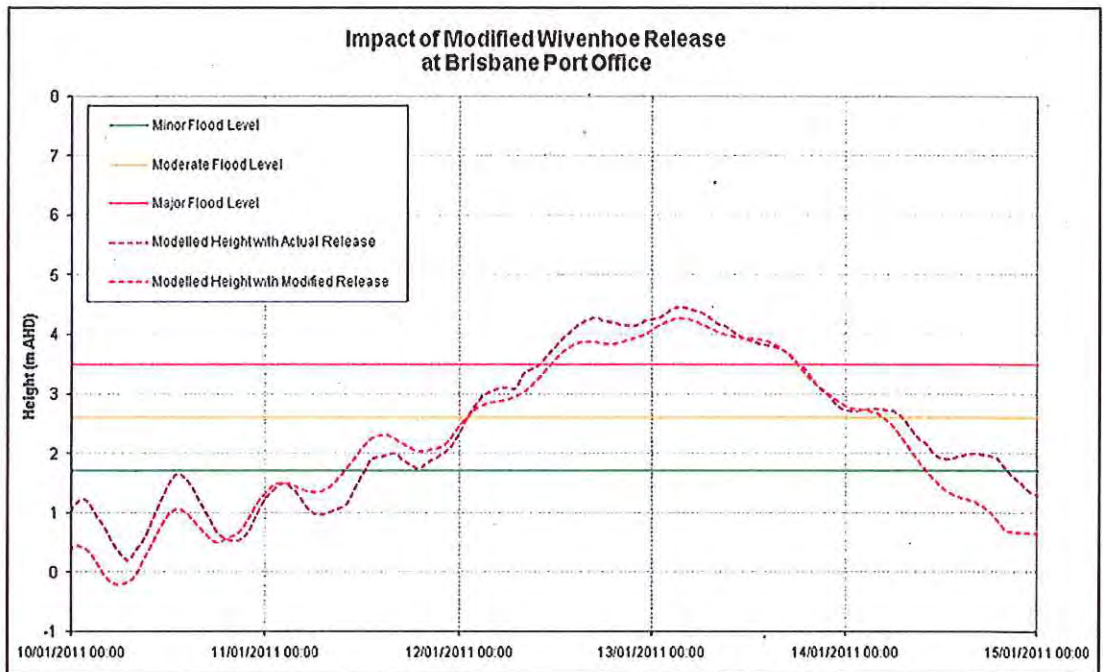


Figure 3

- (i) It should be noted that these results are based upon a hydrologic model, when a hydrodynamic model would be more appropriate and expected to give more accurate results. I do not have a working hydrodynamic model but Seqwater have commissioned SKM to get the Hydrodynamic model used by the Wivenhoe Alliance Spillway Augmentation Study working. However, the results are indicative of the relative impact of the suggested change in the release strategy.
- (j) Even though the Wivenhoe Dam peak release may have been reduced from 7,500m³/s to under 5,000m³/s under the early release suggestion, the impact in the lower Brisbane River (Moggill) is minimal. This is largely due to the interaction between the main river channel and its adjacent floodplain at several locations along the river between Wivenhoe Dam and Brisbane. This behaviour is driven as much by flood volumes as flood peaks. In the case of the early release strategy, flood volumes do not change. The flood peaks of the Lockyer River, Bremer River and local area runoff remains unchanged under the early release suggestion, hence the minimal impact in the lower reaches.

Impact if Wivenhoe dam started the January 2011 Flood Event at 75% of Full Supply Level

- 4. I am also aware of a suggestion that if the level in Wivenhoe Dam was at 75% of Full Supply Level (EL 64m AHD) at the commencement of the January 2011 Flood Event, then the peak of the flood in the lower Brisbane River (Moggill) would have been significantly lower.
- 5. I deal with this suggestion below:
 - (a) At 75% capacity, equivalent to about EL 64m AHD, Wivenhoe Dam has about 290,000ML to the Full Supply Level of EL 67.0m AHD and an additional 28,000ML before reaching the gate trigger level of EL 67.25m AHD, making a total deficit of 318,000ML. It should be noted that this volume deficit is only 12% of the total volume of the inflow to Wivenhoe Dam during the January 2011 flood.
 - (b) Modelling of inflows to the dam shows that this deficit would have been filled and gate trigger level reached on early Sunday morning without any releases up to this time.
 - (c) From this point releases would have been made in accordance with the Manual. Releases would have been increased up to 1,500 m³/s late Sunday night and thereafter would have followed a similar pattern to the actual releases up to 1400 Tuesday 11th January 2011.

- (d) At this point in time, the water level in the dam would have reached EL 74.0m AHD and strategy W4 would have been invoked. Releases would then have been increased until water levels stabilised, which the modelling shows would have occurred at a peak flow of 6,500 m³/s. Peak height in Wivenhoe Dam may have been lower by about 0.7m.
- (e) The release strategy would then have reverted to that adopted during the event.
- (f) The outflow from Wivenhoe dam for this scenario would have been as indicated in Figure 4 below. The solid blue line is actual releases and the dotted blue line is the modelled releases under the scenario I have explained. The volume under the solid blue and dotted blue lines is the same (that is, 2,650,000ML).

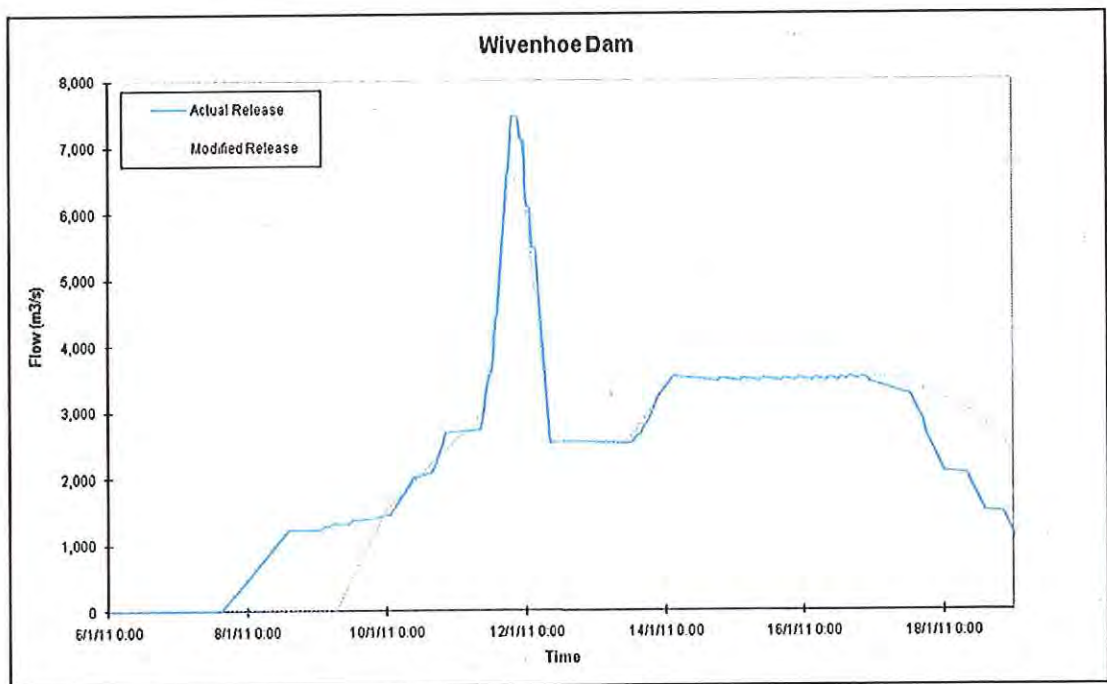


Figure 4

- (g) The modelled impact of this modified release strategy is shown in Figure 5. The modelled reduction in peak flow at Moggill is very small. The reduction in starting level only impacts the low flows between 8th and 11th January. After this point, the hydrograph at Moggill is virtually the same.

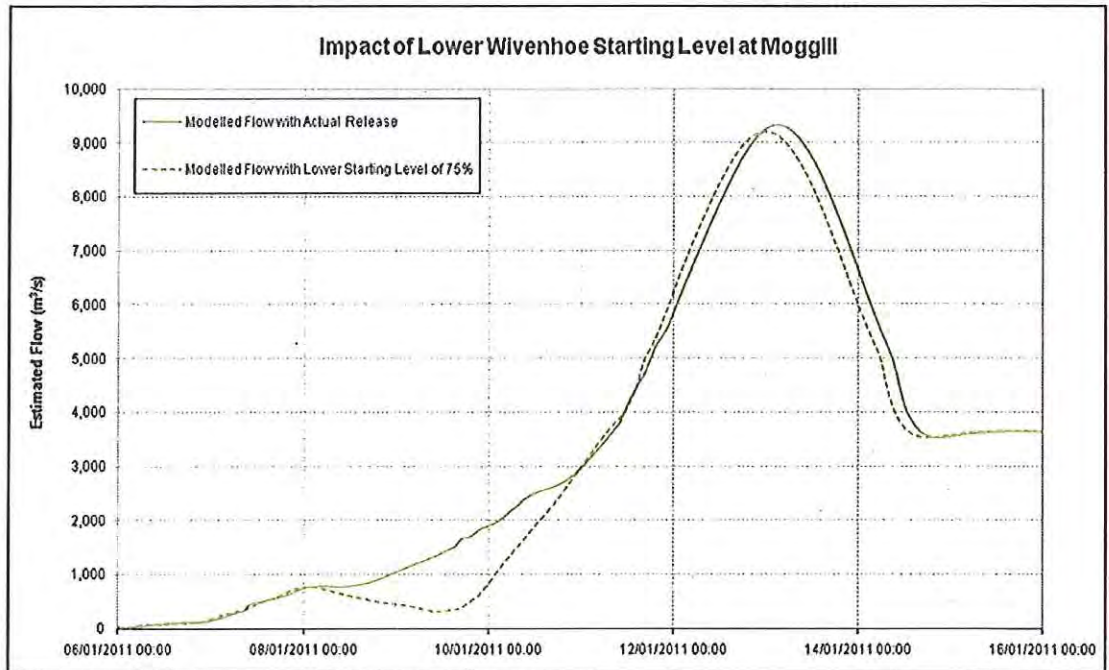


Figure 5

- (h) At the Brisbane Port Office Gauge, Figure 6 below shows that the impact of a lower starting level at Wivenhoe dam would have had minimal impact on the peak height at the Brisbane Port Office Gauge.

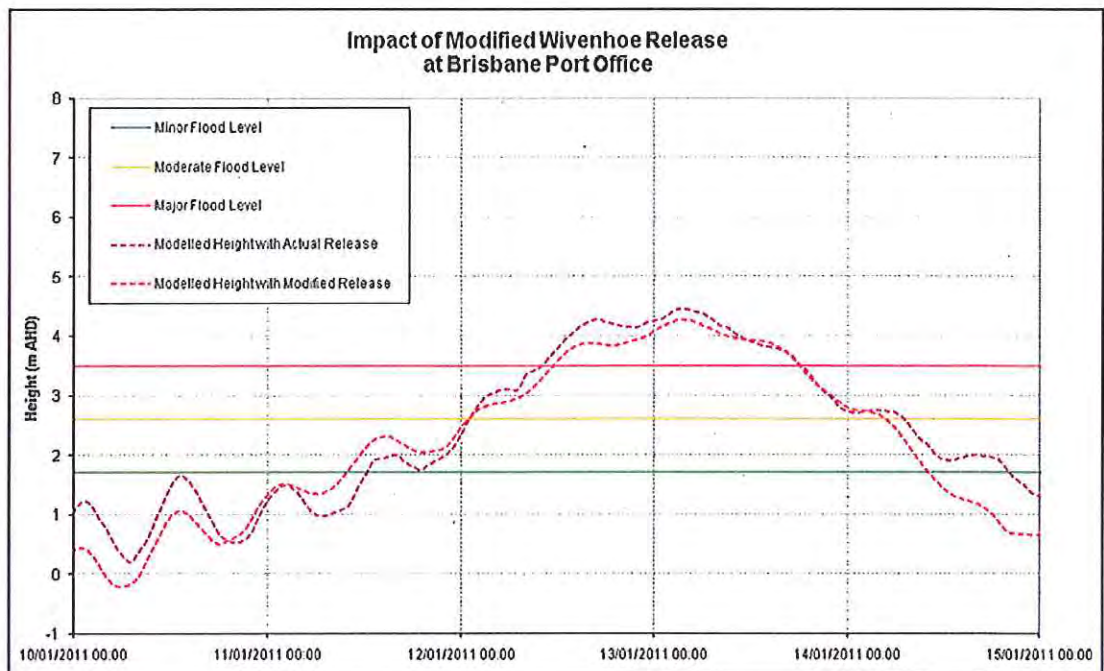


Figure 6

- (i) Again, it should be noted that these results are based upon a hydrologic model when a hydrodynamic model would be more appropriate and expected to give more accurate results. However, the results are indicative of the relative impact of the suggested change in the release strategy.
- (j) Under the scenario of a lowering starting level of 75% at Wivenhoe, the peak release may have been reduced from 7,500m³/s to 6,500m³/s but the impact in the lower Brisbane River is minimal because of the size of the January 2011 Flood Event and reasons outlined in 3(j). Further, the flood peaks of the Lockyer, Bremer and local area runoff remains unchanged.

Wivenhoe Headwater Gauge readings

- 6. I was recently requested by Peter Allen of DERM to provide information relating to the differences in gauge board and ALERT readings of the lake level in Wivenhoe Dam during the January 2011 Flood Event. Attached as **Annexure TM-8** is a paper I prepared, which is true.


My first statement

- 7. I refer to:
 - (a) paragraphs 66, 68(a) and 69 of my first statement dated 25 March 2011; and
 - (b) my interview with Lisa Hendy of the Commission of Inquiry on 30 March 2011 and, in particular, my statement contained in lines 20 to 21 on page 10 of the transcript of my interview.
- 8. Since making my first statement, I have been shown an email I sent on 25 October 2010 to certain individuals from Seqwater, the Bureau of Meteorology (the *BOM*) and the Brisbane City Council (the *Council*). A copy of that email is **Annexure TM-9**.
- 9. At the time of making my first statement and attending my interview with Commission staff, I had forgotten the email shown in **Annexure TM-9**.
- 10. The context of that email is as follows:
 - (a) There had been a Flood Event earlier in October 2010. Low level releases had been made from Wivenhoe dam during the event and there had been some confusion in public statements by agencies about whether the releases would cause low level flooding in Brisbane.
 - (b) Following the October Flood Event, Seqwater, the BOM and the Council commenced discussions about what communications should occur between the parties in respect of future releases from Wivenhoe Dam.

- (c) I received an email on 18 October 2010 regarding a meeting to be held on 22 October 2010 between Seqwater, BOM and the Council. **Annexure TM-10** is a copy of that email.
- (d) I presented a powerpoint at the meeting on 22 October 2010. **Annexure TM-11** is a copy of that powerpoint. The sixth page of the powerpoint is a copy of Appendix B of the manual of operational procedures for Wivenhoe and Somerset Dams.
- (e) I cannot now recall the discussions which occurred at the meeting on 22 October 2010. I made notes during the meeting. A copy is shown in **Annexure TM-12**.
- (f) Although I cannot now recall the discussions which occurred at the meeting, based on my notes, I accept it is possible that Council officers said to me that their view was that urban damage would occur in Brisbane at a rate of 3,500 cumecs.
- (g) On 25 October 2010 I proposed a set of triggers, as shown in the email **Annexure TM-9**, which would used to initiate communications between Seqwater and other parties.
- (h) I also attended a meeting on 29 October 2010. I cannot now remember the discussions in that meeting.
11. As a result of my above comments, it may be that the statement at paragraph 66 of my first statement is incorrect.
12. I note in answer to a question from the Commission (at lines 20 to 21 on page 10 of the transcript of my interview with the Commission) I said I was surprised at the information provided by Council earlier in the night to the other engineers. I do recall being surprised at the time. That may have been because I had forgotten my email and the earlier discussion and was focussed on the current event.
13. At no time during these discussions did anything the Council say trigger in my mind any thought it was necessary to amend Strategy W3 in the Manual.
14. My note shown in **Annexure TM-12** says "review Q (which means flow) in Table in Appendix of manual". I made no note to review Strategy W3 in the Manual.

SWORN by **TERRENCE ALWYN MALONE** on 11 April 2011 at Brisbane in the presence of:


Deponent


Solicitor
JAMES ANTHONY HUGHES

**IN THE MATTER OF
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SECOND STATEMENT OF TERRENCE ALWYN MALONE

INDEX OF ANNEXURES

Annexure No.	Document	Date
TM-8	Paper regarding lake level readings	
TM-9	Email from me to the BCC and the BOM	25/10/2010
TM-10	Email from BCC	18/10/2010
TM-11	Powerpoint presentation	22/10/2010
TM-12	Note	22/10/2010



Wivenhoe Headwater Gauge

The headwater level of Wivenhoe Dam is measured in three ways during a flood event:

1. Gauge boards which are located at the back of left hand training wall in an area of still water.
2. A float well and shaft encoder (ALERT Id 6637) located about 35 metres upstream of the gates on the left hand side of the approach to the gates.
3. A wet pressure transmitter (ALERT Id 6638) located in the area behind the trash racks on the left hand side of the approach to the gates.

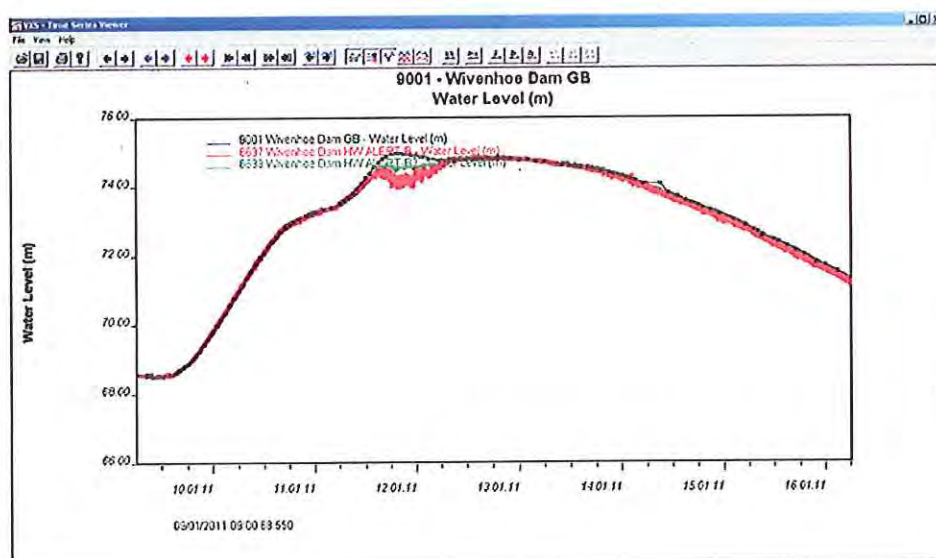
Outside of floods, gauge boards, a short drive from the dam office, are used. These are not used during floods as this would require the operators to leave the site. Normally, gauge board readings were sent in by email at the commencement of each day. During flood events, readings are emailed and faxed at regular hourly intervals. At the peak of the Jan 2001 flood, half hourly readings were phoned directly into the FOC.

ALERT Ids 6637 and 6638 are event based radio telemetry stations which report every event (i.e. incremental change in water level) via radio directly to the FOC, BoM and some Councils.

ALERT gauge 6638 was published on the BoM web site which is updated with the latest information every 15 minutes.

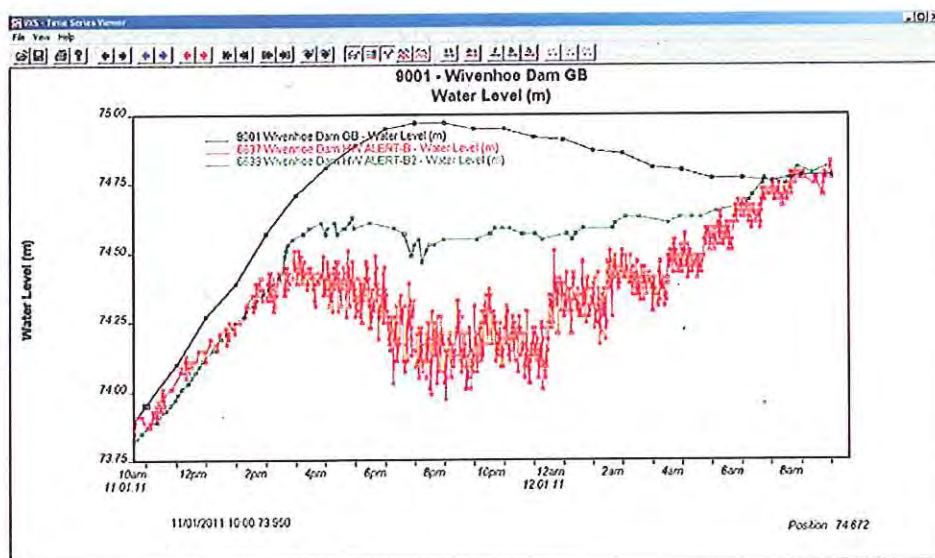
Traditionally, float well and shaft encoders are preferred over pressure transmitters as they have proven to be more reliable than wet pressure transmitters, especially in situations where a wide range of levels is monitored.

A comparison of the three water level sensors for the period 10th to 16th January 2011 is shown below.



The figure above clearly shows that there is a significant difference between the gauge board readings and the ALERT gauges during the period around the peak.

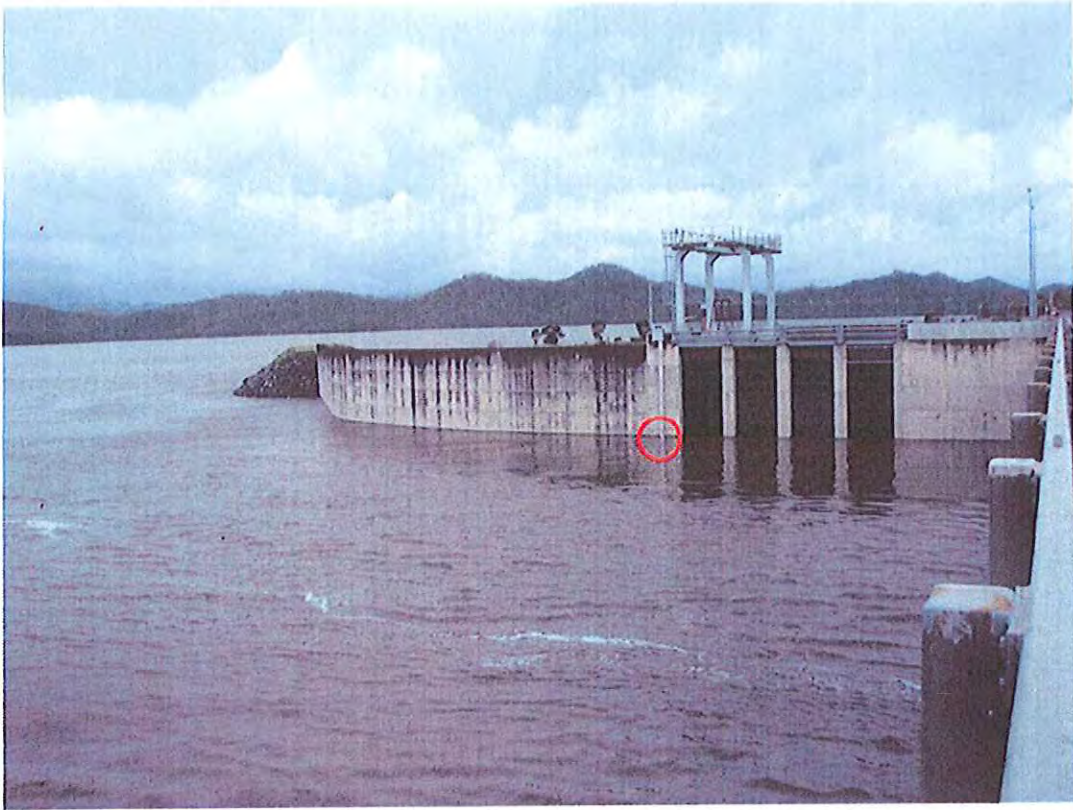
The Seqwater Senior Hydrographer advised the FOC of the discrepancy between the gauge board readings and the automatic gauges early in the afternoon of 11th January 2011. Up to this time, there was little difference between the readings. An email was issued to BoM and BCC advising of the discrepancy at 2.26pm 11th January 2011.



The figure above shows the differences between the automatic readings and the gauge board readings for the 11th January 2011.

ALERT gauge 6638, shown in red, is very close to the gauge board readings. However, as the outflows increased during the afternoon of the 11th January, the gauge commenced to oscillate over a range of 200mm in very short time. It under reads the gauge boards by a much as 1 metre around the peak of the outflow.

ALERT gauge 6637, shown in green, is more stable but still under reads the gauge board readings by as much as 0.5 metres around the peak of the outflow.



This picture above was taken at 5.42pm 10th January 2011. At this time, the automatic headwater gauge (ALERT Id 6637) was reading 72.91m and the staff gauge reading was 72.92m AHD. Note the laminar nature of the flow around the stilling well and the lack of turbulence. At the time, the outflow was the dam was 2,400m³/s.



The above picture was taken at 6.41pm 11th January 2011 about the time of the maximum height and release. At this time, the automatic headwater gauge (6637) was oscillating between 74.27 and 74.51m AHD and the staff gauge reading was 74.94m AHD. Release from the dam was about 6,770m³/s. Note the turbulent nature of the flow around the stilling well and the accompanying drawdown on the downstream side of the well. Also note the staff gauge reading (approximately 74.9m AHD) taken about this time.

Given the uncertainty associated with the ALERT gauges during the event, the operation of Wivenhoe Dam during the January 2011 flood was based upon the more reliable gauge board readings.

[REDACTED]

From: James Charalambous [REDACTED]
Sent: Monday, 18 October 2010 4:01 PM
To: Baddiley, Peter; [REDACTED] John Tibaldi; Terry Malone
Cc: Carroll, Don; Caswell, Evan; Morris, Ken
Subject: Friday Morning 22/10 - Technical Capability Meeting

Hi

As discussed this Friday 22/10 from 9am to 12:30pm would like to conduct a technical meeting between SEQWater/BOM/BCC:

Agenda as follows:

1. SEQ Water, BOM and BCC to each discuss for 30mins technical capabilities and how they operate/function in a flood event
2. Open discussion on communication between agencies, processing of information and data
3. Suggestions or improvements to current systems/processes

Morning tea and lunch will be provided.

Regards
JamesC.

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Please direct all enquiries to the message author.

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Your Anti-virus Service scanned this email. It is safe from known viruses.
For more information regarding this service, please contact your service p

From: Terry Malone
Sent: Monday, 25 October 2010 8:57 AM
To: James Charalambous; Baddiley, Peter; Carroll, Don; Caswell, Evan; [REDACTED]
 [REDACTED] John Tibaldi; Morris, Ken; [REDACTED] Rob Drury
Cc: Lavin, Chris; Scroope, Greg
Subject: RE: Friday Morning 29/10 - Technical Capability Meeting
Gents

Seqwater would to submit this as a proposal for discussion at this Friday's meeting:

Relationships with external agencies during flood events when water is released from Wivenhoe Dam.

1. Seqwater will contact Bureau of Meteorology (BOM), Somerset Regional Council (SRC), Ipswich City Council (ICC) and Brisbane City Council (BCC), Disaster Management Duty Officer, by phone when the Flood Operations Centre (FOC) is mobilised. It is understood that BCC Disaster Management Duty Officer will advise BCC Flood Information Centre (FIC) Duty Officer to establish an officer-to-officer technical relationship with the FOC.
2. Seqwater will not contact ICC or BCC Councils unless releases are expected from Wivenhoe.
3. Seqwater may contact SRC if the expected flood impact is limited to areas upstream of Wivenhoe.
4. Seqwater will advise Councils when it is expected that a combination of local runoff and releases from Wivenhoe will result in the following flows being reached or exceeded:

Trigger	Impact	Deck Level	Agency to Advise	Comment
Mid Brisbane >50 m3/s	Twinn Bridges	20.0	SRC	Seqwater will advise of likely impact
Mid Brisbane >130 m3/s	Savages Crossing		SRC	Seqwater will advise of likely impact
Mid Brisbane >175 m3/s	Colleges Crossing		ICC	Seqwater will advise of likely impact
Mid Brisbane >430 m3/s	Burtons Bridge	19.6	SRC	Seqwater will advise of likely impact
Mid Brisbane >550 m3/s	Kholo Bridge	11.9	ICC	Seqwater will advise of likely impact
Mid Brisbane >1,000 m3/s	Minor Flood Level Savages Crossing		BOM	Seqwater and BOM to discuss flows Seqwater will provide actual and

				projected Wivenhoe releases to BOM
Mid Brisbane >1,900 m3/s	Mt Crosby Weir Bridge	12.4	ICC	Seqwater will advise of likely impact
Mid Brisbane >2,000 m3/s	Fernvale bridge	33.8	SRC	Seqwater will advise of likely impact
Lower Brisbane >3,500 m3/s	Threshold of urban damage in BCC		BOM, BCC FIC	Seqwater, BOM and BCC FIC to discuss flows

5. At the first instance of the expectation of the trigger, contact by Seqwater will be by phone, thereafter advice will be via email.
6. Seqwater will provide daily email advice of the status to SRC, ICC, BOM and BCC when Mid Brisbane flows are expected to reach or exceed 130 m3/s.
7. Seqwater will provide twice daily email advice of the status to SRC, ICC, BOM and BCC when Mid Brisbane flows are expected to reach or exceed 550 m3/s.
8. Nominated Councils officers are invited to contact the Flood Operations Centre for technical discussions at any time after mobilisation.
9. Seqwater will advise when the FOC is demobilised.
10. In the event of email failure, contact will be by phone, if possible.

Items for further discussion

Will Seqwater provide actual and projected Wivenhoe releases to Councils?

What are the triggers for phone contact to BCC FIC?

Regards

Terry Malone
Principal Hydrologist
Queensland Bulk Water Supply Authority trading as Seqwater



Level 3, 240 Margaret St, Brisbane City QLD 4000 Australia
PO Box 16146, City East QLD 4002

p [REDACTED]

From: James Charalambous [REDACTED]
Sent: Friday, 22 October 2010 3:01 PM
To: Baddiley, Peter; Carroll, Don; Caswell, Evan; Charalambous, James; [REDACTED]
[REDACTED] John Tibaldi; Morris, Ken; p.blrch@bom.gov.au; Rob Drury; Terry Malone
Cc: Lavln, Chris; Scroope, Greg
Subject: Friday Morning 29/10 - Technical Capablility Meeting

As per our discussions today:

SEQWater/BOM/BCC have agreed to reconvene next Friday 29/10/2010

Time: 8:45 am to 12:30pm.

Location: Green Square Level 2 (GSQ-L2A-4-10p)

Agenda as follows:

1. Open discussion on communication between agencies, processing of information and data
2. Suggestlons or Improvements to current systems/processes

Morning tea (10am) and lunch (12-12:30pm) will be provided.

The meeting will follow on from today's discussion (meeting notes attached).

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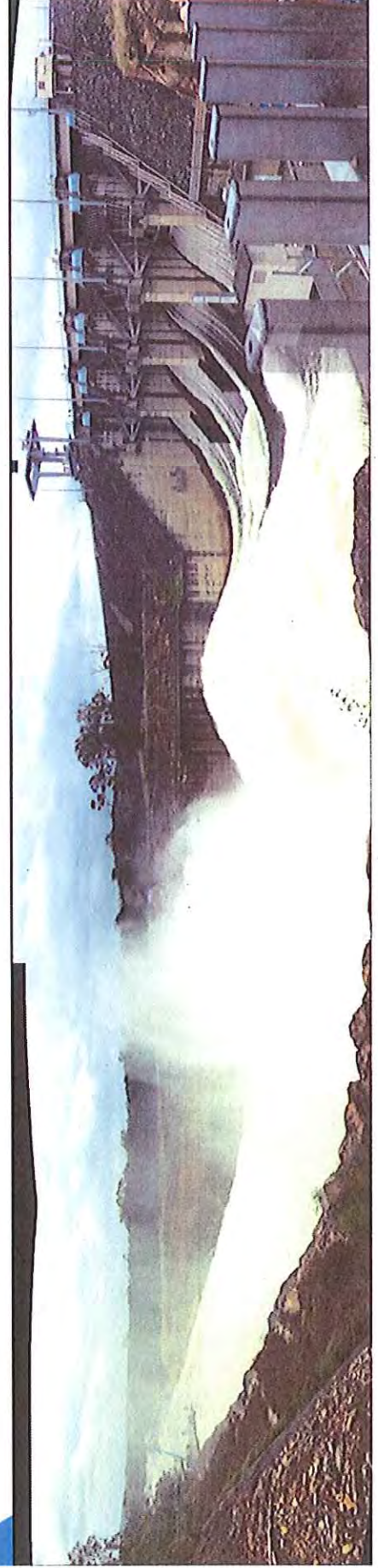


Roles, Responsibilities, Technical Capability and Future Directions in Flood Management

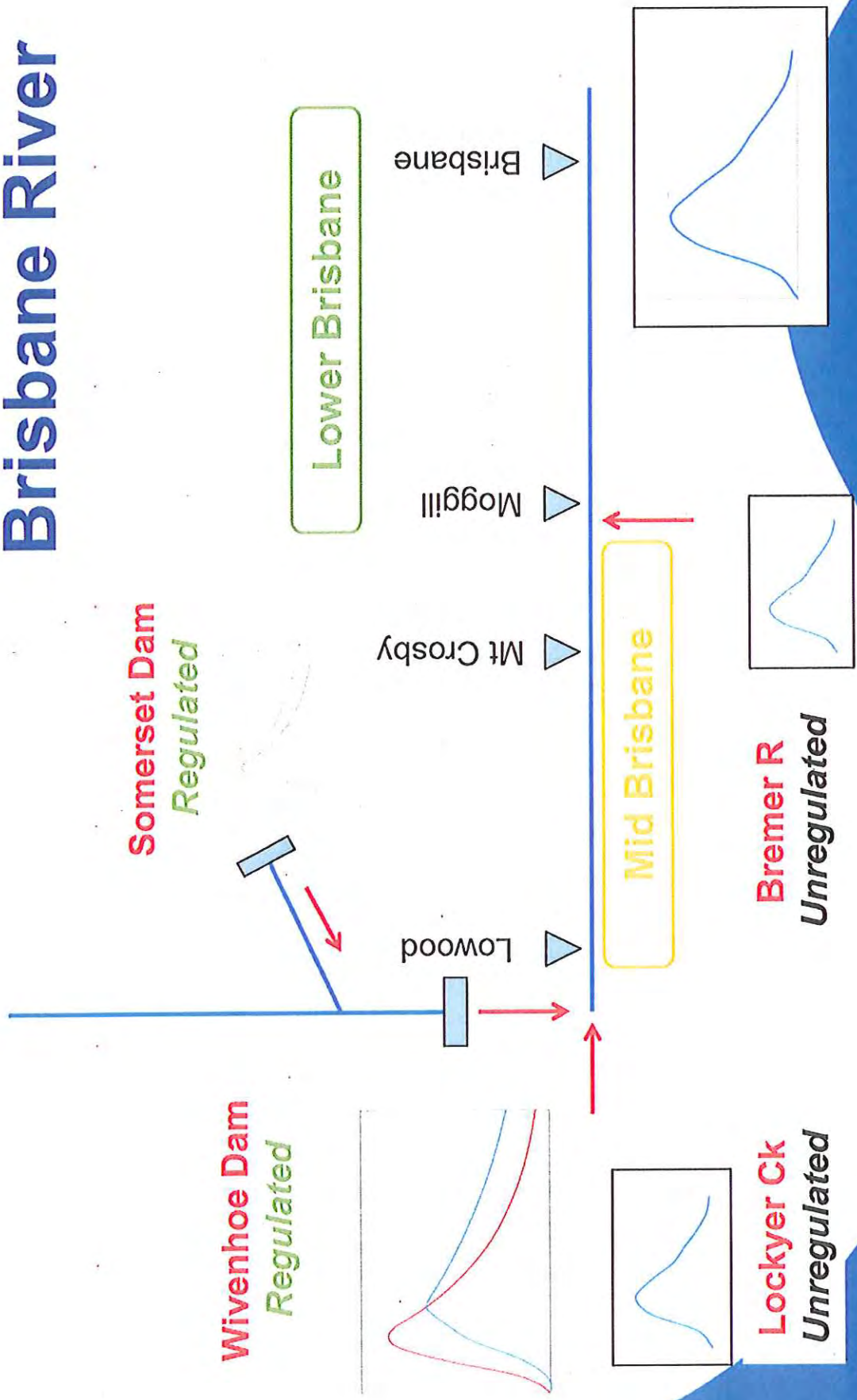
BCC Meeting
22/10/2010

- Responsibilities & Roles
 - What we do
 - Who we are
- Technical Capabilities
 - Modelling floods
- Future Directions
 - FEWS
- Issues

Outline



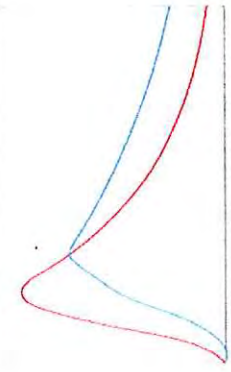
Brisbane River



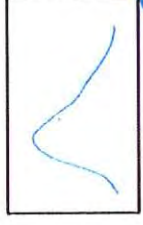
Somerset Dam
Regulated

Wivenhoe Dam
Regulated

Lower Brisbane

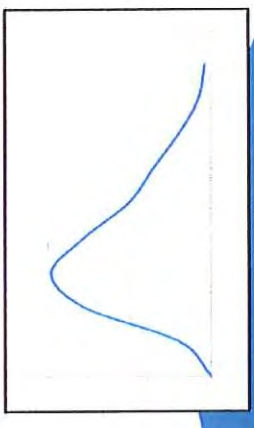


Lockyer Ck
Unregulated



Bremer R
Unregulated

Mid Brisbane



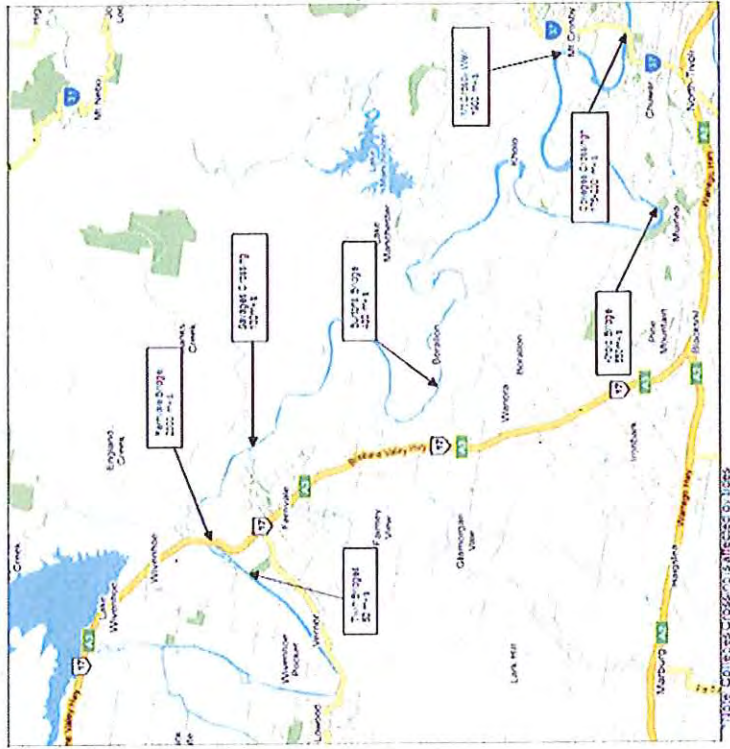
Responsibilities

- All Seqwater Dams covered by Queensland Dam Safety Guidelines and Regulations
- Operation of North Pine, Somerset and Wivenhoe Dam covered by Water Supply Act 2008
 - Manual of Operational Procedures
 - Emergency Action Plans
- Other dams covered in-house operations



Flood Manual Objectives

- Ensure the structural safety
- Optimum protection of urban areas
- Minimise disruption to rural life
- Retain the storage at FSL
- Minimise environmental impacts
- Drain in 7 days



**APPENDIX B
KEY REFERENCE GAUGES**

Location	Gauge Zero m AHD	1974 Gauge Height		Minor Flood		Moderate Flood		Major Flood	
		m	m	Gauge Height m	Flow m ³ /s	Gauge Height m	Flow m ³ /s	Gauge Height m	Flow m ³ /s
Stanley River at Somerset Dam	0.00	106.57	103.0	106.0		106.0		106.0	
Brisbane River at Lewood	23.68	22.02	8.0	15.0		20.0		20.0	
Brisbane River at Lewood	22.74	-	8.6	15.9	1,000	21.2	3,300	21.2	6,000
Brisbane River at Savage's Crossing	18.43	23.79	9.0	16.0		21.0		21.0	
Brisbane River at Mt Crosby	0.00	26.74	11.0	13.0		21.0		21.0	
Beamer River at Ipswich	0.00	20.70	7.0	9.0		11.7		11.7	
Brisbane River at Moggill	0.00	19.95	10.0	13.0		15.5		15.5	
Brisbane River at Jimblee Bridge	0.00	14.10	6.0	8.0	4,000	10.0	5,000	10.0	6,500
Brisbane River at City Gauge	0.00	5.45	1.7	2.6		3.5		3.5	

Flows are approximate only and gauge heights are tide dependent in the lower reaches.

Triggers

Roles

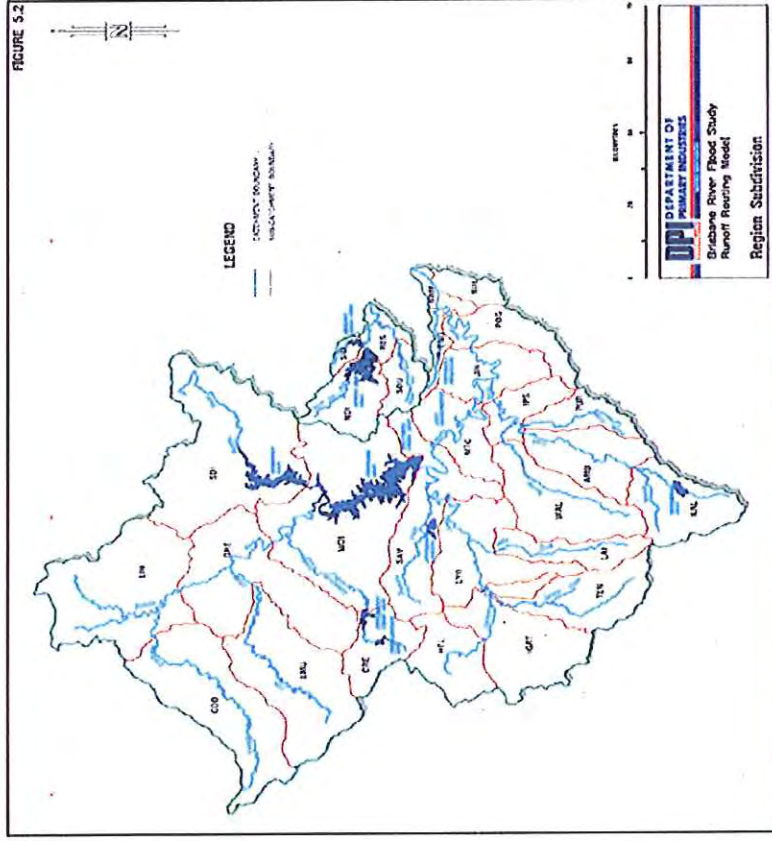
- Manager, Dam & Source Operations
 - Rob Drury
- Principal Engineer, Dam Safety
 - John Tibaldi
- Principal Hydrologist, Dam Safety
 - Terry Malone
- Flood Operations Centre
 - Contracted Headworks Operator Sunwater
 - 2 Senior Flood Operations Engineers
 - Rob Ayre (SunWater), John Ruffini (DERM)
 - 2 Flood Operations Engineers
 - Terry Malone, John Tibaldi (Seqwater)
 - 12 Data Collectors (SunWater and Seqwater)

Flood Operations Centre Procedures

- FOC is mobilised whenever gate openings are expected
- FOC and dams are staff 24 hours until demobilisation
- Instructions for gate operations are issued and acknowledged by operators in writing
- Regular contact is maintained with BOM and affected Councils

FloodCol & FloodOps

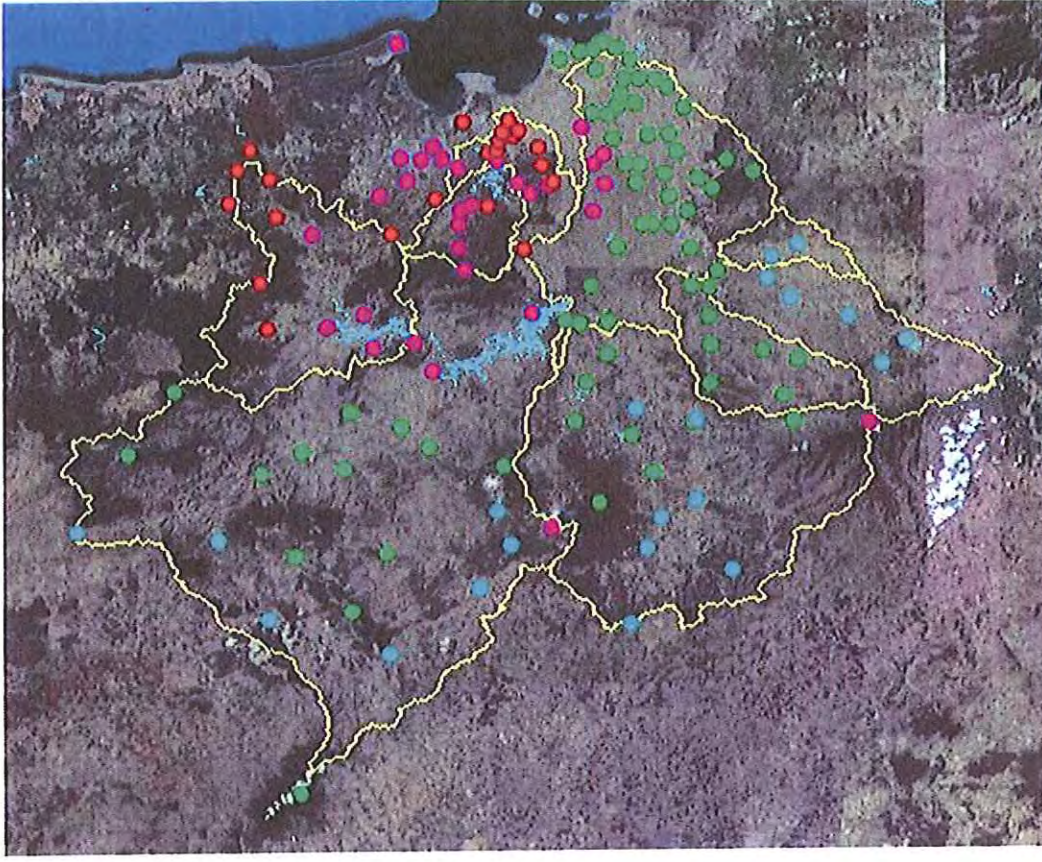
- FloodCol – collects data from Seqwater owned stations
- FloodOps – series of linked WT42 models
- Gate Operations – determined by spreadsheet model



Seqwater ALERT Network
80 rainfall sensors
50 water level sensors

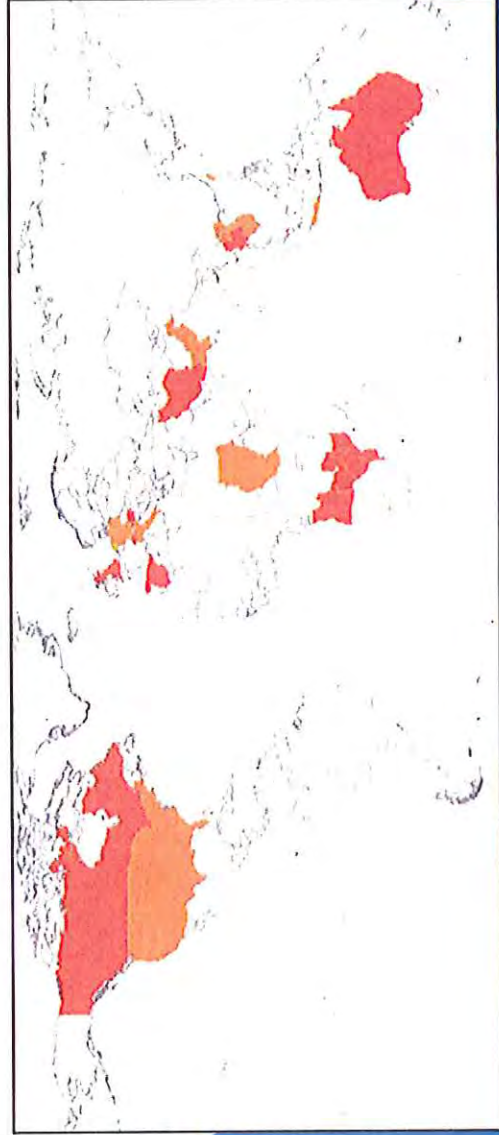
Enviromon & URBS

- Enviromon
- URBS – series of linked models
 - Baseflow
 - Infiltration
 - Dependent ratings
- Gate Operations – determined by spreadsheet model



FEWS

- Forecasting Shell
- Integration of data from several sources
- Provides general functional utilities
- Open approach to integrating models and forecasting methods



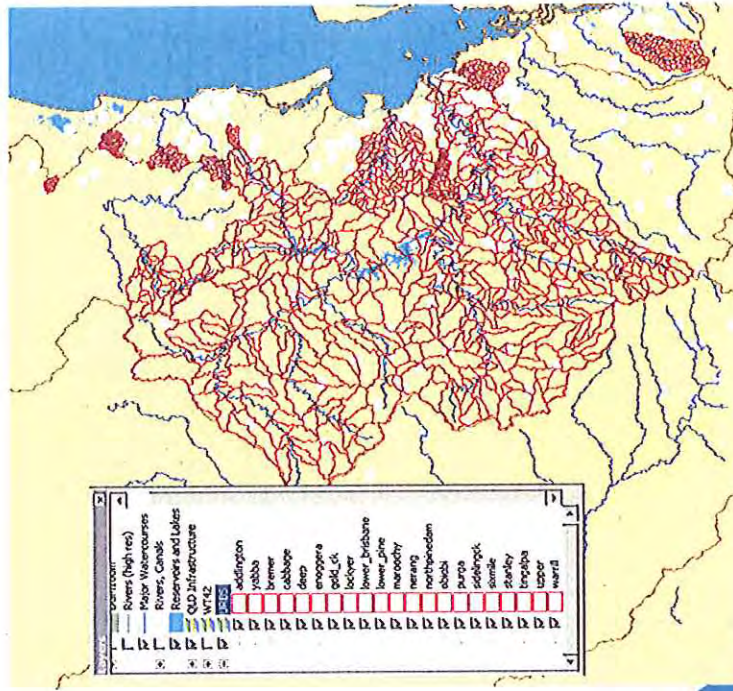
FEWS Modelling

- Wide range of models integrated
- Hydrological (snow models, rainfall-runoff, routing)
- Hydraulic (1D, 2D)
- Lookup models

Model	Type	Supplier/Owner	Country
SOBEK	Hydrodynamics, Water Quality, RR	Deltares	Netherlands
SOBEK-2d	Linked 1d/2d inundation modelling	Deltares	Netherlands
DELFT-3D	2D-3D Hydrodynamics	Deltares	Netherlands
Sacramento	Rainfall-Runoff	Deltares	Netherlands
RIBASIM	Water distribution + Reservoir	Deltares	Netherlands
REW	Distributed Rainfall-Runoff	Deltares	Netherlands
DELFT3D	2/3D Hydrodynamics/ Water quality	Deltares	Netherlands
Flux	1D Hydrodynamics	Scienc	Austria
URBS	rainfall-runoff and hydrological routing	Don Carol	Australia

Model	Type	Supplier/Owner	Country
ISIS	Hydrodynamic	HB/Halcrow	UK
PDM	Rainfall-Runoff	CEH	UK
TCM	Rainfall-Runoff	CEH	UK
KW	Routing (kinematic wave)	CEH	UK
PACK	Snow Melt	CEH	UK
ARMA	Error Correction	CEH	UK
PRTF	Event Based RR	PlanB	UK
TRITON	Surge propagation/Overtopping	PlanB	UK
TWAM	2D Hydrodynamics	PlanB	UK
STF	Transfer functions	EA	UK
DODO	Routing (layered Muskingum)	EA	UK
MCRM	Rainfall-Runoff	EA	UK
Modflow96VKD	3D groundwater	Deltares/Adam Taylor	Netherlands/UK
Mike11	Hydrodynamics	DHI	Denmark
NAM	Rainfall-Runoff	DHI	Denmark
TOPKAPI	Rainfall-Runoff	Univ. of Bologna	Italy
HBV	Rainfall-Runoff (inc snowmelt)	SHMI	Sweden
Vflo	Distributed Rainfall-Runoff	Vieux & Associates	USA
SWM3	Urban Rainfall-Runoff	USGS	USA
HEC-RAS	Hydrodynamic	USACE	USA
HEC-Res-Sim	Reservoir Simulation	USACE	USA
Snow17	Snow Melt	NWS	USA
SAC-SMA	Rainfall-Runoff	NWS	USA
Unit-HG	Unit-Hydrograph	NWS	USA
LAGK	Routing (hydrological)	NWS	USA
SARROUTE	Routing (hydrological)	NWS	USA
SSARRESV	Reservoir Simulation	NWS	USA
RESSNGL	Reservoir Simulation	NWS	USA
RES-J	(Multiple) Reservoir Simulation	NWS	USA
PRMS	Rainfall-Runoff	Univ. of Karlsruhe	Germany
SynHP	Hydrodynamics	BIG	Germany

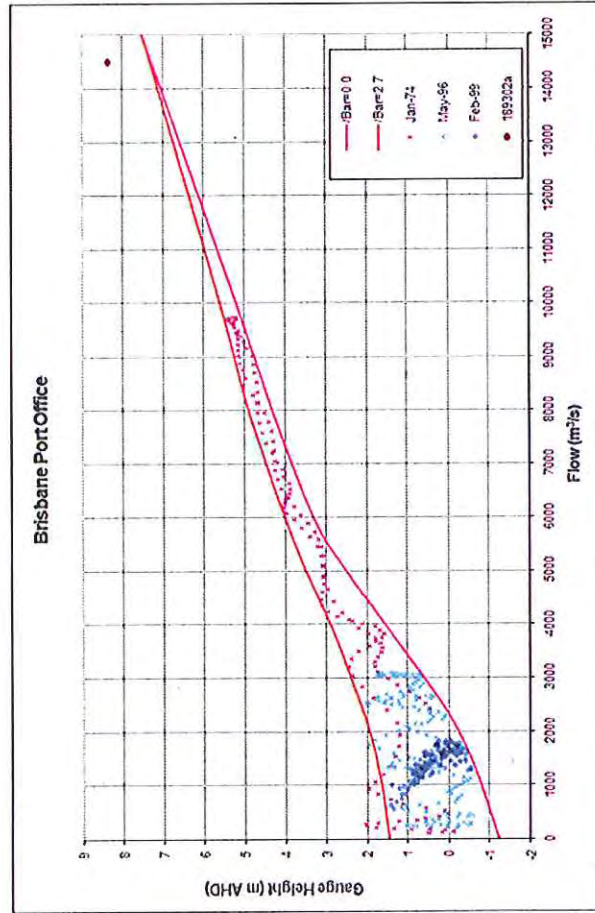
FEWS



- Flood Expert Panel established July 2009
- BOM FEWS Pilot of Brisbane R July 2009
- Expert Panel agrees to proceed Dec 2009
- Contract signed with Deltares May 2010
- First version delivered
 - Initially WT42 and URBS
- Future ?
 - Continuous simulation
 - Hydrodynamic models

Ratings

Need for agencies to have a consistent agreed set of up-to-date ratings covering full range of flows, especially in the mid and lower Brisbane

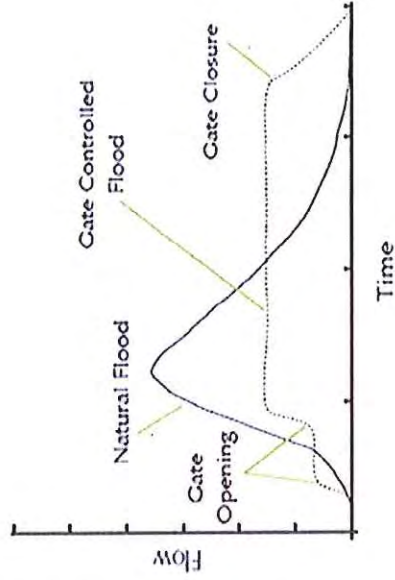


Wivenhoe FSL Raising

- QWC instigated project to investigate impact of raising Wivenhoe FSL to 68
- Phase 1 – use existing design flood hydrology (WA 2005) to assess downstream impacts using existing rules
- Phase 2 – modify rules to mitigate impacts
- Assess – cost and benefits (hold point)
- Phase 3 – re-derive design flows using new model and assess impacts
- Councils heavily involved in assessing & costing impacts

Triggers for Contact

- Need for:
- an agreed set of triggers for initiating contact
 - meaningful
 - practical

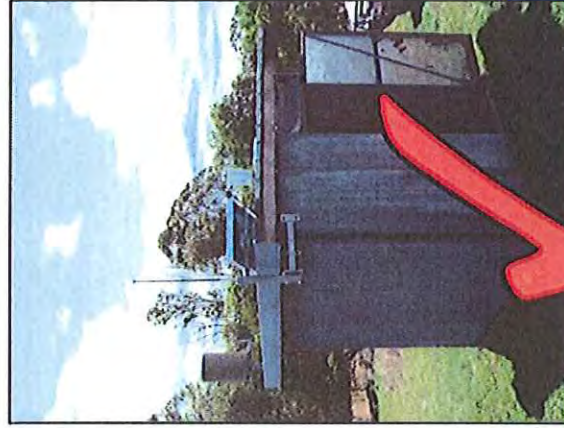


Difference between natural flows and releases from Wivenhoe

Gauge Ownership/Maintenance

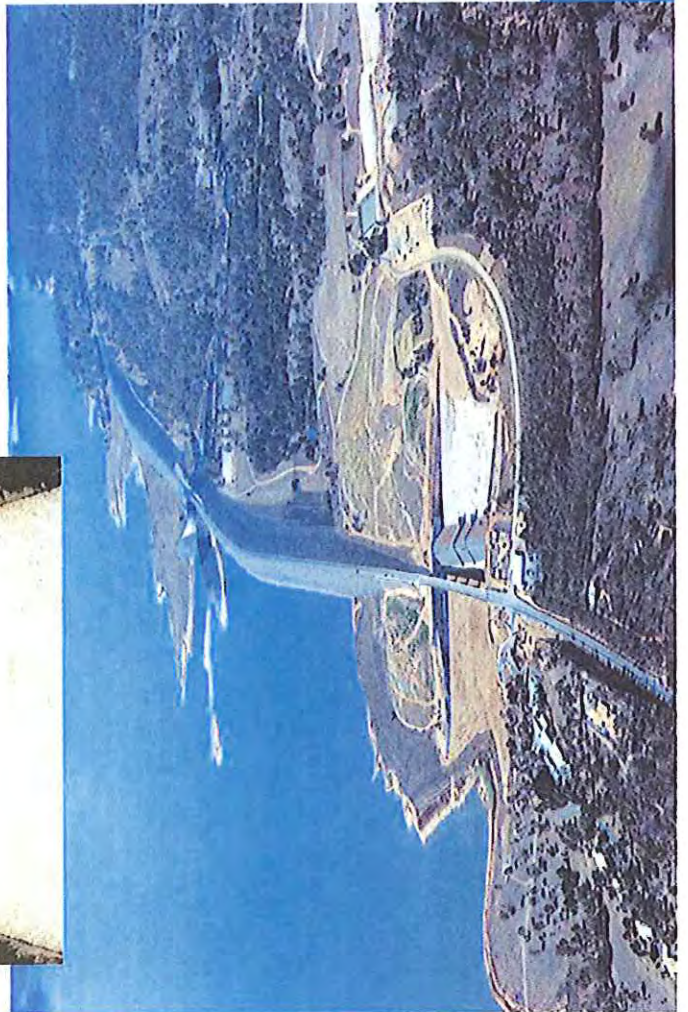
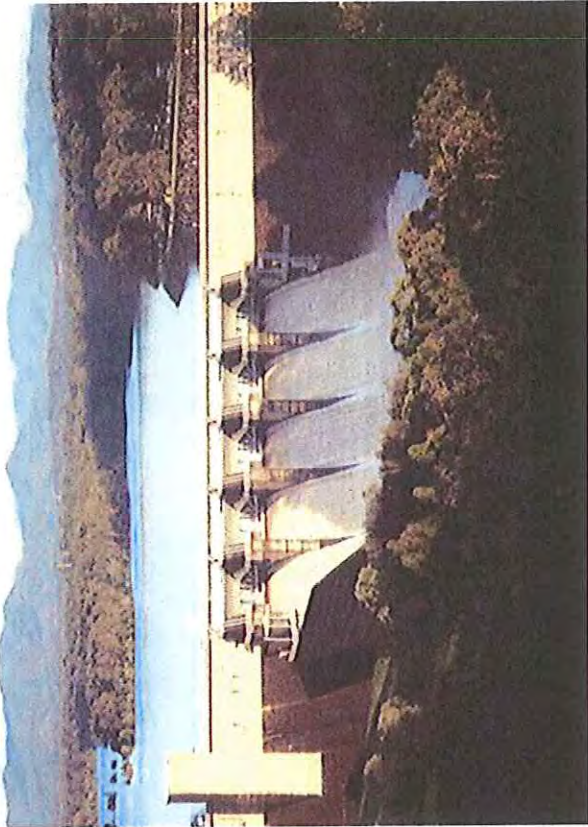
Need to sort out:

- Ownership
- Maintenance responsibilities
- Installation standards





Questions?



22/10/10

MEETING WITH BCC 9.00AM GREEN SD.

* BOM presentation

- can we please discuss travel times after this meeting.

* BCC

- Minor 3000 \rightarrow too high!

Mod 4000 5000

Major 7, 9, 10, 000

Extreme 38,000.

\downarrow
need to investigate smaller events.

Uniform distribution of rainfall

- revise Q in Table in Appendix of manual.