Submission to Queensland Floods Commission of Inquiry - 11 March 2011

By

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[redacted]

Introduction and Credentials:

I am a Civil Engineer, and hold a Bachelor Degree of (Civil and Systems) Engineering (First class Honours). I am a Chartered Professional Engineer, a Corporate Member of the Institute of Engineers Australia, a Registered Professional Engineer in Queensland and am a Fellow of the Australian Institute of Company Directors, as well being a Queensland Flood Victim. My own house was inundated, but insured and I own an investment property, which was inundated, but uninsured.

Disclaimer: For the sake of full disclosure, I am not employed by, nor have ever been employed by any government /council agency connected with water design or distribution, nor I am employed or commissioned by an insurance company or any other vested interest. The opinions expressed herein are my own. The analysis and recommendations herein should not be relied upon or considered as professional engineering advice, but merely proposals for consideration and further analysis by professional civil engineering and other hydrology experts.

Conventions:
In this submission, all research sources of data are referenced in the Bibliography, and all opinions or commentary (political or otherwise) has been separated from the main submission and are shown in *italicised shaded boxes.*

Terms of Reference and Context
Even though I believe the terms of reference should have been *more targeted* on the topics of Strategic Water Planning and Flood Mitigation Planning processes *to protect Queenslanders*, I have concentrated this submission on only 4 aspects of the terms of reference of the inquiry, being:

1. ☑ preparation and ***planning*** by federal, ***state*** and local ***governments***, emergency services and the community
2. ☑ **implementation of systems operation plans for dams** and in particular the Wivenhoe and Somerset release strategy and an assessment of compliance with, and the suitability of the operational procedures relating to flood mitigation and dam safety,
3. ☑ private insurers and their responsibilities
4. ☑ the response to the 2010/2011 flood events, particularly measures taken to inform the community and protect life, private and public property

The major focus of this paper is on the first two of these items, as these of the most strategic important to the protection of the majority of Queenslanders.

Rather than focus on areas of which I have little first-hand knowledge or experience, the focus of this submission is only on flood mitigation and water resource planning for the Moreton Catchment Area (as defined by DERM), which includes Brisbane. This catchment is the most important in Queensland, due to the concentration of population in its catchment, with SEQ representing 66%[3] and Brisbane alone representing 45%[3] of all of Qld's population.

[3. At 30 June 2009, the Queensland population was estimated to be 4,425,100 persons. The south east corner comprising Brisbane, Gold Coast, Sunshine Coast and West Moreton statistical divisions accounted for two-thirds (66%) of the state's population. During the year to June 2009, Brisbane statistical division reached the population milestone of two million, which was 45% of Queensland's population. Source: www.abs.gov.au]

Specifically, this paper is targetted at the objective of comprehensively ensuring Brisbane ***never, ever, ever*** suffers another event like the 2011 flood. Such a dangerous event must ***never, ever, ever*** be allowed to endanger the majority of our states' population again. I believe anything less than a comprehensive strategy to protect our population from the devastating costs and social effects of the 2011 flood is clearly and provably negligent.

Executive Overview

The role of Engineers in Society is to design solutions which provide for the safety and welfare of the population, and which cater to address the phenomenon of nature, including the effects of extraordinary natural disaster events such as cyclones, or floods. Regardless of the challenges from nature, engineers are able to reliably design practical solutions which provide for human safety, whether it be in cyclone-proofing buildings in exposed beachfront areas, or building dams or flood mitigation solutions to protect large population masses threatened through uncontrolled water flows. Such fundamental roles are what the engineering profession stand for and deliver as routine to their clients in their professional lives.

SO, with this background in mind, my thesis is the following:

- Brisbane, despite being built on a flood-plane, can absolutely be made 'flood-proof'
- Brisbane can absolutely be provided with 100% water security for both its current and predicted future population growth

The key questions are:

- Do our politicians share this vision?
- Will they be prepared to take the tough decisions required to overcome minority stakeholders with vested interests (e.g. the environmental lobby, residents who may be affected by land resumptions), in order to provide safety and security for the greater majority?
- Will they budget the money to provide this required level of real insurance to our population?
- What amount should be set aside to achieve these important goals?
- If they fail to accept the imperative of needing to flood-proof Brisbane, will they accept responsibility for their negligence to act with a duty of care to both individuals, to businesses and to insurance companies and accept the bill for all future flooding events for all those impacted?

As the 2001 floods showed, these decisions are now a matter of life and death for many people. Thus, these matters are imperative for this inquiry, and ultimately, imperative for the people of Brisbane.

No longer can we, as a major population, have our lives and livelihoods threatened by the vested or philanthropic interests of vocal minorities.

It is now time for courageous decision makers to come forward with a comprehensive strategy to protect the people of Queensland.

Terms of Reference #1

☑ preparation and ***planning*** by federal, ***state*** and local ***governments***, emergency services and the community

Issue #1 *– Competing Objectives for the Role of Wivenhoe Dam:*

The most-significant strategic conclusion of analysis is that there are two competing objectives in the current role of Wivenhoe Dam for Brisbane, being:

1) Flood Mitigation
2) Water Supply Security

This is a **major dichotomy**, for which one single piece of water infrastructure, being Wivenhoe Dam, cannot ever hope to meet. When either of these two objectives is maximised, the other is conversely minimised; it is a balancing act.

Brisbane must find alternate water security and/or alternate flood mitigation strategy/ies.

Given Wivenhoe's design objective was developed after the 1974 flood to primarily satisfy the Flood Mitigation objective, and given the lack of choices for alternative flood mitigation, we **must** find alternative solutions to Brisbane's Water Supply Security to avoid the first of these 2 primary roles **ever** being compromised again.

In short, whilst the water grid will assist in addressing objective #2, we must build more dams to remove and reduce dependency on Wivenhoe for Water Supply Security. Having such alternatives in place before the 2011 event would certainly have ensured that the policy would have been changed in the Dam Operations Manual specifying the dam to be maintained at 100%, after a flood / filling event. By way of example, had the Wolfdene dam been built back in 1989, Wivenhoe's ***original and primary*** purpose as a Flood Mitigation facility could have been fulfilled, with the resultant effect that the dam operational manual/ policy would then have been able to specify a much lower level than was specified in January 2010 edition of same (which specified the dam's water supply level be maintained at 100%).

I suggest that with alternative water security in place, that Wivenhoe's Water Supply level could have been reduced to as little as <25% of its Base Water Supply Level given the circumstances which existed around 5 January, 2011. This would have prevented the disastrous effects from the 2011 Brisbane flood event. ***It was a totally avoidable event***. As discussed later in this submission, there were also other means (e.g. dam operations procedures) by which this event could also have been avoided.

This single change in policy would have avoided a significant part of the cost and detrimental effects that the 2011 flood had on Brisbane, Ipswich and surrounding populations.

By way of example, a single additional dam for Brisbane of 2M ML for drinking water supply (being almost twice Wivenhoe's water supply capacity), has been estimated by GHD Engineering consultants to require an investment of $1.4B an additional $0.5B for reticulation, pipeline and grid integration works. This is a modest investment indeed.

An example of a comparative ROI analysis is below:

Estimated Investment in Wolfdene/ Alternative[2] (2011 $, using adjusted 1989 dollars) = $1.4B-$1.9B[2]
Versus
Estimated (hard) Cost (2011 $) (private insurance) =$2B[1] (Insurance Council of Australia =43,755 claims @ avge $46k/claim). [NB: this estimated May yet double this figure as full re-building assessments are still occurring and many have yet to be finalised]
Estimated Building Costs (uninsured; yet to claim insurance) = $2B++
Estimated (hard) Cost (2011 $) (infrastructure) =$2B
Estimated Soft Costs (social and dislocation) = say 22,000 families x $100k/ family = $2.2B

→ Total Estimated Cost (Brisbane 2011 Flood) = >$8B

From this, we could conclude that not only is flood protection a legal imperative (i.e. to protect the human population), but is also commercially justified, as well as being affordable, especially when this cost proposal is compared with the cost of the Gateway Bridge duplication (@$1.9B).

Commentary from Institute of Public Affairs:
http://www.ipa.org.au/sectors/water/news/2000/damned-decision

The lack of sufficient water security confronting south-east Queenslanders today is also a product of another fateful decision, albeit made almost two decades ago.

After its election in 1989 the Labor government, led by Wayne Goss and advised by current Prime Minister Kevin Rudd, cancelled plans to proceed with the Wolfdene dam on the Albert River.

The cancelation of the Wolfdene project by Goss and Rudd no doubt proved to be a popular one amongst the emerging environmental movement in Queensland.

However this decision, which reeked of political opportunism, quickly emerged as a curse bedevilling water policy in Queensland for decades to come.

With a capacity equivalent to that of the Wivenhoe dam, Wolfdene would have played a critical role in boosting the region's absolute water storage capacity in the face of prolonged droughts.

Instead of the buffer of greater water reserves, Queenslanders living in the south-east have borne the major inconveniences of inefficient and often heavy-handed water rationing juxtaposed with a massive increase in the local population including interstate and overseas migration.

From the wasted opportunity of Wolfdene to the travesty of Traveston, no level of government has emerged unscathed from the murky depth of troubles that is Queensland water politics.

Even worse, the lack of foresight when it comes to major dam developments have done little but to threaten the quality of life for which Brisbane and its surrounds have been long renowned.

Analysis:

SEQWater currently manages 25 dams, of which 12 dams make up what is termed "Grid Twelve" in the Qld Water Grid and thus contribute to the Security of the Brisbane / SEQ water supply system. (note: Wyralong Dam, when completed in mid 2011, will boost the Bromelton / Logan system to become the 25th dam under SEQWater's management).

The 12 dams that comprise 'Grid 12" in new $7B Water Grid project, are Wivenhoe, Somerset, North Pine, Hinze, Baroon Pocket, Leslie Harrison, Ewen Maddock, Cooloolabin, Lake Kurwongbah, Lake Macdonald, Little Nerang and Wappa.

Of these dams, 9 are located upstream of Brisbane City and effectively either contribute to flood control or conversely, in the event of a flood, channel their outflows directly into the Brisbane River.

These 9 dams are: Atkinson, Bill Gunn, Clarendon, Enoggera (part of Brisbane city), Gold Creek, Lake Manchester, Moogerah, Somerset and Wivenhoe. **All of these dams, excepting Somerset and Wivenhoe, have no flood mitigation capacity**, as their primary purposes is for water security or for agricultural irrigation.

SEQWater owns and operates 25 dams, 47 weirs and 14 bores and aquifers supplying as much as 90 per cent of South East Queensland's drinking water supply.

A comprehensive summary of the weirs managed by SEQWater is included in **Appendix B**. The primary purposes of these weirs, which only hold a total of 10600 ML, is water supply & none appear to provide any flood mitigation role.

A comprehensive summary of the 25 dams in SE Qld is included as a table in **Appendix A**, which includes the dams' attributes, their water supply capacities and their flood mitigation capacities.

An analysis was carried out by SEQWater in 2007[21] to consider three options for raising Water Supply Security from Wivenhoe Dam, by raising the Fully Supply Level (FSL) from 67m by +2m, +4m & +8m. Not all of these options raised the flood mitigation capacity of the dam by a commensurate level. In light of

the 2011 Flood experience, any strategy which increase the base level water supply at the expense of (reducing) the the current flood capacity of Wivenhoe are extremely dangerous and border on recklessness. The opposite strategy needs to be followed i.e. reducing the water supply capacity in Wivenhoe to increase the flood mitigation potential.

Conclusions:

From analysing the tables in Appendices A & B, in addition to a number of other sources, a range of conclusions can be made:

1. Other than Wyralong Dam (being completed mid-2011), **no new dams** have been built in the last 22 years in South East Queensland since 1989, being the year which marked the completion of the Baroon Pocket Dam and the Hinze Dam. To put this in context, Wyralong represents only a +5% increase in water capacity of South East Qld, despite the increase of some +70% in population over the same time period.

2. In this last 22 years, Government has failed to provide another major water storage facility to meet the requirements of providing water security for Brisbane and its surrounds. Whilst the investment in the Water Grid infrastructure is a good initiative for balancing water demand/ supply end-points, **it does nothing to add to the total capacity of water in the grid** (excepting from adding the very notional quantities from desalination or retreatment).

Commentary from "ABC Unleashed" 17th November, 2009 - Damned Decision - Julie Novak
http://www.ipa.org.au/sectors/water/news/2000/damned-decision
The decision last week by Kevin Rudd, delivered by his environment minister Peter Garrett, to veto the ***proposed Traveston dam*** *near Gympie represents a failure of governments all round to secure adequate water supplies for a rapidly growing south-east Queensland.*
By concluding that the proposed dam would have 'unacceptable impacts on matters of national environmental significance', the minister has made a decision in favour of fish and rear end-breathing turtles over the water needs of people.
And it is not as if the species would have been endangered by the dam. As with other such constructions, creatures and human needs can co-exist.
As a consequence, the south-east corner of the state will be deprived of water storage infrastructure capacity of at least 75,000 megalitres each year, building up to 150,000 megalitres to 2035 as the regional population expands.
The Bligh government already spent $545 million to resume land in the Mary Valley area. Now it faces an embarrassing backflip of offering properties for sale back to their original owners.
With Traveston now relegated to the dustbin, there is a clear need for alternatives if the state is to cater for the expected growth in south-east Queensland residents from 2.8 million today to 4.4 million in two decades' time.
Already Premier Anna Bligh is softening up local residents for significant water price hikes for the financing and production of water from up to four new, energy-intensive desalination plants stretching from the Sunshine to Gold coasts.
Typically, desalination costs five times as much as a dam to deliver water to urban areas. This is the implicit tax penalty that Rudd and Garrett have imposed on Queenslanders.
Given the hefty price tag for desal, the relative costs and benefits of alternative options such as raising the capacity of existing dams should be assessed as a matter of priority.

3. Ironically, 1989 was also the same year that the Goss/ Rudd government de-committed from the proposal to build the Wolfdene Dam, which was regarded by Engineers as a near-perfect dam site and clearly the best dam site to provide water security to South-East Queensland. From the research I have conducted, the proposed capacity of Wolfdene was to have been around that of Wivenhoe @ 1.15M ML.

Commentary from "The Australian - January 03, 2007 – Greg Hunt
http://www.mannkal.org/downloads/environment/thewolfdenedam.pdf

In December 1989 the first act of Kevin Rudd, the new chief of staff to Queensland's incoming Labor premier, was to cancel plans for the Wolfdene dam. This was despite expert advice that such a dam would be needed for southeast Queensland in the early 21st century.
The experts were dead right. With approximately 70 per cent population growth in southeast Queensland in the intervening period, Brisbane is paying the price for one of the worst infrastructure decisions in modern Australian history. Wolfdene dam would not have changed rainfall patterns but it would have allowed for perhaps 15 years of accumulated water storage, which in turn would have dramatically altered Queensland's capacity to deal with the inevitable ebb and flow of rainfall. While the Wolfdene dam is one practical example of how Rudd would govern - opting for short-term trendiness rather than showing long-term courage and planning - more deeply, it is a pointer to the failed philosophy he wants to impose on Australia: social democracy. The impact is simple: job losses and a continued failure of water infrastructure.

4. 1989, being the year that Wolfdene was cancelled, was also the same year that the Goss/ Rudd government commenced disbanding the Queensland Water Resources Commission, being the centre of engineering competence for Queensland's State's Water Supply Design and Construction expertise. It was finally disbanded in 1992.

Refer excerpt from:
http://www.archivessearch.qld.gov.au/search/AgencyDetails.aspx?AgencyId=1675#bookmarkDescription
The Queensland Water Resources Commission was established under the "Water Resources Administration Act 1978" replacing the Irrigation and Water Supply Commission. ***In 1989 the Commission became a business group within the Primary Industries Department.***
With the creation of the Primary Industries Corporation, ***the Water Resources Commission was abolished*** *and Water Resources became a Division of the Primary Industries Department* ***in 1992****.*

Comment from Retired Design and Construction Engineer, Qld Water Resources Commission:
I was employed in the commission between 1985 and 1994 and experienced the transitional change in culture from the Bjelke Peterson era (1968-1987) and the Rudd/ Goss era (1989-1996). Considerable development of the state's infrastructure took place during the Bjelke-Petersen era, including the building of the Wivenhoe, Burdekin and Hinze Dams. When Goss/ Rudd came into power, they went on a deliberate and targetted campaign to "de-engineer" the Commission. Our commission was immediately rolled into the Department of Primary Industries and then rolling large-scale redundancies followed for a period of the next 3 years or so, until the Commission was finally abolished in 1992. At this time, there was a general winding back of capital investment in water engineering works under the Goss/ Rudd regime. The design mantra became "demand side management" (a euphenism for brainwashing consumers to use less water), instead of traditional water catchment planning. Over a period of time, the design parameters for dam (water security) planning were reduced from ~550L/Water/person/day to today's parameters of ~150L/Water/person/day. This policy change has now also become responsible for reduced water supply (and flood mitigation capacity) in all dams. Such a great tragedy....

5. Had Wolfdene been built and in existence before the 2011 flood event, we would have had the opportunity to greatly accommodate the two competing objectives of my thesis, being: Water Supply and Flood Mitigation. For example, with Wolfdene, we would have met our requirements of Water Supply and the policy of having Wivenhoe at 100 % of its Water Supply Capacity (as per the January 2010 update in Wivenhoe's Operations Manual), could have been dramatically altered to a much lower level (e.g. to say 25% of its water supply capacity, when extreme weather events were being forecast i.e. La Nina, Bureau of Meteorology).

6. The Traveston Dam site, with a designed capacity of 1.13M ML, would have offered Brisbane additional water security, but it was cancelled by Peter Garrett on environmental grounds. There is currently no major dam proposal which meets Brisbane's need for Water Security.

7. From the table above, Wivenhoe /Somerset provide 66% of capacity of the entire SEQ Water Security. Even if you include the benefit of the Water Grid and consider just the Grid 12 dams, the dependence for Brisbane's water from Wivenhoe /Somerset is 75%.

8. **Given no other Brisbane Valley Dams (or Weirs) have any nominated flood mitigation role or (theoretical) capacity, the dependence on Wivenhoe /Somerset dams to protect Brisbane and Ipswich Cities is absolute**. As a gauge, their nominated flood mitigation capacity equates to *78*% of the total water supply security.

9. Had Wivenhoe's dam wall been breached, we may have been looking at a large-scale human tragedy in Brisbane, not just through the flooding, but also through the aftermath of a lack of ongoing water supply to service the (remaining) population. In other words, as Appendix A shows, we have far too much dependence on Wivenhoe/Somerset for water security. We need another major water supply to provide ongoing water security redundancy.

Refer Excerpt – S3.2, Page 10 of the Wivenhoe Dam Operations Manual[19] says: "techniques for estimating extreme floods show that floods are possible which would overtop both dams. In the case of Wivenhoe Dam such an overtopping would most likely result in the destruction of the dam."

10. **Another major dam is required to provide for Brisbane's Water Supply Security, so that Wivenhoe's Flood compartment capacity can be increased. Such an additional facility will enable Wivenhoe to dramatically improve its Flood Mitigation Role.**

Wivenhoe's flood mitigation capacity can be increased in 2 ways:

a. Increase the Dam Wall Height
b. Adjust the notional split/ level between Water Supply/ Flood Mitigation (current policy split is 1.15ML : 1.45ML) to increase the Flood Storage Component. This will be possible with the advent of another major dam for Water Supply. I propose a dynamic policy framework be established to do this. I have expanded on this proposal under Recommendations –see later.

Recommendations - Issue #1:

1. At least one new major dam **must** be built in SE Qld to provide Water Security for Brisbane, so as to avoid the conflict of Wivenhoe serving its 2nd competing objective, being Flood Mitigation. Dependence can then be removed from Wivenhoe for Water Security, allowing it to service its primary objective of being a Flood Mitigation mechanism. The Flood Compartment can then be increased (either on a semi-permanent basis by reducing the Water Storage Compartment below its current level of 1.15M ML) or dynamically by dumping water from the Water Storage Compartment depending on weather forecasts and seasonality.

2. This new dam/s should have a combined capacity to ensure adequate Water supply security for Brisbane and be designed to a minimum capacity of the water storage compartment of Wivenhoe i.e. > 1.15M ML. This capacity, if possible, would then allow dynamic management of Wivenhoe, when under a flood threat, to be theoretically drained to zero, thus maximising its Flood Mitigation objective, for its full total capacity of 2.6M ML.

3. When combined with sound and dynamic management principles, I believe (whilst flash-flooding will always exist), this will 'flood-proof' Brisbane at the strategic level.

4. Candidate sites for this new dam need to be re-examined by competent Engineers, but some alternatives (post Traveston), which should be considered include:
    a. Major Increase of Borumba Dam
        i. refer http://wivenhoesomersetrainfall.com/borumba_proposal.htm, which provides a compelling analysis of this option and the proposed interconnection with Wivenhoe/ Somerset for take-off storage management and inter-connected redundancy of these three sites.
    b. Increase Wivenhoe Dam Wall (whilst this is useful to increase flood mitigation capacity, only a new dam at a different site can truly address the issue of independent water supply security & avoid the current problem of Wivenhoe serving two competing objectives)
    c. Revisit Wolfdene Proposal
    d. Upstream Site in the Brisbane Valley (ie above Wivenhoe and/or Somerset)
    e. Supplementary Sites in the Bremer/ Lockyer/ Moogerah Valleys

1.

Issue # 2 – Lack of Flood Mitigation Focus, Study or Strategies

Analysis and Conclusions:

1. An Extract from the "State Water Conservation Strategy – A Discussion Paper" – Sept 1993, issued by Ed Casey, Minister for Primary Industries (Goss Government) – pages 92, 93, Table 7.6 is contained below for the South-East Region.

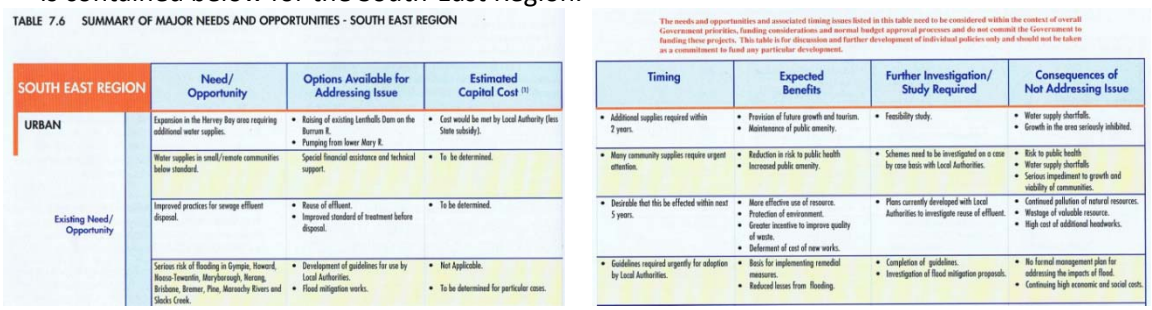


TABLE 7.6 SUMMARY OF MAJOR NEEDS AND OPPORTUNITIES - SOUTH EAST REGION

The needs and opportunities and associated timing issues listed in this table need to be considered within the context of overall Government priorities, funding considerations and normal budget approval processes and do not commit the Government to funding these projects. This table is for discussion and further development of individual policies only and should not be taken as a commitment to fund any particular development.

SOUTH EAST REGION	Need/ Opportunity	Options Available for Addressing Issue	Estimated Capital Cost [1]	Timing	Expected Benefits	Further Investigation/ Study Required	Consequences of Not Addressing Issue
URBAN	Expansion in the Hervey Bay area requiring additional water supplies.	• Raising of existing Lenthalls Dam on the Burrum R. • Pumping from lower Mary R.	• Cost would be met by Local Authority (less State subsidy).	• Additional supplies required within 2 years.	• Provision of future growth and tourism. • Maintenance of public amenity.	• Feasibility study.	• Water supply shortfalls. • Growth in the area seriously inhibited.
	Water supplies in small/remote communities below standard.	Special financial assistance and technical support.	• To be determined.	• Many community supplies require urgent attention.	• Reduction in risk to public health • Increased public amenity.	• Schemes need to be investigated on a case by case basis with Local Authorities.	• Risk to public health • Water supply shortfalls • Serious impediment to growth and viability of communities.
Existing Need/ Opportunity	Improved practices for sewage effluent disposal.	• Reuse of effluent. • Improved standard of treatment before disposal.	• To be determined.	• Desirable that this be effected within next 5 years.	• More effective use of resource. • Protection of environment. • Greater incentive to improve quality of waste. • Deferment of cost of new works.	• Plans currently developed with Local Authorities to investigate reuse of effluent.	• Continued pollution of natural resources. • Wastage of valuable resource. • High cost of additional headworks.
	Serious risk of flooding in Gympie, Howard, Noosa-Tewantin, Maryborough, Nerang, Brisbane, Bremer, Pine, Maroochy Rivers and Slacks Creek.	• Development of guidelines for use by Local Authorities. • Flood mitigation works.	• Not Applicable. • To be determined for particular cases.	• Guidelines required urgently for adoption by Local Authorities.	• Basis for implementing remedial measures. • Reduced losses from flooding.	• Completion of guidelines. • Investigation of flood mitigation proposals.	• No formal management plan for addressing the impacts of flood. • Continuing high economic and social costs.

The last line of this table is important. It states that:

- Existing Need: (there was a) **Serious Risk of flooding in** Gympie, Howard, Noosa-Tewantin, Maryborough, Nerang, **Brisbane, Bremer**, Pine, Maroochy Rivers and Slacks Creek.
- Option for addressing the issue: Development guidelines; **Flood Mitigation Works**
- Timing: …**Required urgently**…
- **Expected Benefits: Reduced losses from flooding**
- Further investigation of flood mitigation proposals (was required)
- **Consequence of Not Addressing Issue:**
    - **No formal management plan in place for addressing the impacts of flood**
    - **Continuing high economic and social costs**

2. The notes in red at the top right-hand corner of this table are interesting and disclaim any government commitment to funding these projects. It is clear that these priorities and recommendations **were not pursued** and that little has been done the recommendations in this table were developed in 1992, in the interests of flood mitigation planning or major flood-proofing of either the Brisbane and Bremer river systems.

3. Searches on the internet reveal very few documents on Flood Mitigation Planning and/or Strategies for SE Qld rivers/ creeks. There appears to be few, if any, public documents which exist on the subject of Flood Mitigation Strategies for either the Bremer River or Lockyer Creek, both of which were major contributors to the 2011 Brisbane Flood.

4. Searches on the Australia Flood Studies Database[17] have revealed a total of 79 Flood studies for Queensland. However, the large majority of these studies have been commissioned by local councils.

5. In relation to flood studies relating to the 2011 Flood in the Brisbane Valley, only the following document references could be found on Australia Flood Studies Database[17]:

River System	Flood Study Conducted	Year	By Who	For Who
Bremer River	Bremer River Catchment - Flood Risk Management Study (914)	-	KBR Sinclair Knight Merz PL	Ipswich Rivers Improvement Trust
Laidley Ck	Laidley Creek - Floodplain Management Study (916)	2003 (Feb)	WBM	Laidley Shire Council
Bremer River, Western Creek, Franklin Vale Creek, Warill Creek, Purga Creek	Ipswich Rivers Flood Studies – Phase 3: Final Report (921)	2002 (Sep)	Halliburton KBR PL	Ipswich Rivers Improvement Trust
Bremer River, Brisbane River, Purga Creek, Ironpot, Creek, Mihi Creek, Deebing Creek, Bundamba Creek, Six Mile Creek, Goodna Creek, Sandy Creek, Woogaroo Ck	Ipswich Rivers Flood Studies (951)	2000 (Jul)	Sinclair Knight Merz PL	Ipswich Rivers Improvement Trust

River System	**Flood Study Conducted**	**Year**	**By Who**	**For Who**
Brisbane River	Brisbane River Flood Study (968)	1999 (June)	Sinclair Knight Merz PL	Brisbane City Council
Brisbane River	Brisbane River Flood Study - Further Investigation of Flood Frequency Analysis (969)	2003 (June)	Sinclair Knight Merz PL	Brisbane City Council
Cabbage Tree Creek	Cabbage Tree Creek Flood Study Upgrade Report (956)	2000 (Jan)	Brisbane City Council	Brisbane City Council
Moggill Creek	Brisbane River Flood Study	1999 (June)	Sinclair Knight Merz PL	Brisbane City Council
Caboolture River, Burpengary Creek, North Pine River, South Pine River, Brisbane-Bremer River, Logan-Albert River, Pimpama River, Coomera River, Nerang River, Tallebudgera Creek, Currumbin Creek	'Flood Risks' in Natural Hazards and the risks they pose to South-East Queensland (1036)	2001 (Jan)	Geoscience Australia and the Bureau of Meteorology	Geoscience Australia

6. Unfortunately, the website for the Australia Flood Studies Database[17] does not provide access to downloadable copies of each of these studies. As a result, the author was unable to obtain or review these documents, or make any comment about them in time for this submission.

7. A notable absence from the flood studies listed on the Australia Flood Studies Database[17,] was any study done on the Lockyer Creek system.

8. The Brisbane River Flood Study published by Brisbane City Council's Independent Review Panel in 3/9/03, contained a gross factual error (Page 9), being the stated (regulated temporary) flood mitigation capacity of Somerset Dam as 524,000 ML, assuming the accuracy of the SEQWater web site, which states that **524,000 ML is Somerset's total capacity** and the flood mitigation capacity was **only 155,000 ML.** This error did not seem to have been picked up by the CMC Review Report of March 2004.

In many instances it is not necessary to explicitly account for key catchment characteristics in detail, as their influences can be adequately defined within a simplified scope of modelling parameters that are determined through a process of calibration against historical records.

Characteristics within the Brisbane River catchment have been continually changing, primarily as a result of progressive settlement and development. These changes will have had an effect on runoff characteristics (flood flow rates and levels), but one considered small in relation to the impact of the large dams, Wivenhoe and Somerset.

Investigations by both BCC and SKM have assumed that the only change in catchment characteristic of importance has been the construction of these dams. Under the circumstances this assumption is considered reasonable, given that most other key catchment characteristics can be considered to have largely remained unchanged over the years. It is noted that although development of the major regional centres of Brisbane and Ipswich Cities will have resulted in substantial change to local runoff characteristics, the overall impact on Brisbane River flooding is expected to be relatively small on account of the relatively small area of the overall catchment occupied. Catchment change has therefore been presented with respect to two scenarios: "No Dams"; and "With Dams".

3.4 Position and size of major storages

As noted previously, there are two major dams located within the catchment that provide both water supply and flood attenuation service:

- Wivenhoe Dam:
  - Completed: 1985
  - Water supply storage capacity: 1,150,000ML (approximately)
  - Regulated temporary flood storage capacity: 1,450,000ML (approximately)
  - Location: Brisbane River upstream from confluence with Bremer River
  - Catchment: approx. 7,000km^2
- Somerset Dam:
  - Completed: 1959
  - Water supply storage capacity: 370,000ML (approximately)
  - Regulated temporary flood storage capacity: 524,000ML (approximately)
  - Location: Stanley River upstream from confluence with Brisbane River

[information extracted from SKM 2003 (b)]

Clearly, the amount of flood storage is these dams is very significant relative to the design runoff volumes, so the correct simulation of these dams (and their operation during events) is of paramount importance.

9. Despite a statutory responsibility on the Department of Environment and Resource Management (DERM), under both the *Water Act 2000* for **flood control and prevention** and the *Water Supply (Safety and Reliability) Act 2008*, for flood mitigation, according to the Australia Flood Studies Database[17] (http://www.ga.gov.au/oracle/flood/flood_studies.jsp) **only 1 flood study** (other than Wivenhoe/Somerset studies) **(has ever been commissioned by the Qld State Government**. This single flood study was done, **not for DERM**, but for the Department of Emergency Services for the Murweh Shire (Warrego River).

Does this constitute gross negligence by the State Govt?

Excerpt from DERM Web-site: http://www.derm.qld.gov.au/about/legislationpolicy/legislation/acts.html#w

Act of Parliament	Responsible minister
Water Act 2000 (PDF)* (except to the extent administered by the Minister for Natural Resources, Mines and Energy and Minister for Trade through the Queensland Water Commission). All rights to the use, flow and control of all water in Queensland are vested in the State. The purpose of this Act is to advance sustainable management and efficient use of water and other resources by establishing a system for water planning, allocation and use. The Act provides for: • rights to, and measurement and management of water • the construction, control and management of works for water conservation and protection • irrigation and water supply; drainage; flood control and prevention; improvement of the flow in or changes to the courses of watercourses, lakes and springs • protection and improvement of the physical integrity of watercourses, lakes and springs.	Minister for Natural Resources, Mines and Energy and Minister for Trade

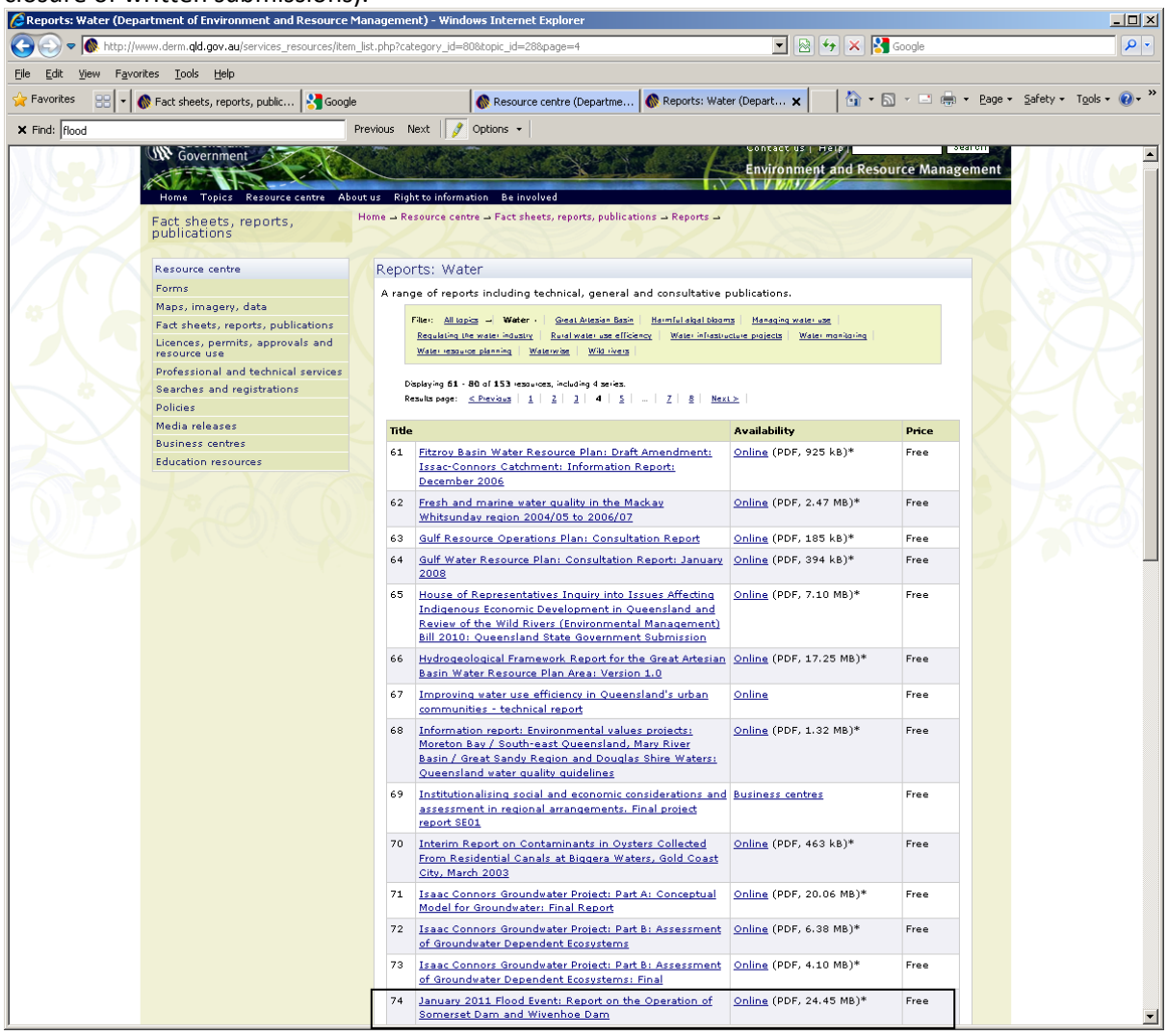
Excerpt from DERM Web-site:
http://www.derm.qld.gov.au/about/legislationpolicy/legislation/acts.html#w

Water Supply (Safety and Reliability) Act 2008* (PDF)	Minister for Natural Resources, Mines and Energy and Minister for Trade
The purpose of this Act is to provide for the safety and reliability of water supply primarily by: • providing for • a regulatory framework for providing water sewerage services in the state, including functions and powers of service providers • a regulatory framework for providing recycled water and drinking water quality, primarily for protecting public health • the regulation of referable dams • flood mitigation responsibilities • protecting the interests of customers of service providers.	

10. A request made more than a week prior to the deadline for the inquiry, to the Corporate Communications Department at SEQ Water, provided the following response on 10/3/11:

Dear Mr Land,
We refer to your recent enquiry to the Water Grid regarding public documents for dams and flood studies.
All public documents relating to dams and flood studies are available from the Department of Environment and Resource Management (DERM) website – www.derm.qld.gov.au/services_resources/index.php

A subsequent search, using this link on the DERM website within the >>Water>>Reports>> section of this web site, provided **only 1 document out of 153** documents, with the word "Flood" in the title, (i.e. #74 on the list) being the SEQWater report on the 2011 flood on Wivenhoe which was only released on 8/03/11 (i.e. 3 days prior to the date for this inquiry's closure of written submissions).



11. Despite their published agenda and purpose, the lack of flood studies and development of any substantial flood strategies by DERM suggests a serious failure in meeting their statutory responsibilities and also a failure in meeting their own planning documents, as evidenced by

the lack of any substantial investigations or progress against the issues highlighted by the 1993 Casey report (refer item 1. above).

12. The DERM website contains very little reference material on specific Flood Mitigation Strategies or studies conducted into *any catchment* in Queensland. The only substantial documents which exist on DERM's web-site is DS 5.1[18]– Flood Mitigation Manual for a Dam, being an outline of the generic process undertaken for assessing a flood mitigation manual for a dam. This document, developed under the auspices of the *Water Supply (Safety and Reliability) Act 2008,* states that: *only 3 dams in Queensland have formally documented manuals for the controlled releases of water for flood mitigation.* These dams are:

    - North Pine Dam, gazetted on 28 September 2007;
    - Wivenhoe and Somerset Dams (approval for one manual for both dams), gazetted on 22 January 2010.

13. The two primary planning documents specified under the *Water Act 2000* for each catchment in Queensland are the:

    - (Moreton Area) Water Resource Plan
    - (Moreton Area) Resource Operating Plan

    Of specific interest to the 2011 Brisbane Flood, is a review of the *Moreton Area* plans, which includes the Brisbane Valley. It is interesting to note that SEQWater's 25 Dams and the new Water Grid spans 4 of the Water Resource Area plans/ responsibilities, being the:

        - Moreton Area
        - Mary River Basin Area
        - Logan River Area
        - Gold Coast Area

    The Table presented in Appendix A of SEQ Water-managed dams spans these 4 x Area Plans.

14. Apart from three "referable dams" nominated for flood mitigation (Wivenhoe, Somerset and North Pine), a review of the DERM *Water Resource Plan/s* and *Resource Operating Plan/s* reveals a complete deficiency in delivering any responsibility for flood strategy/ mitigation planning. The large majority of these documents are focussed on water supply, irrigation, licensing and procedure. They meaningfully fail the requirements for proper engineering of flood mitigation plan development. The philosophy seems to be to leave it to the councils to prescribe specific building levels e.g. via the Q100 flood levels.
Being kind at best, the state government again seems quite negligent of its responsibilites.

15. Specifically, the *Water Act 2000* states:
    - **S346 Principles for performing functions**

    (1) This section states the principles under which the (Qld Water) commission is to perform its functions for the SEQ region or a designated region……

    (3) The specific principles are—…..

    (g) <u>for flood mitigation and dam safety</u>—the principle that these issues should be considered in the preparation of assessments of regional water supply.

In my opinion, both the (Moreton Area) Water Resource Planand Resource Operating Plans **<u>fail</u>** to meet this legally-prescribed requirement.

16. The *Water Act 2000* is woefully deficient is laying out more-specific responsibilities on the Qld Water Commission, DERM or other agencies for flood mitigation and development of specific plans/ strategies. From discussions with water-planning personnel employed by the government, the philosophy seems to be "all rivers and streams flood, our strategy is to let

them. All we can do is to have local councils prescribe proper building controls to mitigate the effects of flooding".
This philosophy is an abject failure of our government, its leadership and investment priorities, and fails to exploit the strategic role of the engineering profession, being to solve problems for our society.

17. There is a total lack of focus, culture and hence genuine strategy development within our government entities on real flood mitigation strategies. Instead, through lack of state government leadership, councils then become *forced* to use the "blunt instrument" of development controls, most typically the Q100 building regulations which force protect property owners, at their own expense to build above flood levels. This is not the way to go. Instead, this culture must change and real work and real investment must be made on flood mitigation solutions.

    By way of example, BCC this week released their revised Q100 levels (post the 2011 flood event). In some suburbs inundated in the 2011 flood, Q100 levels have gone up by +2.2m. Interpreted literally, it would mean they have to add +2-2.5m onto existing levels to get to a new habitable level. This will make many properties unable to be developed at all. When we get to this extreme effect on *established* urban development, the population must seriously question the use of alternatives to the "blunt instrument" of Q100 development controls.

    Instead, real flood mitigation works should be funded (eg major new dam/s to allow Wivenhoe to increase its flood mitigation role), else they destroy the economic and social basis of Brisbane.

18. *The Water Supply (Safety and Reliability) Act 2008* contains only a limited focus on flood mitigation strategies, unless a specific dam, is defined as a Flood Mitigation Dam, or a "referable Dam" under Part 1, Section 341. Only North Pine, Somerset and Wivenhoe fits the criteria for flood mitigation in SE Qld.

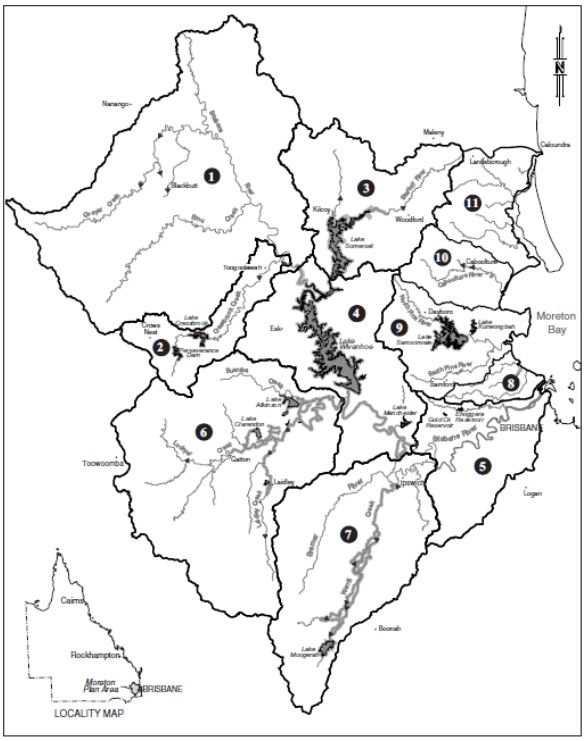
19. Weirs, depending on their design, size, control and drainage mechanisms, can provide flood mitigation mechanisms. However, as per the table collated in Appendix B, the total of all SE Qld weir capacities is < 0.5% of the Water Supply capacity. Also, their primary design purpose has been water supply security for consumers, councils and farmers (i.e. irrigation). In other words, these weirs by virtue of their designed purpose and capacity, currently provide little, if any, real flood mitigation capacity.

20. Many people, including myself, have observed high levels of sediment deposition on their foreshores in the aftermath of the 2011 Brisbane flood, in some places up to +2m. Of particular concern should be the potential reductions in flow rate and the effect of increase flood levels caused through significant sediment deposition as a result of both the 2011 flood and the end of Brisbane River's 100+year dredging history[20] which occurred on 30 September 1997. These two events have the potential of dramatically reducing the river's capacity to drain water, adding a significant risk potential of elevated (future) flood levels to Brisbane and Ipswich housing.

Recommendations - #2 – Flood Mitigation

1. That both the *Water Act 2000* and *The Water Supply (Safety and Reliability) Act 2008* be amended to include statutory responsibility for developing Flood Mitigation studies and strategies for flood-affected catchments and also the ownership of developing these Flood Mitigation plans (one independent of council boundaries e.g. DERM) be clearly assigned in same. *(i.e. there needs to be more than just controls through building guidelines/ Q100 levels being specified by local authorities)*

2. Referring to the Subcatchment Area plan from Schedule 4 of the Moreton Area Water Resource Plan (below), that a proper, detailed Engineering consultancy be engaged to develop thorough flood mitigation strategies (without being limited by constrained budgetary limits) for the following sub-catchments:
   - **a.** Locker Creek (=6 below) – feeds Brisbane River below Wivenhoe
   - **b.** Bremer River (= 7 below) – feeds Brisbane River below Wivenhoe
   - **c.** Stanley River (= 3 below) – feeds into Somerset
   - **d.** Upper Brisbane River (= 1 below) - feeds into Wivenhoe
   - **e.** Cressbrook Creek (= 2 below) – feeds into Wivenhoe



3. All of the above sub-catchments need to be analysed to look at catchment-specific flood mitigation plans with relevant stakeholders, and assessing the levels of contributing outflows to the resultant 2011 flood peak. From review of reports to-date, the 2011 Brisbane flood was caused about 70% by Wivenhoe Dam releases and about 30% by the combination of the outflows from Locker Creek/ Bremer Systems. These three sub-catchments (+ Somerset) need to be studied with diligence.

4. Flood Mitigation options may include:

   - Upstream Dams / Flood Storages:
     i. Single
     ii. Multiple
   - Temporary Water Storages e.g. specially-designed:
     i. Dams
     ii. Weirs
     iii. Detention/ Retarding Basins
     iv. Drains

v. Pipelines

- Channel Works:
  i. to improve flow
  ii. to divert water into off-stream storages
  iii. to other dams
- Levees or Walls:
  i. To protect towns/ city areas
  ii. To protect developed areas
  iii. To protect houses
  iv. To protect businesses
- Bridge Upgrading / Bypass Floodways
- Land Resumption
- Debris / Obstacle Clearing – to improve exit flow rates
- Dredging to improve capacity and drainage/ outflow flow rates of:
  i. Stream/ rivers/ water courses
  ii. Channels

5. A detailed assessment needs to be conducted of how the effect of sediment deposition on the river bed has changed as a result of this 2011 flood (and the last 14 years of the absence of dredging[20]) and an engineering assessment made of any threat increase to future flooding. Key questions that need to be examined by such a study, including:
   a. Has the river become shallower as a result of sediment deposition from the 2011 flood?
   b. Given the historical reason for dredging the river was to provide for navigation, aggregate, and in-part protect from flooding[20], has the river become significantly shallower over the last 14 years since dredging was stopped in the Brisbane river[20]?
   c. If so, where and what is the effect of this at different locations along the river?
   d. If (a) or (b) are yes, what effect will this have on the river's drainage flow rate and future flood levels?

If increases in flood threat levels from sediment deposition are deemed significant, the proposal to resume (full or selective) dredging to the Brisbane River needs to be considered.

6. A full range of potential flood mitigation strategies need to be considered for the nominated Moreton sub-catchment areas, in particular Lockyer Creek and the Bremer Systems (as this paper has already analysed, a more strategic solution to dramatically increasing Wivenhoe's Flood Mitigation capacity). Hybrid solutions have proven to be very effective; no one solution will be a 'silver-bullet' answer.
   For example, a cursory review of these 2 specific catchments highlights some potential flood mitigation solutions, being:
   - Bremer River:
     - Add 2-3 Flood Mitigation Dam/s in Upper Bremer System e.g. East of Laidley South, upstream of Grandchester
     - Provide substantial increase to Moogerah Dam's capacity by damming between adjoining mountain ranges
     - Excavate / construct a series of downstream detention basins
   - Lockyer Creek:
     - Add flash flood / diversion channel control to divert flash flood occurrences from Toowoomba / Upper Lockyer to offline detention basis
     - Add upstream flood mitigation dam above Helidon/ Murphy's Creek
     - Add Flood Mitigation (controlled) Dam capability in or around Atkinson Dam, Clarendon Dam and Bill Gunn Dams to augment /replace the water supply roles for these 3 dams.
     - Excavate / construct a series of downstream detention/ retardant basins
     - Selective levy bank construction

   Engineering professionals, ideally with strong local and/or overseas flood mitigation experience should analyse all options here for viable (esp. hybrid) solutions.

Issue # 3 – True Size of Flood Compartment (Lowering of the Flood Mitigation Compartment's Capacity by 25% when Fuse Plugs and 2nd Western Spillway were Constructed)?

Newspaper Report - The Australian - Cheap Wivenhoe Dam upgrade reduced its capacity
Hedley Thomas, National chief correspondent - February 05, 2011 12:00AM

The actual capacity of Brisbane's Wivenhoe Dam for flood storage is significantly less than claimed by the Queensland government -- and about 20 per cent below the dam's capacity when it was built to reduce the serious flooding of Australia's third largest city.

The compromise in flood storage is one of the reasons the dam operator, SEQWater, shed massive volumes of water at the worst possible time on January 11, resulting in most of the devastating flooding in Brisbane, The Weekend Australian can reveal.

The dam's capacity to store floodwater was significantly compromised four years ago when engineering works occurred.

But the reduction has not been previously communicated to the general public by the Queensland government or SEQWater, which asserts that the flood storage capacity has not changed in the 25 years since the dam's opening.

Engineers and other experts, who are studying the dam's key role in the Brisbane flood, told The Weekend Australian the official claims that the dam's storage compartment still has a total capacity of 1.45 million megalitres are demonstrably false.

The capacity for flood mitigation was cut by at least 250,000 megalitres to about 1.2 million ML as a result of a dam upgrade four years ago that was one of the cheapest options to meet new safety rules. The reduction is equivalent to almost half the volume of Sydney Harbour.....

....The cheaper upgrade went ahead in 2006 after the dam's operators were warned that the dam would over-top with catastrophic results in a probable maximum precipitation event, measured by the Bureau of Meteorology as likely once in several thousand years on average.

As a result of the upgrade, which was tens of millions of dollars cheaper than raising the dam's wall, the dam was compliant for an event with an average return of about 5000 years. However, the upgrade removed a large part of its vital storage capacity to manage more frequent rainfall events such as those last month.

The upgrade included building three so-called "fuse plugs", which were designed to automatically collapse and release a large volume of water to quickly lower the level of the lake at Wivenhoe Dam during extreme rainfall.

The trigger-point of 75.7m for the first fuse plug is 1.3m below the 77m level at which the dam's capacity was calculated when built to be 1,450,000ML.

About 250,000ML of capacity was removed from the storage compartment withe the upgrade. In addition to the loss of 250,000ML of capacity between the trigger point of 75.7m and 77m, many tens of thousands of megalitres more potential capacity is removed by SEQWater's priority to keep the level at least 70cm below the trigger point.

Mr Robertson did not respond to detailed questions yesterday, instead issuing the following statement: ...."The dam's ability to manage extreme flood events was increased during the upgrade program which included the fuse plug installation. Therefore the reality is, the flood mitigation benefit of the dam has not been altered. The flood management of Wivenhoe Dam is now subject to investigations of the independent commission of inquiry."

Analysis and Questions to be Pursued by Inquiry:

1. From newspaper reports, the dam only ever reached a peak level of around 188.5% on Wednesday January 12. With a theoretical total capacity of Wivenhoe around 225% (=2.6M ML/1.15 M ML) of the base Water Storage compartment, why did Wivenhoe only reach ~190% of its potential? Why was the remaining +35% of spare flood capacity not used?

   a. Was it that the flood compartment was actually lowered when the fuse plug and emergency spill way west of the main spillway was constructed some years ago to the point that it is impossible to actually ever fill Wivenhoe to its designed potential of 1.4% ML in the flood compartment?
   b. Did the operations staff panic and in the pursuit of Strategy W4 of the Operations Manual, prematurely let massive water go from the main gate?
   c. *Was the dam breached elsewhere* (to such an extent that it prevented further filling or was considered too dangerous to do so)? e.g. in its abutments / Saddle 2 Dam Area ? Reports have been made that the dam was overflowing / leaking around the area where the high-school rowing competitions are held (Saddle Dam 2?) & that emergency gravel/ concrete filling was being hurriedly filled in this area to avoid a disaster from occurring. According to SEQWater's 2011 Flood Report[22,] the Saddle Dam level is at Elevation of 80m, c.f. the recorded flood peak of 74.97m. If the Saddle was breached at the flood peak of 74.97, there is a **5m discrepancy** (c.f the Design of 80m), highlighting a **major risk issue**. ***Did this breach occur & why does such a large discrepancy exist ?***

2. If the flood compartment was lowered (or cannot ever be reached for other reasons) as suggested above, then the flood compartment of Wivenhoe is actually 25% less than that publicly stated. This is a significant misrepresentation of the facts and utilisation of the full flood compartment would have considerably reduced the scale of flooding to Brisbane.

Recommendation - #3: The Commission of Inquiry needs to pursue all these questions in detail.

Issue # 4 – Latest Amendment and Prioritisation of Strategies specified in the Dam Operating Manual

> ***Newspaper Report - Wivenhoe bosses were not allowed to empty dam before flood crisis - The Courier-Mail - January 25, 2011 - Steven Wardill***
> *DAM managers were under orders to ensure Wivenhoe's water storage was full after any flood, denying them the ability to lower limits ahead of huge downpours.*
> *The latest version of the controversial Wivenhoe and Somerset flood manual shows that retaining the dams at 100 per cent storage capacity was introduced as a top-level priority.* ***The objective stating each dam's water storage must be at the "full supply level at the conclusion of the flood event" was only introduced in a January 2010 update.***
> *Full dam capacity was listed as the fourth most important role for operators during a flood ahead of protecting flora and fauna. However, no such objective existed in previous editions.*
> *The objective exposes how Wivenhoe's water supply role has become the dominant purpose of the dam, completed in 1985.*
> *Some engineers have claimed water held in Wivenhoe's flood compartment, and possibly more, should have been released on the weekend before January 13. But managers would be unable to empty water from the storage compartment ahead of a flood in case it didn't occur as predicted, leaving them in breach of the manual. The manual's objectives largely restrict managers to be reactive to floods, rather than proactive.*
> *Natural Resources Minister Stephen Robertson yesterday refused to say who was behind the introduction of the new storage objective or whether it compromised the dam's flood mitigation role.*
> *But in a statement sent from Mr Robertson's office that was attributed to Seqwater, the dam's operator said reducing Wivenhoe back to 100 per cent supply capacity after a flood had always been the procedure.*

Analysis and Questions to be Pursued by Inquiry:

1. A review the SEQWATER Operating Manual for Wivenhoe (V7, dated November 2009)[19], contains a preface note which says:

> *Note: This version is a redacted version that has been amended to remove material that may be of concern in relation to the security of critical infrastructure.*

   - Whilst this seems innocuous, the inquiry should determine if any such editing of this publication has been made to obfuscate the operational management of the dam during the 2011 flood period.

2. This November 2009 version of the manual[19], being that the manual was gazetted in January 2010 (date as per press article), states:

> Wivenhoe's Operating Manual - Section 3.5, page 11, states:
> ***3.5 Retain the storage at Full Supply Level at the Conclusion of the Flood Event***
> *As the dams are the primary urban water supply for South East Queensland, it is important that all opportunities to fill the dams are taken. There should be no reason why the dams should not be full following a Flood Event.*
>
> Also, Wivenhoe's Operating Manual - Section 8.4, page 22, states:
> ***8.4 Flood Operations Strategies***
> *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. As outlined in Section 3, the objectives,* ***listed in descending order of importance****, are as follows:*
> *• Ensure the structural safety of the dams (W4);*
> *• Provide optimum protection of urbanised areas from inundation (W3);*
> *• Minimise disruption to rural life in the valleys of the Brisbane and Stanley Rivers (W1, W2);*
> *• 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.*
> ***Within any strategy, consideration is always given to these objectives in this order, when making decisions on dam releases.***

3. Note that this Section 8.4 of the Wivenhoe Operations Manual lists the objective of retaining the dam at its full capacity (as per S3.5), as being 4th in overall importance and below the importance of the 2nd objective to "Provide optimum protection of urbanised areas from inundation"
4. The Wivenhoe Operations Manual repeatedly states that the above ***Objectives (S8.4) are always considered in order of importance.*** Why was this not observed?
5. It would appear from other newspaper reports that SEQWater retained the dam at 100% of the Water Supply Capacity in order to meet satisfy the FSL objective as outlined in S3.5 (too late), but in so doing, failed to place this objective in its correct priority below that of *providing*

optimum protection of urbanised areas from inundation. i.e. SEQWater's own prioritisation protocol was not followed.

Recommendations - #3 – Latest Amendment and Prioritisation of Strategies specified in the Dam Operating Manual

1. The Commission of Inquiry needs to pursue specific questions in detail regarding the manual and the operating procedures and decisions taken during the lead-up to the peak on 13 January and in the years between 1984 and 2011, regarding policy/ decision making framework around codifying the dams operations into the Operations Manual[19].

   Suggested questions include:

   a. Did the prior version/s (Version 5/6, dated December 2004) of the Wivenhoe Operations manual contain this objective (S3.5) to "*Retain the storage at Full Supply Level at the Conclusion of the Flood Event"**?***

   b. If this was not in prior versions of the Operations Manual, which person or persons proposed or requested this change to the manual in 2009?

   c. Why was the objective to "*Provide optimum protection of urbanised areas from inundation"* de-prioritised below that of "*Retain the storage at Full Supply Level at the Conclusion of the Flood Event",* when this was contrary to the repeated directions and priorities stipulated throughout the Operations manual?

   d. If the objectives in (c) were reprioritised, which person or persons directed this alternate decision by the Dam's Operators to make such decisions contrary to the prioritisation outlined in the manual?

   e. If the Dam operators were so directed by other persons, what was the qualification of such persons and did they meet the qualifications of the approved Senior Flood Engineer, as set out in Sections 2.3-2.6 of the manual itself?

   f. What were the changes made in all prior versions of the Operations Manual and should these changes (with the benefit of the 2011 flood hindsight) have been made?

   g. Since the design and construction of the Wivenhoe dam in 1984, have adjustments been made from the original specifications of the levels or the relative proportions specified for the Water Supply Compartment Versus the Flood Compartment? either formally in the Operations manual or elsewhere by management? If any such changes have been made, who made the, when were they made and were such amendments made in accordance with the specific procedures of the *Water Act 2000* and *The Water Supply (Safety and Reliability) Act 2008*?

Terms of Reference #2

☑ **implementation of systems operation plans for dams** and in particular the Wivenhoe and Somerset release strategy and an assessment of compliance with, and the suitability of the operational procedures relating to flood mitigation and dam safety

Analysis and Conclusions

1. *S374 of the Water Supply (Safety and Reliability) Act provides for a level of Statutory immunity for dam operators, who comply with the manual, as follows:*

> **374 Protection from liability for complying with flood mitigation manual**
> (1) The chief executive or a member of the council does not incur civil liability for an act done, or omission made, honestly and without negligence under this part.
> (2) An owner of a dam who observes the operational procedures in a flood mitigation manual, approved by the chief executive, for the dam does not incur civil liability for an act done, or omission made, honestly and without negligence in observing the procedures.
> (3) If subsection (1) or (2) prevents civil liability attaching to a person, the liability attaches instead to the State.
> (4) In this section—
> ***owner***, of a dam, includes—
> (a) the operator of the dam; or
> (b) a director of the owner or operator of the dam; or
> (c) an employee of the owner or operator of the dam; or

2. Conversely, I believe S374 of the Water Supply (Safety and Reliability) Act clearly outlines the circumstances when personal or Statutory Liability for Dam operators occurs. Dishonesty or Negligence is not a defence to liability. Under this provision, the State has a far broader liability than individuals.

3. In the lead-up to the Dam's operational decisions taken in the 10 days period before the 2011 Flood event, the background environment that a reasonable person should have known in Brisbane, as to the ***general*** *conditions / knowledge* pertaining at that time were:

   a. the scientifically–proven La Nina cycle of weather pattern had commenced

   b. weather forecasters were predicting 6 cyclones for the season and one of the wettest summers on record was to occur

   c. the level of prior inflows into the catchment were high

   d. the fact that the catchment area had many weeks prior reached total saturation levels

   e. the facts that all major SEQ catchments were full and the security of SEQ's water supply was very high, regardless of Wivenhoe's (full) position

   f. there was already a very large combined quantity of water held in both Wivenhoe and Somerset dams

   g. a high level of rain had been predicted to fall in the coming days by the Bureau of Metrology

4. By adhering to the incorrectly prioritised objective for retention of water supply at 100% (of the base compartment) in the light of this *general* background, pointed to a monumental disaster waiting to happen, especially when added to the *specific* background of the warnings given to the Dam operators (and/or their Senior Management) by other professional advisers, as has been outlined by other newspaper reports. Refer below.

5. It need not have happened, if the dam was used properly for its intended flood mitigation objective and the level of water in the base Water Supply Compartment of Wivenhoe had been reduced in expectation of the coming rain. The 2011 Flood was a totally avoidable event.

   When did flooding of low-level crossings (W1 strategy of the manual) become more important than inundation of peoples' houses, their lives, their lifes' work, their lifetime possessions and the economic stability of our state capital and largest city? As outlined earlier, the Dam Operations priorities were out of order, given the specific prioritisation order as set out in the manual, was not followed.

   The dam should have been kept much lower (suggest at <50%), not 100% in the preceding week. The heavy rainfall was forecast 4 weeks in advance by the weather experts, with a severe weather warning issued on January 5.

Commentary 16 February 2011:
http://www.crikey.com.au/2011/02/16/wivenhoe-release-couldve-prevented-floods-nonsense-say-experts/
Some experts argue that the dam held too much water in its flood compartment on the weekend of January 8-9 and believe the subsequent release of a large amount of water on January 11 produced most of the flooding. Hydrometeorologist Aron Gingis says the decision to reduce water levels in the Wivenhoe Dam should have occurred last year.
"I am the one who warned the government and associations about the issue and they just brushed me off," he told Crikey. *"I was aware this problem could occur almost two years before it happened. I strongly believe they [the Queensland government] have mismanaged the dam."*

6. Given my inability to source direct evidence from the individual SEQWater communications or operational decisions taken, I have relied on the following newspaper report from Hedley Thomas of the Australian and his account of the decision-making process, prior to and during the 2011 Brisbane flood event:

Newspaper Article: The Great Avoidable flood: An Inquiry's Challenge - The Australian - January 22, 2011 - Hedley Thomas, National chief correspondent

*At 12.26pm on Wednesday, **January 5**, those in the loop for receiving advice on the operations at Wivenhoe Dam received a timely alert.*
It was headed "Bureau of Meteorology (BOM) Severe Weather Warning - Dam Flood Operations". Its author, Wivenhoe Dam engineering officer Graham Keegan, wanted to ensure that those authorised to receive his emails understood that significant rainfall of 100mm to 200mm "may occur during the next few days".
Relaying information from his colleagues at the dam's Flood Operations Centre (FOC), he added: "Somerset and Wivenhoe Dams are still above (full supply level) and rising slowly due to continuing base-flows from their catchments. As the catchments are still wet it is likely that we will be releasing floodwaters in the near future if BOM's forecasts are accurate. Please be prepared. We will keep you up to date with our plans as this event develops."
In the early afternoon of January 5, the 7000sq km catchment for Wivenhoe, Queensland's most important public asset with the potential to protect or doom tens of thousands of Brisbane residents and their properties, and its feeder dam, Somerset, was saturated.
The Bureau of Meteorology had been warning the Queensland government, disaster management groups and the public since last September that the coming wet season, to March this year, had a high probability of being particularly intense.
The drought was well and truly broken; El Nino was dead. The La Nina phenomenon was living up to its scientifically proven role of causing "some of the worst and most widespread flooding" of the past 110 years.
This La Nina, though, looked particularly intense. The extreme rainfall and flooding in Queensland in the last three months of last year had reinforced the concerns of severe weather meteorologists from Australia to NASA in the US.
For reasons that are now highly controversial, in the early hours of Thursday, January 13, Australia's third-largest city was devastated by a major flood in the Brisbane River. Thousands of homes and businesses were severely damaged; priceless possessions including artefacts and photographs of incalculable sentimental value were destroyed; and a multi-billion-dollar bill was inflicted on the River City. Large swaths of a spectacular city were submerged as the sun shone.
… as engineers and hydrologists model increasing amounts of data from the Bureau of Meteorology and SEQWater on the performance of the dam - its inflows from the vast catchment, its releases during

crucial periods, the changes in river heights and flow rates, and the manual that the operators are instructed to follow - a very different picture emerges.
These calculations, yet to be tested by SEQWater, show that the urgent release from the dam of huge volumes at unprecedented rates of flow of up to 7500 cubic metres per second, when the operators were gravely concerned late on January 11 that the dam's rising levels could trigger a collapse of the system, produced most of the flood in the Brisbane River.
The calculations also show that the dam's capacity for flood storage was wrenched away because the releases on the previous weekend were too low, too late.
Instead of emptying the flood compartment as it rose, the levels in the dam were permitted to rise.
It became a time bomb that would go off on the Tuesday, under extremely stressful emergency conditions as the operators believed that they were fast running out of options.
These are early days. SEQWater is adamant it did everything "by the manual". But the repercussions from any future finding by a rigorous independent inquiry that poor public policy on dam management generally, if combined with key misjudgments in the operation of the Queensland government-owned dam, would be far-reaching on political and financial measures alone.
It is undeniable that if the dam did not exist, all the water running directly to Brisbane would have created a worse flood, but this is not the point. The dam was designed to be capable of much more.
The message from SEQWater that everything was fine because the "manual" was followed correctly is being interpreted by some flooded residents as early buck-passing; to others, however, it is almost heretical to question what happened and whether it was completely avoidable.
For the past 12 days, senior engineer Michael O'Brien - an ASX-listed company's chief operations officer whose curriculum vitae includes overseeing major infrastructure projects in a 40-year career - has been analysing the official data. He is not alone. A number of other engineers and hydrologists are quietly doing the same calculations.
O'Brien makes no apology for raising the issues now, given the immediate and critical need to ensure mistakes are not repeated before the wet season ends. He was concerned that in the flush of co-operative spirit and commendation after the flood, the facts about why it occurred would be swept under the carpet.
The SEQWater Grid employs numerous engineers and hydrologists as either employees or consultants, but O'Brien sent his papers and calculations to SEQWater eight days ago and told them he would back down publicly and go away if they could provide credible answers to his concerns. There has been no such rebuttal.
Yesterday, after O'Brien examined further data including the SEQWater emails leaked to The Australian and the vaunted manual released on Thursday night by Robertson, his certainty that the Brisbane River flood was largely, and tragically, man-made was unshakeable. He has been joined in that view by a number of other experts whose roles prevent them from going public.
"I am in no doubt about why this flood happened," O'Brien told The Australian. "The only thing I cannot understand is why, when the data is readily available, they have been so insistent that they have done everything right.
"The manual . . . tries to tell the dam operator in the midst of an emergency when guys are operating under extraordinary stress 'you have to make a prediction'. Prior to SEQWater realising, too late, that they were in an emergency, the dam's flood storage was filling up.
"We can see from the emails that SEQWater knew what was going on with the weather. SEQWater knew the bureau forecasts for heavy rain through to Tuesday. The emails read like something from a disaster movie, and show how they nearly lost control.
"They were too concerned over the weekend with what was going on in the Brisbane Valley - they were trying to limit their releases of water to keep minor crossings and low-level bridges open - when the big picture is about trying to protect Brisbane.
"This is a bit like driving towards a cliff and worrying about the bumps in the road. The criteria (in the manual) for the protection of urbanised areas in Brisbane from inundation appeared to have been skipped, apparently because the strategy being selected was based on actual dam levels rather than predicted dam levels, as required by the manual.
"And then right at the end they came to the view that 'the dam is too full; we have to save the dam'.
"A decision to switch the focus to ensuring the structural safety of the dams, Strategy W4, in effect appears to be the cause of the flooding in Brisbane on Thursday.
"When the rate was substantially increased to a peak of 645,000 (megalitres a day) on Tuesday (January 11) it appears that, rather than being staggered with peak flows from the Lockyer, downstream river gauges indicate that the peak flows from the dam and from the Lockyer substantially overlapped. This is likely to have increased the peak of the flood in Brisbane early Thursday.
Keegan's 20-odd emails - from January 5 until the crisis at the dam had passed late the following week - become urgent in tone early on Tuesday, January 11, with notification that "we are entering conditions where dam safety overrides other concerns - although minimisation of urban flooding remains very important".
A few hours later at 9.50am he reported "the flood situation has moved into a critical phase".
Communications with the FOC were difficult, river levels were rising rapidly, and the dam's flood storage capacity was diminishing.
By that evening, Keegan, who had been working around the clock to keep stakeholders up to date with the dam's operation, was apologising for being off air while getting badly needed sleep.
He also warned that the dam was expected to reach "a maximum level of 75.5m provided no further significant rainfall occurs".
"This is 0.1m below the trigger level for (an uncontrolled discharge) - this is the major focus of the current release strategy," Keegan said. "If this target is achieved, we may be able to slowly reduce the release rate overnight. Please note that our operators are continuing their regular inspections of Wivenhoe Dam and that it is still sound".
Workers at Wivenhoe told how they had been operating the gates incrementally on the crucial pre-flood weekend, releasing about 200,000 megalitres into the river system below. Several have described being isolated, exhausted and nervous as the rain grew heavier on Monday, and a crisis erupted with the deadly flash-flooding in Toowoomba and the Lockyer Valley.

A collapse of Wivenhoe, which would occur from over-topping because of the inflow from the catchment exceeding outflow from the dam's gates, would be catastrophic. An engineering paper by the dam's operators a decade ago found that "the population at risk within a distance that would result in less than three hours' warnings of a dam failure is between 57,000 and 244,000, depending on the time of day and nature of the breach".
Since a safety upgrade a few years ago, keeping water below three collapsible engineered levee banks, known as "fuse plugs", is the key to maintaining control of the dam. Should the levels rise to 75.7m and trigger a fuse plug, a very large release occurs to ease pressure, but the outpouring is not controlled by any gate - only by the speed at which the levee or bank is eroded by the water.
The analysis of the decisions made by SEQWater during the crises has riled some professionals such as Owen Droop, a senior water resources engineer with the firm, Gilbert Sullivan.
"Since the flood peak, there has been neither the time nor the opportunity to properly review and validate the mountain of data recorded during what was, almost certainly, the most extreme rainfall and runoff event experienced in the past 100 years," Droop says.
"At least some of the mechanical and electronic instruments have failed to keep pace or were damaged, thus yielding data unreliable and flawed. Any assessment using unvalidated data should not be given any credence and is, in itself, dangerous. Anyone who is even remotely aware of the diligence and professionalism displayed by those in the government flood room will want them heavily involved in the review - not the armchair critics who only appear when it suits them."
But the debate is well under way. And the public policy issues are equally important. The government's longstanding policy of operating Wivenhoe at 100 per cent full supply level, with 1,150,000 megalitres of water for urban use (instead of a lower volume to give the dam a larger buffer in addition to its 1,450,000MG of capacity for flood storage) is now highly controversial.
It is a policy that some regard as folly from a public safety perspective, particularly given the change to La Nina, the risk of further extreme rainfall and cyclones this wet season, and the multi-billion-dollar development of Queensland's Water Grid to drought-proof the region. But politicians and many Queenslanders, still paranoid about wasting water after years of severe restrictions, are yet to appreciate that the droughts of El Nino are over.
If one of those predicted cyclones dumps as much or more rain than Cyclone Wanda in the previous biggest flood of 1974, and the dam again loses its buffer for flood mitigation, nobody will thank Bligh and Fraser for the savings.

Conclusions and Recommendations – Dam Operations

1. The dam operations staff became more fatigued as this event continued to develop and this was not a good environment in which to make major decisions with very significant consequences. Staffing and rostering schedules for Human resourcing of the operation and decision making personnel needs to be reviewed and amended, including the ability for individuals to travel to and/or sleep at the centre, in the event that roads/ access are cut off.

2. Communications systems between senior management and the Dam Operations Centre appear to have been unreliable and need to be upgraded to ensure total 100% reliability and redundancy.

3. I propose that a more-*dynamic and responsive policy framework* be established to govern future dam operational decision making, as follows:
    - For pre-defined risk events (- per S4 of the Manual[19] , Minor or Moderate Flooding Risk) , a (revised) manual be followed by a 2-person team, largely consistent with the HR and engineering qualifications and resourcing described in current Wivenhoe Dam Operations Manual. For such events, the manual would be followed for key operations procedures.
    - For 'large-scale' risk events (- per S4 of the Manual[19] , Major or Extreme Flooding Risk) , a 3-person committee be established and provided with statutory immunity to be the appointed operational decision-makers for dam operations and to act 'outside' of the bureaucratised parameters of an operating manual. This should consist of 3 eminent engineers, 2 being senior flood engineers, each with a minimum of 10 years flood management experience. Once the 'large-scale' event is triggered, this group have total (and protected) responsibility to act "outside of the manual's guidelines" in making operational decisions.

4. The trigger conditions for moving to a 'large-scale' risk event would need to be defined by an expert panel, but could include parameters, which would be monitored daily to continually define a "risk rating" of continued high-probability intense wet weather likely to cause a major flood event.
   Parameters could include, for example:

- Is this an El-Nino/ La Nina cycle?
- What is the 30 day weather outlook/ 14 day weather outlook / 7 day weather outlook/ 3 day weather outlook for **each sub-catchment**?
- What has been prior rain history in each contributing sub-catchment ?
- Real-time feedback from monitoring stations and personnel in other Brisbane Valley sub-catchments.
- River gauges and Flow rates (as are measured now).

5. In conjunction with the earlier recommendation of adding a major dam to supplement Brisbane's Water Security (and hence the removal of the objective of water supply security from Wivenhoe's role and thus the removal of Clause 3.5 from the manual), this would then afford a ***responsive decision-making framework*** to allow for the ***dynamic adjustment of the Base Water Compartment level,*** i.e. **for <u>the FSL to be reduced in advance</u>**, depending on the nature/ assessment of the forecast / actual weather conditions and dam in-flows, especially in the circumstances when the criteria for a 'large scale' Dam threat was met.

   For example, had this been in place before the 2011 flood, the base compartment level may have been adjusted sufficiently in advance to say <50% of its current nominated level of 1.15M ML. This management framework would have saved Brisbane and the devastation of thousands of houses.

6. It appears that the real-time feedback from severe water conditions (ie the >3m wall of water approaching Brisbane) from the Lockyer Ck/ valley was not adequately communicated to the Wivenhoe Dams Operations Centre. (else why did they apparently continue with major discharges of Wivenhoe to coincide with the peak of the Lockyer 'water wall' as it hit the Brisbane river?) Was this a failing in communications, systems or management?

7. It appears, from the above commentary, that SEQWater need to upgrade some of their monitoring equipment to reflect latest mechanical and electronic technology for real-time water measurements. This risk should be tested by the inquiry.

8. Following a review of the logic contained in S8.4 of the Manual[19] and the recently-issued *January 2011 Flood Event- Report on the Operation of Somerset Dam and WivenhoeDam*[22], it seems SEQWater <u>incorrectly</u> assessed the scale of the potential of the flood in the early stages & chose to adopt Strategy W1 (designed to minimise disruption to downstream rural life), instead of Strategy W3 (designed to protect urban areas from inundation) in the lead-up to this event. They chose to protect low-lying bridges in the Upper Brisbane Valley (W1), rather than the major urbanised area of Brisbane. *How wrong they were !*

   The selection and adherence to the Strategy option chosen by SEQWater's staff and the specific times at which strategy choices were altered, and whether it was compliant with the Operations Manual's prioritisation (S8.4) & criteria, should be a <u>major</u> area of investigation and questioning for the inquiry's proceedings. If specific strategy decisions taken were not correctly made, were not optimal, or were directed by non-qualified personnel or were not taken by appropriately skilled personnel, why not?

9. With only a limited amount of time for the author to fully review and analyse the *January 2011 Flood Event- Report on the Operation of Somerset Dam and WivenhoeDam*[22] report that was recently released by SEQWater on 8/3/11, the author has taken the approach of raising only summary critique points, which are included in the table below:

SEQ Water's Position	*'The Bureau of Metrology (BOM) forecasts are not sufficiently accurate to be used as the basis for making decisions on releasing flood water from the dams'* (ie. the rain in the catchment was larger than forecast). *Rainfall forecasts in the early stages of the Event did not support flood releases being made greater than those that occurred.* [ie. This limited our ability to make timely adjustments to operating procedures] [refer report's Executive Summary – p(ii) & p(iii)]
Key Questions For The Inquiry to Pursue	Why have they just found out, 27 years after the completion of Wivenhoe and 19 years after the release of V1 of the Operations Manual, that the BOM information to SEQWater was considered unreliable for the purposes of operating the dam?
Analysis / Recommendations	With more than 100 real-time field-monitoring locations and radio telemetry network, as detailed in S5.1 of their own Operating Manual (including their own rainfall monitoring equipment), surely SEQWater had more-than-enough reliable inputs to make decisions in a real-time environment and they should not have been as dependent on BOM to the extent they now are claiming?

SEQ Water's Position	The volume of total inflow into the Wivenhoe Dam even was twice the scale of 1974….yet we maintained river flood levels were maintained below '74.
Key Questions For The Inquiry to Pursue	How could operating practices & Strategy choices (per S8.4 of the Operating Manual) have been improved on to reduce the inundation of Brisbane ?
Analysis / Recommendations	The real question here is not wether Wivenhoe Dam reduced flood levels, but could inundation been practically avoided i.e. could SEQW have done a (far) better job? - *Yes, of course they could !!*

SEQ Water's Position	P225, S20 – SEQ have (only) 3 recommendations: (1) We need more rain gauges in the catchment (2) We need to review the Operations Manual & (3) We need to review Inter-Agency Communications Protocols.
Key Questions For The Inquiry to Pursue	Consider a detailed analysis & question each decision for all flood periods, review of the Flood Event/ Time Logs & seek alternative opinions from outside (non-SEQ Water) engineers.
Analysis / Recommendations	These recommendations lacks substance, especially after 1180 pages of analysis ! Whilst these 3 recommendations are valid (especially #2) , they don't address the failings in the prioritisation of Strategy selection (W1-W4) over the time log periods, related decision making, HR structures & the proportions of water in the dam's design/ manual between the Water Supply Compartment compared to the Flood Mitigation Compartment.

SEQ Water's Position	The volume of total water inflow into Wivenhoe during the Event was 2,650,000 ML. [refer report's Executive Summary – p(ii)]
Key Questions For The Inquiry to Pursue	• If, say all of Wivenhoe's water (both compartments = 2.6 M ML) could have been released from the dam before the event commenced, then isn't it true that only 50,000 ML would have flowed down the river from Wivenhoe? • Had this been possible, what would have been the peak level at the Brisbane Gauge (allowing for this modest flow to coincide with the Bremer & Lockyer Ck peak water outflow) ?
Analysis / Recommendations	It is clear from this statistic that if Brisbane had had an alternative water supply dam (at another location), then decision making could have been totally different, using a dynamic management regime. Water could have been released in advance, including from the Base Water Storage. The result would have been barely any Brisbane flooding at all from Wivenhoe, as it could have then stored up it **total** capacity of 2,600,000 ML capacity, **100% for Flood Mitigation**. The great flood was thus totally avoidable.

SEQ Water's Position	*Without the mitigating effects of Wivenhoe...the peak flood height measure at the Port Office.. would have been ~2m higher than that experienced….Without the flow rate reductions, up to 14,000 more properties would have been impacted…(we conclude) that the Dam was operated in accordance with the Manual…)* [refer report's Executive Summary – p(iii)]
Key Questions For The Inquiry to Pursue	• According to the Flood Event Summary, W3 was formally executed on 08:00 on 8 Jan 2011, **Despite this being noted in the Flood Log, it seems however, in reality, that flow control remained constrained by SEQWater until they finally made the decision some 35 hours later at 19:00 on 9/1/2011 to focus on 'protecting urban areas'**. Only W1 was deployed between 6/1/11 & 8/1/11. Was Operations Strategy W3 deployed 48-72 hrs too late? Was there an incorrect assessment of conditions & was W1 used incorrectly (instead of W3) between 6/1/11 & 9/1/11 (inclusive). Also, why were flows constrained for another 35 hours after W3 was invoked ? This seems a direct breach of the Operations Manual explicit instruction of ensuring Objectives are prioritised. (p28). • W4 was only formally invoked at 08:00 on 11 January 2011. **As per P18 of the report, the Rainfall model first predicted that the Estimated Peak at Wivenhoe was to exceed 74M (i.e 74.7m) as early as 01:00 on 10/1/11.** The logic chart on p23 (S8.4) of the Manual requires W4 to be invoked upon this threshold. **Why then was Operations Strategy W4 only deployed 31 hours later than the pre-requisite condition was reached as prescribed by the manual?** Both the hydrograph & the logic chart in S8.4 of the Operations Manual suggest that W4 should have been invoked earlier.
Analysis / Recommendations	The 'big-picture' hydrograph in Figure 9.1.2 [Executive Summary – p(iii)] shows that the effect of Wivenhoe and its operations was that it mitigated ~2.5m of peak water height (=77.5m-75m). However this Hydrograph, when compared with the Flood Operations Log, shows that alternative strategies (W3 transitioning to W4) could have been executed earlier. This hydrograph shows an increase of ~2m in level between 6/1/11 & 10/1/11, which, given the weather forecast, should have been *more-aggressively* mitigated. It seems an undue emphasis was placed on the Objective of 'protecting rural life' (i.e. low-level bridges) (W1) than 'protecting from inundation' (W3) during this period. The invoking of W3 (instead of W1) was late by 35-72 hours, depending on how the manual was interpreted. Similarly W4 should have been invoked 31 hours earlier when modelling predicted the threshold for invoking W4 has been reached. **Even when major strategy changes were invoked, it seems apparent that the dam operators exercised too much latitude, perhaps pressured by external stakeholder to reduce water flows to appease such interests. This appears to have been a major error of judgement. If so, who were these responsible external stakeholders ?**

10. **The 2011 event was <u>provably</u> avoidable for 2 key reasons:**
    - **(1) More-aggressive / earlier deployment of strategies W3 & W4 should have been made earlier than was recorded &**
    - **(2) Reduction of the FSL (base water 'full' storage level) & a consequential increase in the capacity of the dam for flood mitigation, given the seasonal risk parameters, was warranted well before the pending event occurred. It is for this reason, we must build another major dam, supplemented by a dynamic decision making regime for managing the FSL (downward) as outlined elsewhere in this submission.**

11. **Even if the Inquiry should determine that the SEQWater dam operations staff acted in accordance with manual, the logic & decision-making parameters contained in the Operations Manual needs to be completely overhauled. Given the Manual had its origin nearly 50 years ago (V0 drafted in 1968) for the management of Somerset & was then modified in 1992 to incorporate Wivenhoe, a major review of the logic is both overdue & completely warranted.**

    Independent experts need to be engaged to provide state-of-the Simulation Modelling techniques to review all decision making steps against the data from the 2011 Flodo Event, as well as prior events to redevelop improved logic for substantially reducing the risk of his flood ever, ever happening again. Only by an exhaustive review of options, assisted by sophisticated Simulation Modelling and independent lateral thought, can we improve upon our past behaviour.

Terms of Reference #3

☑ private insurers and their responsibilities

Issues and Conclusions

1. Insurance Companies have taken significant time to respond to their policy holders after this flood event.
2. Insurance Companies have not communicated a formulated claim process.
3. Insurance Companies have not communicated any time frame for dealing with claims.
4. Insurance Companies have not clearly defined Flood as an insured event.
5. Insurance Companies have applied insufficient resources to handle claims in a timely manner.
6. Insurance Companies have appeared to delay the claims process as a matter of internal policy.
7. Insurance companies have requested undue proof of ownership of individual line items. This has been very difficult when piles of household contents were destroyed under mud or piled into large scrap-heaps on the footpath, making identification/ proof difficult.

Recommendations

1. Response Times to Flood (and other natural disasters) should be prescribed in legislation e.g. after receipt of completed paperwork, insurance companies must pay / respond to the policyholder e.g.
    a. 14 days after the event to confirm their liability/ otherwise to the policyholder
    b. 7 days to respond to Temporary Accommodation Claims
    c. 14 days to respond to Removalists/Storage Claims
    d. 30 days to respond Building Claims
    e. 60 days to respond to Contents claims
    f. 60 days be to respond to all other claims

2. The remedy for non-compliance should be a fine, escalating based on delays from the prescribed time deadlines.

3. Insurance companies must have a documented Claims Process, which must be communicated, in writing to the policyholder.

4. The definition of a Flood Event should be spelt out in Legislation

5. There should be a system similar to the “Schools Website System” that clearly advises the general public how a particular insurance policy is rated against its peers and how a particular insurance company handles it claims on a number of criteria.

6. Any Insurance Council/committee of review should have at least one consumer advocate within it.

Terms of Reference #4

☑ the response to the 2010/2011 flood events, particularly measures taken to inform the community and protect life, private and public property

Issues and Conclusions

1. The volunteer brigade displayed fantastic human spirit, especially on the weekend immediately following the flood.

2. After the initial weekend where the volunteer army was prolific, it became quite difficult to source volunteer help. After leaving particulars with both the BCC help line and Volunteers Qld lines, only one couple responded to these requests over the course of the following week of the flood's aftermath. I have heard this to be a common experience with many others.

3. Many volunteers were looking for more people/ places to help, but advised me they had some difficulty finding work locations to go to, or being informed by co-ordinating authorities of people in need.

Recommendations

1. Whilst BCC did a good job in coordination of volunteers, a *more-responsive* system of volunteer registration, notification, coordination and task assignment would be helpful.

2. Due to the overall length of the task for most flood victims, smaller groups of volunteers spread over longer periods of time are probably more valuable to flood victims than short-bursts of large groups of volunteer labour.

3. There have been some stand-out responses from specific authorities, which need to be congratulated and acknowledged, being:

    a. Qld Fire Service:
        i. who moved approx 20T of mud off my riverbank through use of its fire engine and twin hoses/ operators
        ii. who pumped the river water from my pool

    b. The Army - for the management of the rubbish collection process

    c. Brisbane City Council - for their ongoing kerbside rubbish collection and water discount / $100 cashback

    d. All the individual volunteers, many of whom worked tirelessly in extreme conditions to rid houses of stenching mud, going from one house to another.

    Thanks to everyone who helped !

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22. January 2011 Flood Event. Report on the operation of Somerset Dam and WivenhoeDam *by SEQWater*

APPENDIX A – SEQWATER-Managed DAMS

SEQWATER DAMS - Summary Table — **Source:** www.seqwater.com.au ; www.wyaralongdam.com.au

	River System/ Area	Storage	Catchment (DERM categorisation)	Year Completed	Full Supply Capacity (ML)*	Dams which supply SEQ's Water Security (post Water Grid 12 interconnection)	Upstream of Brisbane City ? - Outflows contribute to Flooding Inflows of Brisbane River	Potential Flood Mitigation Capacity (= total capacity - water storage)	Comments
1	Buaraba Creek, Lockyer Valley	**Atkinson Dam**	Moreton	1970	30,488		yes	0	Joins Lockyer Ck, then Brisbane River
2	Obi Obi Ck	**Baroon Pocket Dam**	Mary Basin	1989	61,000	61,000	no		
3	Lake Dyer/ Laidley Creek	**Bill Gunn Dam**	Moreton	1987	6,947		yes	0	Offstream Storage, Small Catchment, Laidley Ck, Flows into Lockyer Ck, & then Brisbane River
4	South of Gympie; Yabba Ck, then into Mary River	**Borumba Dam**	Mary Basin	Stage 1 - 1963, Stage 2 - 1997	45,952		no		Significant potential for additional storage
5	East of Gympie; Deep Creek	**Cedar Pocket Dam**	Mary Basin	1984	730		no	0	
6	LOGAN	**Bromelton (Off-stream Storage)**	Logan	2008	8,210		no	0	Offstream Storage
7	Gatton, Lockyer Ck	**Clarendon Dam**	Moreton	1992	24,276		yes	0	Lockyer Ck then into Brisbane River
8	Rocky Ck, Yandina	**Cooloolabin Dam**	Mary Basin	1979	13,800	13,800	no	0	Low expansion option
9	Enoggera Creek, Gap, Brisbane	**Enoggera Dam**	Moreton	1866/ 1976 (ug)	4,567		yes	0	Impact only to lower reaches
10	Addington Ck, Landsborough	**Ewen Maddock Dam**	Mary Basin	1982	16,587	16,587	no	0	
11	Brisbane	**Gold Creek Dam**	Moreton	1885	801		yes	0	
12	Nerange River	**Hinze Dam**	Gold Coast	1989	161,073	161,073	no	0	
13	Sideling Ck, Petrie	**Lake Kurwongbah**	Moreton	1969	14,370	14,370	no	0	
14	Six Mile Ck, Cooroy Noosa	**Lake Macdonald**	Mary Basin	1965	8,018	8,018	no	0	
15	Cabbage Tree Creek,	**Lake Manchester**	Moreton	1916 / 2008 (ug)	26,217		yes	0	
16	Tingalpa Ck, Capalaba	**Leslie Harrison Dam**	Logan	1984	24,868	24,868	no	0	
17	Little Nerang Ck	**Little Nerang Dam**	Gold Coast	1961	6,705	6,705	no	0	
18	Burnett Ck, Beaudesert	**Maroon Dam**	Logan	1974	44,319		no	0	Burnett Ck into Logan River
19	Reynolds Ck. Boonah	**Moogerah Dam**	Moreton	1961	83,765		yes	0	Reynolds Ck, into Bremer River, to Brisbane River. Potential Flood Mitigation Site/ Weir
20	North Pine River	**North Pine Dam**	Moreton	1976	214,302	214,302	no	0	
21	South Maroochy River	**Poona Dam**	Mary Basin	1959	655		no	0	
22	Brisbane Valley	**Somerset Dam**	Moreton	1959	379,849	379,849	yes	155,000	Some Flood Mitigation Potential
23	South Maroochy River	**Wappa Dam**	Mary Basin	1963	4,694	4,694	no	0	
24	Brisbane Valley	**Wivenhoe Dam**	Moreton	1984	1,165,238	1,165,238	yes	1,450,000	Substantial Flood Mitigation Potential
25	Teviot Brook, Beaudesert	**Wyralong Dam (new)**	Logan	2011	103,000		no	0	
		TOTAL			**2,347,431**	**2,070,504**		**1,605,000**	
		Flood Mitigation Dependence on Brisbane River Dams - Wivenhoe/Somerset:			***66%***	***75%***		***78%***	

Appendix B – Upstream Weirs - Brisbane Valley/ (2011) Brisbane River Floods

SEQWATER - Managed Weirs		
Catchment	**Name**	**Storage Capacity (ML)**
Logan / Albert Rivers	Bromelton Weir	390
	South Maclean Weir	153
	Cedar Grove Weir	1139
Warrill Valley	Upper Warrill Diversion Weir	3
	Kents Lagoon Diversion Weir	5
	Aratula Weir	54
	Warroolaba Creek Diversion Weir	8
	West Branch Warrill Diversion Weir	2
	Warrill Creek Diversion Weir	110
	Churchbank Weir	170
	Railway Weir	20
Lockyer Valley	Buaraba Creek Diversion Weir	74
(Atkinson Irrigation	Brightview Weir	390
	Sippels Weir	25
	Potters Weir	30
	O'Reillys Weir	610
Lockyer Valley	Jordan I Weir	450
(Clarendon Irrigation	Jordan II Weir	30
	Wilson Weir (Gatton College Weir)	230
	Clarendon Weir	230
	Glenore Grove Weir	330
	Kentville Weir	480
Lockyer Valley	Laidley Creek Diversion Weir	44
(Bill Gunn Irrigation	Showgrounds Weir	24
	Crowley Vale Weir	8
Lockyer Valley	Lower Flagstone Creek Weir	20
(Upper Reaches)	Flagstone Creek Weir	94
	Mulgowie Weir	14
	Gatton Weir	130
	Grantham Weir	150
	Carpendale Weir	110
	Ma Ma Creek Weir	86
	Redbank Creek Weir	18
	Sandy Creek Weir	19
	Lower Tenthill Weir	70
	Tenthill Creek Weir	15
Upper Brisbane	Mt Crosby Weir	3430
Stanley River	Stanley River Weir (Woodford WTP)	68
	Kilcoy Creek Weir	185
Mary Valley	Maleny Weir	66
	Imbil Weir	46
	Yabba Creek Weir	8
	Obi Obi Creek Weir (Weir No. 1)	-
Maroochy River	South Maroochy (Maroochy River)	76
Caboolture River	Caboolture River Intake & Weir	820
	Waraba Creek Weir	182
North Pine River	Dayboro Road Pump Station Weir	-
	TOTAL:	**10,616**
	% of Water Storage of SEQ Dams	**0.45%**