ALSO 45 PAGES OF SUPPORTING DOCUMENTS

QLD. FLOODS COMMISSION OF INQUIRY
G.P.O. BOX 1738
BRISBANE,
QUEENSLAND. 4001.

[redacted]

11. 2. 2011

[redacted]

DEAR COMMISSIONERS,

THIS INQUIRY WILL ATTEMPT TO UNRAVEL DECADES OF PUBLIC ADMINISTRATION UNDER VARIOUS PREMIERS SINCE WIVENHOE DAM WAS COMPLETED IN 1985.
(AT LEAST I HOPE THAT YOU WILL TO CONSIDER THE FLOODS IN 2011)

IN 1988 THE BRISBANE & AREA WATER BOARD (BAWB) WAS THE QUANGA RESPONSIBLE FOR WIVENHOE DAM.

17.10.1988
BAWB'S
THE ADVISORY COMMITTEE CHAIRED BY MR. W. WEBBER MET TO CONSIDER THE REPORTS PREPARED BY QUEENSLAND WATER RESOURCES COMMISSION DATED 29.4.1988 & MR. G. COSSINS DATED 24.6.1988
SUBJECT : SAFETY OF BOARD DAMS
[REFER BAWB MINUTES AGENDA ITEM 5.5 DATED 17.10.88]
THE INQUIRY SHOULD REQUEST BOTH THESE REPORTS BE PRODUCED FOR SCRUTINY.

18.10.1988

MR. WEBBER WROTE TO HIS BOSS THE COMMISSIONER MR. TOM FENWICK TO REQUEST THAT A BRIEF BE PREPARED FOR THE COMMISSION TO CARRY OUT THESE STUDIES INTO THE SAFETY OF THE BOARDS DAMS.
[REFER LETTER DATED 18.10.1988]
THE INQUIRY SHOULD REQUEST THESE REPORTS IF CARRIED OUT AS THEY SHOULD HAVE BEEN UNDERTAKEN BY THE Q.W.R.C.

28.4.1988

EARLIER IN 1988 DAM SAFETY WAS BROUGHT TO THE ATTENTION OF THE BAWB'S ADVISORY COMMITTEE CONCERNING WIVENHOE DAM.

[REFER Q.W.R.C. LETTER DATED 28.4.1988]

THE ORIGINAL DESIGN FLOOD FOR WIVENHOE DAM WAS DONE BY Q.W.R.C. IN THE LATE 1970's.

ANCOLD HAD REVISED THE PROBABLE MAX. FLOOD (P.M.F.) IN 1986 FOR HIGH HAZARD DAMS SUCH AS WIVENHOE TO 1 IN 10,000 AEP WITH A RESULTANT 3 FOLD INCREASE IN THE PEAK INFLOW FROM THE ORIGINAL 15,000 CUMECS TO 47,800 CUMECS (CUBIC METRES/SEC.)

14.7.1988

BAWB MET TO CONSIDER THIS Q.W.R.C. LETTER ABOUT "SAFETY OF THE BOARD DAMS"

[REFER BAWB LETTER DATED 8.7.1988 REPORT ITEM 5.5.]

23. 1. 1989

THE BRISBANE CITY COUNCIL (B.C.C.) CIRCULATED A PAPER PREPARED BY G. COSSINS FOR BAWB SUBMISSION TO THE BRISBANE RIVER COMMITTEE

[REFER MEMORANDUM DATED 23. 1. 1989)

19. 1. 1989

THE BAWB SECRETARY DAVID EVANS RECOMMENDED THIS PAPER BE SUBMITTED TO THE BRISBANE RIVER COMMITTEE WHICH THEN HAPPENED ON 23. 1. 1989.

[REFER BAWB MEETING 19. 1. 1989 AGENDA ITEM 5.3]

THIS PAPER PREPARED BY THE BAWB'S CONSULTING ENGINEER DISCUSSED AT SOME LENGTH THE DIFFERENT FLOODS EXPERIENCED IN THE BRISBANE RIVER CATCHMENT AND HAD QUITE A FEW SUGGESTIONS TO MITIGATE AGAINST A SIMILAR AND/OR LARGER FLOOD THAN EXPERIENCED IN 1974.

RECOMMEND THE INQUIRY RESEARCH THIS PAPER THOROUGHLY AND TO FIND OUT WHY NOTHING WAS DONE BY EITHER THE GOVERNMENT THE BAWB OR B.C.C. — FOR 12 YEARS.

13. 11. 1989

B.A.W.B. ADVISORY COMMITTEE MET CHAIRED ONCE AGAIN BY MR. WEBBER WITH REPRESENTATIVES FROM BAWB, BCC & Q.W.R.C. PRESENT

AGAIN FURTHER STUDIES WERE RECOMMENDED TO BE UNDERTAKEN

[REFER MINUTES DATED 13. 11. 1989]

20.3.1990

I AS PRESIDENT OF THE ALBERT VALLEY PROGRESS ASSOC. (AVPA) SUMMARISED THE LEAKED DOCUMENTS ABOUT POSSIBLE FUTURE FLOODS IN BRISBANE WHICH HAD COME INTO OUR POSSESSION DURING THE CAMPAIGN TO STOP THE WOLFFDENE DAM.

I FELT IT WAS MY CIVIC DUTY TO DRAW THE NEW MINISTERS ATTENTION TO THIS BUCK PASSING THAT WAS BEING CONDUCTED BETWEEN THE Q.W.R.C., BAWB & B.C.C.

I MET WITH THE MINISTER MR E. CASEY ON 20.3.1990 AND HANDED OVER THE LEAKED DOCUMENTS TOGETHER WITH MY SUMMARY DATED 20.3.1990

[REFER A.V.P.A. LETTER DATED 20.3.1990]

5.4.1990

THE MINISTER QUITE QUICKLY RESPONDED TO MY SERIOUS ALLEGATIONS AND STRENUOUSLY DEFENDED BOTH THE COMMISSIONER & HIS ASSISTANTS WITHIN THE QWRC.

[REFER MINISTER FOR PRIMARY INDUSTRIES DATED 5.4.1990]

[redacted]

THE B.A.W.B. WAS DISBANDED IN 1993 AND THE SOUTH EAST QLD WATER BOARD REPLACED IT WITH A NEW CHAIRMAN.
S.E.Q. WATER THEN EVOLVED AS THE CONTROL ENTITY.

[redacted]

P/L [redacted]

[redacted]

WHEN THE WIVENHOE ALLIANCE WAS ESTABLISHED TO UPGRADE THE DAM SPILLWAY CAPACITY IN 2004, AS A STAGED INCREASE FIRST STAGE COMPLETED IN 2005, WITH THE SECOND STAGE BY 2035. (REFER ATTACHED GLOSSY)

SEQ WATER PRODUCED A REPORT IN 2007 TITLED "PROVISION OF CONTINGENCY STORAGE IN WIVENHOE & SOMERSET DAMS MARCH 2007." (REFER ATTACHED COVER PAGE)

THE MAIN THRUST OF THIS REPORT WAS TO INCREASE THE WATER SUPPLY STORAGE CAPACITY OF BOTH DAMS WHILST UNDERTAKING THE NECESSARY WALL UPGRADES & CONSTRUCTION OF SPILLWAYS TO SAFELY PASS THE P.M.F. FLOODS AS REQ'D BY ANCOLD.

[NOTE: DAMBREAK STUDIES WERE STILL NOT DONE IN 2007.]

DURING THE 3½ YEARS OF THE TRAVESTON DAM WE ARGUED THAT THIS WAS THE MOST ECONOMICAL PROVISION OF ADDITIONAL STORAGE FOR S.E. QLD. (SEE ALSO RON MCMAHS & JOHN HODGKINSON PROPOSAL TO PUMP TO "BIG BORUMBA DAM")

THIS OF COURSE WAS IGNORED BY ALL LEVELS OF GOVT FROM THE PREMIER DOWN, INCL. THE MINISTER THE QLD. WATER COMMISSION AND THE BRISBANE CITY COUNCIL, EVEN THOUGH IT WAS A RECOMMENDATION IN THE S.E.Q.R.W.S.S. INTERIM 2005 STAGE 2 REPORT WHICH WAS RELEASED PUBLICLY BY THE PREMIER & HIS MINISTER ON 27.1.2006.

[REFER ATTACHED MEDIA RELEASE DATED 27.1.2006]

THE PROBLEM OF A MAJOR FLOOD EVENT LIKE THE JAN. 2011 FLOODS COULD HAVE BEEN FURTHER MITIGATED HAD THE GOVERNMENT NOT PENNY PINCHED IN 2000/2001 AND CARRIED OUT THE FULL UPGRADE TO WIVENHOE DAM BY RAISING THE WALL BY 8 M. (OPTION W3 IN TABLE 5.1)

THIS WOULD HAVE INCREASED DRAMMATICALLY THE FLOOD STORAGE CAPACITY OF THE DAM WHILST PROTECTING IT FROM OVERTOPPING WITH THE RESULTANT CATASTROPIC DISASTER DOWNSTREAM.

THE COST OF THIS FINAL STAGE UPGRADE IN 2007 WAS ESTIMATED TO BE 248 MILLION DOLLARS.

THE GOVERNMENT INSTEAD ELECTED TO CHOOSE THE CHEAPER STAGED CONSTRUCTION WHICH COST ABOUT $70 MILLION IN 2005.

HOWEVER IN APRIL 2006 PREMIER BEATTIE ANNOUNCED A NEW DAM AT TRAVESTON CROSSING ON THE MARY RIVER IN JUNE 2006, HE ANNOUNCED STAGE 1 OF THIS NEW DAM WOULD COST AN ESTIMATED $1,700 MILLION SO PROVING MONEY WAS NO OBJECT AT ALL.
[STAGE 1 FOR 1.7 BILLION ANNOUNCED FIRST BY THE PREMIER 5.7.2006]
YET HE ONLY WANTED TO SPEND A MISERLY $70 MILLION TO PROTECT BRISBANE RESIDENTS FROM FLOODING. HE COULD HAVE SPENT THE FULL $248 M. AND ACHIEVED THE DUAL WATER SECURITY/FLOOD PROTECTION.

[redacted]

[redacted]

FOR OVER 2 DECADES I AND HUNDREDS LIKE ME, HAVE FOUGHT TOOTH & NAIL TO GET REALISTIC SENSIBLE CHANGES MADE TO QLD. CABINET DECISIONS. WE FAILED BECAUSE THE GOVERNMENT WAS NOT LISTENING PERHAPS YOUR NOT ROYAL "COMMISSION" WILL SUCCEED IN INFLUENCING THE QUEENSLAND PREMIER & HER ADVISORS. WE CERTAINLY TRUST YOU DO.

THANK YOU FOR THE OPPORTUNITY TO PROVIDE MY INPUT.

I SUPPOSE WHAT ANNOYS ME THE MOST ABOUT THIS LACK OF ACTION TAKEN TO UPGRADE WIVENHOE DAM IS THERE WAS AMPLE OPPORTUNITY TO CARRY OUT THIS CONSTRUCTION THROUGHOUT 2002 TO 2008 AS THE DAM'S FULL SUPPLY LEVEL STEADILY DROPPED. THERE WAS NO BETTER TIME TO CARRY OUT THIS CONSTRUCTION AND THIS WAS A LOST OPPORTUNITY. THEN WHEN THE NEXT BIG SIGNIFICANT EVENT OCCURRED IT WOULD HAVE CAPTURED SOME OF THE FLOW WHICH WAS ALLOWED TO SPILL BECAUSE OF THE CURRENT OPERATING RULES.

TO FIND THAT THE DAM'S OPERATOR SEQ WATER SPENT THE MINIMUM #70 M. INSTEAD OF # 248 M. IS JUST UNFORGIVEABLE.

FROM 2007 I & OTHERS AGITATED TO INFLUENCE THE QLD. GOVERNMENT & THE QLD. WATER COMMISSION THE CORRESPONDENCE SENT & RECEIVED ARE TESTAMENT TO THEIR FAILURE OF THE RESIDENTS, RATEPAYERS & TAXPAYERS OF QUEENSLAND AND AUSTRALIA (EG. REFER QLD. WATER COMMISSION LETTER TO ME DATED 3.10.2010.) THESE POLITICIANS & SENIOR BEAUCRATS HAVE COST US ALL DEARLY, YET THEY STILL HAVE THEIR JOBS [redacted]

MY FILES ARE AS EXTENSIVE AS MY DETAILED KNOWLEDGE GAINED OVER THE LAST TWO DECADES.

I WANT TO ENSURE THESE IGNORANT, ARROGANT TWITS AND THEIR PAID CONSULTANTS, ARE HELD ACCOUNTABLE FOR THEIR COLLECTIVE DECISIONS.

THE GREAT MAJORITY OF THE PRESS REPORTS PARTICULARLY THE AUSTRALIAN HAVE CONCENTRATED AROUND WIVENHOE & ITS FUSE PLUG DESIGN FOR THE EMERGENCY SPILLWAY COMPLETED AS STAGE ONE OF THE UPGRADE IN 2005. THE SEQ WATER EMAILS, AT LEAST THOSE COMMENTED ON BY REPORTERS APPEAR NEVER TO MENTION SOMERSET DAM BY NAME WHY ?.

SOMERSET DAM & WIVENHOE DAM ARE CONSIDERED TO BE ONE SYSTEM. THEY WORK AS ONE DAM

WE KNOW SOMERSET DAM REACHED A PEAK FLOOD VOLUME OF WED 12.1.2011 OF 189.7%. THE ENGINEERS MUST HAVE BEEN WARNING THAT IT WAS POSSIBLE THAT THEY HAD COME CLOSE TO LOSING CONTROL OF THE DAM, AND IT MAY FAIL, WHICH WOULD RESULT IN A CASCADE OF THE FULL VOLUME OF 72,000ML INTO WIVENHOE ON THE SAME DAY AS WIVENHOE PEAKED.

WIVENHOE HAD SIMILARLY PEAKED IN FLOOD VOLUME OF 188.5% ON THE SAME DAY W/E 12.1.2011.

WHY HAS THIS NOT BEEN DISCUSSED PUBLICLY.

THERE MUST BE E'MAIL ALERTS AVAILABLE ON SOMERSET DAM.

THE 2007 SEQ WATER REPORT DISCUSSES THIS CASCADE EFFECT ON A FULL WIVENHOE FROM A SOMERSET DAM FAILURE.

WE EXPECT YOUR INQUIRY TO OBTAIN THIS EVIDENCE & MAKE RECOMMENDATIONS TO FIX THIS POTENTIAL FUTURE CATASTROPE.

IT WAS ONLY IN 2008 THAT THE PREMIER ANNA BLIGH & HER CABINET WERE TRYING TO CONSTRUCT A 1.7 BILLION DOLLAR NORTHBANK DEVELOPMENT.

HAD WE THE PEOPLE NOT OBJECTED SO STRENUOUSLY SHE & HER PREFERRED DEVELOPER, MAY HAVE BEGAN THIS CONSTRUCTION WITH THOSE MULTI STOREY TOWERS & ALL THOSE PILES OUT OVER THE RIVER.

WHAT A DISASTER THIS WOULD HAVE BEEN FOR BRISBANE RESIDENTS & QLD. TAXPAYERS AFTER THE JAN. 2011 FLOODS.

SEQ WATER WERE PERILOUSLY CLOSE TO LOSING CONTROL OF WIVENHOE DAM WATER RELEASES, IF THE FUSE PLUGS WERE BLOWN / ACTIVATED BY THE RISING FLOOD IN THE DAM, THUS RELEASING THE FLOOD IN AN UNCONTROLED WAY DOWNSTREAM OF THE WALL.

SEQ WATER HAVE REFUSED TO DIVULGE THIS INFORMATION TO ME. [SEE ATTACHED E-MAIL DATED 20.1.2011.]

YET THIS PREMIER WAS PREPARED TO CONSTRUCT HIGH RISE BUILDINGS & OTHER PUBLIC INFRASTRUC OUT OVER THE RIVER IN HER RIDICULOUS NORTHBANK PROPOSAL IN 2008.

BUT LUCKILY WE STOPPED HER & HER MATES FROM DOING THIS DANGEROUS & STUPID IDEA.

HAVE WE HEARD THE LAST OF THIS NONSENSE NOW.?

THE BRISBANE CITY COUNCIL MUST SHARE SOME OF THE BLAME FOR NOT TAKING MORE STEPS TO PROTECT ITS RATEPAYERS FROM POTENTIAL FLOODING.

B.C.C. HAS ALWAYS HAD CONSIDERABLE VOTING POWER WITHIN THE S.E.Q. REGION.

FROM BEFORE 1988 IT HAD 75% OF THE CONTROL OVER THE BRISBANE & AREA WATER BOARD (BAWB)

WHEN THIS BOARD WAS REPLACED BY THE EXPANDED SOUTH EAST QLD. WATER BOARD TO INCLUDE OTHER COUNCILS IN THE OPERATIONAL AREA THE B.C.C. STILL HAD ABOUT 65% CONTROL.

THEN WHEN IT BECAME THE NEW ENTITY SEQ WATER IN 2004 MAYOR CAMPBELL NEWMAN WAS ELECTED, THE CHAIRMAN OF THE COUNCIL OF MAYORS WHO WAS DIRECTLY RESPONSIBLE FOR SIGNING OF ON THE STAGE 1 & STAGE 2 INTERIM REPORTS FOR THE SOUTH EAST QLD. REGIONAL WATER SUPPLY STRATEGY (SEQRWSS)

THIS WORK WAS EVENTUALLY HANDED OVER TO QUEENSLAND WATER COMMISSION TO UNDERTAKE THE 50 YEAR PLAN. (QWC ESTABLISHED IN JUNE 2006)

CAMPBELL NEWMAN IS AN EXPERIENCED CIVIL ENGINEER THEREFORE HE SHOULD HAVE BEEN FULLY INFORMED (NOT IGNORANT) OF THE WIVENHOE DAM SAFETY UPGRADE IN 2004/2005.

[redacted]

[redacted]

THE S.E. QLD. WATER GRID WAS FIRST PROPOSED BY PREMIER BEATTIE & DEPUTY PREMIER & TREASURER BLIGH IN 2006.
WHEN BEATTIE QUIT IN SEPT. 2007 HIS DEPUTY BLIGH BECAME PREMIER AND PROCEEDED WITH ALL HASTE & NO CAUTION TO BUILD THE NOW "INFAMOUS" 9 BILLION DOLLAR WATER GRID.
MOST OF WHICH NOW STANDS IDLE, RUSTING & DETERIORATING.

THOUGH WE INFORMED HER FROM 2007, PREMIER BLIGH IGNORED US, SHE HAS TO BE HELD RESPONSIBLE.
THE BUCK STOPS WITH THE PREMIER.

YOURS SINCERELY

[redacted]

DAVE MILLIGAN

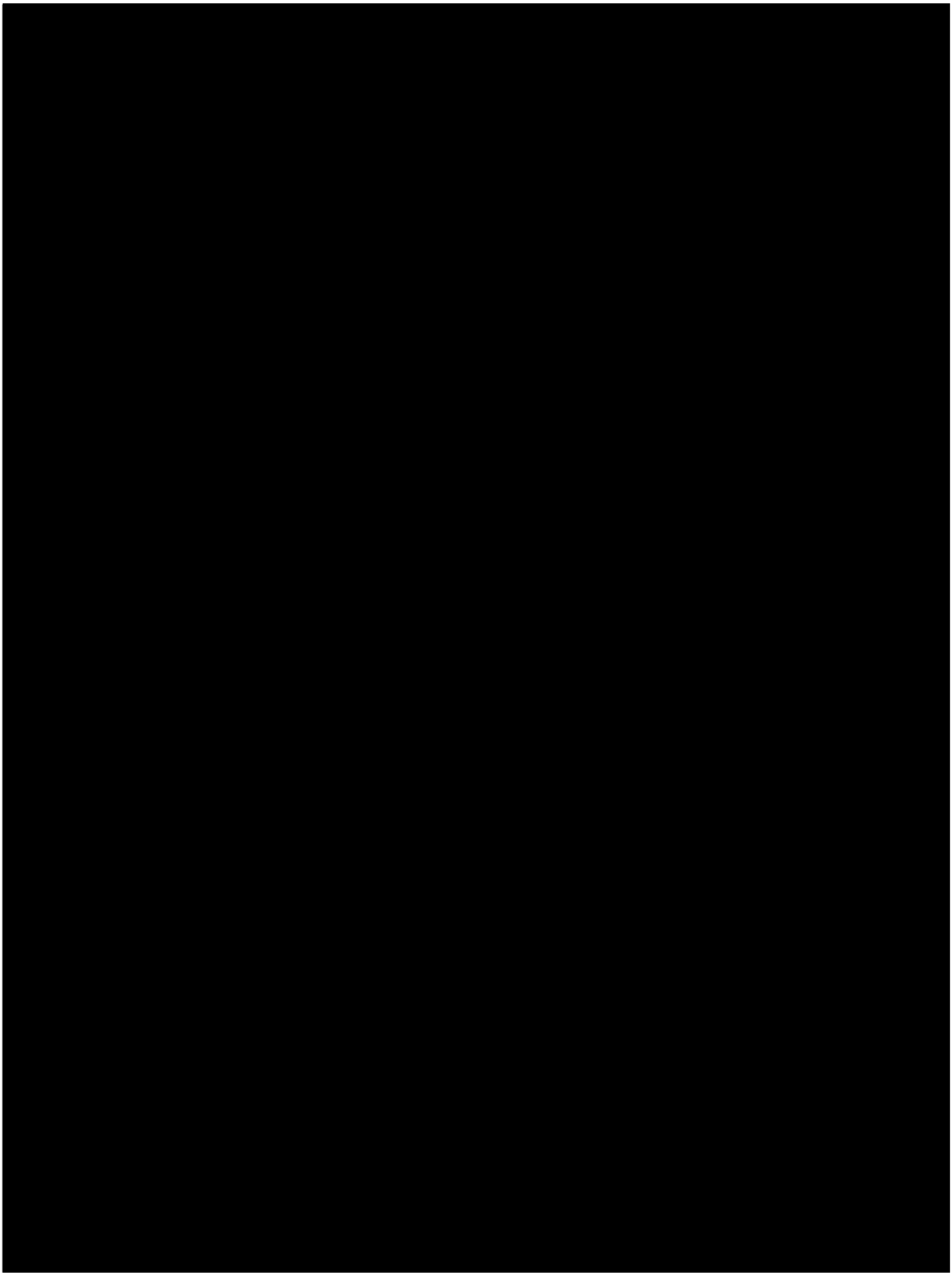
David Milligan

From: [redacted]
To:
Sent: Wednesday, 13 October 2010 9:07 AM
Subject: Story Comment Published

Your comment has been published:
Wivenhoe Dam WAS BUILT TO HAVE A FLOOD MITIGATION CAPACITY not to eliminate a future flood event EQUAL TO OR BIGGER THAN THE 1974 EVENT.Both the Queensland Government and The Brisbane City Council have all the reports and studies into this possible future disaster.WHAT ARE THEY DOING ABOUT THESE REPORTS AND THEIR RECOMMENDATIONS.???? Dave Milligan

To view your comment online go to:
http://www.couriermail.com.au/news/queensland/brisbane-suburbs-most-at-risk-of-flooding-as-campbell-newman-warns-of-repeat-of-1974/story-e6freoof-1225937856670

Please note the Editor may have slightly edited your comment to be suitable for publishing.



Queensland water Commission

Securing our water, together.

Trim Ref: D/10/007645

3 MAR 2010

Mr Dave Milligan
[redacted]

Dear Mr Milligan

Thank you for your letter of 25 January 2010 about the revised draft South East Queensland Water Strategy (Strategy). Your comments will be taken into account when finalising the Strategy.

People in South East Queensland (SEQ) demonstrated that when water supplies were threatened by the most serious drought in recorded history, adjustments can be made to reduce water demand. Water usage reduced from an average of over 300 litres per person per day to as low as 140 litres per person per day. However, permanently reducing water supplies to the low levels achieved during the drought could significantly reduce the amenity and lifestyle choices of many in our community.

The Queensland Water Commission will carefully consider the public submissions on water demand when finalising the planning targets in the Strategy.

You may be aware that structural reform of SEQ's water industry will deliver more uniform pricing for urban supplies. Under new arrangements water charges reflect water demand. Customers who use more water pay more on a volumetric basis and large users have to pay at progressively higher rates of charge.

The 235 000 subsidies by government to the community for rainwater tanks reduced water demand and emphasised the role that individuals have on reducing the overall water demand on our bulk water supply sources.

Development codes, introduced by this Government on 1 January 2007, require new residential, commercial and industrial buildings to develop local supplies. In SEQ new detached homes must achieve water savings of at least 70 000 litres per year, while terrace and town houses must aim to achieve savings of 42 000 litres per year. Rainwater tanks are one acceptable method of achieving these savings. This could see up to 800 000 homes over the next 50 years use off-grid supply sources like rainwater tanks. This will supply about 35 000 megalitres per year by 2026 and 60 000 megalitres per year by 2056. With high series population growth and an allowance for climate change it is estimated that to meet demand an additional 416 000 megalitres per year will be required by 2056.

Although local water supplies have the capacity to contribute to supply and delay the need for bulk water supply infrastructure, there will be a significant shortfall of at least 356 000 megalitres per year.

Queensland Water Commission
PO Box 15087 City East Qld 4002
Ph: +61 7 3227 8207 Fax: +61 7 3227 8227

There are limits to how big a dam can be based on factors such as catchment size, rainfall and runoff patterns, terrain and particularly, impacts on the environment. The Strategy does not recommend the raising of Wivenhoe Dam but to investigate improving the yield through operational adjustments that balance flood and water supply requirements. This is one of a number of possibilities along with a raised Borumba Dam that are being investigated. *

The operation of the SEQ water grid is based on optimising local use and minimising the moving of water over long distances. Nevertheless, the ability to move water to where it is needed has a significant impact on water security and provides options to minimise drawdown from storages reaching critical levels.

Should you have any further enquiries please contact Tad Bagdon, Acting Director of Water Strategy in the Queensland Water Commission on telephone [redacted]

Yours sincerely

[redacted]

Daniel Spiller
Acting Executive Director

THE PREFERRED OPTION

Upgrading Wivenhoe Dam to cater for the probable maximum flood will occur in two stages.

As part of Stage One, an embankment controlled spillway will be constructed on the right abutment. The new spillway, which will be approximately 200 metres wide, will be located opposite the entrance to the Wivenhoe Dam Information Centre, as shown on the map below.

A bridge will also be constructed over the new spillway on the Brisbane Valley Highway.

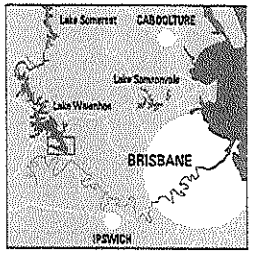
When completed, Stage One will ensure the dam can manage a flood event that has in the order of a 1 in 100,000 chance of occurring in any one year.

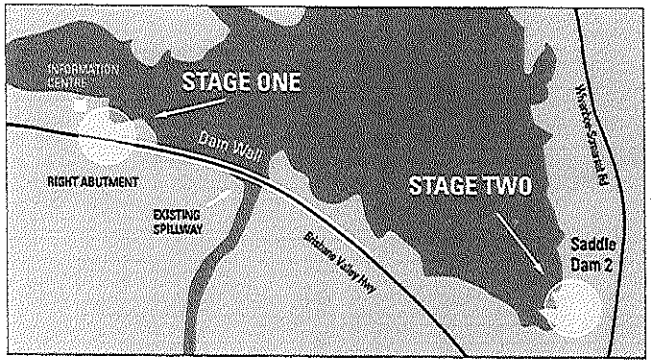
Stage Two will involve the construction of an embankment controlled spillway at Saddle Dam 2 sometime in the future.

WHY WAS THIS OPTION CHOSEN?

Characteristics of this option include:

- Consideration of technically most
- Least impact on local landholders
- Best geological conditions
- Fewer environmental impacts
- Improved flood mitigation
- Longer remediation
- Lower financial risk





STAGE ONE

- Construction of an embankment controlled spillway
- Approximately 200 metres wide
- Located on the right abutment
- Construction of a bridge for traffic over the new spillway
- Strengthening of the existing concrete spillway
- Construction planned to commence during the first half of 2004 subject to State Government funding

STAGE TWO

- Construction of an embankment controlled spillway
- Approximately 200 metres wide
- Located at Saddle Dam 2
- Replacing existing Saddle Dam
- Construction timeframe yet to be determined

WHY STAGE THE CONSTRUCTION?

Upgrading the dam in two stages allows greater flexibility, and provides many benefits, for example, a staged approach:

- Ensures the dam will be able to manage an event that has approximately a 1 in 100,000 chance of occurring in any one year by 2006
- Provides flexibility for the future and enables SEQ Water the opportunity to explore alternative development options in new resource and infrastructure of Australia's rainfall patterns
- Reduces construction impacts on the community
- Reduces the financial impact of the project

WHAT IS AN EMBANKMENT CONTROLLED SPILLWAY?

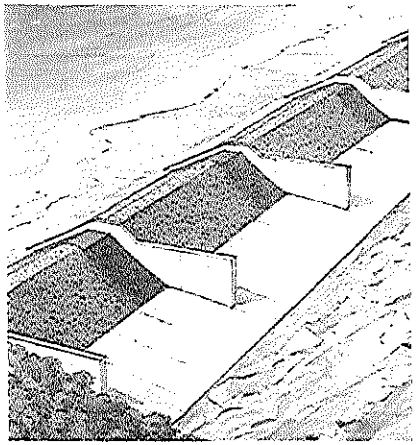
An embankment controlled spillway is an earth and concrete structure that allows floodwater to be released in a controlled manner.

It is designed to operate only when the water level within the dam rises to a predetermined level set to manage an extremely rare flood event.

Concrete walls are used to separate sections of rock and earth material.

Each section is set to operate at progressively higher water levels. When the water level rises to the set point on the lowest section of the embankment controlled spillway, the material between the concrete walls erodes away, allowing the water to be gradually released. This then reduces the water level inside the dam.

If the water level continues to rise after the first release, the other sections of the embankment controlled spillway will then operate progressively at their predetermined water levels.



FREQUENTLY ASKED QUESTIONS

Q ***Will construction allow the dam to hold more water?***

A The upgrade project will not alter the full supply level of Wivenhoe Dam. At full supply level the dam will hold 1.16 million megalitres or about 2000 times Brisbane's daily water consumption requirements.

Q ***Will the Brisbane Valley Highway be closed during construction?***

A Highway access will always be maintained during construction. Temporary deviations and speed restrictions will be required but access will always remain open.

Q ***What will happen in an extreme flood?***

A The existing concrete spillway will manage the release of flood waters into the Brisbane River for most significant floods.

Only when a flood reaches an event that has approximately a 1 in 5,000 chance of occurring in any one year, will the new spillway be activated.

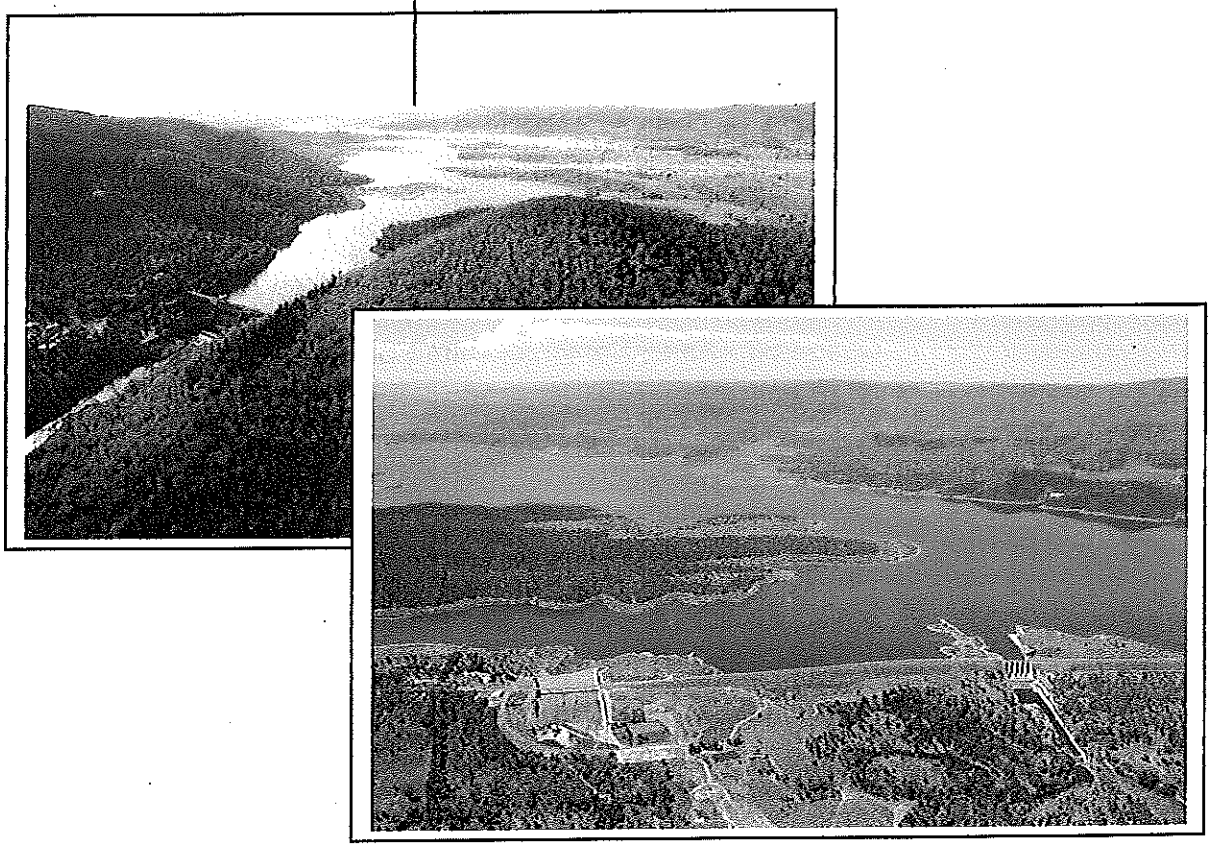
Q ***How long will construction take?***

A Construction of Stage One is expected to take approximately 24 months.

QUEENSLAND WATER COMMISSION

DEPARTMENT OF NATURAL RESOURCES AND WATER

PROVISION OF CONTINGENCY STORAGE IN WIVENHOE & SOMERSET DAMS



SEQWATER

Wivenhoe, Somerset & North Pine Dams

Quality of water. Quality of life.

March 2007

Report No WS/OPS 011106

1. Executive Summary

This report has been prepared in conjunction with the Queensland Department of Natural Resources and Water (NRW) to investigate options to provide contingency storage as part of the South East Queensland Regional Water Supply Strategy (SEQRWSS). As part of these investigations it is proposed to look at options for the provision of an additional 200 to 600 GL of contingency storage in the Brisbane River catchment. The two options for this report are:-

- Raising Wivenhoe Dam Full Supply Level (FSL)
- Raising Somerset Dam FSL

These two options are being compared with other storage options in South East Queensland.

1.1 Scope of Work

This scope of work for this report includes the following options for the provision of the contingency storage:-

- Option W1 - Raise Wivenhoe Dam FSL by 2m to EL69.0
- Option W2 - Raise Wivenhoe Dam FSL by 4m to EL71.0
- Option W3 - Raise Wivenhoe Dam FSL by 8m to EL75.0
- Option S1 - Raise Somerset Dam FSL by 2m to EL101.0
- Option S2 - Raise Somerset Dam FSL by 4m to EL103.0
- Option S3 - Raise Somerset Dam FSL by 6m to EL105.0

This report provides:-

- Background data for each dam including risk profiles.
- A broad description of the works required to raise each dam to the nominated FSL.
- Feasibility cost estimates for each option.
- A preliminary assessment of the environmental and social impacts of each option.
- Risks and opportunities associated with each option.

The six options for the provision of contingency storage in Wivenhoe and Somerset Dams are presented in Table 1-1.

Table 1-1 - Summary of Raising Options

Option	Raising (m)	Raised FSL (m)	Increase in Storage Capacity (ML)	Estimated Cost ($m)
Wivenhoe Raising Options				
W1	2	69	228,000	63
W1A (Operational change)	2	69	228,000	5 to 10
W2	4	71	481,000	138
W3	8	75	1,066,000	248
Somerset Raising Options				
S1	2	101	92,000	55
S2	4	103	202,000	70
S3	6	105	332,000	85

It can be seen from the table that the most attractive option for the provision of contingency storage would be a 2m raising of Wivenhoe Dam as an operational change eliminating the need for expensive capital works. Intuitively, Wivenhoe would be the most logical option for contingency storage given the size of the catchment and the corresponding probability of capturing the additional flows.

The provision of contingency storage in Somerset will be difficult due to the upstream flooding issues associated with Kilcoy and land owners.

1.2 Flood Security Costs

Neither Wivenhoe nor Somerset currently satisfies the ANCOLD Guidelines on Acceptable Flood Capacity (2003). SEQWater is committed to an agreed program of works to allow the dams to comply with both ANCOLD and the Spillway Adequacy Guidelines (NRW 2005) in the timeframe specified by NRW. Given the assumptions for this study that the dams will be required to pass the current estimate of the PMF, a substantial portion of the costs to raise the FSL is associated with the long term works to increase flood security. It is arguable whether these costs should be included for the provision of contingency storage as SEQWater is likely to incur these costs in the future even if the storage is not raised. An attempt has been made to separate out the costs associated with the provision of additional storage from the costs required to upgrade the current dams. These costs are presented in Table 1-2.

Natural Resources and Mines
The Honourable Henry Palaszczuk

Friday, January 27, 2006

Government, Councils move ahead with SE Qld water supply solutions

The Queensland Government and the Council of Mayors, South East Queensland released a report outlining a number of water supply solutions they were already working on for the region.

Natural Resources and Mines Minister Henry Palaszczuk and Council of Mayors (SEQ) Chairman Campbell Newman released the South East Queensland Regional Water Supply Strategy (SEQRWSS) Stage Two Interim Report today.

Mr Palaszczuk said the interim report released today identified a number of projects that could help save water and access alternative supplies.

"The strategy is clearly not solely based on dams. There is already more than a trillion litres of unused water storage capacity in south-east Queensland dams," Mr Palaszczuk said.

"By 2026, we expect 3.7 million people will live in South East Queensland. This growth has to be supported by a secure, quality water supply."

Cr Newman said the 18 Councils had been working with the Queensland Government on the SEQRWSS to address the urgent challenges of the current drought.

"Local government is responsible for providing water to homes and businesses, so it's very important we work with the State Government and get smarter about the use of water resources, explore new options and protect water quality," he said.

"Although this strategy spells out some possible solutions, there is no quick fix to the drought. With dam levels at around 34%, we still need to watch every drop."

The Queensland Government provided $1.6 million funding towards stage two of the SEQRWSS and local Councils have contributed $1 million.

Short term projects highlighted for investigation in the interim report include:
* recycled water - collecting wastewater from Brisbane and Ipswich to supply to industry in the Western Corridor, Swanbank power station and possibly Tarong power station and Australia Trade Coast;
* recommissioning both Enoggera Dam and Lake Manchester;
* minor aquifers - investigating groundwater for emergency supplies in mainland areas in Brisbane, such as Oxley;
* regional pressure reduction and leakage management - $20 million from the Queensland Government to subsidise local government pressure reduction schemes. This is expected to save 50 - 75 megalitres per day across the region;
* inter-catchment water distribution - small storages in higher rainfall areas could be emptied more quickly to take advantage of their greater chance of being filled. Project will look at Gold Coast off-take, southern regional pipeline and North Stradbroke augmentation and possible Redland interconnection;
* indoor water efficiency - possibility of mandating rainwater tanks in new homes for toilet and external use;
* regional desalination - Gold Coast City Council has commissioned an advanced study to determine costs of a 55 - 110 megalitre per day desalination plant;
* Cedar Grove Weir - State Government to progress construction of Cedar Grove Weir on the Logan River;
* construct Mary River Weir - to improve security of supply for Gympie and Noosa.

Other medium and long term options include new infrastructure such as:
* raising of Hinze Dam and Wivenhoe Dam
* Investigate recycled water options
* Wyaralong Dam
* recommissioning of Ewen Maddock Dam.

Cr Newman said the interim report primarily focuses on urban water provisions.

"The requirements for rural water supply will be done as part of the final report for the SEQRWSS due for release at the end of 2006."

The Queensland Government and the Council of Mayors is equally concerned about sustaining water supplies for rural communities.

Mr Palaszczuk said the Quensland Government has also initiated a review of the existing institutional arrangements for water in south-east Queensland.

"There are 19 major water supply storages with 12 different owners in the regions. A total of 18 local governments deliver water to their ratepayers, while a number of adjoining councils obtain water from south-east Queensland," he said.

The Council of Mayors (SEQ) represents the 18 Councils of South East Queensland - Beaudesert, Boonah, Brisbane, Caboolture, Caloundra, Esk, Gatton, Gold Coast, Ipswich, Kilcoy, Laidley, Logan, Maroochy, Noosa, Pine Rivers, Redcliffe, Redland and Toowoomba.

Media contacts:
* Kirby Anderson (Mr Palaszczuk's office) 3896 3689 or 0418 197 350
* Francis Quinlivan (Lord Mayor's office) 3403 4832 or 0408 709 160

REFER DRAFT GUIDELINES ON ACCEPTABLE FLOOD CAPACITY FOR DAMS OCT. 2005 QLD. GOVT. NRM

Development of PMP Estimates

The original Generalised Tropical Storm Method (GTSM) for estimating Probable Maximum Precipitation (PMP) was developed in the mid to late 1970s on the basis of the limited number of storms and a limited amount of storm data.

In the years since the basic GTSM methodology was originally developed, it was progressively updated. This resulted in a progressive updating of flood estimates. This development also coincided with developments in hydrological modelling which allowed better modelling of dam catchments. Overall, it resulted in dam spillways progressively needing to pass bigger and bigger design floods.

Most of the dams designed since the original GTSM methodology became available would have been designed taking the then estimates of the PMP into account.

NRM&E, together with the NSW Dam Safety Committee and the Western Australian Water Corporation recognised that it was in need of review in 1999 and jointly sponsored an extensive review. NRM&E provided 'in kind' and financial support for the project. It was also represented on the project steering committee and a supporting 'technical advisory' committee.

The entire Bureau of Meteorology rainfall record was systematically examined objectively for the largest rainfall events. A total of 122 storms were identified (as against the 7 used in the original model) and analysed to develop an upper estimate of the possible rainfall over different durations. Once the upper envelope was determined and the process refined, this information is used in conjunction with information about specific catchment in order to estimate Probable Maximum Precipitation over those catchments.

This GTSM-R review process was very rigorous and is considered to have resulted in far more reliable PMP estimates than were previously available. In many respects the methodology adopted was similar to that recently adopted in the Generalised Southern Australian Method (GSAM) for southern Australia.

The updated GTSM-R methodology was finalised and rainfall estimates started to become available to dam owners in September 2003. In Queensland, the Wivenhoe Dam catchment (near Brisbane) and the Ross River Dam catchment (near Townsville) were used as 'test catchments' for the methodology. The revised method was peer reviewed internally within Australia and it was internationally reviewed by Lou Schreiner, US Bureau of Reclamation.

Overall, the recent GTSM review resulted in increases in the flood estimates of about 15% in south-east Queensland and about 30% to 35% in north western Queensland. The greater increases in north western Queensland being primarily attributed to higher persistent dew point data becoming available in the area.

The overall effects of this growth seem to be variable across Queensland. The critical duration design floods for Wivenhoe Dam increased by about 3.5 times over the period and those for Ross River Dam doubled. Either way, the increases are significant.

Minister for Primary Industries

POSTAL: G.P.O. Box 46, Brisbane Qld 4001
OFFICE: Primary Industries Building
80 Ann Street, Brisbane
TELEPHONE: (07) 239 3000 TELEX: 145352
FACSIMILE: (07) 229 0260

6 APR 1990

The President
Albert Valley Progress
Association Inc.
PO Box 83
BEAUDESERT QLD 4285

Dear Mr Milligan,

I refer to your recent representations and particularly your letter of 20th March 1990 with the enclosed document headed "Summary of Leaked Documents - Possible Future Floods in Brisbane", in which you make quite serious allegations against [redacted]

In relation to Wolffdene Dam, this matter was fully investigated by the Parliamentary Committee of Public Works. This Committee heard evidence from a number of interested parties and examined all available documents relating to the matter which comprised a very large number of exhibits. Notwithstanding the findings of the Committee, my Government has decided not to proceed with Wolffdene Dam; that is the end of the matter.

With regard to flooding in the Brisbane River, I reject totally your statement that there was a "cover up by the Authorities" as you call it.

It is a well known fact that only some 52 per cent of the catchment area of the Brisbane River system is controlled by Wivenhoe Dam, and that large floods can arise from the Bremer River catchment.

Also, the huge floods mentioned by Mr Cossins in his paper are regarded as having a probability of occurrence in any year of somewhere between 1 in 100,000 and 1 in 1,000,000. By contrast, the 1974 Brisbane flood is estimated to have a probability of occurrence in any one year of 1 in 70.

Obviously, the extreme floods are outside the realm of any person's experience, they are most unlikely to occur in any person's lifetime and they most certainly do not constitute any immediate threat.

The Water Resources Commission is at present involved in a very large amount of work in implementing flood warning systems for all dams owned by the Brisbane and Area Water Board and in reviewing the flood operating procedures. Letters and papers dealing with these studies have obviously not been leaked to you and you are therefore not well acquainted with the complete situation. With regard to the work being done by the Commission, I have every confidence in their professionalism.

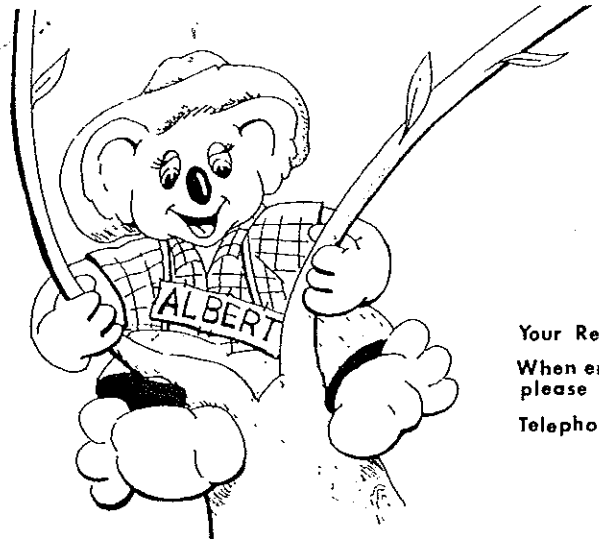
At any time, these tasks have to take a priority in relation to other matters in which the Commission is involved. I can see nothing sinister in the timings of letters you mention. Nor can I see any lack of competence given the wide range of other matters with which the Commission is involved on both Wivenhoe and elsewhere right across the State. I reject the conclusions you have attempted to draw.

[redacted]

In relation to your earlier letter of 9th March 1990 concerning the leasing of land purchased by the Board for the now abandoned Wolffdene Dam project, I have noted your requests and will consider them further when the issue of land disposal is able to be addressed in the near future.

Yours sincerely,

EDMUND CASEY
Minister for Primary Industries



THE ALBERT VALLEY PROGRESS ASSOCIATION INC.

"THE CITIZENS COMMITTEE AGAINST THE WOLFFDENE DAM"
P.O. BOX 83
BEAUDESERT 4285

Your Ref:
When enquiring please ask for: D. Milligan, President
Telephone : [redacted]

20.3.90.

SUMMARY OF LEAKED DOCUMENTS - POSSIBLE FUTURE FLOODS IN BRISBANE

TO WHOM IT MAY CONCERN:

My concern, is that I am aware of information which I cannot ignore and [redacted]

I refer to a recent programme on the 7.30 Report which screened in Brisbane Monday 26th February 1990, about the recent local flooding in Brisbane caused by heavy rains over the weekend 24th, 25th February 1990.

Unfortunately the truth has not been revealed by the authorities about the possible damage including loss of life which will be suffered if major floods once again affect Brisbane.

During our research into the need and costs for the controversial Wolffdene Dam a number of reports and other documents were leaked to our Association. [redacted]

In particular a submission by G. Cossins Consulting Engineer for the Brisbane & Area Water Board dated 25.11.88 and issued under covering Brisbane City Council Memo Department W.S. & S. States clearly on P8 that a future "FLOOD FLOW COULD BE FIVE TIMES THE 1974 PEAK FLOW OF 9,500 CUBIC METRES PER SECOND; WITH THE FLOOD HEIGHT APPROACHING 15 METRES AT THE BRISBANE CITY GAUGE, COMPARED TO THE 5.5M FLOOD HEIGHT REACHED DURING THE 1974 FLOOD."

"THE DAMAGE CAUSED IN THE URBAN AREAS BY THE BRISBANE RIVER IN THE 1974 FLOOD WAS ASSESSED AT $660 MILLION AT 1988 PRICES. HOWEVER, THE DAMAGE WOULD RISE RAPIDLY WITH BIGGER FLOODS, REACHING AS MUCH AS $2,000 MILLION FOR A 10 METRE FLOOD AT THE BRISBANE CITY GAUGE."

....contd/2

This of course does not allow for subdivision, building and capital investment made since the 1974 floods in the flood plains or in fact further ajustment to 1990 dollar values or beyond.

With reference to Ald. David Hinchcliff's statement about the Brisbane City Councils, current flood plan zoning, we refer to P9 of this submission, which states

> "Little has yet been done in Brisbane along these lines."
>
> "Flood prone land is cheap land and attracts industries and people willing to take the risk of being flooded. People in such flood prone areas are vocal in demanding flood mitigation works to protect them from the results of their own location."

Further P10 states -

> "The Greenhouse Effect is expected to bring increased rainfall including larger storms to the Brisbane Valley as well as raising sea levels..... average flood damage losses will increase. Larger Floods may threaten existing dams with damage and destruction with overtopping so that it may be necessary to spend tens of millions of dollars to <u>improve the safety</u> of Board Dams."

<u>ON THE SUBJECT OF SAFETY OF BOARD DAMS:</u>

.....It appears that the Queensland Water Resources Commission wrote to the Brisbane & Area Water Board 28.4.88 and indicated that current revisions by *A.N.C.O.L.D.; the design floods for Dams, owned and operated by the Board should take place. (Ref R. Geddes letter enclosed).

This instruction was finally relayed by the Secretary D.J. Evans of the Board at a meeting 14.7.88 almost 3 months later.

The Boards Secretary recommended that the safety of the Board's Dams be referred to the advisory committee for a report.

On the 18.10.88 following a meeting of the Advisory Committee on 17.10.88 the safety of Board Dams was discussed and it was advised that the Queensland Water Resources Commission should advise the time required and the cost involved if the Commission carried out the studies..... W.A.L. Webber Chairman, Brisbane & Area Water Board Advisory Committee.

It took 6 months after the matter was first raised by Queensland Water Resources Commission <u>before a request was</u> made to Queensland Water Resources Commission [redacted] the Brisbane & Area Water Board, <u>to advise how much and how long</u> the studies will take. - [redacted]

.....contd/3

* A.N.C.O.L.D.....Australian National Committee on Large Dams.

Queensland Water Resources Commission correspondence dated 22.11 .89 confirms that the Brisbane & Area Water Board advisory committee and the Queensland Water Resources Commission have not advanced any further in the last 12 months.

Have the studies since been completed? If so what are the recommendations about the safety of the dams affecting the people and property downstream of the dams?

[redacted]

D. Milligan,
President,
ALBERT VALLEY PROGRESS ASSOCIATION INC.

Encls.

BRISBANE AND AREA WATER BOARD ADVISORY COMMITTEE

MINUTES

FOR THE MEETING CONVENED IN THE 13TH FLOOR CONFERENCE ROOM, MINERAL HOUSE ON 13TH NOVEMBER, 1989

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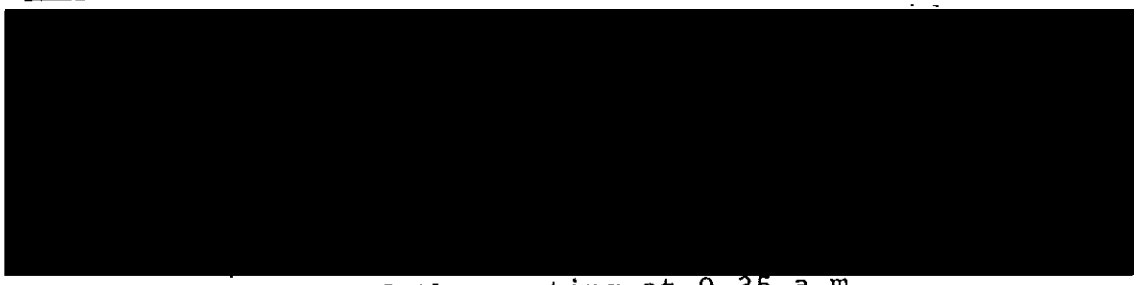
1. PRESENT



The Chairman opened the meeting at 9.35 a.m.

2. MINUTES OF PREVIOUS MEETING

There were no comments on or amendments to the Minutes of the previous meeting held on 31st July, 1989.

3. MATTERS REFERRED TO THE ADVISORY COMMITTEE BY THE BOARD

(a) Brisbane City Council Report on Floods
1st - 8th April, 1989

The Brisbane and Area Water Board requested the Committee to consider a report prepared by the Brisbane City Council on the operation of North Pine, Somerset and Wivenhoe Dams during the flood period 1st to 8th April, 1989.

With regard to Item 6(c) of the report - North Pine Dam Spillway Gate Discharge Rates - doubts about the discharge ratings of the gates have been satisfactorily resolved in that it has been found that the indicators on the gates showing the amount of gate opening had been set incorrectly. This problem is in the process of rectification.

There is no reason to doubt the tabulated discharges in the Manual.

It was agreed that the report was in order and that the Brisbane and Area Water Board be advised accordingly.

Various matters raised by the Council have been previously noted to be attended to during the review of the Manuals of Operational Procedures for the dams.

4. REPORTS

(a) Wivenhoe, Somerset and North Pine Dams - Dam Safety/Dam Break/Flood Studies

The proposed brief on dam safety, dam break and flood studies prepared by Brisbane City Council was considered. After discussions with the officers in Water Resources Commission responsible for dam safety, it was felt that a complete safety review of the dams as suggested by Brisbane City Council was not necessary at this stage, but that, as a matter of urgency, dam break studies, review of hydrology and determination of downstream flood profiles should be carried out. As a corollary, it was decided that the Advisory Committee write to the Water Resources Commission requesting advice as to what studies would need to be carried out including the review of as-constructed information in order that licences may be obtained for the three dams. The Commission would also be asked to explain the responsibilities of the various parties in terms of the dam safety legislation.

Mr Webber suggested that Water Resources Commission and Brisbane City Council meet to finalise the terms of reference for the dam break, hydrologic and flood profile studies.

Mr Evans pointed out that the Brisbane and Area Water Board would like to know the costs involved as soon as possible and when the money will be spent.

Mr Webber suggested also that, as the Commission would be reviewing the flood operating manuals, the Commission be requested to carry out the studies, as they were linked to the operating procedures.

(b) Flood Warning Telemetry System for North Pine Dam

This is proceeding with a committee to be set up.

5. DATE OF NEXT MEETING

It was agreed that the next meeting would be held after the briefs for the flood studies had been finalised.

The Chairman closed the meeting at 10.45 a.m.

25 JAN 1989

DEPARTMENT OF WATER SUPPLY AND SEWERAGE

RJ:KLB

23 January 1989

MEMORANDUM: Alderman P. Denman
Deputy Mayor

Alderman J. Goss
Alderman for McDowall

Alderman P. Vaughan
Alderman for Eagle Farm

Alderman D. Randall
Alderman for Kianawah

RE: PAPER PREPARED BY G. COSSINS FOR BAWB SUBMISSION TO THE BRISBANE RIVER COMMITTEE

Attached is a paper prepared by G. Cossins for presentation to the Brisbane River Co-Ordinating Committee.

The Deputy Mayor has requested that all Council representatives on BAWB be provided with a copy of the paper as it includes some statements relevant to timing considerations for Wolffdene Dam. These statements appear on pages 3, 4 and 10 and have been highlighted for ready reference.

The paper was considered by the Property Management Committee on 19 January for possible submission to the Brisbane River Committee. It is understood that the paper was withdrawn.

[redacted]
Manager

c.c. Alderman Olsen

AGENDA ITEM 5.3

PROPERTY MANAGEMENT COMMITTEE

MEETING - THURSDAY 19TH JANUARY, 1989

BRISBANE RIVER CO-ORDINATION COMMITTEE

The Brisbane River Committee, through its Executive Officer, recently sought a submission from the Board with regard to a number of aspects related to the Brisbane River.

The matter was referred to the Board's Consulting Engineer, Mr G Cossins, for preparation of the submission. Mr Cossins has now completed that submission and it is presented for consideration of the Committee.

RECOMMENDATION

That the Board submit to the Brisbane River Committee the submission prepared by Consulting Engineer, G Cossins, as requested in that Committee's letter of 8th September, 1988.

[redacted]

D.J. EVANS

Secretary

16th January, 1989.

BRISBANE AND AREA WATER BOARD

SUBMISSION TO THE BRISBANE RIVER COMMITTEE

ON

WATER QUALITY IN THE BRISBANE RIVER

The Brisbane and Area Water Board is a body corporate established on 1st July, 1979 under the provisions of the Brisbane and Area Water Board Act.

The functions of the Board are specified in Section 22 of the Act as set out in Appendix A. From Appendix A it will be seen that the primary functions of the Board are the provision of raw water for urban consumption by the building, operating and maintenance of dams and also the provision of flood mitigation by the operation and control of the Board's dams during flood times. The Board also has the functions of maintaining and preserving the quality of water supplied in its Operational Area and of providing, operating, maintaining and protecting recreation facilities on land under the Board's control.

The Board may, also, under certain circumstances, provide and operate water treatment plants and trunk mains but the main functions of the Board are the provision of raw water from dams to sell to the Local Authorities in the Board's Area and the mitigation of floods.

The Board is empowered under Section 6 of the Act to exercise its functions in the "Operational Area of Brisbane and Area Water Board" as delineated on Map No. M 393 deposited in the Department of Mapping and Survey at Brisbane. A copy of the plan is attached. The Board's "Area", as it is known in short, covers the whole of the area of the cities of Brisbane, Ipswich, Logan and Redcliffe and the whole of the Shires of Esk, Gatton, Kilcoy, Laidley, Moreton and Pine Rivers as well as parts of the Shires of Albert and Beaudesert.

It will be seen from the attached copy of the Board's "Area" plan that the jurisdiction of the Board does not extend over the whole of the Brisbane River catchment; a small part of the catchment in Nanango, Rosalie, Crows Nest, Cambooya and Boonah Shires being excluded. These exclusions cover most of Cooyar and Emu Creeks and the upper parts of Cressbrook Creek, the Bremer River and Oxley Creek.

The Board assumed control of Somerset and Wivenhoe Dams in the Brisbane River Valley in October 1985. It also assumed control of North Pine Dam on the North Pine River at the same time but as this dam lies outside the area of concern of the Brisbane River Committee no further reference will be made to it. In the same way no further reference will be made to the proposed Wolffdene Dam on the Albert River, a stream independent of the Brisbane River.

Australia is not only the driest continent but experiences higher floods with greater flood volumes and also more severe droughts, than the other continents.

Within this framework the Brisbane River is typically one of the medium sized east coast streams of sub-tropical Queensland characterised by a low average rainfall/runoff ratio, large volume floods, occasional severe droughts with zero stream flows and a pan evaporation equal to the average rainfall. All these factors combine to require the provision of large storages for both water supply and flood mitigation.

The Brisbane Water Supply System requires three times as much headworks dam storage per capita as Melbourne for instance, and ten times as much as London. Where flood mitigation is provided in the Brisbane Valley some 60% of the total storage capacity of the major dams (Somerset and Wivenhoe) is kept permanently empty to absorb flood flows. In Britain the annual urban water supply drawdown in dams is frequently sufficient to absorb wet season floods. This is not possible on the Brisbane River but, on the other hand, the above factors are even less favourable in the drier part of Australia, say at Alice Springs.

Rainfall is greatest on the eastern (coastal) side of the Brisbane River catchment and the east - west rainfall gradient is reflected in the runoff variation. The Stanley River, the major eastern tributary of the Brisbane River, has a runoff per unit area four times higher than Lockyer Creek, a western tributary. The average rainfall over the total 13,560 sq. km. catchment is 942 mm but the average annual streamflow, allowing for abstractions, is 1,350,000 megalitres representing only 11% of the rainfall. The remainder is treated as an evapotranspiration loss by the surface hydrologists but much of the "loss" is in the form of transpiration which keeps vegetation growing.

The Brisbane River System is the major source of urban water supply for the Brisbane and Toowoomba conurbations via nine dams.

Somerset Dam on the Stanley River and Wivenhoe Dam on the Brisbane River are, by far, the largest dams in the catchment and provide the major source of supply for the Brisbane conurbation via Mt Crosby Weir also on the Brisbane River. Lake Manchester Dam on Cabbage Tree Creek is also part of the system although its role is now relegated to that of flow balancing for Mt Crosby Weir. Enoggera Dam on Enoggera Creek and Gold Creek Dam on Gold Creek, both tributaries of the Brisbane River within the City of Brisbane contribute a small amount of water to the Brisbane conurbation

North Pine Dam on the North Pine River, Leslie Harrison Dam on Tingalpa Creek and Caboolture Weir on the Caboolture River also contribute to the urban water supply of the Brisbane conurbation although located outside the Brisbane River Valley.

Cressbrook Dam on Cressbrook Creek and Perseverance Creek Dam on Perseverance Creek, both tributaries of the Brisbane River, are used exclusively for the urban water supply of Toowoomba.

Moogerah Dam on Reynolds Creek also provides a small amount of water for the Brisbane conurbation via Moreton Shire which has an allocation of water from the dam which is otherwise used for irrigation and power station cooling.

The nine water supply dams are together capable of supplying about 420,000 megalitres of water per annum. Apart from the Brisbane and Toowoomba conurbations several small towns such as Lowood, Esk, Toogoolawah, Kilcoy, Woodford and Yarraman draw their water supplies from the Brisbane River System while Gatton and Laidley will soon be supplied from the river.

The total urban population supplied from Brisbane River sources in 1988 was of the order of one million. The existing dams supplying the Brisbane conurbation are not yet fully utilised and at full utilisation, will be able to supply over one and a half million population.

Another four dams in the Brisbane Valley together with a number of weirs, principally on the Lockyer Creek are devoted largely to irrigation supplies and are capable of supplying 62,000 megalitres of water per annum.

The present major usage of water from the Brisbane River catchment is urban and the proportion of urban use of the water will grow as the full potential of the existing dams is utilised and as the further potential of the catchment is developed. This latter factor is small as currently 95% of the catchment potential is capable of being utilised by the existing dams. The development of the remaining potential yield of the catchment is limited to some five percent due to the extreme variability of streamflow and the lack of suitable damsites.

The water yield of the Brisbane River catchment can be considered to be almost completely developed.

Large volume floods account for significant proportion of the total flow of the Brisbane River but is not economical to build dams to store more of the runoff due to disproportionately increased evaporation losses from the greatly increased water surface areas of the dams involved. In coastal Queensland the economic yield of a dam is 65% to 70% of the average annual streamflow against up to 95% in Britain.

The overall effect of the operation of all the dams in the Brisbane River catchment is to reduce the overall river flow by the amount of water taken out for urban and irrigation use. As seen above this amount is significant and, when the catchment is fully utilised, some 65% to 70% of the overall river flow will be abstracted. As floods contribute a large proportion of the overall river flow it will be seen that the greatest reduction in river flow due to abstraction occurs during "normal" weather. This effect is greatly emphasised during droughts when no water is released from the dams and the streams below the dams dry up.

The cessation of flow in the Brisbane River is a natural phenomenon. There are at least eight occasions during the last century when the Brisbane River either stopped flowing or was reduced to a trickle. Several of these occasions occurred before any dams were built and it can clearly be inferred that the flow would have almost ceased if the dams had not been built. The presence of the dams, however, and the heavy abstraction of water from the system has meant that river flow now ceases more frequently during minor drought than in the past and this tendency will increase as the utilisation of the dams reaches full potential.

Water is pumped and piped directly away from most of the dams in the Brisbane Valley for its various uses but the situation is different for the two major dams, ie., Somerset and Wivenhoe. The latter dam extends right up to the foot of Somerset Dam so that the water released from Somerset Dam enters Wivenhoe Dam directly. In this sense the two dams can be regarded as one.

Water released from Wivenhoe Dam flows down the Brisbane River to the Mt Crosby Weir from which it is pumped for the Brisbane conurbation. The section of the Brisbane River between Wivenhoe Dam and Mt Crosby Weir is kept permanently running. It has to be to maintain the water supply of Brisbane. In principle only enough water is released from Wivenhoe Dam to supplement the natural flow from the catchment of the Brisbane River between Wivenhoe and Mt Crosby Weir to just meet the water supply requirements of the Mt Crosby pumping station. In practice, however, it is difficult to exactly match the varying requirements at Mt Crosby exactly as it takes two to three days for the water released from Wivenhoe Dam to be effective at Mt Crosby Weir. A small surplus flow is therefore released from Wivenhoe Dam and flows over the spillway of Mt Crosby Weir (usually through the fish ladder) and enters the tidal compartment of the Brisbane River at Colleges Crossing about two kilometres below the weir.

Until the full potential of Somerset and Wivenhoe Dams is utilised, some 25 years or so in the future, some water will be available for overflows over Mt Crosby Weir to join the tidal compartment of the Brisbane River. This will not be a continuous process. During droughts the tendency will be to regulate the flow into Mt Crosby Weir more closely, using Lake Manchester Dam on Cabbage Tree Creek for the fine regulation of the river flow. Under these circumstances little water will flow over Mt Crosby Weir during droughts.

This particular form of operation will become more frequent as populations rise, the consumption of water in the Brisbane conurbation rises and the utilisation of the yield of the dams supplying the Brisbane and Toowoomba conurbations and also irrigation users approaches 100%.

As far as the tidal section of the Brisbane River is concerned, extending almost 90 kilometres from Colleges Crossing to Moreton Bay, the average input of raw river water will, on an average, be only 30% to 40% of the natural streamflow. This contribution will vary from maximum flood flows to zero flows during droughts.

In a sense the Board's water supply interest lies only with the main Brisbane River as far as Mt Crosby Weir. Although the yields of other dams in the catchment above Mt Crosby are not negligible they have no specific flood mitigation functions and the operations of the Board's major dams at Somerset and Wivenhoe both during floods and droughts will ultimately determine the extreme flood and drought flows in the Brisbane River at, and downstream of, the weir.

A considerable proportion of the total Brisbane River however lies downstream of Mt Crosby Weir; the major tributaries being the Bremer River and Oxley Creek. The Bremer River flow is regulated to some extent by Moogerah Dam on one of its tributaries. The principal function of this dam is the supply of water to be pumped out of the stream by irrigation farmers and for the supply of cooling water for Swanbank Power Station near Ipswich; the powerhouse supply being pumped from Barrys Lagoon weir at Churchill, a suburb of Ipswich. A small supply is also taken from the system at Amberley by Moreton Shire for urban water supply as part of the Brisbane conurbation. Moogerah Dam has the limited, although not negligible, flood mitigation capability due to its open spillway.

Oxley Creek is, as yet, undeveloped for water supply but a damsite exists which Brisbane City Council has examined for flood mitigation purposes only. Enoggera Creek and Gold Creek both have water supply dams, the oldest and second oldest respectively for the Brisbane conurbation. Although their combined contribution to the water supply of Brisbane conurbation is now less than half of one percent of the total consumption, their affect on the downstream creek flow is precisely that of the major dams. As the urban supplies are piped directly away from these dams the streamflow is completely stopped downstream of the dams except during floods and in wet periods when the stream flow is in excess of the urban requirements. Gold Creek Dam provides the flood mitigation automatically given by an open spillway but Enoggera Dam has a considerable flood mitigation storage from which the discharge is regulated by a fixed culvert; extremely high floods being discharged over an open spillway.

The flood flows from the Brisbane River catchment downstream of Wivenhoe Dam are largely unregulated by man made structures. The natural flood contribution from this area of the catchment enters the Brisbane River with virtually no modification. Flood mitigation in the urban reaches of the Brisbane River - which coincide with the tidal reaches from Mt Crosby to the Moreton Bay - is provided by the careful operation of Somerset and Wivenhoe Dams. On the other hand the catchment water flow contribution into the tidal reach of the Brisbane River is small during ordinary periods decreasing to zero during droughts, firstly because this part of the catchment has a relatively poor runoff from the lower rainfall it experiences and, secondly, because the whole flow of the Bremer River is diverted and Enoggera and Gold Creek Dams abstract water for urban use. Irrigation pumps on the remaining creeks effectively use up the remainder of the natural flow during dry periods.

The only contributions to the river flow are the effluents of waste water treatment plants serving the sewered communities of Brisbane and Ipswich as well as the urbanised areas of Moreton Shire within the Brisbane River catchment. These plants are scattered along the river but the largest, by far, discharges into the river at Luggage Point, virtually at Moreton Bay.

The Board has no detailed data of the flows and the quantities of the various wastewater discharges.

As far as the tidal compartment of the Brisbane River is concerned the contribution of non ocean water varies from maximum flood flows when the whole of the water in the river is flood water of low total dissolved solids but high turbidity, to droughts when the only contribution to the estuary is the effluent from wastewater plants. Under extreme conditions a drought could effectively last for as much as five years. During this period with no contribution of river water, the evaporation from the surface of the estuary would result in a nett inflow of salt water from Moreton Bay until the whole estuary was virtually saline. It is understood that the Water Quality Council has data on the rate of intrusion of salt water into the estuary after floods.

The Brisbane River has a long history of destructive flooding; the most recent event being the 1974 flood which caused $660 million of damage, at 1988 prices, in Brisbane and Ipswich. The actual 1893 flood height was much higher than the 1974 flood and the 1841 flood was of a similar height to 1893 but comparisons of historical flood heights are complicated by navigational dredging of the river channel, the operation of flood mitigation dams and by tidal conditions. However, data gathered principally in the 1893, 1968 and 1974 floods has made a comparison of historical flood possible.

The effect of flood mitigation dams has been calculated for floods since 1887 but lack of upstream data limits the procedure for earlier periods. Thus, for modern conditions, 1974 is marginally the largest historical flood . Brisbane River floods occur at irregular intervals and, in some years, notably 1893, several floods occurred.

Typically, floods in the Brisbane River are caused by major storms which accompany tropical cyclones or hurricanes. The first effect occurs as a cyclone approaches Brisbane. The onshore winds increase and cause a storm surge by piling up the ocean on the continental shelf and adding to the height of the tide. These abnormal tides are usually the factor which determines the maximum flood levels in the first ten kilometres of the Brisbane River. Upstream from Pinkenba the highest flood levels are determined by the flood flow in the river.

The next effect is due to the heavy cyclonic rain falling on the suburban creeks of Brisbane and Ipswich. These small catchment creeks respond very quickly to the heavy rainfall and the resultant floods take only a few hours to reach the Brisbane River and, alone, can cause minor flooding in the suburban reaches of the Brisbane River itself.

Major flooding in the Brisbane River is due to the heavy cyclonic rain over the upper catchments of the Brisbane River and its tributaries. There is, typically, an interval of two to three days between the peak rainfall of the storm and the arrival, in Brisbane, of the flood peak from the upper catchment. The overall pattern then is firstly, a storm surge causing an abnormal tide which is followed, a few hours later, by a minor flood from the suburban creeks and followed, two days later, by a major flood from the catchment.

After the initial storm surge on 25 January 1974 in the Brisbane River took 4 days to reach peak height at the Brisbane City Gauge but only a further two and a half days to fall back to normal levels. This effect is due to the time taken by the flood components from the different parts of the catchment to reach Brisbane from a double peaked storm.

A feature of Brisbane River flooding is the great depth of inundation in a major flood and the extensive areas of the flood plain involved.

Flood envelopes were derived, principally by Brisbane City Council from a detailed study of the data collected in the 1968 and 1974 floods. These envelopes are to be found on the reverse sides of the Flood Maps of Brisbane and Ipswich published by the Department of Geographic Information. These diagrams were derived from a more detailed diagram prepared by the Department of Water Supply and Sewerage of Brisbane City Council. Each envelope shows the maximum level to which the Brisbane River will rise at any location along the tidal reach of the river as the peak of a given flood travels from Mt Crosby to Moreton Bay taking 24 hours to do so. Distances are measured along the river from its mouth. The envelopes are labelled in terms of the height which a particular flood would reach at the Brisbane City Gauge (Edward St., City).

The flood envelopes all slope from Mt Crosby down to Moreton Bay. This may seem surprising because it is frequently believed that a river in flood is rather like a long sinuous lake, rising simultaneously along its full length to the peak height and then declining again simultaneously. This is not so. A flooded stream must have a gradient upon it for the water to be able to flow.

The peak flood level for Mt Crosby is therefore necessarily higher than the peak level at Jindalee which is in turn necessarily higher than the level in the central City. The flood must always necessarily come down to the level of Moreton Bay at the mouth of the river.

The objection is often heard that water finds its own level. This is true as long as the water is still and not flowing and applies to the floodplains of the river. The water level at any point in the river extends at right angles to the channel across the floodplains to the extreme limit of inundation. This idea, however, does not apply to the river flowing down its bed.

Contrary to popular belief the tide has very little effect on major floods in Brisbane and, in fact, the tide is damped out in an upstream direction along the river. In the 1974 flood the tide was damped out at Toowong. In smaller floods the tide is damped out further upstream, in larger floods the tide is damped out further downstream.

Dredging of the Brisbane River from about 1870 until about 1920 to improve navigation has reduced flood levels in the area of river concerned. The Port of Brisbane is being moved to the mouth of the Brisbane River over a number of years. If the $11 million per annum maintenance dredging of the river channels is discontinued the river will silt up. As the savings in flood damage in Brisbane due to the navigational channel dredged in the river since 1879 is calculated to be $26 million per year it seems that a case could be made for the annual maintenance dredging of the River to be continued as a charge against flood mitigation. However further dredging to reduce flooding would be of marginal economic value. The main areas affected by dredging are the flood plains adjacent to the dredged area but both the benefits of dredging and the losses due to its abandonment die out rapidly in an upstream direction from the area dredged.

The frequency study of the Brisbane River shows that there is every chance of a future flood reaching much greater levels than the 1974 flood. Higher floods will, of course be less frequent. There is, however, a cut-off point known as the Probable Maximum Flood. The height of this flood can be found by considering the maximum amount of rain that possibly could fall in a major storm from a combination of the most severe meteorological conditions. The Probable Maximum Flood for the Brisbane City Gauge has yet to be determined but the flood flow could be five times the 1974 peak flow of 9,500 cubic metres per second with the flood height approaching 15 metres at the Brisbane City Gauge against the 5.5 metres for the 1974 flood. A flood of such a height would be exceedingly rare yet, theoretically, it could happen.

This will come as very depressing news to the citizens of Brisbane and Ipswich because so many of them want to believe that flooding of the 1974 magnitude will never happen again. The reality of the matter, in spite of the flood mitigation provided by Somerset and Wivenhoe Dams, is that, for every record flood in the past, a higher flood lurks somewhere in the future. The only consolation is that, if you have once experienced the Probable Maximum Flood, there will never be anything higher. There is, however, no record of any place in the world having experienced the Probable Maximum Flood in historical times (with the possible exception of Noah). Aboriginal legends and some geological evidence support at least a 12 metre flood having occurred in Brisbane.

The damage caused in the urban areas by the Brisbane River in the 1974 flood was assessed at $660 million at 1988 prices. However, the damage would rise rapidly with bigger floods, reaching as much as $2000 million for a 10 metre flood at the Brisbane City Gauge.

The distribution of damage along the Brisbane River for the higher floods is concentrated in a few areas, notably the Oxley Creek valley which accounted for half the total in the 1974 flood. Jindalee, which was very vocal over its 1974 losses, hardly contributed to the total losses of the 1974 flood.

Somerset Dam has been mitigating floods in the Brisbane River since 1943. It reduced the 1974 flood damage in Brisbane and Ipswich by no less than $360 million (at 1988 values) and, over the period since it was first constructed, it has saved total flood damage in the order of $860 million at 1988 values. Similarly, Wivenhoe Dam would have reduced the damage in the 1974 flood by a further $500 million. While the possible savings in flood damage for a major flood is spectacular, such floods are relatively rare and, in fact, contribute little to the average annual flood damage which is due largely to medium sized floods which occur with medium frequency.

Under 1974 conditions of the river channel and at 1988 costs, the average flood damage in Brisbane and Ipswich from the Brisbane River, assuming Somerset Dam and Wivenhoe Dam did not exist, is estimated to be $46 million per annum. With Somerset Dam in operation this is reduced to $22 million. Wivenhoe Dam now reduces the average annual flood damage in Brisbane and Ipswich by a further $15 million. The modern cost of building Somerset Dam is approximately $110 million. An average saving of $23 million per annum for flood damage by the dam was therefore, a good investment, particularly when it is realised that Somerset Dam is a dual purpose project for both water supply and flood mitigation. Similarly, the extra cost of adding flood mitigation works to Wivenhoe Dam was a worthwhile investment, although a diminishing return. However a study also makes it clear that the

annual saving in flood damage due to building yet another dam on the Brisbane River system would be less than $7 million. At present day rates of interest, an investment of about $72 million would be justified for building the dam but, at present day costs, it is clearly impossible to build a suitable dam on any of the remaining sites for this price. It will, therefore, not be economical to build another flood mitigation dam for Brisbane and Ipswich. The river can, therefore, be considered to be fully developed as far as flood mitigation is concerned.

Somerset and Wivenhoe Dams mitigate flooding in the urban areas of Brisbane and Ipswich by with-holding as much flood water as possible from the peak of the flood that originates in the half of the Brisbane River catchment located downstream of Wivenhoe Dam. This process is, naturally, limited by the amount of flood storage available in the two dams. No less than 60% of the storage capacity of each dam is kept permanently empty to store flood waters.

Beyond a certain sized flood it is necessary to release water on to the peak of the lower catchment flood to prevent the dams from being overfilled and, possibly, being destroyed by overtopping.

So far only physical methods for reducing flood damage ie., dredging the river or building flood mitigation dams, have been considered. There are, however, other methods of reducing flood damage; flood plain zoning, flood-proofing of buildings, and compulsory flood insurance.

Floodplain zoning is a method of reducing flood damage by locating the most easily damaged and vital structures in areas of least flooding and by utilizing the most frequently flooded areas for installations, such as sports fields, which suffer little damage during a flood. Flood plain zoning requires legislation to make it effective and the plan for zoning the floodplains has to be incorporated into local authority Town Plans or the equivalent. Little has yet been done in Brisbane along these lines. Flood damage can also be considerably reduced by constructing buildings of materials as resistant to flood water inundation as possible and by locating easily damaged electrical and electronic equipment as high as possible in each building.

Flood prone land is cheap land and attracts industries and people willing to take the risk of being flooded. People in such flood-prone areas are vocal in demanding flood mitigation works to protect them from the results of their own location. Experience, particularly in the U.S.A., has shown that when flood mitigation works are built, the value of the formerly flooded land increases and attracts an even greater capital investment.

The net result is that when the next cycle of flooding comes around the total flood damage, instead of falling, has actually risen. Compulsory insurance of floodable property is a way of ensuring that the land carries its true value whilst building up a fund to pay for future flood damage. In the U.S.A., for instance, the Federal Government will not provide subsidies for flood mitigation schemes unless compulsory insurances are attached to the floodable land. No proposals have yet been announced anywhere in Australia for such schemes.

Contrary to popular opinion, the forecasting of the 1974 flood levels was extremely accurate after the first two days of confusion. These forecasts were not made available to the public as a result of a high administrative decision. It is understood that the theory behind this decision was that if the public knew

what was going to happen they would panic. Studies carried out by social scientists in disaster situations have shown that this theory is not tenable. However, even if the accurate forecasts had been released during the 1974 flood, there was simply no mechanism available, at that time, for conveying the information in a meaningful fashion to the people in the flooded areas who needed the advice most. Since that time there has been a major re-organisation of the means of advising the public of possible flooding and the Brisbane-Ipswich Flood Warning System has been set up. This is a co-operative effort between the Police, the State Emergency Service, the Bureau of Meteorology and the Brisbane and Ipswich City Councils. The new arrangement allows the various specialist groups to concentrate on their own areas and it spreads the load of disseminating messages to the public over an extensive system of volunteers.

The greenhouse effect is expected to bring increased rainfall, including larger storms, to the Brisbane Valley as well as raising the sea level. The overall effect of the increased rainfall will be to raise the yield of existing dams and, possibly, to make further dams economical thus increasing surface water harvesting. The increased storm activity, however, will bring more floods so, in spite of the existing flood mitigation dams, average flood damage losses will increase. Larger floods may threaten existing dams with damage and destruction with overtopping so that it may be necessary to spend tens of millions of dollars to improve the safety of the dams. On the other hand the changed circumstances may make further flood mitigation dams economical.

Increasing sea levels will not only flood existing low level areas as well as port installations but will cause the backwater effect of high ocean levels to extend further upstream but it should be remembered that this effect dies out rapidly in an upstream direction.

The Brisbane and Area Water Board has powers under Section 54 to 58 of the Brisbane and Area Water Board Act to take action to protect the quality of the water stored in its dams. The exercise of such powers, however, can have little effect upon the quality of the Brisbane River water in the tidal reaches from Colleges Crossing to Moreton Bay as the water stored in the dams is almost all withdrawn for urban and other consumption. Little of the stored water enters the tidal reaches of the river and the part that does is contaminated with other materials that enter urban sewerage systems.

The Board has virtually no control over the quality of the river water entering the tidal section of the Brisbane River. A small proportion of the settlable solids may be settled out of the water during floods but this is believed to be of minor consequence.

A more important factor is probably the retention, in Somerset and Wivenhoe Dams, of the bed load of sand and gravel normally carried by the river during floods. As those two dams command almost half the total catchment of the Brisbane River they have a significant effect on the replenishment of sand and gravel supplies dredged from the tidal reaches of the river. No quantitive estimate of this effect is available to the Board.

Certain tributaries of the Brisbane River are prolific sources of turbidity in the river water. The prime culprit in this respect is undoubtedly Lockyer Creek. The alluvial soils of the Lockyer Valley are easily eroded to cause turbidity and the whole effect is greatly magnified by the extensive small crop farming practiced in the valley. The worst recorded example of Lockyer Creek turbidity occurred in January 1969 due to a severe hail storm in the Valley. The hail was so extensive that it blocked gullies and drains causing the accompanying rain to flood large areas of farmland. When the hail melted the next morning the rapid drainage from the saturated black soils produced turbidity levels estimated at some 300,000 milligrams per litre (parts per million). When this water entered the Brisbane River it was diluted by an almost equal amount of low turbidity water from the Upper Brisbane River. The resultant mixture was measured by dilution method at Mt Crosby to have a turbidity of 150,000 milligrams per litre. The water slid over the spillway of Mt Crosby Weir without a sound; any splashing being suppressed by the mud content. The Department of Water Supply and Sewerage of Brisbane City Council records the daily turbidity of the Brisbane River at Mt Crosby and at more frequent intervals during episodes of high turbidity.

Such extreme instances are rare but heavy turbidities are frequently encountered in the river during wet periods. The Board has no control over such turbidities. They will always occur unless some change in agricultural practices in the Lockyer Valley can reduce the erosion component of the turbidity.

The Board considers that any restraint on the entry of topsoil, fertilisers and pesticides into the Brisbane River system would be beneficial for the Board's interests although the effect of such reductions upon the tidal estuary is unknown to the Board. The reduction of erosion would reduce the rate of siltation of the Board's dams. Studies have shown that the rate of siltation is presently not serious but a reduction in the rate could possibly extend the useful lives of the dams by more than a century.

Fertilisers act as plant nutrients in the Board's dams and encourage the growth of algae and other water plants in the lakes This downgrade the quality of the water and increase the cost of urban water treatment as well as imparting unpleasant tastes to the water that are difficult to remove.

Although the Board has an ongoing programme of water testing for the effects of special sources of pollution in its lakes it is not yet possible to draw broad conclusions from the study. The reduction in algal growth in Lake Samsonvale, on the other hand, due to the reduction in pineapple farming in the catchment which uses heavy fertilisation is striking. Brisbane City Council may be able to provide data on this subject.

The only other contribution the Board can make to the problems to be addressed by the Water Quality Sub-Committee concerns the question of the historical clarity of the river. Experience in the 1974 flood in Brisbane showed that fine mud was spread by the flood over the flood plains of the river throughout the inundated suburbs of Brisbane and Ipswich and that sand was deposited on the river banks in the city. A sandy beach appeared, once again, on the southern bank of the river beneath the Indooroopilly bridges, for instance. This suggests a mechanism whereby large floods deposit sand on the river banks, particularly, on the convex sides of bends. Subsequent smaller floods and urban runoff then cover these sand beaches with mud thus obliterating them.

This mechanism can account for the reports of picnic parties in the past of sandy beaches along the Brisbane River. Following the pattern of the 1974 flood sandy beaches would have been laid down in the floods of the early 1840's and again in the floods of 1890, 1893 and 1898 but then, probably not again until 1974 although the 1931 flood may just have been high enough for the purpose.

It seems then that sandy beaches are conditional upon large floods in the river. With Somerset Dam and Wivenhoe Dam in operation the frequency of flooding to the 1974 level will be much reduced by a factor of about four so that the reappearance of sandy beaches will become rarer than in the past.

The Board has no record of historical river clarity in tidal estuary of the Brisbane River.

In summary the Board is able to contribute to the Questions To Be Addressed By The Water Quality Sub-Committee as follows:

1. The Board has no data on the historical clarity of the tidal section of the Brisbane River but considers that sandy beaches are deposited by large floods and are covered with mud by subsequent small floods.

2. The question of littering is outside the Board's terms of reference and functions.

3. The Board considers that the damming of the river has little effect on the clarity of the river during flood times as the Board's dams do not command the half of the total catchment which included Lockyer Creek, a known producer of great amounts of turbidity.

   The effect of damming the river has been to greatly reduce the inflow of river water to the tidal component of the Brisbane River particularly during dry periods. The Board has no opinion as to whether this action has any effect on the river clarity.

4. The "filtering" of urban runoff would undoubtedly reduce the contribution of turbidity and other forms of pollution to the river but the Board is unable to express an opinion as to the effect on river clarity.

5. This matter is too far out of the Board's jurisdiction for an opinion to be expressed. However, as Somerset and Wivenhoe Dams command about half of the total Brisbane River catchment they trap a considerable proportion of the sand and gravel which, otherwise, would be deposited in the bed on the tidal reach of the river.

6. The Board is not in a position to express an opinion on the subject of dredging and the clarity of the river water.

7. The reduction of rural runoff of topsoil and fertilisers would benefit the Board's storage dams, firstly by reducing the rate of loss of storage capacity by siltation and secondly by the reduction of plant nutrients which promote the growth of algae and other water plants which cause the deterioration of the stored water as well as reducing the aesthetic pleasures of visitors viewing the lakes.

Although the Board desires to supply raw water to its consumers as free from contamination as possible the Board cannot express an opinion on the exact role played by pesticides and considers that matter should be referred to other authorities such as Brisbane City Council and the Water Quality Council.

The Board believes that the reduction in erosion would benefit the turbidity of the water in the tidal section of the river but that the fertiliser and pesticide components are probably of major concern to urban water supplies and that a reduction in these components would benefit the Board's lakes and the associated urban water supplies as well the tidal section of the river.

[redacted]

G. COSSINS, B.E., M.I.E. AUST.

CONSULTING ENGINEER

25 - 11 - 88

APPENDIX A

BRISBANE AND AREA WATER BOARD ACT 1979-1984

22. FUNCTIONS

(1) The Board's functions are:

(a) to conserve and store water and allocate water to:

(i) Local Authorities whose Areas or part of whose Areas are within the operational area: and

(ii) with the prior approval of the Minister, to Local Authorities whose Areas are outside the operational area, and to electricity generating authorities.

(b) to sell water to Local Authorities, with the prior approval of the Minister where it is required by paragraph (a), for their own use or for resale of part of such water to another Local Authority;

(c) to sell water direct form a reservoir, with the prior approval of the Minister, to electricity generating authorities for the purposes of one or more of their generating stations;

(d) to incorporate into headworks under the control of the Board constructed before or after the date of commencement of this Part such flood mitigation provisions as the Board deems expedient:

(e) to reduce, so far as practicable, the effects of flooding, by the proper control and regulation in time of flood of headworks under the control of the Board, with due regard to the safety of the structures comprising those headworks;

(f) to investigate and plan for such future headworks and trunk mains as, in the Board's opinion, may be required to meet the requirements for the supply of water as a function of the Board and to take all steps deemed by the Board to be practicable to implement plans and schemes accepted for such headworks and trunk mains;

(g) to take all steps adjudged by the Board to be necessary or desirable to ensure and maintain the quality of present and future supplies of water in the operational area;

(h) to construct operate and maintain and, where necessary, to improve or extend headworks and trunk mains under the Board's control;

(i) at the request of one or more Local Authorities to construct, operate and maintain and where necessary to improve and extend treatment works to supply treated water to such Local Authority or Local Authorities and if so requested by a Local Authority to take over treatment works under the control of the Local Authority;

(j) to provide such roads and communications, offices, stores, depots and other accommodation as the Board adjudges to be necessary to meet the requirements of its undertakings or any of them;

(ja) to provide, operate, protect and maintain such recreational facilities as the Board sees fit at headworks or on any other land or property owned by or under the control of the Board and to enter into commercial ventures incidental to the operation of those recreational facilities and to let out to other persons the operation of those facilities or ventures;

(k) to administer and manage all property vested in the Board;

(l) to take such measures and to carry out such works as are incidental to the proper discharge of the aforesaid functions of the Board.

REPORT ITEM ~~5~~ 5.5

PROPERTY MANAGEMENT COMMITTEE

MEETING - 14TH JULY, 1988

SAFETY OF BOARD DAMS

By letter dated 28th April, 1988 the Commissioner of Water Resources drew to the Board's attention current revisions of the design floods for dams owned and operated by the Board. Particular reference was made to Wivenhoe Dam and the Commission's policy with regard to the safety evaluation of the dams under the Board's control was outlined. A copy of that letter is attached.

The Board's Consulting Engineer, Mr. G. Cossins, was requested to review the situation in the light of the letter from the Commissioner of Water Resources and a copy of his report is attached.

RECOMMENDATION

It is recommended that the matter of the safety of the Board's dams be referred to the Advisory Committee to the Board for a report in due course.

[redacted]

D.J. EVANS
Secretary

8th July, 1988.

Queensland
Water Resources
Commission

References 88/5295/7/14
Telephone 224 7330
Mr R. Geddes

GPO Box 2454
Brisbane
Queensland 4001

28th April 1988

The Secretary
Brisbane and Area Water Board
G.P.O. Box 2436
BRISBANE QLD 4001

ATTENTION: Brisbane and Area Water Board Advisory Committee

Dear Sir

DAM SAFETY - BRISBANE AND AREA WATER BOARD DAMS

The purpose of this letter is to advise the Board of current revisions of the design floods for dams owned and operated by the Board, particularly Wivenhoe Dam and to discuss the Commission's policy with regard to the safety evaluation of these dams.

LEGISLATIVE RESPONSIBILITIES

Under the provisions of the Brisbane and Area Water Board Act 1979-1984, the Brisbane and Area Water Board owns and operates Somerset, Wivenhoe and North Pine Dams. Recent legislative changes place the administration of this Act with the Minister for Water Resources, who is also responsible for the Water Resources Amendment Act 1975 which requires the Commissioner of Water Resources to ensure that the owners of referable dams adequately maintain their dams in a safe condition for the protection of the community at large.

.../2

WIVENHOE DAM FLOOD STUDIES

1. Original Flood Assessments

The Queensland Water Resources Commission designed Wivenhoe Dam in the late 1970's. The original design floods were calculated by rainfall frequency analysis and probable maximum precipitation being combined with a unit hydrograph approach to calculate flood discharge. The probable maximum precipitation was determined by maximising the 1893 storm "in situ".

The probable maximum flood determined by this method had a peak discharge of 15,000 cumecs and a volume of 4.2 million megalitres. This flood results in a maximum storage level of EL 77.0 with the assumption that one of the five gates is inoperative. Freeboard was provided above this level for wave run-up, resulting in a level of EL 79.7 for the top of the wave wall.

2. Current Flood Assessments

Since the design of Wivenhoe Dam, the Bureau of Meteorology has revised its procedures for estimating probable maximum precipitation, resulting in a general increase in the probable maximum flood estimates for dams in Australia. The Australian National Committee on Large Dams (ANCOLD) and the Institution of Engineers Australia have both accepted that the previous techniques of estimating extreme precipitation may have resulted in underestimates of probable maximum floods (PMF).

IMPORTANT

The ANCOLD Guidelines on Design Floods for Dams - 1986 recommed that for high hazard dams such as Wivenhoe, the design flood should lie in the range from the PMF to the flood with an AEP of 1 in 10,000. (By definition an AEP cannot be assigned to the PMF).

The following tabulation gives details of the original and revised PMF and also floods for a range of annual exceedance probabilities (AEP).

ANNUAL EXCEEDENCE PROBABILITY → AEP %

	ORIGINAL ESTIMATE		REVISED ESTIMATE	
	PEAK INFLOW CUMECS	VOLUME MEGALITRES	PEAK INFLOW CUMECS	VOLUME MEGALITRES
2 (1 in 50 yr)	7,200	1,330	-	-
1 (1 in 100 yr)	8,500	-	8,700	1,234,000
0.2 (1 in 500 yr)	10,500	-	-	-
0.1 (1 in 1000 yr)	12,500	2,313,000	13,400	2,177,000
0.01(1 in 10000 yr)		-	-	-
PMF	15,000	4,272,000	47,800	10,260,000

PROBABLE MAX. FLOOD

2.4 TIMES DESIGN VOLUME

Wivenhoe can store 1,409,000 Rad + 1,100,000 F.S.L = 2,509,000 MAX. CAPACITY

It has been estimated that the revised probable maximum flood would overtop the embankment by some 2 to 3 metres.

While such a flood would have disastrous consequences for the dam, it should be noted that the imminent failure flood, ie. the flood which just reaches the top of the wave wall and is on the point of overtopping the embankment, has an AEP in the order of 1 in 100,000.

DAM SAFETY AND COMMISSION POLICY

Dam safety is evaluated by two measures, namely "hazard" and 'risk".

The hazard is a measure of the potential for the failure of a dam to cause damage and loss. It is not related to the mechanism of the failure but to damage and loss which would be caused by the uncontrolled release of the storage contents.

The risk is a measure of the likelihood of a dam failure and it is related to the thoroughness of the design and the soundness of construction practices.

It is universally accepted that the higher the hazard, the lower the acceptable risk of failure.

The dams of the Brisbane and Area Water Board are clearly high hazard dams using the ANCOLD Guidelines which the Commission considers appropriate for application in Queensland. If any of them breach, flooding of inhabited areas will occur. It is therefore considered necessary that these dams have been designed, constructed and operated such that there is a very low risk of failure.

The Commission believes that a comprehensive safety review should be carried out on all high hazarddams in Queensland. A necessary component of each review should be a flood inundation study, whereby areas at risk during failures are identified and realistic evaluations of hazard made.

Three levels of documentation are considered necessary for high hazard dams:

(1) Emergency Preparedeness Plans (EPP).

(2) Standard Operating Procedures (SOP).

(3) Maintenance Manuals.

The EPP should be a concise document which will contain instructions for the operator to follow in extreme events such as flooding, earthquake and dam break events. In particular it will contain directions on the civildefence measures to be invoked for the different emergencies. These manuals will need to be developed in consultation with State Emergency Services, Police, Local Authorities and the State Government.

The SOP should contain details of procedures to be followed in the normal operation the storages. Such details would cover the operation of spillway gates for passing floods and items to be monitored to detect at the earliest time the onset of a dam breach event or other serious event.

Maintenance Manuals should contain operational and maintenance details of all equipment involved in the operation of a dam.

With respect to the dams of the Brisbane and Area Water Board, it is understood the current status is as follows:

	HYDROLOGY REVIEW	INUNDATION STUDY	DAM BREAK	DESIGN REVIEW	EPP
(1) Wivenhoe Dam	Yes	No	No	No	(1)
(2) Somerset Dam	Yes	No	No	No	(1)
(3) North Pine Dam	No	No	No	No	?

Notes: (1) The existing Procedural Manuals contain some of the relevant information but do not wholly meet the requirement. A separate manual would be preferable.

The Commission will prepare a detailed discussion paper on the revised probable maximum floods and their possible implications for the Water Board Dams and on the Commission's Dam Safety Policy in general.

At some time in the near future, the Commission would like to arrange for an informal discussion on these matters with the Board.

Yours faithfully

for COMMISSIONER OF WATER RESOURCES

Queensland Water Resources Commission

GPO Box 2454
Brisbane
Queensland 4001

References
Telephone : 224 2411
Officer : Mr Webber
QWRC File : 151/01/02

18th October, 1988

The Commissioner,
Water Resources Commission,
G.P.O. Box 2454,
BRISBANE. Q. 4001

ATTENTION: Mr R. Geddes

Dear Sir,

The Brisbane and Area Water Board Advisory Committee has been requested to advise the Board with reference to the safety of its dams.

As discussed with you, I would be pleased if the Commission would prepare a brief setting out the studies that you require to be carried out for the Wivenhoe Dam/Somerset Dam system and North Pine Dam as follows:

(a) dam full, dam break - no rain;
(b) maximum P.M.P. dam break; and
(c) imminent failure dam break as part of P.M.P. dam break.

Will you please also advise the time required and the cost involved, if the Commission carried out the studies.

Yours faithfully,

[redacted]

W.A.L. WEBBER
Chairman, Brisbane and Area
Water Board Advisory Committee.

BRISBANE AND AREA WATER BOARD ADVISORY COMMITTEE

MINUTES

FOR THE MEETING CONVENED IN THE 11th FLOOR CONFERENCE ROOM, MINERAL HOUSE ON 17th OCTOBER, 1988

1. PRESENT

Messrs W. Webber (Chairman)
A. Ginn
K. Tibbits

The Chairman opened the meeting at 9.30 a.m.

2. MINUTES OF PREVIOUS MEETING

There were no comments on or amendments to the Minutes of the previous meeting.

20.3.90
NOT SIGHTED

3. SUBJECT: Safety of Board Dams

The reports prepared by Queensland Water Resources Commission dated 28th April, 1988 and by Mr G. Cossins dated 24th June, 1988 were discussed.

It was agreed that as the dam break studies were necessary under the dam safety legislation, there was no alternative, but that they be carried out. The main concern was the preparation of a brief to indicate the extent of the studies required.

The Chairman invited Messrs R. Geddes and R. McConnell, Water Resources Commission, to join the meeting. These gentlemen discussed the analyses required, the collection of data, and the fact that there was concern as to the credibility of the probable maximum precipitations.

Finally, it was agreed that the Committee would write to the Water Resources Commission, asking the Commission to prepare a brief setting out the studies that were required, and to indicate the time required and the cost involved for the Commission to carry out studies for the Wivenhoe Dam/Somerset Dam system and North Pine Dam as follows:

(a) dam full, dam break - no rain;
(b) maximum P.M.P. dam break; and
(c) imminent failure dam break, as part of P.M.P. dam break.

The results of the studies will then be used in the preparation of the Emergency Preparedness Plans.