To:

Subject: FW: Re: Wivenhoe dam

HI

Also, can we get a response to teh Australian's front page story today:

What is the minister's reaction to claims inthe Australian newsaper today that the dam was unsafe and incomplete construction of the spillways due to cost played a part in the disaster?

Investigations Reporter
The Sydney Morning Herald
1 Darling Island Road, Pyrmont 2009
GPO Box 506 Sydney NSW 2001
ph:
fax:
mo
em

™om

Sent: Wednesday, 19 January 2011 10:54 AM

To:

Subject: Re: Wivenhoe dam

As discussed can we pls have a response to the following questions:

- 1. Has the minister or is the minister planning to direct Seqwater to keep releasing water once the dam level reaches 100 per cent capacity?
- 2. Does segwater have the authority to make that decision independently?
- 3. What allowances if any are made for rainfall outlook to enable that level to be changed?
- 4. When was the 100 per cent / 1.165 million megalitres capacity level set?

Our deadline is 5pm. However, I'd appreciate if you are able to call me before our afternoon news conference at 2.30 and give some indication as to how you might be responding.

Kind regards,

vestigations Reporter
The Sydney Morning Herald
1 Darling Island Road, Pyrmont 2009
GRO Roy 50/ Sudnow NSW 2001
ph
fax
mo

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Sent:

Thursday, January 20, 2011 2:34 PM

To:

DLO NRMET

Cc:

Dan Spiller

, Dan Spill<u>er</u>

pborrows

Subject:

RE: Min on-site briefs and Wyaralong and Mt Crosby to be rescheduled

As discussed.

Due to weather forecasts for this afternoon, please reschedule the Minister's on-site brief at Mt Crosby to next week.

Please work with

on a suitable time.

Doliny Adviso

Policy Advisor

Office of the Minister for Natural Resources,

Mines and Energy and Minister for Trade

Phone:

Mobile

Fax: (0

From:

Sent: Wednesday, 19 January 2011 10:29 AM

To: 'DLO NRMET'

Cc:

'Dan Spiller

Dan Spiller; 'pborrow

Subject: Min on-site briefs and Wyaralong and Mt Crosby to be rescheduled

Importance: High



Due to unforeseen circumstances, the Minister will not be able to attend the planned on-site briefing at Wyaralong dam this afternoon. He will also not be able to attend the on-site briefing at Mt Crosby East Bank in the morning.

Please pass this info onto those involved in organisation ASAP to minimise inconvenience.

Please arrange a new time for the dam visit with Kirstie, for next week. Please arrange for the visit to Mt Crosby to be moved to tomorrow afternoon, if possible.

Please let me know if you have any questions

- would you be able to take these out of the Min's diary now,

and re-enter once new times are settled.



Policy Advisor
Office of the Minister for Natural Resources,
Mines and Energy and Minister for Trade
Phone
Mobi
Fax: (

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To: Dan Spiller Subject: RE: Min on-site briefs and Wyaralong and Mt Crosby to be rescheduled Wyaralong has not yet been rescheduled. Policy Advisor Office of the Minister for Natural Resources, Mines and Energy and Minister for Trade Phor Mob Fax: ----Original Mess From: Dan Spiller Sent: Thursday, 20 January 2011 2:43 PM Subject: RE: Min on-site briefs and Wyaralong and Mt Crosby to be rescheduled I am starting to lose track, has the Wyaralong Dam visit been rescheduled yet? Dan Sent: Thursday, 20 January 2011 2:34 PM To: DLO NRMET Cc: I Dan Spiller, Dan Spiller, Subject: RE: Min on-site briefs and Wyaralong and Mt Crosby to be rescheduled Due to weather forecasts for this afternoon, please reschedule the Minister's on-site brief at Mt Crosby to next week. Please work with on a suitable time. Policy Advisor Office of the Minister for Natural Resources, Mines and Energy and Minister for Trade Phone: Mobile

Thursday, January 20, 2011 2:46 PM

From: Sent:

Fax

Fro

Sent. Woundsday, 12 January 2011 10:29 AM

To: 'DLO NRMET'

Cc:

'Dan Spiller';

Dan Spiller'; 'pborrows

Subject: Min on-site briefs and Wyaralong and Mt Crosby to be rescheduled

Importance: High



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Please arrange a new time for the dam visit with Kirstie, for next week. Please arrange for the visit to Mt Crosby to be moved to tomorrow afternoon, if possible.

Please let me know if you have any questions

Kirstie - would you be able to take these out of the Min's diary now, and re-enter once new times are settled.



Policy Advisor

Office of the Minister for Natural Resources,

Mines and Energy and Minister for Trade

Phone

Mobi

Fax:

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Mike Foster

Sent:

Thursday, 20 January 2011 4:04 PM

To:

Cc:

Dan Spiller; SEQWGM Media; Peter Borrows

Subject:

FW: Draft MR Segwater Manual Release - NOT SENT

Attachments:

Media release - Operating decisions supported by flood mitigation manual_19.01.11

(v2).doc

Importance:

High



Draft manual media release as approved by Seqwater.

Happy to discuss

Cheers Mike

rom: WaterGridMedia

Sent: Thursday, 20 January 2011 2:54 PM

Mike Foster

Cc:

Subject: Draft MR Segwater Manual Release - NOT SENT

Importance: High



and Mike

Draft MR on release of Manual byt Seqwater – this was not sent to media

-----Safe Stamp-

Regards

John

Water Grid Communications



www.watergrid.com.au

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Media release 19 January 2011

Wivenhoe flood manual publicly released.

OPERATING DECISIONS SUPPORTED BY FLOOD MITIGATION MANUAL

The State Government today released key elements of the flood management manual for Wivenhoe and Somerset dams.

Natural Resources Minister Stephen Robertson said the *Manual of Operational*Procedures for Flood Mitigation at Wivenhoe and Somerset Dam' (Flood Manual)

detailed the management strategies required to operate Wivenhoe Dam during flood events.

The Flood Manual provides a number of strategies to, in descending order of priority (i.e the top one is the most important):

- ensure the structural safety of the dam, particularly in events where there
 is the threat of the dam over-topping
- provide optimum protection of urbanised areas from inundation
- minimise disruption to rural life in the valley of the Brisbane and Stanley Rivers
- retain the storage at full supply level at the conclusion of the flood event
- minimise impacts to riparian flora and fauna during the drain down phase of the flood event.

It also sets out qualifications for dam operators and the reporting and approval processes for the dam's operation.

The operational procedures outlined in the Flood Manual have been developed and progressively refined over many years, and have been reviewed by Australia's leading water experts. The most recent review involved representatives from DERM. BOM, BCC and SunWater.

including Professor Colin Apelt, Head of Department, Department of Civil Engineering, University of Queensland and Mr Eric Lesleighter, Principal Hydraulic Engineer and Chief Engineer Water Resources, Snowy Mountains Engineering Corporation. Professor Apelt is also Chair of the Brisbane City Council flood taskforce.

The Flood Manual in its current form was developed in 1992 and has had six revisions since this time, with the latest review taking place in 2009, and approval was gazetted finalised in January 2010.

Revisions of the Flood Manual take into account a range of factors including the flood alert network, the real-time flood models, the construction of an auxiliary spillway in 2005, studies on downstream flooding impacts, and institutional and legislative changes.

The Flood Manual is approved by the State's Dam Safety Regulator in accordance with the Water Supply (Saftey and Reliability) Act 2008.

For a copy of the Flood Manual please visit xxxxx <to be confirmed by Segwater>

ENDS

For further details contact the SEQ Water Grid Communications Unit on:

Ph: (07) 3247 3000 | Mobile:

Email: media@seqwgm.com.au

Sent:

Friday, 4 February 2011 1:17 PM

To:

Dan Spiller; media; SEQWGM Media; Bradley John; WaterGridMedia

Subject:

FW: dam capacity

Importance:

High

Good afternoon,

Can you please assist with the query below?

Regards,

Assistant Media Advisor

Office of the Hon. Stephen Robertson MP

inister for Natural Resources. Mines and Energy and Minister for Trade

Phone: Mobile e-mail:

From: Thomas, Hedley

Sent: Friday, 4 February 2011 1:07 PM

To:

Subject: dam capacity Importance: High

As discussed on the telephone, my questions relate to the actual capacity for flood storage at Wivenhoe Dam.

s you probably know, the Queensland Government's published figures in relation to the dams' capacity are as :lowsاأك

- 1,150,000 mega litres of storage for urban water supply (and when it is at this level, it is referred to as Full Supply Level or FSL or 100 per cent).
- 1,450,000 mega litres of storage for flood mitigation (and if it were to ever reach this number, the total capacity of the dam would be referred to as 225 per cent).

However, calculations by engineers who have been examining the dam and various technical papers and the operating manual show that b) is in fact a false and misleading claim.

Since the development of the fuse-plugs at the dam in the past five years, the level of the dam's lake can reach a maximum of 75.7 metres – and then the first fuse plug initiates to ensure a discharge that will bring the level down. There are two other fuse plugs.

Prior to the fuse plugs being installed, the level of the dam's lake could go several metres higher (see various technical papers by the dam's engineers, designers etc). The higher level that could previously be attained (prior to the installation of the fuse plugs) was the equivalent of 1,450,000 mega litres of flood storage.

Put simply, this means that the capacity for flood mitigation was 1,450,000 mega litres when the dam was commissioned and for about two decades hence - but it has been significantly less for several years.

By conservative calculations it is in fact about 1,200,000 mega litres, some 250,000 mega litres less..

This is a reduction in capacity for flood mitigation of about 20 per cent.

However, the Queensland Government and SEQWater have continued to assert that the flood capacity is 1,450,000 mega litres.

Questions:

- 1. What does Mr Robertson say is the true and actual flood capacity of Wivenhoe Dam?
- 2. What does Mr Robertson say to the suggestion that the true and actual flood capacity of Wivenhoe Dam has been misrepresented by him, by the Queensland Government and by SEQWater?
- 3. What does Mr Robertson say to the suggestion that the misrepresentations have occurred to conceal the reduction in the dam's flood capacity have misled people who would have been otherwise concerned if they had been told as much as 20 per cent of the dam's flood storage capacity had been deleted as one of the cheapest upgrade options for the dam?
- 4. What does Mr Robertson say to the suggestion that the reduction in the dam's flood capacity, which occurred with the development of the fuse-plugs, should have been responsibly addressed by reducing the dam's capacity for urban water supply; or by increasing the overall capacity of the dam by raising its wall?
- 5. What does Mr Robertson say to the suggestion that as the minister with most responsibility for Wivenhoe Dam, he has been a party to misleading assertions about the true capacity of the flood storage compartment of the Wivenhoe Dam?

SEQWater has determined as a matter of policy that it will not respond to questions about the Wivenhoe Dam. SEQWater is citing the Commission of Inquiry as justification for this approach.

I would prefer to discuss the questions above and any other background with Mr Robertson over the telephone today, but in the event that is not possible we would need answers to the questions above by 5.30pm today due to early publishing deadlines for The Weekend Australian.

My mobile is

Cheers

Hedley Thomas National Chief Correspondent The Australian & The Weekend Australian



28 Mayne Road Bowen Hills Qld 4006

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From: Dan Spiller

Sent: Monday 14 February 2011 8:32 AM

To:

Cc: Barry Dennien
Subject: Dam levels

When was Wivenhoe Dam last at 75%? In March 2010, Wivenhoe Dam increased from about 60% to above 90% of capacity.

Daniel Spiller

Director, Operations

SEQ Water Grid Manager

Phone Email:

Visit: Level 15, 53 Albert Street Brisbane ost: PO Box 16205, City East QLD 4002

ABN: 14783 317 630

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Sent:

Friday 18 February 2011 3:51 PM

To:

Cc:

Mike Foster;

Subject:

FW: Colleges Crossing PDF with legend

Attachments: Colleges Crossing1.pdf

as discussed.

Mike – will need a HIB urgently please.

Cheers Mike

From

Sent: Friday 18 February 2011 3:48 PM

To:

Cc: Dan Spiller

Subject: Colleges Crossing PDF with legend

Please see updated pdf

Data & Knowledge Officer

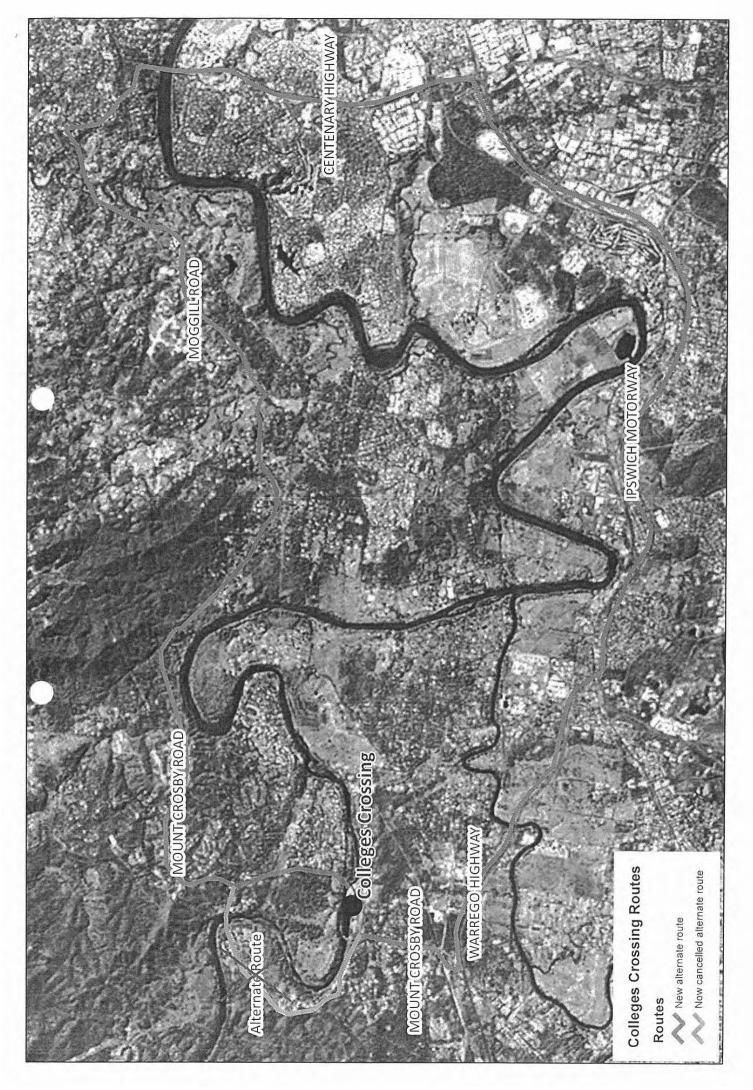
SEQ Water Grid Manager

Phone:

Email:

Visit: Level 15, 53 Albert Street Brisbane Post: PO Box 16205, City East QLD 4002

ABN: 14783 317 630



Mike Foster

Sent:

Monday, 21 February 2011 5:46 PM

To:

Cc:

Dan Spiller; SEQWGM Media;

Subject:

Dam releases



Can confirm that we will have to open the gates at North Pine tonight (7pm to 5am). Had 60mm plus across the catchment and dam this afternoon.

As per our operating protocols Moreton Bay Regional Council has been notified and is moving to close Young's Crossing.

No change expected to Wivenhoe flows, however we will continue to monitor overnight.

Cheers Mike

rom:

---Original Message

Sent: Monday, 21 February 2011 5:08 PM

To: Mike Foster

Subject:

Mike, Was any gate action or otherwise taken at Wivenhoe as these storms swept across - just in case some journo asks

Senior Media Advisor

Office of the Hon Stephen Robertson MP

Minister for Natural Resources. Mines and Energy and Trade

P:

M:

Ε:

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QLD Bulk Water Supply Authority ABN75450239876 (Trading as Seqwater).

From: Sent:

Tuesday, F

To:

Dan Spiller

Sub ject:

RE: Is there a number we can call you on?

From: Dan Spille

Subject: Is there a number we can call you on?

This small, logether with any allochments, the intended for the named recipient(s) only; and rmy comain privileged and combinerated information. You understand that any privilege or confidentially alloched to this imassage is not waited, total or doziaryed because you have excelled on the received or the right of south or specific and delete time email and any contex of this form your computer system network. In ord an intended employed of this worms, you must reproduce on the angular probable or the right of the right

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From:
Sent: Tuesday, February 22, 2011 12:37 PM
To: Dan Spiller
Subject:

Hi guys, any update on operations at Mt Crosby?

Senior Media Advisor
Office of the Hon Stephen Robertson MP
Minister for Energy and Water Utilities
P:
M
E:

Sent:

Tuesday, February 22, 2011 12:39 PM

To:

Dan Spiller

Sub ject:

RE:

thks

----Original Message----

From: Dan Spille

Sent: Tuesday, 22 February 2011 12:38 PM

To:

Subject: RE:

We will call you and

e in 5 minutes

----Original Message----

From

Sent: Tuesday, February 22, 2011 12:37 PM

To Dan Spiller

Subject:

Hi guys, any update on operations at Mt Crosby?

Senior Media Advisor

Office of the Hon Stephen Robertson MP

Minister for Energy and Water Utilities

P

M

Ε

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From: Sent:

Tuesday, February 22, 2011 12:56 PM

To:

Dan Spiller

Subject:

RE: Is there a number we can call you on?

Good now

From: Dan Spiller

To:
Subject: Re: Is there a number we can call you on?

Let me know when suits

On 22/02/2011, at 12:32 PM,

wrote:

The enail, logating with any statements, is intended for the named retrigion(s) only, and may contain privileged and confidential information. You understand that any originess contains and any content in the content of the content of the formation of the forma

waterd, led to dedicted by Dealtres you have received the introduced means in a secretary of the control of the congress, this ones represent one the resecting amount memors on the service and manager scape me supernoval various only; and may contain privileged and confidentia. This email, together with any attachments, is intended for the named recipient(s) only; and may contain privileged and confidentia

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Tuesday, 22 February 20<u>11 1:42 P</u>M

Sent: To:

SEQWGM Media; mfoste

sgolding

Cc:

SEQWGM Communications Staff; SEQWGM Emergency; Dan Spiller; Barry Dennien;

Subject:

RE: Draft media release: WATER CONSERVATION ENCOURAGED

Attachments:

image001.gif

Categories:

T11

All good by us. Cheers,

From: SEQWGM Media

Sent: Tuesday, 22 February 2011 1:40 PM

To: mfoste

C: SEQWGM Communications Staff; SEQWGM Emergency; Dan Spiller; Barry Dennien

Subject: Draft media release: WATER CONSERVATION ENCOURAGED

Hi team

Please see attached the draft media release for water conservation messaging.

This version should now incorporate all suggested changes. Please advise if there is anything further you would like to add.

At this stage, a soft-message approach is likely to be issued this afternoon - to be confirmed.

Kind regards

DRAFT ONLY

MEDIA RELEASE XX FEBRUARY 2011

STORM DAMAGES MT CROSBY TREATMENT PLANTS – WATER CONSERVATION ENCOURAGED

Brisbane residents are being asked to conserve water over the next 24 hours after last night's severe electrical storms damaged key equipment at the Mt Crosby water treatment plants.

Lightning strikes knocked out the primary and back-up automatic control systems at the site's two treatment plants forcing them to be operated manually for the first time in 20 years.

Treated water output from the plants has been reduced as a result.

Water Grid spokesperson, Barry Dennien, said the request to conserve water was being made as a precaution until electrical engineers can rebuild the damage circuits and bring treatment equipment back on line.

"It just makes sense to watch the amount of water everyone uses during the peak demand periods tonight and in the morning to allow the engineers time to repair the plants and bring them back up to full operation," he said.

Mr Dennien said output at the Gold Coast Desalination Plant had been increased today to pump additional water to Brisbane suburban reservoirs. North Pine Water Treatment Plant has also increased output.

"The Desalination Plant proved its worth during the floods when silt clogged the Mt Crosby treatment plants. It is again proving what a valuable asset it is in ensuring the security of quality water supplies across the SEQ Water Grid."

Mr Dennien said suburban reservoirs had been topped up prior to the storm in accordance with standard practice.

"We have plenty of water in our dams, we just don't have the equipment available right now to treat has much water as we would like to pump to the reservoirs as they are drawn down. Some suburbs amay also experience pressure issues as a result," he said.

"Sensible water use will allow reservoirs to cope with demand until urgent repairs can be completed at the Mt Crosby treatment plants."

Sensible water use tips include:

- Keep showers to 4 minutes or less
- Don't water gardens
- Don't hose buildings, driveways and footpaths
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- · Only use dishwashers when you have a full load
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ENDS

Notes to the editor

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Ph: (07) 3247 3000 | Email: media@segwgm.com.au

Senior Media Advisor

SEQ Water Grid Communications Unit

Phone Email:

ABN: 14783 317 630

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Mike Foster

Sent:

Tuesday, 22 February 2011 2:34 PM

To:

SEQWGM Media:

Cc:

SEQWGIVI Communications Statt: SEQWGIVI Emergency: Dan Sniller: Barry Dennien:

Subject:

RE: Draft media release: WATER CONSERVATION ENCOURAGED

Folks,

Given the latest phone hook-up ...can we change par on North Pine to read.

If it could read. If required additional water could be sourced from North Pine WTP.

Cheers Mike

`rom: SEQWGM Media

ent: Tuesday, 22 February 2011 1:40 PM

To: Mike Foster;

Cc: SEQWGM Communications Staff; SEOWGM Emergency: Dan Spiller; Barry Dennien;

Subject: Draft media release: WATER CONSERVATION ENCOURAGED

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Kind regards

DRAFT ONLY

MEDIA RELEASE XX FEBRUARY 2011

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Treated water output from the plants has been reduced as a result.

Water Grid spokesperson, Barry Dennien, said the request to conserve water was being made as a precaution until electrical engineers can rebuild the damage circuits and bring treatment equipment back on line.

"It just makes sense to watch the amount of water everyone uses during the peak demand periods tonight and in the morning to allow the engineers time to repair the plants and bring them back up to full operation," he said.

Mr Dennien said output at the Gold Coast Desalination Plant had been increased today to pump additional water to Brisbane suburban reservoirs. North Pine Water Treatment Plant has also increased output.

"The Desalination Plant proved its worth during the floods when silt clogged the Mt Crosby treatment plants. It is again proving what a valuable asset it is in ensuring the security of quality water supplies across the SEQ Water Grid."

Mr Dennien said suburban reservoirs had been topped up prior to the storm in accordance with standard practice.

"We have plenty of water in our dams, we just don't have the equipment available right now to eat as much water as we would like to pump to the reservoirs as they are drawn down. Some suburbs may also experience pressure issues as a result," he said.

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Senior Media Advisor

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Phone Email:

Visit: Level 15, 53 Albert Street Brisbane Post: PO Box 16205, City East QLD 4002

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From: Tuesday, 22 February 2011 2:35 PM Sent: Barry Dennien: Dan Spiller: To: Cc: Subject: FW: T11 Categories: Hi all, Minister Robertson has approved triggering the release and any media interviews as discussed. This should be done as soon as possible. Thanks From: Sent: Tuesdav. 22 February 2011 2:30 PM To: Premiers Office - Media Unit Cc: Subject: RE: am ok with this release and approach. <u>Thanks</u> Sent: Tuesday, 22 February 2011 2:28 PM To: Cc: Subject: attached is the MR Water Grid Manager proposes to send out asap. Barry Dennien and Dan Spiller will be available for any interviews. You ok with this? << File: Water-Storm conserve FINAL 220211.doc >> Principal Media Advisor Office of the Hon Stephen Robertson MP

Minister for Energy and Water Utilities

P: M:

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Tuesday, February 22, 2011 2:35 PM

Sent: To:

Mike Foster

SEOWGM Media

Cc:

Dan Spille

SEQWGM Emergency Barry Dennien

Sub ject:

RE: Draft media release: WATER CONSERVATION ENCOUR A GED

Happy with that change, G

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"We have plenty of water in our dams, we just don't have the equipment available right now to treat as much water as we would like to pump to the reservoirs as they are drawn down. Some suburbs may also experience pressure issues as a result," he said.

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SEQWGM Media

Sent:

Tuesday 22 February 2011 3:33 PM

To:

mfoste

Dan Spiller; Barry Dennien;

Cc:

SEQWGM Communications Staff; SEQWGM Emergency

Subject:

RE: Draft media release: WATER CONSERVATION ENCOURAGED

Hi team

Please note the updated media release below, following further conversations with emergency management participants. The conservation messaging has been scaled down at this stage, with a more general version to be issued this afternoon.

This incident will continue to be closely monitored. Please advise if you have any additional changes to the below version before 4.00pm.



DRAFT ONLY

MEDIA RELEASE XX FEBRUARY 2011

STORM DAMAGES MT CROSBY TREATMENT PLANTS

As a result of last night's storm event lightning strikes knocked out the primary and back-up automatic control systems at Mt Crosby's two water treatment plants, forcing them to be operated manually for the first time in 20 years.

Tater Grid spokesperson, Barry Dennien, said electrical engineers are currently working to bring the extensively damaged control systems back online.

Mr Dennien said that with the support of the Gold Coast Desalination Plant and other sources within the Grid, current supply demands are being met.

However, current demand is being closely monitored and given the serious nature of the damage, considerations regarding water conservation may be necessary if the situation cannot be rectified quickly.

"The Gold Coast Desalination Plant and the regional pipeline connections within the Water Grid proved their worth during the floods. It is again proving what a valuable asset it is by continuing to supply quality water to support the Water Grid.

"Sensible water use will also allow reservoirs to cope with demand until urgent repairs to the automatic control system can be completed at the Mt Crosby treatment plants."

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ABN: 14783 317 630

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From: SEQWGM Media

ent: Tuesday. 22 February 2011 1:40 PM

To: mfoster

Cc: SEQWGM Communications Staff; SEQWGM Emergency; Dan Spiller; Barry Dennien;

Subject: Draft media release: WATER CONSERVATION ENCOURAGED

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Dan Spiller From: Tuesday, February 22, 2011 3:39 PM Sent: To: 'Bradley John' ; 'Ken.Smith 'stephen.robertson Cc: 'Best Debbie' Barry Dennien Subject:

RE: Mt Crosby Water Treatment Plant

All,

We are now holding reservoir levels. We expect levels to reduce during the evening peak, before increasing overnight. We are bringing on additional supplies in order to return to typical operating levels over coming

While levels are holding, we are exposed to in the event of asset failure.

On this basis, we are issuing a media release highlighting that:

- plants were damaged by the storm
- supply is being maintained through the Grid, including desalination
- we may ask people to conserve water if there is an asset failure over coming days.

I will provide an update tomorrow morning.

Regards,

Dan

From: Dan Spiller

Sent: Tuesday, February 22. 2011 1:39 PM

To: 'Bradley John'; 'stephen.robertson

'Ken.Smith

Cc:

'seqwgm Barry Dennien Subject: RE: Mt Crosby Water Treatment Plant

All,

Mt Crosby is now producing 150 ML/day, leaving a supply gap of only 50 ML/day (and potentially less if demand is low).

'Best Debbie';

While supply is improving, reservoir levels are low. This leaves us exposed should there be an asset failure, including if Mt Crosby was unable to maintain production. In particular, there are risks associated with continuing to operate Mt Crosby in manual mode - with the problem with the SCADA system not yet diagnosed and no ETA for its rectification.

We will make a recommendation on the need for conservation messages by 3pm.

Regards,

Dan

From: Dan Spiller

Sent: Tuesday, February 22. 2011 10:30 AM

To: 'Bradley John': stephen.robertson

Ken.Smith

Cc: 'Best Debbie';

'seqwgman Barry Dennien

Subject: RE: Mt Crosby Water Treatment Plant

All,

Current update attached for info.

Mt Crosby is now producing 100 ML/day in manual mode (having not routinely operated in that mode for at least 20 years). Seqwater is stabilising production at this level, prior to increasing to 150 ML/day and then 200 ML/day (aiming to do this no later than tomorrow morning).

Storages are at about 250 ML, being drawn down at about 100 ML/day. Storages have not previously been below 120 ML.

We are preparing contingency plans and communications materials. We will assess the need for these following a midday teleconference.

The emergency room has been activated and is available on 3405 5201. I will brief QH officers and have invited them to our midday teleconference.

I am available on 0403 607 857 if you have any other queries.

Regards, Dan

From: Bradley John

Sent: Tuesday, February 22, 2011 8:49 AM

To: stephen.robertson Ken.Smith

Cc; Dan Spiller

Subject: Mt Crosby Water Treatment Plant

Min R, Ken Mick,

Just FYI at this stage - not yet a problem to supply.

Mt Crosby water treatment plant (both East Bank and West Bank) are both currently offline due to electrical failure in last night's storms.

- There is about 270 ML in storage in reservoirs across Central SEQ but the issue of concern will be the ability to resupply reservoirs in the western areas, closest to Mt Crosby.
- Southern Regional Water Pipeline is transferring max (95 ML/d) into Central SEQ zone and the North Pine treatment plant is at maximum (due to low quality inflow water) at about 100 ML/d.

There is urgent work underway by Seqwater to get Westbank back online by lunchtime, which will provide at least 100 ML/d in the first stage. Provided this all goes to plan, there should be no interruption to water supply.

Dan Spiller at SEQWGM will provide SITREPs and updates during the day, escalating if there any concerns.

John Bradley

Director-General
Department of Environment and Resource Management
Telephone:
Email
www.derm.qia.gov.au

Department of Environment and Resource Management 400 George Street, Brisbane Q 4000 GPO Box 2454, Brisbane Q 4001

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3 sheets of A4 paper = 1 litre of water
+

SEOWGM Media From: Sent: Monday, February 28, 2011 10:59 AM To: Peter Borrows Cc: Jim Prus Rob Drug Sub ject: RE: Segwater Wivenhoe release update

Thank are working on a release now.

Regards

Senior Media Advisor SEO Water Grid Communications Unit Phon

Visit: Le Post: PO Box 16205, City East QLD 4002

ABN: 14783 317 630

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From

Sent: Monday, 28 February 2011 10:57 AM To: Mke Foster;

Dan Spiller; SEQWGM Media

Cc: Peter Borrows; Jim Pruss; Rob Drury Subject: RE: Segwater Wivenhoe release update

Mike, can you please check that the Grid Comms working on a MR to specifically announce the 36 hour extension. Th

From: Mike Fosts

Dan Spiller: SEOWGM Media

Cc: Peter Borrows; Jim Pruss; Kob Drury; Subject: Segwater Wivenhoe release update

Below is update from Segwater on Wivenhoe releases.

After discussions with Councils wa will now be extending the current release strategy until COB Wednesday 2 March 2011 given the BOM forecast for storm activity this Friday and for rainfall between 50-100mm forecast over the following four days.

This will mean all bridges will be out for an additional 36 hours. Ipswich and Somerset councils have advised there has been very few community complaints to date.

Water Grid will ensure Council comms staff (particularly ipswich) are aware Council operations have supported the extended release and advise their Counciliors

The Water Grid will be putting out an update later this morning.

Segwater Update

- The release strategy to reduce Wivenhoe Dam to 75% of its Full Supply Level (FSL) was almed at creating an additional flood buffer zone for the rest of the wet season quickly and with as minimal impact on the community as possible.
- The release period of 9 days was always dependent on further rainfall across the dam and catchment as well as rainfall downstream,
- Releases commenced Sunday 20 February 2011 at 6am.
- As of 9AM Monday 28 February 2011Wivenhoe Dam is 82.2 per cent of FSL. This equates to a reduction of FSL of approximately 208,000 mega illres (ML) or
- Storm activity across the Wivenhoe Dam catchment and Brisbane River catchment below the dam on Monday 21 February 2011 Impacted on the release
- Flow rates were reduced for a 24 hour period to allow flows down the Lockyer to sufficiently pass,
- In addition both Wivenhoe and Somerset dams received inflows. To date inflows of up to 40,000 ML or the equivalent of about four per cent capacity have flowed into Wivenhoe Dam. Minor inflows are continuing.
- Seqwater estimates inflows combined with the need to reduce flow rates has currently added at least 36 hours to the release strategy.
- The nine day release strategy was scheduled to be completed on AM Tuesday 1 March 2011. By this stage Seqwater estimates Wivenhoe Dam levels will between 79-80 per cent FSL, depending on further inflows.
- The current Bureau of Meleorology forecast is for 10-15 mm over the until Thursday 3 March 2011. Storm activity is forecast from Friday 4 March 2011 with 50-100mm forecast over the following four days until Tuasday 8 March 2011.
- Based on the above forecast of storm activity and heavier rainfall by the end of the week, and after consultation with the Somerset Regional Council, ipswich Regional Council and Brisbane City Council, Seqwater intends to continue current strategy until COB Wednesday 2 March 2011.
- By this stage Segwater estimates Wivenhoe Dam will be between 75-77 per cent FSL.

Under the extended release strategy it is expected Twin Bridges and Savage's Crossing will no longer by inundated by Thursday 3 March 2011 with College's
Crossing no longer inundated by Friday 4 March 2011.

Cheers Mike

Mike Foster
Manager Strategic Relations & Communication
Queensland Bulk Water Supply Authority trading as Seqwater



PO Box 16146, City East OLD 4002 Website | www.segwater.com.au

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From: Sent:

Monday, March 7, 2011 6:24 PM

To:

Sub ject:

RE: FINAL version attached

Thanks all, this is a comprehensive effort with very limited notice. Sorry to have to push so hard but I think it was best allround for something to be delivered to Mr Stark today. Much appreciated, thank

Barry Dennie

From: Sent: Monday, 7 March 2011 6:13 PM

To: Barry Dennien
Subject: FINAL version attached Dan Spiller;

Importance: High

Regards

Communications Officer

SEQ Water Grid Communications Unit

SEQ Water Grid Manager Phone

Email:

Visit: Level 15, 53 Albert Street Brisbane

Post: PO Box 16205, City East QLD 4002

ABN: 14783 317 630

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Documents subject to Cabinet confidentiality

No	Document	Date	Time
1	Email Barry Dennien to Peter Borrows and John Bradley cc Dan Spiller and others re Public inquiry discussion points – brief – cabinet in confidence	25.01.2011	5.38pm

From: Sent: Mike Foster

Monday, 4 October 2010 10:06 AM

To:

Cc: Subject:

; Dan Spiller

Rob Drury; Peter Borrows; Jim Pruss

Wivenhoe releases



Update on Wivenhoe/Somerset releases

- Wivenhoe is at 101% this morning (trigger level for gate releases 102.5%)
- From 10am Seqwater will start releasing through the hydro at the maximum capacity allowed of 1200ML/day. We already release through the hydro for consumption. Over the past month we have averaged about 240ML a day in consumption releases. The 1200ML a day will include any daily consumption releases.
- We expect to have to release between 10,000-12,000ML over next 10 days or so to reduce Wivenhoe to just below FSL. The variable is evaporation and the slight inflows we will still see coming in over the next few days.
- No impact downstream as a result of the releases.
- Somerset releases ceased over the weekend.

Cheers Mike

Mike Foster

Manager Strategic Relations & Communication
Queensland Bulk Water Supply Authority trading as Seqwater



Ph (07)

Level 3, 240 Margaret St, Brisbane City QLD 4000

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

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Mike Foster

Sent:

Friday, 8 October 2010 9:37 PM

To:

Dan Spiller

Subject:

Rob Drury
Fw: Current rainfall situation

Gents ...see below rainfall update. Will update further in the am. Chrs mike

From: Rob Drury

To: Mike Foster; Peter Borrows; Jim Pruss

Cc:

Sent: Fri Oct 08 21:07:24 2010 Subject: Current rainfall situation

As of this afternoon BoM predictions were for 10 to 30mmof rain over the next 24 hours.

As of now, we have already had 30 to 40mm of rain in the Wivenhoe catchment, similar falls in the Somerset catchment and less in other areas.

BoM predictions are now for further rain tonight and over the next few days.

It now seems probable that if the rain continues we will reach trigger level for Wivenhoe Dam tomorrow sometime. Somerset will also go up and may require releases.

Peter Borrows:

North Pine is not rising significantly nor is Leslie Harrison but will not need much rainfall to change that situation.

Actions

- John Tibaldi is monitoring overnight and Terry Malone is running models.
- We will discuss 8am tomorrow morning and consider where we are heading, will discuss with Flood Control Centre and Dam Regulator
- At this stage it may mean opening one gate several increments but it depends on what happens over the
 next 12 hours, however even if we require a gate opening it will not at this stage mean a major release
- We intend to aim for Sunday opening if possible for various reasons but will see.
- North Pine and Leslie Harrison also depend on rainfall
- If we do intend operating Wivenhoe, we will advise the Council and Local Disaster Management Group. It will no doubt mean closing Twin Bridges.
- We will advise fish recovery staff to mobilise on closing of event.
- I spoke to Rohan Thorogood tonight but will talk to Rohan tomorrow re initiating the traffic management plan we have.

Mike,

Will call you tomorrow morning.

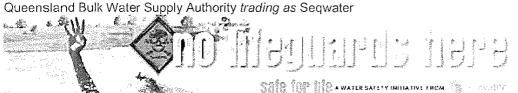
Brett, will call you tomorrow morning re impacts at Mt Crosby.

Will send another update in the morning when we have monitored the overnight rain to determine whether and when we need to make a gate release.

August, September and beginning October are usually fairly dry months.

Rob

Robert Drury
Dam Operations Manager
Water Delivery



Swimming in weirs and t flowing water is FA1





Ρħ

Wivenhoe Dam, Brisbane Valley Highway, via Fernvale Q4306 Australia PO Box 37, Fernvale QLD 4306 Website | www.segwater.com.au

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Mike Foster

Sent:

Saturdav, 9 October 2010 8:07 AM

To:

Dan Spiller

Peter Borrows

Subject:

Fw: Current situation

Gents .. see below up date. Michael will call to discuss. Chrs mike

From: Rob Drury

To: Rob Drury: Mike Foster: Peter Borrows: Jim Pruss

Cc:

Sent: Sat Oct 09 07:23:56 2010 Subject: RE: Current situation

Over night we had between 60mm and 150mm at places on the Sunshine Coast and Wappa, Cooloolabin and Lake MacDonald will all overflow today.

In the Brisbane we had over 50mm.

Somerset is 99.3m (.3m over FSL) and Wivenhoe is 67.13m (0.13m over FSL) and both rising.

John monitored over night and we mobilised the Flood Centre this morning.

We expect to reach trigger level late today or tonight and open one gate one increment. If we get no more rain, this should continue for several days at least. Further gate openings depending on inflows.

The Lockyer is flowing and releases from Wivenhoe will flood Twin Bridges (Council will be advised to close it) but we will try to keep the total flow in the river below all other bridges.

North Pine Dam is going to go close to FSL as it did not receive as much rain but could activate depending on inflows. Leslie Harrison is not expected to at this stage.

We are preparing traffic management around the area, Rohan is arranging signs on the dam wall, security to manage flows and have some staff on hand tomorrow.

Again not a major event but we expect around 100,000ML inflow and peak inflow to Wivenhoe of 400 cubic metres per second.

Will up date later.

Rob

Robert Drury
Dam Operations Manager
Water Delivery

Queensland Bulk Water Supply Authority trading as Seqwater



Swimming in weirs and f flowing water is FA1





D

Wivenhoe Dam, Brisbane Valley Highway, via Fernvale Q4306 Australia PO Box 37, Fernvale QLD 4306 Website | www.seqwater.com.au

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Sent: Friday, 8 October 2010 9:07 PM **To:** Mike Foster: Peter Borrows: Jim Pruss

Cc

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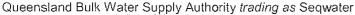
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Robert Drury
Dam Operations Manager
Water Delivery





Swimming in weirs and t flowing water is FA1





Ph

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Mike Foster

Sent:

Saturday, 9 October 2010 6:10 PM

To:

SEQWGM Media

Peter Borrows

Cc: Subject:

Fw: Segwater Flood Status - at 18:00 on Saturaday 9 October 2010

Dan Spiller;

Fyi. Will advise once gates are activated. As discussed keen to push line about discouraging public to head to wivenhoe etc. Cheers mike

From: Rob Drury **To**: Mike Foster

Sent: Sat Oct 09 17:55:28 2010

Subject: Fw: Seqwater Flood Status - at 18:00 on Saturaday 9 October 2010

From: Duty Engineer

ੈ**o**: flood.gld Rob.avre

Terry Malone

; John.Ruffini John Tibaldi; Rob Drury;

Cc:

Sent: Sat Oct 09 17:51:03 2010

Subject: Seqwater Flood Status - at 18:00 on Saturaday 9 October 2010

At 17:00 Wivenhoe Dam had reached 67.23 m AHD and Somerset Dam 99.52 m AHD and rising. Gate trigger is expected to be reached before 19:00 hours.

Proposed gate operations are scheduled to commence at 19:00 hours at Wivenhoe Dam and 21:00 hours at Somerset Dam. The gate operations are as follows:

Wivenhoe Dam

Opening of Gate 3 in 0.5 m increments from 19:00 until an opening of 3.5 m has been reached at 01:00 on Sunday 10 October 2010. Successive openings at one hourly intervals. The release at this time will be approximately 360 cumecs.

This release will continue until around mid-day on Wednesday 13 October 2010 when the shut-down sequence will commence. (This assumes no further rainfall).

Somerset Dam

Sluice gate M will open at 22:00 on Saturday 9 October 2010. At around mid-night cone valve 12 will be opened. This will equal a release of about 270 cumecs.

Likewise the release will continue until at least Tuesday evening.

No operations are expected at North Pine Dam (level 39.48 m AHD) at this stage although the forecast rainfall of between 30 to 50 mm will result in gate trigger being reached sometime early tomorrow morning.

Regards

Rob Ayre Duty Engineer

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Mike Foster

Sent:

Saturday, 9 October 2010 7:36 PM

To:

SEQWGM Media: Dan Spiller;

Cc:

Peter Borrows;

Subject:

Re: Seqwater Flood Status - at 18:00 on Saturaday 9 October 2010

Folks .. wivenhoe gate now open. Chrs mike

From: Mike Foster

To: 'media

'Daniel Snille

Cc: Peter Borrows;

Sent: Sat Oct 09 18:10:24 2010

Subject: Fw: Seqwater Flood Status - at 18:00 on Saturaday 9 October 2010

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Sent: Sat Oct 09 17:55:28 2010

Subject: Fw: Seqwater Flood Status - at 18:00 on Saturaday 9 October 2010

From: Duty Engineer

To: flood.ald John.Ruffin John Tibaldi; Rob Drury;

Rob.ayre Terry Malone

Cc: Brett Schultz;

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Regards

Rob Ayre Duty Engineer

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Mike Foster

Sent:

Sunday, 10 October 2010 3:37 PM

To:

SEQWGM Media;

Borrows:

Subject:

Fw: Update

Folks ...latest operational update. Not for media consumption. Chrs mike

---- Original Message -----

From: Rob Drury

To: Peter Borrows; Jim Pruss; Mike Foster

Sent: Sun Oct 10 15:28:51 2010

Subject: Update

With less rainfall than predicted last night, the flood centre has reduced the gate opening at Wivenhoe to 1.5 m, still releasing over 13000 Ml per day. This will continue to about Wednesday. This will in day or so allow some crossings downstream to open during the week depending on travel times. However things may change if further rain ocurrs.

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1

Dan Spiller; Peter

Mike Foster

Sent:

Monday 11 October 2010 7:06 AM

To:

SEOWGM_Media

Cc:

Peter Borrows

Subject:

Fw: Update

Folks ..update as per below.

Wiv and som releases are continuing as per normal ..will asess during the day as to whether increases are required.

Rob Drury

All major sunshine coast dams are spilling. No gate releases. All spillway

Leslie harrison at redlands began controlled gate releases 3am this morning.

North pine will begin gate releases this morning

Watching hinze but likely to have to use new emergency gates to begin controlled releases at some stage today.

Welcome to monday morning.

Cheers mike

From: Rob Drury

To: Peter Borrows: Jim Pruss: Mike Foster

Cc:

Sent: Mon Oct 11 06:34:38 2010

Subject: Update

Rain overnight was again quite heavy.

600mm to 130mm around the Sunshine Coast, 70mm around Somerset catchment, S to 15mm in Wivenhoe, 30mm to 150mm around Pine Rivers, S0 to over 100mm in Gold Coast.

Many places received much higher levels in some spots.

Leslie Harrison was operated at 3am this morning and is releasing.

North Pine is being monitored but will no doubt be releasing some time this morning.

Somerset is rising as is Wivenhoe and releases will be reassessed by the Flood Centre.

Hinze is rising and may require use of the emergency gate at some stage to reduce levels to the original spillway level as the new spillway is completed but work is not at a stage to allow water to be stored.

Other than that just a normal Monday morning.

Rob

Robert Drury
Dam Operations Manager

Water Delivery

Queensland Bulk Water Supply Authority trading as Seqwater



Swimming in weirs and 1 flowing water is FA1

Dan Spiller





Ρh

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Mike Foster

Sent:

Wednesday, 13 October 2010 5:40 PM

To:

Barry Dennien; Dan Spiller

Cc:

Rob Drury; Peter Borrows; Jim Pruss

Subject: Segwater response

Folks.

First up we should be telling Courier Mail to contact BOM. In our discussions with BOM they agreed the discharges from Wivenhoe will have an insignificant impact on flood levels on lower Brisbane River compared to the high tide impact.

SEQWGM Communications Staff

Response for the Courier

- Releases from Wivenhoe and Somerset Dam are being made in accordance with the approved flood release manual. This flood management plan is signed off by the Dam Safety Regulator and gazette.
- Wivenhoe and Somerset Dam have provided significant flood mitigation for this event reducing the peak flow in Brisbane by between fifty to sixty percent.
- Current releases from Wivenhoe are approximately one-third of what would naturally come down the river without the dam in place to store flood water.
- As part of managing inflows over the past week Seqwater has held back 500,000-600,000 mega litres (equivalent of a Sydney harbor) which is now being discharged through controlled release.
- The current release was held back until the flood flows from the Bremer and Lockyer had subsided sufficiently.
- The threshold for damaging floods in the Brisbane area is 3500 cubic metres per second and our current releases are well below (1200 cubic metres per second).
- Seqwater does not believe the current releases will have any significant impact in levels in the lower Brisbane River in the coming days.

Mike Foster

Manager Strategic Relations & Communication Queensland Bulk Water Supply Authority trading as Segwater



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

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Mike Foster

Sent:

Thursday, 14 October 2010 7:08 AM

Dan Spiller

To:

Barry Dennien;

Subject:

Fw: Update

From: Rob Drury

To: Mike Foster; Jim Pruss; Peter Borrows

Sent: Thu Oct 14 06:43:27 2010

Subject: Update

North Pine will close at 8am today, fish recovery is organised.

Somerset is getting close to be back to FSL.

Wivenhoe continuing to discharge, gates about at final opening level discharging about 1500cumecs.

Closing plan for Wivenhoe being considered as emailed.

Rob

Robert Drury
Dam Operations Manager
Water Delivery

Queensland Bulk Water Supply Authority trading as Seqwater



Swimming in weirs and 1 flowing water is FA1





Ph

Wivenhoe Dam, Brisbane Valley Highway, via Fernvale Q4306 Australia PO Box 37, Fernvale QLD 4306 Website | www.seqwater.com.au

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Reilly Bob

Sent:

Thursday 14 October 2010 9:44 AM

To:

ken.smith

Cc:

Barry Dennien: Peter Borrows; Dan Spiller; Allen Peter

Subject:

Flood Mitigation operational arrangements for Wivenhoe/Somerset Dams

Hi Ken

Dot points below:

Background

Wivenhoe and Somerset dams were designed as flood mitigation dams. In other words, they have a substantial storage capacity that is normally empty, and is used to store floodwaters. The aim is to release the flood waters gradually once the immediate downstream flooding impacts, (from floodwaters that come from streams/rivers other than the one on which the dam is located), have bassed.

As Wivenhoe and Somerset dams are on the same river, they are effectively operated as one unit for flood management purposes.

The floodwater release strategy is a balance between releasing the water quickly enough so that the flood storage capacity is available if another major rain event occurs, versus minimising downstream flooding impacts (basically property damage) from the releases

The strategy is contained in a flood mitigation plan that is approved by DERM.

Key Issues

The current strategy for Wivenhoe was approved in 2009, but the basic water release strategies, which are still being used today, were approved in 1992. While the plan was submitted by the dam owner (now Seqwater, but then a council-controlled entity), it involved extensive negotiation and discussions with all of the Councils downstream of Somerset/Wivenhoe dams and Emergency Services. Brisbane City Council was included in these discussions.

A fundamental principle behind the plan is that all floodwater should be released from the dams within seven days. This ensures the dam can cope with another major rain event. (Because the dam has an auxiliary spillway, it is unlikely that it would collapse if the floodwaters were not released, but the flooding impacts would be worse because the floodwaters would be released in an uncontrolled manner).

The plan contains quite detailed flood release strategies which Seqwater is obliged to follow.

For releases such as is occurring at the moment, the approval strategy for individual releases is based on the levels in Wivenhoe and Somerset, and the discharges from downstream Lockyer Ck and Bremer River catchments. The aim is to limit total flows (including discharges from Wivenhoe) at Mt Crosby to less than 1900 cubic metres per second. In this instance, the total flows have not needed to go to the full 1900 cubic metres per second, and total flows (including the discharge from Wivenhoe Dam) at Mt Crosby is about 1500 cubic metres per second.. (It is worth noting that flood damage in Brisbane commences at a total flow around 4,000 cubic metres per second.).

If the flood release strategies are followed, then the Queensland Government, rather than the dam owner, assumes legal liability for any consequences. (This is of little practical significance in this case, given the ownership of Seqwater).

Please let me know if I can be of further assistance.

Regards

Bob

Bob Reilly

General Manager, Office of the Water Supply Regulator

Telephone

Email:

www.derm.qld.gov.au

Department of Environment and Resource Management

Lvl 3 41 George Street, Brisbane Q 4000

GPO Box 2454, Brisbane Q 4001

+ -----+

Think B4U Print

- 1 ream of paper = 6% of a tree and 5.4kg CO2 in the atmosphere
- 3 sheets of A4 paper = 1 litre of water

Allen Peter

Sent:

Thursday, 14 October 2010 10:09 AM

To:

Barry Dennien; Reilly Bob

Cc:

Peter Borrows; Dan Spiller; ken.smith

Subject:

RE: Flood Mitigation operational arrangements for Wivenhoe/Somerset Dams

Barry,

The following arrangements apply in terms of modelling for Brisbane River discharges.

- Seqwater (through their Flood Operations Centre) are responsible for doing sufficient modelling to determine the appropriate discharges from Wivenhoe and Somerset Dams. This is typically hydrological models of inflows into the dams. They also have the capability of doing numerical modelling of flows from Wivenhoe to the mouth of the Brisbane River (to include tidal effects)
- Seqwater advise the BoM of the discharges (and the planned discharges) from Wivenhoe and the BoM feed this into their own models and determine whether they need to issue downstream flood warnings.

I understand BCC get this data from the BoM and then do their own modelling to determine if there are local impacts on Brisbane creeks etc.

The Seqwater Duty Flood Engineers understand that the BoM has not issued a flood warning for the Lower Brisbane River and don't, at this time, have any intention of doing so. The Seqwater Flood Control Centre has also spoken to Ken Morris from the BCC and I have been advised that he doesn't see how the published flood warnings were justified.

I am also advised that there will be a meeting at the Flood Control Centre of the Dam Flood Engineers, the BCC flood engineers and the BoM to discuss the issue.

Peter Allen

Director Dam Safety (Water Supply)

Office of the Water Supply Regulator

Telephone

Email

www.derm.qld.gov.au

From: Reilly Bob

Sent: Thursday, 14 October 2010 9:44 AM

To: 'ken.smitl

Cc: 'Dennien Barry' 'Peter Borrows'; Spiller Daniel (SEQWGM); Allen

Peter

Subject: Flood Mitigation operational arrangements for Wivenhoe/Somerset Dams

Hi Ken

Dot points below:

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Bob

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Email:
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Department of Environment and Resource Management
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GPO Box 2454, Brisbane Q 4001

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1 ream of paper = 6% of a tree and 5.4kg CO2 in the atmosphere

3 sheets of A4 paper = 1 litre of water

Litsupport Brisbane

From:

Peter Borrows

Sent:

Thursday, 14 October 2010 10:21 AM

To:

ken.smith

Cc:

Barry Dennien; Dan Spiller; Allen Peter; Reilly Bob

Subject:

RE: Flood Mitigation operational arrangements for Wivenhoe/Somerset Dams

Attachments:

Issues Brief - Segwater - as at Oct 14.doc

Info from Segwater as requested

Regards, Peter.

Peter Borrows

Chief Executive Officer

Queensland Bulk Water Supply Authority trading as Seqwater



Ph

Level 3, 240 Margaret St, Brisbane City QLD 4000

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

From: Reilly Bob

Sent: Thursday, 14 October 2010 9:44 AM

To: ken.smith

Cc: Dennien Barry; Peter Borrows; Spiller Daniel (SEQWGM); Allen Peter

Subject: Flood Mitigation operational arrangements for Wivenhoe/Somerset Dams

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Dot points below:

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The strategy is contained in a flood mitigation plan that is approved by DERM.

Key Issues

The current strategy for Wivenhoe was approved in 2009, but the basic water release strategies, which are still being used today, were approved in 1992. While the plan was submitted by the dam owner (now Seqwater, but then a council-controlled entity), it involved extensive negotiation and discussions with all of the Councils downstream of Somerset/Wivenhoe dams and Emergency Services. Brisbane City Council was included in these discussions.

A fundamental principle behind the plan is that all floodwater should be released from the dams within seven days. This ensures the dam can cope with another major rain event. (Because the dam has an auxiliary spillway, it is unlikely that it would collapse if the floodwaters were not released, but the flooding impacts would be worse because the floodwaters would be released in an uncontrolled manner).

The plan contains quite detailed flood release strategies which Segwater is obliged to follow.

For releases such as is occurring at the moment, the approval strategy for individual releases is based on the levels in Wivenhoe and Somerset, and the discharges from downstream Lockyer Ck and Bremer River catchments. The aim is to limit total flows (including discharges from Wivenhoe) at Mt Crosby to less than 1900 cubic metres per second. In this instance, the total flows have not needed to go to the full 1900 cubic metres per second, and total flows (including the discharge from Wivenhoe Dam) at Mt Crosby is about 1500 cubic metres per second.. (It is worth noting that flood damage in Brisbane commences at a total flow around 4,000 cubic metres per second.).

If the flood release strategies are followed, then the Queensland Government, rather than the dam owner, assumes legal liability for any consequences. (This is of little practical significance in this case, given the ownership of Seqwater).

Please let me know if I can be of further assistance.

Regards

Bob

Bob Reilly

General Manager, Office of the Water Supply Regulator

Telephone:

Email

www.derm.qld.gov.au

Department of Environment and Resource Management

Lvl 3 41 George Street, Brisbane Q 4000

t +
Think B4U Print
I ream of paper = 6% of a tree and 5.4kg CO2 in the atmosphere
B sheets of A4 paper = 1 litre of water
+

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HOT ISSUE BRIEFING NOTE

HOT ISSUE G.X	Seqwater - as at 14 October 2010
Question	Impact of current Wivenhoe releases

Issue:

- Impact of current Wivenhoe releases
- Development of Wivenhoe and Somerset Dam Flood Control Manual

Answer:

- Seqwater is required to develop a Manual of Operational Procedures for Flood Mitigation at Wivenhoe and Somerset Dam.
- Current releases from Wivenhoe and Somerset Dam are being made in accordance
 with the approved flood release manual. This flood management plan is signed off by
 the Dam Safety Regulator and gazette in accordance with the Water Supply Act
 2008.. Seqwater is required to release in accordance with the approved flood release
 procedures in this manual. The procedures may only be altered if warranted in the
 opinion of the Senior Flood Operations Engineer (SFOE). In exercising this
 discretion, must make a reasonable attempt to consult with the Chairperson of
 Segwater and the DG, DERM.
- The current flood release manual was reviewed in during 2009 and finalised in January 2010. Seqwater is required to provide relevant catchment councils with a copy of the flood manual and this occurred. Councils provided with copies include Somerset Regional Council, Ipswich City Council and Brisbane City Council.
- The trigger levels and release procedures are the same as those used to manage the last multi-gate release in 1999
- Wivenhoe and Somerset Dam have provided significant flood mitigation for this event reducing the peak flow in Brisbane by between fifty to sixty percent.
- Current releases from Wivenhoe are approximately one-third of what would naturally come down the river without the dam in place to store flood water.
- Wivenhoe Dam has a 1,450,000 megalitre 'flood compartment'. More than one third
 of the 'flood compartment' was full yesterday holding about 500,000 ML. For
 comparison, this is more than the total storage capacities of North Pine (215,000 ML),
 Hinze (161,000 ML) and Baroon Pocket (61,000 ML) dams combined.
- The current release was held back until the flood flows from the Bremer and Lockyer had sufficiently subsided.
- The threshold for damaging floods in the Brisbane area is 3500 cubic metres per second and our current releases are well below (1500 cubic metres per second).

- The Bureau of Meteorology uses information from Seqwater to do modelling.
- BOM modelling predicts that today's high tide (just before 2:30) will be lower than yesterday's high tide.
- Based on advice from the BOM and its own modeling, Seqwater does not believe the current releases will have any significant impact in levels in the lower Brisbane River in the coming days.
- The release plan does take into account tidal information but not until releases reach the trigger level for damaging floods (3500 cubic metres per second)
- Seqwater's Flood Operations Centre was activated over the weekend and will operate 24 hours a day until the end of the event (expected around next Tuesday)
- The Flood Operations Centre will continue to advise local and emergency authorities on potential impacts downstream as a result of the gated dam releases.

Litsupport Brisbane

From:

Peter Borrows

Sent:

Thursday, 14 October 2010 3:18 PM

To:

Dan Spiller; ken.smith

Cc:

Barry Dennien

Subject:

FW: Draft media release attached

Attachments:

MEDIA RELEASE - River peak reached - 14.10.10.docx

Dan – approved from Seqwater. The changes are clarification/factual.

Give me a call if necessary.

Regards, Peter.

Peter Borrows

Chief Executive Officer

Queensland Bulk Water Supply Authority trading as Seqwater



Level 3, 240 Iviargalet 31, bilspane City QLD 4000

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

From: Mike Foster

Sent: Thursday, 14 October 2010 3:14 PM

To: Peter Borrows

Cc: Rob Drury; Jim Pruss;

Subject: FW: Draft media release attached

Peter,

As approved by Rob and John T.

Cheers Mike

From: SEQWGM Media

Sent: Thursday, 14 October 2010 2:51 PM

To:

Cc: SEQWGM Communications Staff; Dan Spiller; Barry Dennien;

Mike Foster

Subject: Draft media release attached

Hi team

Note draft media release attached - RIVER PEAK REACHED WITH MINIMAL FLOOD IMPACTS AS FORECAST.

Senior Media Advisor

SEQ Water Grid Communications Unit

Phone Email:

Visit: Level 15, 53 Albert Street Brisbane Post: PO Box 16205, City East QLD 4002

ABN: 14783 317 630

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Media Release

MEDIA RELEASE 14 OCTOBER 2010

RIVER PEAK REACHED WITH MINIMAL FLOOD IMPACTS AS FORECAST

The Brisbane River reached its peak level this afternoon with minimal impact from the controlled releases from Wivenhoe Dam, as forecast by the Water Grid and the Bureau of Meteorology.

Bureau of Meteorology data indicates that, since Monday, the peak water level at the Brisbane City measuring point has been decreasing each day. The reason for this is the decreasing astronomical tide, dropping by about 0.1 metre each day.

Water Grid Manager CEO Barry Dennien says this information, combined with other data, has dictated the release rate from Wivenhoe Dam.

aAround 34,000 megalitres per day began spilling from Wivenhoe last weekend when the first of the five flood gates was opened.

Following the initial release, the remaining four gates were progressively opened until 116,000 megalitres per day was spilling by late Tuesday night.

The output from Wivenhoe has been further increased gradually and by 8am this morning, the dam was releasing approximately 130,000 megalitres per day, or 1,500 tonnes per second.

There has been no reduction in the amount of water being released from Wivenhoe since Sunday (we deceased slightly on Sunday morning but had to increase with rainfall Sunday night).

Mr Dennien says releases are expected to stay at this volume until early Saturday morning around 10 pm Friday evening, when the gradual closing of the gates will begin - subject to inflows from further rain.

In the absence of any significant rainfall all gates are expected to be closed early next week.

The Flood Centre continues to monitor the situation on a 24 hour basis.

"The release of water from Wivenhoe Dam has been carefully managed to ensure absolute-minimal impacts downstream," says Mr Dennien.

sate secure sustainable

"With approval from the Flood Control Centre, we held back water in Wivenhoe Dam while waiting for the Bremer and Lockyer flows to subside, which they now have."

It takes about two days for the water released from Wivenhoe to make its way to the lower reaches of the Brisbane River. The gates need to be closed and opened gradually to minimise downstream impacts including bank slumping.

avoid creating large backsplash waves.

With a flood storage capacity more than three times the size of Sydney Harbour, Wivenhoe Dam provides vital protection for Brisbane from flood.

ENDS

For further information visit www.seqwgm.com.au

For further details contact the SEQ Water Grid Communications Unit on: Ph: (07) 3247 3000 | Email: media@seqwgm.com.au

Mike Foster

Sent:

Friday, 15 October 2010 9:44 AM

To:

Barry Dennien: Dan Spiller:

Cc:

Peter Borrows

lim Pruss

SEQWGM Communications Staff

Subject:

FW: Segwater Dams Flood Status at 08:00

Folks,

Please see below dam updates

Situation at 08:00 on Friday 15 October 2010

Wivenhoe Dam

Wivenhoe Dam is currently releasing 1495 cumecs and the lake level is EL 68.69 m AHD. Gate operations are expected to continue over the weekend. However the forecast rainfall is not considered sufficient to change the current release strategy, although it may extend the drainage phase by up to half a day until late Monday/early Tuesday

Further advice will be provided later today when the situation with respect to the forecast rainfall becomes more certain.

North Pine Dam

Flood operations ceased at North Pine Dam on Thursday 14 October. The current lake level is EL 39.62 m AHD, 0.02 m above FSL.

The low level release valve is open 100% releasing approximately 1 cumec to assist fish recovery and suppress base flow rise in Lake Samsonvale.

Forecast is for 35 mm in the next 24 hours and based upon the catchment conditions the lake level is expected to reach a peak of EL 39.73 m AHD which would require further gate releases. The operators at North Pine Dam have been placed on standby for this possibility.

Somerset Dam

The flood operations at Somerset Dam have effectively ceased with the last sluice closed at 08:00 today as the lake level has returned to FSL. The current lake level is EL 98.99 m, 0.01 m below FSL.

Inflows are continuing so as a consequence a regulator valve is open to control the rebound due to these flows. Likewise the operators at Somerset have been placed on standby as the forecast for 30 mm in the next 24 hours.

Cheers Mike

Mike Foster

Manager Strategic Relations & Communication
Queensland Bulk Water Supply Authority trading as Seqwater



⊇h

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

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Mike Foster

Sent:

Friday 15 October 2010 1:07 PM

To:

Barry Dennien; Dan Spiller

Cc:

SEQWGM Communications Staff; Peter Borrows; Rob Drury;

Subject:

FW: Media Questions



Given the Premiers comments today suggest we need to move Brian towards the notion of State and council working better together

Words around ..reviewing current protocols to strengthen communication/information sharing between State/Councils/focus on public safety paramount etc ..appropriate to review ahead of a forecast wetter than average summer/full dams etc.

Suggest the key message below is that information is provided councils and that councils, working with emergency services, have the responsibility for determining the extent of any impact and any actions equired including local bridge and road closures.

Cheers Mike

From: Mike Foster

Sent: Friday, 15 October 2010 12:21 PM

To: Mike Foster

Subject: FW: Media Questions

From

Sent: Friday, 15 October 2010 12:08 PM

To: Mike Foster

Subject: Media Questions

Answers in RED

About how much water will there be in the Wivenhoe flood compartment by about 6pm tonight? Approximately 110,000ML

if we get the projected 40 to 60mm of rain later tonight, how much more water might that deliver to Wivenhoe? This depends on the intensity, spread and duration of rainfall across the catchment, but is not expected to be sufficient to impact our current discharge strategy. However, it may extend the gate closing program by day or so.

I'm also trying to get a handle on the process involved in informing BCC and other authorities about dam releases.

Once levels are reached in Wivenhoe which require controlled flood gate operations, release instructions are made by the Flood Operations Centre (FOC) and undertaken by Seqwater.

Prior to any releases, under the current protocols Seqwater advises relevant councils of impending gate operations including release volumes. Regular contact is made with relevant councils during the duration of the release event.

Councils, working with emergency services, have the responsibility for determining the extent of any impact and any actions required including local bridge and road closures.

How did Water Grid Manager-SEQwater advise bcc on releases that prompted BCC to start sending out sms etc on flooding in low level areas? as per above

do you send out an advisory to a number of authorities, bcc, ipswich, state Govt, emergency services? As per above

was your advice clear and clearly understood or did BCC not understand it? question for BCC do u know at what officer level the decision was taken by bcc to send out minor flood warnings? question for BCC

What exactly is the advice the Weather Bureau gives the Water Grid Manager-SEQwater regarding releases eg, river heights, size of inflows and then who takes the decision to release water and how much? The BOM provides Seqwater with rainfall forecasts for the dam and catchment. The FOC works with BOM during the event.

The Flood Operations Centre has responsibility for determining release volumes and duration in accordance with the flood management plan. This flood management plan is signed off by the Dam Safety Regulator and gazette in accordance with the *Water Supply Act 2008*..

is it correct that the last time the process under which releases are handled was reviewed was in 2005? The current flood release manual was reviewed in during 2009 and finalised in January 2010. Seqwater is required to provide relevant catchment councils with a copy of the flood manual and this occurred. Councils provided with copies include Somerset Regional Council, Ipswich City Council and Brisbane City Council.

The trigger levels and release procedures are the same as those used to manage the last multi-gate release in 1999

What exactly is the process under which the timing and volume of releases is determined? Determined by the Flood Operations Centre in accordance with the regulator approved flood management plan. you had a bigger release from Wivenhoe in 1999, how big was that compared with now? In 1999 was a similar release event with slightly higher release flows (155,000ML per day). In 2010, we are releasing 130,000ML per day

have we ever Wivenhoe's flood compartment totally full? No when was that? N/A

if it has never been totally full, what was the most it has ever held? In Feb 1999 the flood compartment of Wivenhoe/Somerset combined held almost 1 million ML as compared to the almost 600,000 this time around

how many times has the flood compartment been used since construction? Since completion, the flood compartment was used for significant events twice in 1989, once in 1999 and once in 2001.

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Barry Dennien

Sent:

Catalog 46 October 2010 12:28 PM

To:

Peter Borrows; Mike Foster; Rob Drury

Cc: Subject: Dan Spiller Re: Update

Peter

Thanks for your teams efforts this week

I have an agreement with Colin jensen that any change to operations will be fully consulted with BCC technical staff and communicatons staff and they have agreed the same

Any issues please ring

Regards

Barry Dennien

On 16/10/2010, at 10:32 AM,

wrote:

Sent from my iPhone

Begin forwarded message:

From: Mike Foster

Date: 16 October 2010 11:07:15 AM AEDT

To: SEOWGM Media

Subject: Fw: Update

Folks ..update below. Let's keep it very very quiet. Does not look like enough to extend gate releases beyond monday. Chrs mike

---- Original Message -----

From: Rob Drury

To: Jim Pruss; Peter Borrows; Mike Foster

Sent: Sat Oct 16 10:00:08 2010

Subject: Update

Citrix may be out for little while so short update. Rain just enough to operate Leslie Harrison and North Pine. Both most likely shut today. Wivenhoe closure slowed a little due to flows downstream but may not make much difference in final closing. It's sunny. Rob.

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1

Sent:

Thursday, 21 October 2010 1:55 PM

To:

keith.davies Peter Borrows

Cc:

Barry Dennien; Dan Spiller

Subject:

SEQ Water Grid Quality Management Plan

FYI an updated version of this document will be circulated tomorrow, for the meeting scheduled on Tuesday afternoon.

Regards

Executive Assistant to Barry Dennien Chief Executive Officer

SEQ Water Grid Manager

Phone:

Email:

Visit: Level 15, 53 Albert Street, Brisbane Post: PO Box 16205, City East Qld 4002

ABN: 14783 317 630

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Peter Borrows

Sent:

Tuesday, 26 October 2010 9:41 AM

To:

Dan Spiller;

keith.davie

Cc: Subject: Jim Pruss; Barry Dennien RE: Draft Operating Strategy

Attachments:

SEQ Water Grid Operating Strategy Version 2 October 2010(2).docx

Thanks Dan.

I neither have time available to read this before this afternoon, nor the opportunity to discuss it internally, so I will only be in a position to listen this afternoon, rather than discuss it.

Regards, Peter.

Peter Borrows

Chief Executive Officer

Queensland Bulk Water Supply Authority trading as Segwater



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

From: Dan Spiller

Sent: Tuesday 26 October 2010 9:01 AM

Peter Borrows; Keith Davies

Cc: Jim Pruss; Barry Dennien **Subject:** Draft Operating Strategy

All,

tached is the draft Operating Strategy for discussion this afternoon and review by the end of this week.

The Strategy reflects a series a discussions we have had with key officers, including at Segwater at Linkwater.

The focus is twofold:

- It confirms that Maleny, Woorim and Brisbane Aquifer Projects are not required over the next five years (continuing recent Grid Instructions).
- It lists a range of priorities for investigation, with the process for those investigations to be agreed (with and the QWC doing related work).

Keith, you will note that this version is based on a continuation of existing operation of the desalination facility and WCRWS. We will amend it to reflect the outcomes of the advice that is currently being prepared.

Apologies for the tight timeframe for final review - we had intended to distribute earlier but were distracted by the rain.

We need to submit a revised version of the Operating Strategy every six months. I expect that it will be refined significantly over the next year or so.

Please do not hesitate to call if you have any queries or require any further information.

Regards,

Dan

Daniel Spiller

Director, Operations

SEQ Water Grid Manager

Phone Email:

Visit: Level 15, 53 Albert Street Brisbane Post: PO Box 16205, City East QLD 4002

ABN: 14783 317 630

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SEQ Water Grid Operating Strategy Version 2 – 31 October 2010

through perinership and innovation

Document administration

Document version and modification control

Date	Author	Modification and/or action	Version
22/10/10	Daniel Spiller	Consultation draft	2.1

Document approval

Date Name	Signature			Comments	
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TRIM reference: D/10/6232

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1.0 Introduction

The SEQ Water Grid Operating Strategy (Operating Strategy) is created under the *South East Queensland System Operating Plan* (SOP). This is the second version of the Operating Strategy. It will commence upon being approved by the Queensland Water Commission (QWC).

This version of the Operating Strategy contains:

- a summary of the requirements of the Operating Strategy and Grid Instructions (Section 2)
- an explanation of the decision support framework used to prepare the Operating Strategy and Grid Instructions (Section 3)
- current operating context and capacity (Section 4)
- the Operating Strategy effective from October 2010 (Section 5)
- a program of work to refine the Operating Strategy over time, including a range of investigations to be undertaken in consultation with other Grid Participants (Section 6)
- an explanation of how it complies with SOP requirements (Section 7).

The Operating Strategy provides:

- the basis for monthly Grid Instructions
- direction for asset owners on future operational requirements, including performance requirements for specific assets
- a summary of the expected performance of the SEQ Water Grid (Water Grid) over the medium-term, based on the proposed operating conditions and under various inflow and demand scenarios
- the basis by which the QWC can assess compliance with the SOP requirements
- direction to Grid Participants about the priority and scope of future investigations, for the purposes of improving the effective and efficient operation of the Water Grid.

The Operating Strategy will inform the operation and regulation of Grid Service Providers, including:

- strategic and operational planning
- budgeting
- economic and asset regulation
- asset management planning.

This version of the Operating Strategy focuses on the operation of the Water Grid over a period of 12 months from its approval. The version due for submission to the QWC in March 2011 will focus on the operation of the Water Grid in 2011-12, providing key input to the preparation of budgets by the SEQ Water Grid Manager (Water Grid Manager) and Grid Service Providers. Future versions will ensure the optimal operation of the Water Grid over a five year timeframe, having regard to the strategic operation of the Water Grid over the longer-term. It will include a program of works to ensure that the Water Grid can operate at capacity, when key Water Grid storages fall to specific levels.

 Through these iterations, the Operating Strategy will provide increasingly precise specifications of the services required from Grid Service Providers over the short to medium-term, including options to defer future capital expenditure.

1.1 Relationship to other plans and processes

The Operating Strategy is one of a series of integrated plans that provide the strategic operating framework for the Water Grid. These plans are made under a number of regulations and market instruments. The plans are:

- SEQ Water Grid Quality Management Plan, which coordinates the management of water quality in South East Queensland. This plan ensures that the safety and aesthetic quality of drinking water is protected, that drinking water is delivered in accordance with the Australian Drinking Water Guidelines 2004 (ADWG) and that these outcomes are achieved in an efficient and effective manner, taking advantage of the options the Water Grid provides.
- SEQ Water Grid Demand Assessment, which summarises demand trends and presents
 demand scenarios for bulk water over a 1 to 10 year timeframe, including seasonal and
 peak demand. This assessment will incorporate forecasts provided by Grid Customers. The
 forecasts will be used for several purposes, including the Operating Strategy. The first
 demand assessment will be completed in early 2011.
- SEQ Water Grid Capacity Assessment, which summarises asset capacity and reliability. The
 assessment will include an analysis of additional capacity that may be required over the
 next five years, in order to meet forecast demand. This analysis will inform annual advice to
 the QWC regarding regionally significant infrastructure needs. The first capacity assessment
 will be completed in late 2010 and will incorporate the SEQ Water Grid Performance
 Standard, approved by the QWC in 2010, but are no longer required under *The Market*Rules SEQ Water Market (Market Rules).
- SEQ Water Grid Emergency Response Plan, which directs a coordinated effective response in the event of an incident, which meets the Water Grid definition of an 'emergency'.
- SEQ Water Grid Risk Management Plan, which enhances the resilience of the Water Grid by strategically integrating preventative, monitoring and contingent controls. It does this by addressing the essential areas of strategic and operational business risk management, business continuity planning, critical infrastructure security and emergency response planning.

The Operating Strategy takes precedence to each of these plans, with the exception of the SEQ Water Grid Emergency Response Plan.

1.2 Consultation

Grid Service Providers were consulted on this version of the Operating Strategy. Discussions were held with operational and some planning staff from Grid Service Providers to determine key areas of focus for this and future versions of the Operating Strategy. These discussions informed this version of the Operating Strategy and the development on the section relating to future investigations into the optimisation of the operation of the Water Grid. Key operational changes in this version, such as for Maleny and the Brisbane Aquifer Project, were either

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proposed by or agreed with operational staff in relevant Grid Service Providers. Investigations listed in Section 6 were identified in consultation with relevant officers, and will be undertaken in collaboration with them.

Future versions will also be developed in partnership with the Grid Service Providers to collectively achieve best practice operation of the Water Grid. In particular, the process for the investigations in to Section 6 to be undertaken is to be specified in future versions of the Operating Strategy, following further discussion with the entities and QWC.

2.0 Regulatory framework

The Operating Strategy is created under the SOP and must comply with requirements contained within it. It has been prepared having regard to other market instruments and the framework outlined in the *South East Queensland Water Strategy* (SEQ Water Strategy). These requirements are outlined below.

2.1 Operating Strategy requirements

The SOP requires that by 31 October and 30 April each year, the Water Grid Manager must submit to the QWC a proposed Operating Strategy for the next 12 month period. The Operating Strategy must demonstrate how security will be maintained over a five year timeframe.

The proposed Operating Strategy must include:

- details of how the Water Grid Manager intends to supply water to meet the forecast demands of each of its customers, including intended sources of supply, bulk water transfer arrangements and efficient and cost-effective operation proposal
- details of assumptions adopted to support the proposed Operating Strategy
- any additional information supporting the proposed Operating Strategy.

The Water Grid Manager must demonstrate that all reasonable actions have been integrated into the proposed Operating Strategy to achieve the:

- desired Level of Service (LOS) objectives
- risk criteria.

The principal tool for demonstrating compliance with the desired LOS objectives and risk criteria is the SEQ regional water balance model (refer Section 3.2).

The Water Grid Manager must only issue Grid Instructions based on the approved Operating Strategy, unless otherwise directed in writing by the QWC.

In preparing a proposed Operating Strategy, the Water Grid Manager must make reasonable endeavors to consult each entity to which the proposed Operating Strategy will apply. In turn, the entities must comply with any reasonable written request from the Water Grid Manager to supply information that may assist it to fulfil its obligations.

2.2 Objectives and other operating requirements

The SOP includes a wide range of rules for operating the Water Grid. These rules specifically apply to the Operating Strategy and Grid Instructions.

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Maximum volume

The maximum volume of water the Water Grid Manager may enter into contracts to sell is 450,000 megalitres per annum (ML/a).

LOS objectives

The Operating Strategy must include all reasonable actions to achieve the following LOS objectives:

- during normal operations sufficient water will be available to meet an average total urban demand of 375 litres per person per day (including residential, non-residential and system losses), of which 230 litres per person per day is attributed to residential demand
- medium level restrictions will not occur more than once every 25 years, on average
- medium level restrictions need only achieve a targeted reduction in consumption of 15 per cent (%) below the total consumption volume in normal operations
- the frequency of triggering drought response infrastructure will be not more than once every 100 years, on average
- the frequency that the total volume of water stored by all key Water Grid storages declines to 10% of their combined water storage capacity will be not more than once every 1000 years, on average
- the total volume of water stored by all key Water Grid storages must not be permitted to reach 5% of the combined total water storage capacity of these storages
- Wivenhoe, Hinze and Baroon Pocket dams must not be permitted to reach minimum operating levels
- it is expected that medium level restrictions will last longer than six months, no more than once every 50 years, on average.

Risk criteria

The Operating Strategy must include all reasonable actions to achieve the risk criteria contained in Table 1.



Volume of water	Probability of reaching volume of water stored			
stored by key Water Grid storages	Within 1 year	Within 3 years	Within 5 years	
40%	Less than 0.2%	Not specified	Less than 5%	
30%	Not specified	Less than 0.5%	Less than 1%	

Operating rules

The Operating Strategy must comply with the following rules, summarised from Section 8 of the SOP.

8.1 Efficient and cost-effective operation rule

Subject to other rules, seek to optimise the efficient and cost-effective operation of water supply works to deliver the required volumes of water.

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8.2 Water security rule

When the volume of water stored by key Water Grid storages falls below 40% of the storage capacity of these storages:

- the supply of manufactured water from the South East Queensland (Gold Coast)
 Desalination Plant (Desalination Plant) shall be maximised
- the supply of manufactured water to Wivenhoe Dam from the Western Corridor Recycled Water Scheme shall be maximised, subject to appropriate approvals.

8.3 Rule for the supply of water to power stations

Subject to operational constraints, CS Energy Limited shall be supplied:

- water from the Western Corridor Recycled Water Scheme, before
- water from the Warrill Valley Water Supply Scheme, before
- water from Wivenhoe Dam.

Subject to operational constraints, Tarong Energy Corporation Limited shall be supplied:

- water from the Western Corridor Recycled Water Scheme, before
- water from Wivenhoe Dam.

8.4 Rule for the supply of manufactured water from the Desalination Plant

Manufactured water shall be supplied from the Desalination Plant at a rate of at least one third of the production capacity of the plant, subject to operational constraints.

8.5 Rule for supply via the Northern Pipeline Interconnector Stage 1

Subject to operational constraints, the supply of water via the Northern Pipeline Interconnector Stage 1 from within the Sunshine Coast Regional Council to areas shall be:

- zero when the volume of water stored by Baroon Pocket, Ewen Maddock, Cooloolabin,
 Poona and Wappa dams as a proportion of the total storage capacity of these dams is less than or equal to the volume of water stored by Wivenhoe, Somerset and North Pine dams as a proportion of their total storage capacity
- zero when the volume of water stored by Baroon Pocket, Ewen Maddock, Cooloolabin, Poona and Wappa dams is less than 70% of the total storage capacity of these dams
- up to 65 megalitres per day (ML/day) when the volume of water stored by Baroon Pocket, Ewen Maddock, Cooloolabin, Poona and Wappa dams is between 70% and 100% of the total storage capacity of these dams.

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8.6 Rule for supply from Lake MacDonald and the Upper Mary Water Supply Scheme

The supply of water from Lake MacDonald and the Upper Mary Water Supply Scheme shall, subject to operational constraints, be in accordance with the following priorities:

- water is to be supplied from Lake MacDonald while the dam is overflowing and may continue to be supplied until the total volume of water stored by Lake MacDonald falls below 95% of capacity after an overflowing event, before
- water is to be supplied from the Upper Mary Water Supply Scheme, before
- water is to be supplied from Lake MacDonald.

8.7 Rule for supply within the Warrill Valley Water Supply Scheme

The supply of water under water entitlement numbers 103187, 103184 and 103203 shall be in accordance with the following conditions or any varied conditions approved by the QWC:

- water take is sourced from run of river flow
- Berry's Lagoon Weir is overflowing.

8.8 Rule for supply within the Logan River Water Supply Scheme

Water shall not be supplied under water entitlements held by the Water Grid Manager within the Logan River Water Supply Scheme to meet demands other than those of the towns of Beaudesert, Kooralbyn, Rathdowney, South Maclean and Jimboomba, when Maroon Dam is at or below 10,000 megalitres of water storage. This rule is subject to operational constraints or approval is provided by the QWC.

2.3 Other regulatory requirements

The Operating Strategy also:

- provides the basis for determination of forecast volumes as required by Market Rules
- must be consistent with any approved Drinking Water Quality Management Plan or Recycled Water Quality Management Plan, both for the Water Grid as a whole and for individual assets.

2.4 Explanation of key concepts

The SEQ Water Strategy provides context for key concepts contained in the SOP. Attachment A provides a summary of information provided about:

- LOS objectives
- LOS system yield
- drought response triggers
- climate change assumption.

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The maximum volume of water the Water Grid Manager may enter into contracts to sell is based on an immediate 10% reduction in the yield of surface storages due to climate change. This is a conservative assumption, as explained in the SEQ Water Strategy. For comparison, the SEQ Water Strategy states that the LOS system yield of existing infrastructure is 485,000 megalitres per annum (ML/a), compared to a maximum of 450,000 ML/a in the current version of the SOP.

3.0 Method

The Water Grid is a complex system of supplies and interconnections that can be operated in a range of different ways at a regional, subregional and demand zone scale. This system must be operated to achieve a range of often conflicting objectives with varying degrees of regulation and prescription.

This section describes the method by which the Operating Strategy is developed, as summarised in Figure 1. It explains:

- inputs to the Operating Strategy
- the process and systems through which this information is synthesised and a preferred
 Operating Strategy developed
- outputs of the Operating Strategy.

The inputs and process reflect the following key variables:

- demand being the amount of water supplied to Grid Customers at bulk supply nodes
- capacity being potential system and asset throughput measured on an instantaneous or average basis
- security being the availability of water to meet demand over the short to medium-term
- cost being the whole of life costs of operating and augmenting the Water Grid to meet demand over the short to medium-term
- quality measured as compliance with contractual requirements and the ADWG and consistency with community expectations on aesthetic issues of taste, colour and odour
- reliability being system and asset frequency and duration of failure.

A number of other factors are also taken into account as appropriate, ranging from weather forecasts and energy consumption to staff impacts and organisational knowledge.

These factors are considered across the Water Grid, as well as for subregions and demand zones. These subregions and demand zones are illustrated in Figure 2.

The decision making process is robust, contemporary and open to continuous improvement. At present, decision making is supported by a number of separate models, resulting in a linear process with a high degree of manual intervention. Over time, as additional information becomes available, decision making process will become increasingly complex. The Water Grid Manager is progressively developing optimisation models to accommodate this increased complexity, by integrating these existing models and providing for a more iterative optimisation process.

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Figure 1: Operating Strategy inputs and decision making process.

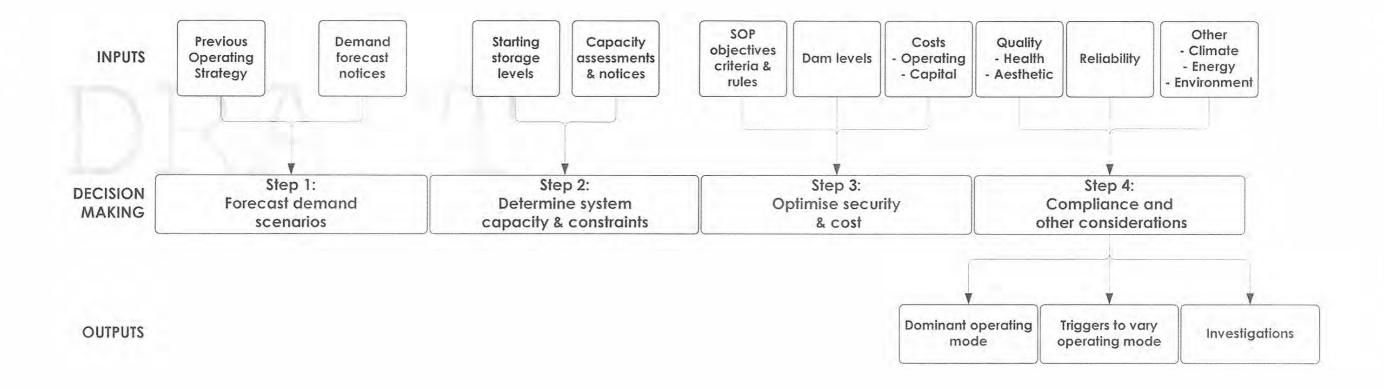
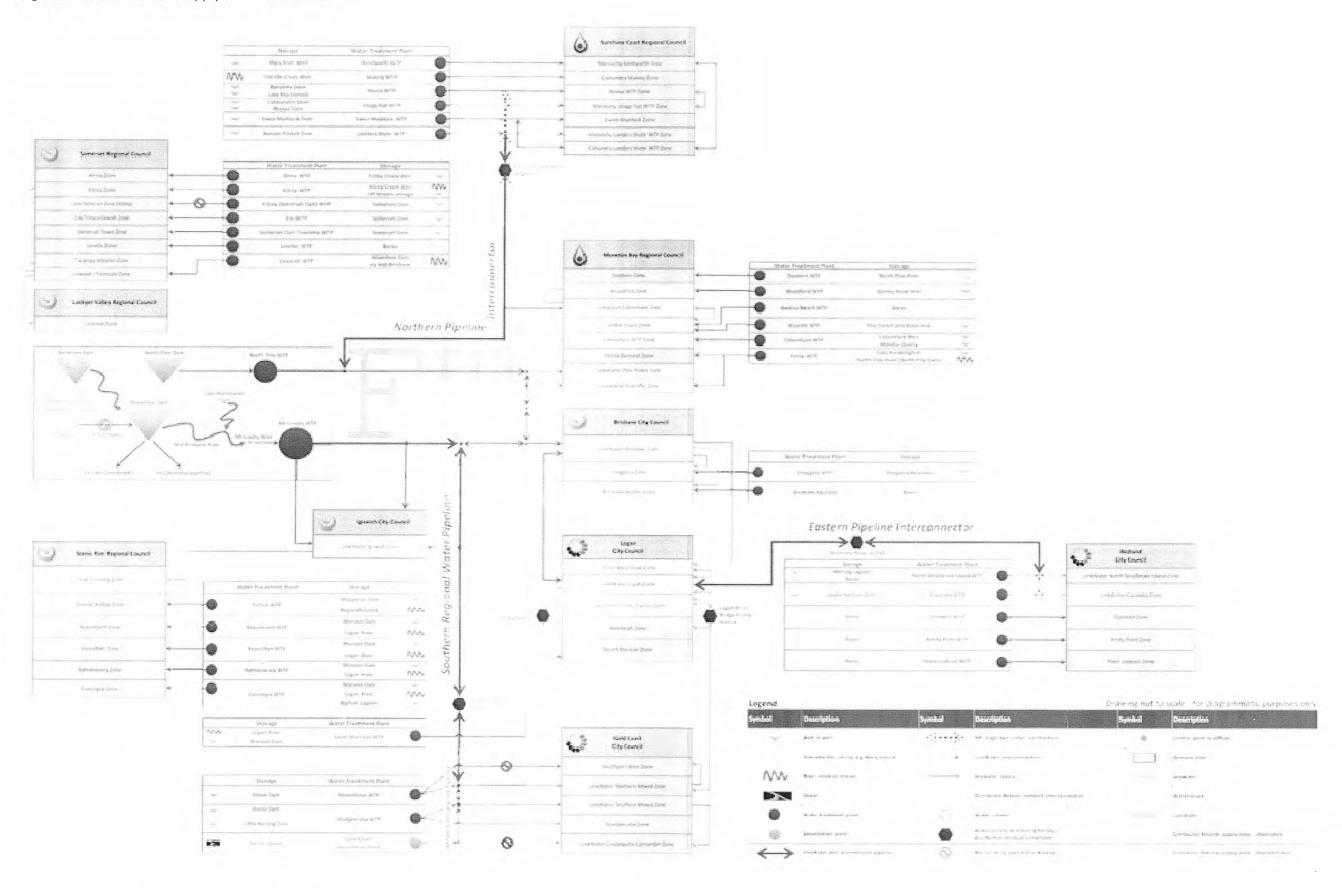


Figure 2: SEQ Water Grid supply zones and assets.



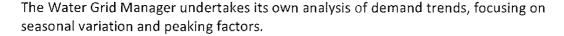
3.1 Inputs

The Operating Strategy is developed based on the following information. Additional information may be requested from Grid Service Providers as appropriate.

Demand forecasts

The Water Grid Manager receives demand forecasts from Grid Customers. Under the Market Rules, Grid Participants are required to submit:

- rolling 12 month demand forecasts by supply zone each month as part of the Grid Instruction process
- three year demand forecasts, mostly by council area, every year by 31 May under the Grid Contract Document.



Capacity

Each year, as required by the Market Rules, the Water Grid Manager undertakes a detailed assessment of asset capacity, based on advice from Grid Service Providers about asset capacity. This assessment informs the *Annual Market Rules Review*, highlighting potential capacity constraints over the short to medium-term.

Each month, the Water Grid Manager receives advice from Grid Service Providers about available capacity on a short-term basis, as part of the Grid Instruction process (Capacity Forecast Notices). This advice focuses on short-term constraints that modify the commissioned capacity of assets, and may impact upon the capacity of the system as a whole. These constraints include:

- operating rules under the SOP and resource constraints such as water entitlements, including limits on transfers between subregions or extractions from particular water sources
- restricted supply due to water quality issues, such as due to algal blooms in a dam or waterway
- maintenance or refurbishment of key infrastructure components
- timeframes for recommissioning of assets or of full asset capacity, due to demobilisation.

In addition, the Operating Strategy takes into account committed system augmentations, based on the timeframes stated in the monthly project progress reports published by the QWC or as otherwise advised by Grid Participants.

Security

One of the largest drivers to water security at any given time is the available volume of supply. Given the large component of the supply that is made up from surface water storages, the amount of water stored in Seqwater's dams is a key input into the Security assessments. Dam storage levels are publicly reported by Seqwater on a daily basis.

Cost

We primarily rely upon cost estimates that have been provided by Grid Service Providers specifically for this purpose. The estimates that have been provided to date are of unit costs for each water treatment plant and major interconnecting pipelines.

Increasingly, the Operating Strategy will be informed by detailed analysis of the costs of operating specific assets under different operating modes. This analysis will include consideration of future capital costs, which the Operating Strategy may influence the timing of. It may also include demobilisation costs, depending upon the operating options being considered.

The Operating Strategy will not impact upon return on and of capital within a regulatory period. However, it may avoid the need for capital expenditure and thereby defer or avoid future increases to the return on or of capital.

Quality

The Operating Strategy is informed by detailed water quality management plans.

For individual assets, the Water Grid Manager relies on the entity that owns the asset delivering water to comply with contractual requirements, which are based on the ADWG. By July 2011, entities must have in place approved drinking water quality management plans.

For the system as a whole, the Operating Strategy is informed by, and complements, the *SEQ Water Grid Quality Management Plan*. Water quality issues are also addressed on a case by case basis in consultation with Grid Service Providers.

Reliability

The Water Grid Manager has commenced a detailed assessment of system reliability across the Water Grid. The assessment will identify critical failure modes and the risks of these failures occurring due to natural and man-made causes. It will identify potential water security impacts by supply zone, as an input to Operating Strategies and capital programs. The investigation will draw on the SEQ Water Grid Performance Standard, Strategic Asset Management Plans and Operating Protocols.

Future versions of the Operating Strategy are expected to specify reliability targets for the Water Grid and key assets within it, based on the reliability assessment and the requirements outlined in any Customer Code.

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In the meantime, system reliability issues are being addressed on a case by case basis in consultation with Grid Service Providers.

Other considerations

A range of other issues can inform the preparation of the Operating Strategy, from climate forecasts and energy consumption to industrial relations and workforce planning. Information about these considerations is sought on a case by case basis as appropriate.

3.2 Decision making process

The Operating Strategy is developed through a four step process, as summarised below.

Step 1: Forecast demand

The first step involves the preparation of demand scenarios, based on the forecast notices provided by Grid Customers and other considerations. Multiple scenarios are prepared, including likely low and high series forecasts. The scenarios:

- are prepared for a five year period, with a focus on the first year
- are prepared for each demand zone, with summaries for each subregion and for the Water Grid as a whole
- take into account seasonal variation and peak periods, in order to ensure that sufficient capacity is available at all times
- take into account potential drought rebound scenarios
- allow for planned developments.

The five year period reflects the need to assess compliance with the risk criteria which apply out to a 5 year period.

Step 2: Determine system capacity and availability

The second step is to determine system capacity over the forecast period, based on current storage levels, the capacity assessment and notices and the timing of committed augmentations.

System capacity is influenced by previous Operating Strategies. For example, a decision to demobilise a small or aged supply will result in that facility not being immediately available.

Step 3: Optimise security and cost

First and foremost, the SOP seeks to always maintain water security. It achieves this through the specification of LOS objectives, risk criteria and operating rules, as outlined in Section 2.2. The SOP also requires that the most cost-efficient option be taken at any point in time in order to achieve this security.

These requirements are addressed as part of the third step, with the identification of proposed operating modes at the regional, subregional and demand zone level.

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Water security

Water security is a function of:

- forecast demand
- stored water
- available treatment and transfer capacity, including climate resilient sources
- proposed operating philosophy
- planned augmentations.

From current storage levels, the critical risk criteria in the SOP is that all reasonable actions be taken to maintain the probability of key Water Grid storages reaching 40% of combined capacity at less than 5%.

While the probability is less than 5%, all options to reduce the costs of operating the Water Grid will need to be investigated, and implemented where appropriate. These options include:

- selling water to irrigators or adjoining areas on an interruptible basis
- reducing production from the generally more expensive small and aged supplies
- reducing production from more expensive climate resilient supplies
- altering the rate of transfer through major interconnections should they require relatively high energy intensive activities
- reducing the capacity required from Grid assets, in order to defer capital expenditure or to address water quality or reliability issues.

Some changes related to smaller sources in areas not connected to the wider supply system may not be able to be tested completely using the SEQ Regional Water Balance Model. However, the implication of increasing demand on larger regional supplies can be tested by assessing the change in the risk of those storages reaching low levels.

Preferred operating framework and operating modes

We identify a preferred operating framework across the Water Grid and preferred operating mode for each demand zone, having regard to:

- short-term demand across the Water Grid and for each supply zone, including seasonal and peak demand (Step 1)
- asset capacity and availability (Step 2)
- variable operating costs, over the short to medium-term
- options to reduce or defer capacity costs, including by demobilising small and aged assets
- compliance with water resource plan requirements
- additional revenue
- potential water quality implications of the various supply options.

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Options are assessed as a portfolio and on a whole of life basis, taking into account the costs and timeframes to bring capacity online as dam levels decline. Capital deferral options will be a key driver, due to the magnitude of potential savings.

Sub-regional impacts are considered to ensure that regional security levels are achieved without placing a higher than desirable stress on a single subregion supply source. This subregional assessment will be used to formulate operating rules and triggers consistent with efficient and cost effective operation.

Triggers to vary operating modes

Within the connected Water Grid we can specify triggers to change the operating approach of key facilities. Variations may be required for a number of reasons, including:

- major changes to storage levels
- operating rules, such as for the Northern Pipeline Interconnector
- water quality issues, including for taste and odour
- reduce the likelihood of reaching levels outlined in the risk criteria.

SEQ Regional Water Balance Model

The SEQ Regional Water Balance Model is used to assess the security impacts of alternative operating portfolios.

This model uses stochastic data to generate longer time sequences of hydrologic data that have similar statistical characteristics to that of the historical record – providing better information about climate variability and the potential for droughts worse than have occurred on record.

For assessing compliance with LOS objectives, a long-term stochastic data sequence of 100,000 years is used. For assessing compliance with risk criteria, a series of 10,000 short-term climatic possibilities is used. The data sets have consistency in that both have the same statistical characteristics.

Long-term data sequences are used in order to predict the recurrence interval of an event on an annual basis, whereas short-term series data provides an ability to determine near future event probability. The long-term data set therefore defines specific event likelihood regardless of current conditions, and the short-term series the risk of occurrence based on specific current conditions. The outcomes are determined by hydrological and hydraulic mathematical simulation.

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Step 4: Compliance and other considerations

The Water Grid provides the opportunity to manage water quality and asset reliability risks across the system as a whole. These opportunities are considered as part of Step 4, once a proposed operating mode has been identified based on optimising for water security and cost considerations alone (given demand scenarios and capacity and availability). A range of other issues may also be considered on a case by case basis, such as impacts on energy consumption.

These considerations may result in:

- changes to the dominant operating mode (that is, redoing Step 3)
- · additional or alternative triggers to vary the operating mode
- initiating detailed investigations.

In some cases, these changes will increase the cost of operating the Water Grid. Where this occurs, we consider that the benefit of the change exceeds the cost.

Water quality

There are two broad elements to water quality, being health related issues and aesthetic issues. These elements must be considered for:

- bulk supply points, where water is supplied to SEQ Distributor-Retailers
- the customers tap, following distribution by the SEQ Distributor-Retailers.

Health related issues are treated as an absolute constraint on the system. That is, if a particular operational response needs to be taken to ensure water delivered to customers will be 100% health compliant, then those operational responses are undertaken regardless of cost. The Operating Strategy can manage health related issues by:

- not using particular water sources until capital or process improvements are undertaken
- maintaining minimum flows in major pipelines.

Aesthetic water quality issues are treated on a case by case basis, taking into account previous supplies, existing community expectations and the ADWG values. This is achieved by balancing between the costs of production and transport and the benefits associated with alternative mitigating responses.

For aesthetic parameters, consistent with the SEQ Water Grid Quality Management Plan, the Operating Strategy seeks to ensure that water quality in any demand zone is no worse than what was delivered to the customers prior to the Water Grid being established. In many areas, quality has improved.

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Reliability

Sufficient capacity must be available within the Water Grid to meet demand in the event that key assets failed. With the context of the Water Grid, the main issue of interest is the likelihood of an asset failing to an extent that demand cannot be met. Scenarios include:

- Unforeseen failures, such as a transformer explosion at a water treatment plant or a switchboard fire at a distribution pump station. Depending on circumstances such a failure might be equivalent to two days of water production.
- Foreseen partial failures, such as when temporary changes in raw water conditions reduce production rates. High dirt loads in the raw water supply associated with heavy rainfall events commonly has this impact.
- Bulk network failures, such as those associated with local power outages and mains bursts.

At this time, impacts on system reliability are being assessed on a case by case basis in consultation with Grid Service Providers.

Future versions of the Operating Strategy are expected to specify reliability targets for the Water Grid and key assets within it, based on the SEQ Water Grid Capacity Assessment and the requirements outlined in any Customer Code.

In addition, as information becomes available, options may be considered in relation to the ability of the Water Grid to continue to supply water to customers as required over shorter timeframes, such as hours and days. Specifically, the assessment would determine whether available supply storage in the network is sufficient for the time taken to implement the contingency option.

Other considerations

A range of other considerations may also be taken into account as part of the Operating Strategy. These issues include:

- opportunities to reduce total energy consumption or energy consumption during peak periods
- impacts on staff, including as a result of demobilising assets
- maintaining operational expertise within each organisation.

These types of considerations may influence the preferred operating mode, or when it is implemented. For example, we may choose to continue to use a water treatment plant until staff can be transferred to a new plant that is being constructed nearby.

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3.3 Outputs

The key outputs of this process are:

- specification of dominant operating modes across the Water Grid and for each demand zone (Attachment 3)
- specification of key infrastructure requirements by Grid Service Provider (Attachments 4, 5 and 6)
- a program of work to fully optimise the operation of the Water Grid (Section 6).

In addition, the Operating Strategy provides:

- a summary of detailed assumptions (Sections 4 and 5)
- evidence that it complies with the SOP requirements (Section 7).

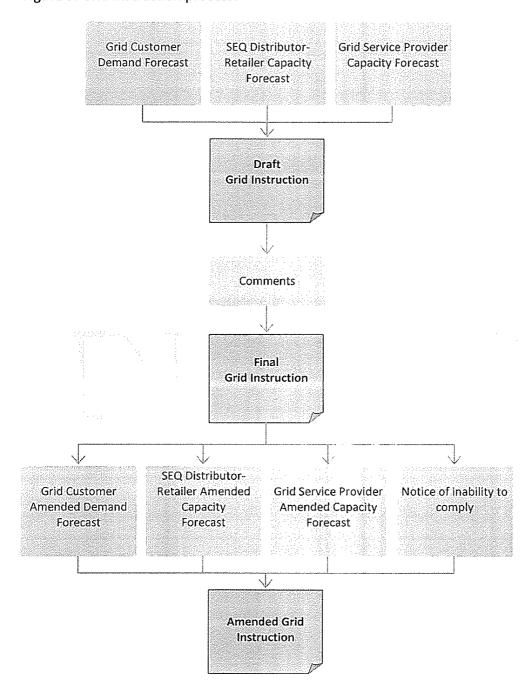
The Operating Strategy will be refined over time in partnership with the Grid Service Providers to collectively achieve best practice operation of the Water Grid, and to be compliant with SOP requirements. Strategic operational requirements will be developed through a staged approach, selecting priority areas and utilising a sound project management delivery framework.

3.4 Grid Instruction process

The monthly Grid Instruction process applies the Operating Strategy based on forecast demand and capacity for that month, including coordination of maintenance and construction activities. The existing Grid Instruction process is illustrated in Figure 3, based on the requirements in the Market Rules.

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Figure 3: Grid Instruction process.



4.0 Operating assessment

Water supply to South East Queensland is now secure, due to key Water Grid storages being full, completion of the key Water Grid projects and continued low levels of water consumption. Looking forward, there is a high probability of above average rainfall over the coming summer, with associated dam inflows and reduced need for outdoor water.

This situation provides the opportunity to ensure the Water Grid is operated in a cost effective manner, while maintaining water quality and long-term water security.

Climate outlook

There is a high probability of above median rainfall in South East Queensland for spring and summer, based on advice from the Queensland Climate Change Centre of Excellence on 1 September 2010. This advice is based on the current and projected state of the El Niño-Southern Oscillation (ENSO) phenomenon, and on factors which modulate the impact of ENSO on Queensland rainfall, such as the Pacific Decadal Oscillation.

A La Niña climate pattern is now well developed in the Pacific and is likely to persist through spring and summer:

The Southern Oscillation Index (SOI) remains quite positive when averaged over the last month (August: +17.0), two months (July and August: +17.9), and three months (June to August: +12.3). The three month value is the highest since that of November 2008 to January 2009, during the peak of the previous La Niña event.

Observed sea surface temperatures in key regions are now much cooler than normal – typical of an established La Niña pattern.

The sea surface temperature gradient (west to east) across the South Pacific Convergence Zone between eastern Australia and the Central Pacific remains quite positive, which the Centre considers to be favourable for rainfall in Queensland.

The recent sea-surface temperature pattern in the North Pacific remains consistent with a 'Cool Phase' of the Pacific Decadal Oscillation (PDO). The PDO modulates the impact of ENSO on Queensland rainfall, particularly under La Niña conditions. A cool phase of the PDO coupled with La Niña conditions is particularly favourable for rainfall in Queensland.

ENSO influences other climate variables apart from rainfall, including temperature, pan evaporation and vapour pressure. This means that the impact of ENSO on water storage and use can be stronger than on rainfall alone.

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4.1 Demand scenarios (Step 1)

This section presents the demand scenarios used for this version of the Operating Strategy, which have been developed having regard to recent trends and the assumptions and measures outlined in the SEQ Water Strategy.

SEQ Water Strategy planning assumptions

The SEQ Water Strategy sets a planning assumption of regional urban consumption of an average of 375 litres per person per day (I/p/day), including an allowance of up to 230 I/p/day for residential use. It explains that this is a conservative assumption for the purposes of long-term water supply planning, taking into account the timeframes for delivering bulk water supply infrastructure and the level of uncertainty regarding such factors as the extent of permanent behavioural changes and the potential impacts of climate change. The SEQ Water Strategy assumes that demand will rebound to this level by 2018.

The SEQ Water Strategy also challenges residents to use less, voluntarily maintaining a regional average residential consumption below 200 l/p/day. It explains that, by maintaining consumption below this level, the need for new supplies could be deferred by at least five years.

Residential trends and scenarios

In South East Queensland, the most recent unrestricted consumption occurred prior to May 2005. Average total urban consumption at that time varied between local government areas, from 300 to 500 l/p/day with an average of 450 l/p/day. On average, residents of South East Queensland with reticulated drinking water supplies consumed approximately 300 l/p/day.

Compared to pre-drought trends, both total consumption and seasonal variability have reduced, as illustrated in Figure 4. Reductions have been achieved in both residential and non-residential consumption, driven by a combination of structural and behavioural measures.

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| Average losses (L/p/d) | Average non residential volume (L/p/d) |
| Average residential volume (L/p/d) |
| Average residential volume (L/p/d) |
| Average residential volume (L/p/d) |
| 100

Figure 4: Average urban demand by sector.

Source: SEQ Water Strategy (2010)

Apr-01 Jul-01 Oct-01

In the central South East Queensland and Gold Coast region, average residential consumption reduced to below 150 l/p/day from early 2007 to late 2009, as illustrated in Figure 5.

Jan-05 Apr-05 Jul-05 Oct-05 Apr-06

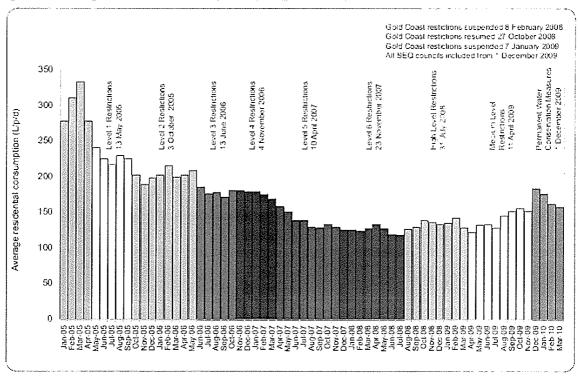


Figure 5: Average residential consumption for areas under QWC restrictions since 2005.

Jul-04

Source: SEQ Water Strategy (2010)

The Water Grid Manager believes that the scale of the drought rebound will primarily be determined by the extent to which residents return to using potable water supplies for outdoor irrigation, and that the timing of this rebound will primarily be determined by rainfall and, to a lesser extent, increasing water prices. Higher rainfall will both reduce the need for outdoor irrigation and replenish the many rainwater tanks that have been installed

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since 2005, dampening demand for water from the Water Grid for outdoor irrigation. We consider that this demand for Water Grid water for outdoor irrigation will be in addition to average internal water use of about 130 l/p/day.

In central South East Queensland, restrictions on outdoor irrigation were eased on 1 December 2009, when permanent water conservation measures were introduced across South East Queensland. Elsewhere, the Gold Coast had been exempted from restrictions and the Sunshine Coast and Redland areas had not previously been subject to QWC restrictions.

Since permanent water conservation measures were introduced, average residential consumption across South East Queensland has been about 160 l/p/day, including in areas that were not previously subject to QWC restrictions. This low consumption has occurred during a period of higher than average rainfall. As illustrated in Figure 6, average residential consumption:

- in central South East Queensland has remained constant at around 140 l/p/day since early 2009, with 10 l/p/day nominally being for outdoor irrigation (based on assumed average internal use of 130 l/p/day)
- on the Gold Coast has averaged about 195 l/p/day since early 2009, from which time it
 was exempted from Medium Level Restriction (averaging 65 l/p/day for outdoor
 irrigation, based on the same assumption). Seven day average demand has varied
 between 124 and 249 l/p/day. Both total consumption and variability provide an
 indication of the trends that may emerge in central South East Queensland over the
 short- to medium-term
- on the Sunshine Coast has averaged around 180 l/p/day since early 2010, having reduced from up to 310 l/p/day during dry weather in late 2009 (averaging 50 l/p/day of outdoor irrigation, with peaks of up to 180 l/p/day).

By comparison, the SEQ Water Strategy planning assumption of average regional residential use of 230 l/p/day represents an increase of 90 l/p/day over the drought consumption levels. This represents around two hours of outdoor water use per household per week, if indoor use remained at approximately the same level. Prior to the drought, residents of South East Queensland used on average more than 120 l/p/day for outdoor irrigation.

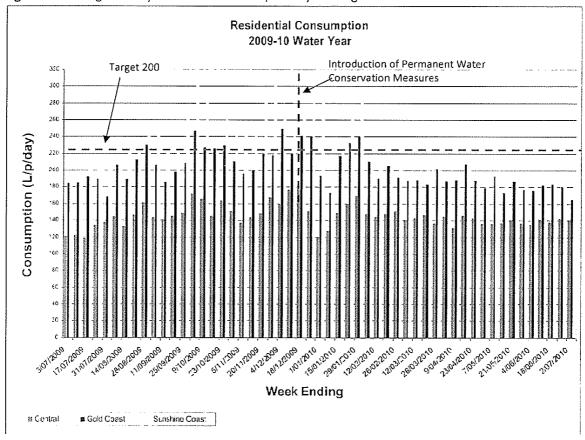


Figure 6: Average weekly residential consumption by sub-region.

While significant increases in outdoor irrigation may occur in future during dry periods, it is considered unlikely over the next 12 months given recent trends and demand forecasts. On this basis, this version of the Operating Strategy is based on a low and a high demand scenario.

The low demand scenario reflects a continuation of average consumption over the past six months, with provision for population growth based on the rate of growth in the demand forecasts provided by the QWC in the SEQ Regional Water Balance Model. Forecasts have been prepared by demand zone used in the SEQ Regional Water Balance Model, reflecting variations across the region. This scenario reflects the likely water usage scenario with continued higher than average rainfall. While it may be accurate over the next year, it is likely to underestimate demand over a five year timeframe.

The high demand scenario is based on the forecasts used for the base case in the SEQ Water Strategy. This forecast reflects an assumption that demand will grow from levels experienced in 2009 to a level consistent with a regional average consumption rate of 230 l/p/day by 2018. Population growth is based on medium series forecasts, which are also used in the SEQ Water Strategy base demand scenario. This scenario is considered a more appropriate basis for medium-term operational decisions, noting that actual demand will vary between areas, seasons and years, and pending more detailed analysis for future versions of the Operating Strategy.

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Actual demand will vary temporally as well as spatially, as illustrated by Figure 6 for the Gold Coast.

Demand rebound precedents

There are limited precedents against which to assess how much of the behavioural changes made during the Millennium Drought will be sustained in the future. As stated in the SEQ Water Strategy, the information available for recent droughts in Australia and overseas indicates that the rebound back to this level of consumption can be expected to occur gradually over a minimum of two years with maximum savings of 10 to 15%. However, we note that the extent and duration of demand reduction in South East Queensland exceeds that experienced in other major cities during severe drought.

Other demand assumptions

Non-residential trends

In 2009, 32% less water was used by the non-residential sector than in 2004–5, saving 76.6 ML/day. These savings have been achieved despite the total number of businesses increasing by 16.9%.

In 2009–10, total non-residential consumption was about 59,000 ML, equivalent to 161 ML or about 60 L/p/day. For this version of the Operating Strategy, non-residential demand:

- for the low demand scenario, has been assumed to continue at current rates with an allowance for population growth
- for the medium demand scenario, increasing from 67 L/p/day to a maximum of 92
 L/p/day as part of the SEQ Water Strategy forecasts.

System losses

System losses are currently about 70 ML/day. For this version of the Operating Strategy, losses:

- for the low demand scenario, has been assumed to remain relatively constant, with development generally offsetting the benefits of further pressure reduction and leakage management measures
- for the medium demand scenario, 30 I/p/day as part of the SEQ Water Strategy forecasts.

System losses include losses from authorised uses such as fire fighting and maintenance, as well as unauthorised uses such as theft and leakage. System losses have been reduced by about 60 ML/day since 2005.

Purified recycled water

The Water Grid Manager has contracts to supply up to 85 ML/day of purified recycled water to the Tarong Energy Corporation and CS Energy Limited. Actual demand over the next five years is likely to be significantly less:

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- Tarong Energy Corporation is expected to take 20 ML/day for use in the Tarong North Power Station
- CS Energy Limited has advised the Water Grid Manager of its intention to stage the closure of Swanbank B Power Station over the next two years. Its demand for purified recycled water will reduce from 14 ML/day in October 2010 down to 9 ML/day in May 2012.

The Water Grid Manager has not yet received demand forecast information for industrial or dual reticulation customers from the SEQ Distributor-Retailers. As a conservative measure up to 125 ML/day of available capacity is assumed to be available in the SEQ Regional Water Balance Model that can be taken up if needed. This is equal to the difference between the estimated available capacity of the Western Corridor Recycled Water Scheme and the power station demand forecasts. Actual industrial and dual reticulation demand is likely to be significantly less until at least mid 2011, at below 10 ML/day.

Options to supply purified recycled water to rural producers in the Lockyer Valley are being investigated, for possible inclusion in future versions of the Operating Strategy.

Rural production

The Operating Strategy assumes that rural producers use the full entitlements available to them. Actual rural use is likely to be less, due to under-utilised allocations and the absence of active trading markets at this time.

Opportunities to supply water to rural producers on an interruptible basis are being investigated, for possible inclusion in future versions of the Operating Strategy.

Supply to areas outside South East Queensland

The Water Grid Manager is contracted to supply up to 10,000 ML/annum to Toowoomba Regional Council. Actual take is likely to be significantly less than the contracted value, due to local storages now being at about 35% of capacity. This is due to the relatively high expense of pumping water from Wivenhoe Dam to their dams.

As a conservative measure, it has been assumed for the modelling that water will be taken at the contracted rate at all times when Toowoomba storages are at less than 100% of combined capacity. The model assumes that water is not taken at times when the Toowoomba storages are spilling. This assumption may be reviewed once demands are more certain.

Opportunities to supply water to other areas outside South East Queensland are being investigated, for possible inclusion in future versions of the Operating Strategy.

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Consolidated demand scenarios

Total forecast demand is illustrated in Figure 7, for South East Queensland as a whole.

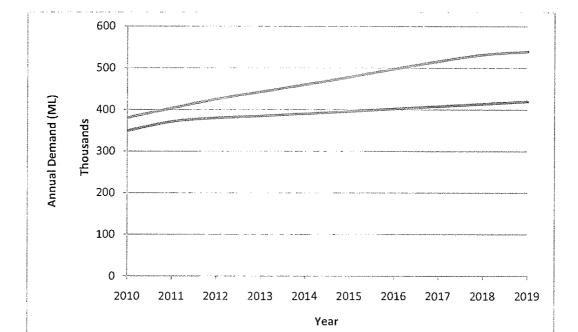


Figure 7: Consolidated demand scenarios.

When preparing these assumptions, we had regard to the forecasts and assumptions provided by Grid Customers. However, the forecasts differ. For comparison, Figures 8a, 8b and 8c illustrate our forecasts and those provided by the SEQ Distributor-Retailers on an annual basis. Just as we are refining our forecasts, we also expect the SEQ Distributor-Retailers to do so, as an input to economic regulation. In the meantime, and mindful that the entities only recently commenced operation, we note that:

■HIGH DEMAND LOW DEMAND

- The method used to prepare forecasts varies between and within entities. For example,
 Allconnex Water having provided forecasts from three separate models.
- Many of the underlying assumptions have not been stated, such as the assumed rate of population growth.
- Only one forecast has been provided for each area, which may not be appropriate for some purposes of the Operating Strategy. For example, Unitywater has provided three year forecasts based on average total consumption of 375 l/p/d. These forecasts are appropriate for identifying capacity constraints, but exceed likely demand over the short-term.

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Figure 8a: Comparison to forecasts provided by Unitywater.

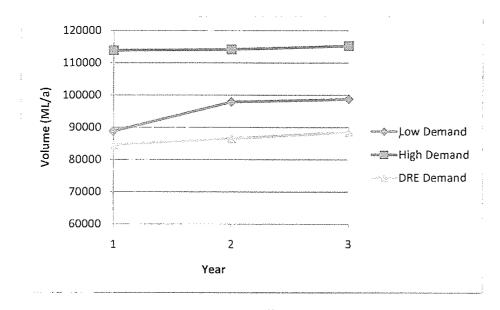
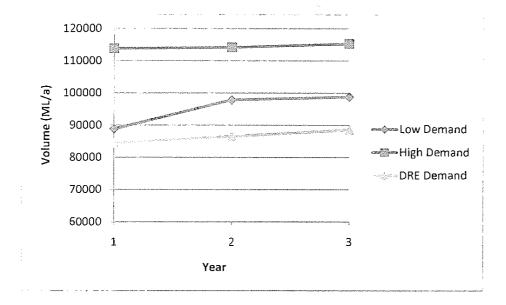


Figure 8b: Comparison to forecasts provided by Allconnex.



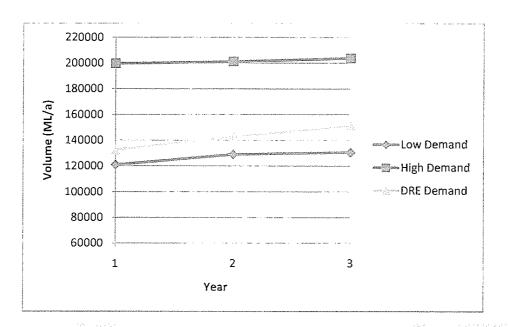


Figure 8c: Comparison to forecasts provided by Queensland Urban Utilities

For the assessment against the risk criteria specified in the SOP, both demand scenarios have been used, with details in the model files accompanying this submission.

For the assessment of the long-term LOS objectives, the demand forecast in the fifth year of the low demand scenario was used across the full duration of the simulation period. This resulted in a constant demand across the 117 years of the simulation, aside from monthly variation for the purpose of this long-term assessment. This approach is consistent with the way in which the long-term assessments were undertaken for the SEQ Water Strategy and SEQ Regional Water Security Program.

4.2 System capacity and constraints (Step 2)

The Operating Strategy was developed based on the following storage levels and infrastructure constraints.

Starting storage levels

Starting storage volumes in mid October 2010 are specified in **Table 2**. These volumes were used for the modelling and assessments supporting the development of this Operating Strategy.

The Grid Twelve storages are now 100% of combined storage capacity, following rainfall in late October 2010. As a result, security is slightly better than is represented in the assessments.

The Grid Twelve comprises approximately 90% of the total storage capacity of the Water Grid. It includes Wivenhoe, Somerset, North Pine, Hinze, Baroon Pocket, Leslie Harrison, Ewen Maddock, Cooloolabin, Lake Kurwongbah, Lake MacDonald, Little Nerang and Wappa dams. The Grid Three refers to the three largest dams, being Wivenhoe, Somerset and North Pine.

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Table 2: Starting storage levels as at 11 October 2010.

Storage	Storage capacity (ML)	Storage level in October 2010 (ML)	Storage level in October 2010 (%)
	1,165,200		
Wivenhoe Dam		1,165,200	100%
Somerset Dam	379,850	379,850	100%
North Pine Dam	215,000	214,302	99.7%
Lake Kurwongbah	15,480	15,480	100%
Enoggera Dam	4,500	4,500	100%
Lake Manchester	26,000	23,906	92%
Central subregion	1,760,050	1,759,352	99.9%
Baroon Pocket Dam	61,000	61,000	100%
Borumba Dam	46,000	46,000	100%
Lake MacDonald	8,000	., . 8,000	100%
Ewen Maddock Dam	16,700	16,700	100%
Cooloolabin Dam	14,200	14.200	99.4%
Wappa Dam	4,615	4,615	100%
Northern subregion	150515	150432	99.9%
Leslie Harrison Dam	24,800	24,800	100%
Eastern subregion	24,800	24,800	100%
Hinze Dam	161,073	155,419	96.5%
Little Nerang Dam	6,671	6,671	100%
Southern subregion	167,744	162,090	96.6
Maroon Dam	44,300	44,300	100%
Moogerah Dam	83,765	52,672	62.9%
Western subregion	128,065	96,972	75.7%
Grid 3	1,760,050	1,759,352	100%
Grid 12	2,072,589	2,044,193	100%
Total*	2,231,174	2,171,685	98.3%

Capacity and availability

The Operating Strategy has been developed based on the asset capacities provided by Grid Service Providers for the SEQ Water Grid Performance Standards, with amendment as required to be reflective of the current infrastructure. The capacity of the Water Grid, and of zones within it, is a function of the capacity and availability of individual assets. Capacity is measured by asset, based on one of the following metrics:

- extraction capacity (ML/day)
- treated water storage (ML)
- treatment production (ML/day)
- transfer capacity (ML/day).

Attachment 3 lists available operating modes by demand zone, based on this existing infrastructure. The preferred operating strategy for each sub-region is described in Section 5.5.

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Minimum flows must be maintained in major pipelines in order to preserve water quality, as stated in Table 3. A range of other asset specific constraints are reflected in the Operating Strategy. For example:

- the Woorim Water Treatment Plant should not be used until capital upgrades are undertaken
- until further optimisation is completed, the Banksia Beach Water Treatment Plant cannot routinely operate at capacity.

Upcoming maintenance activities will be addressed as part of monthly Grid Instructions.

Table 3: Minimum transfer volumes.

Pipeline	Minimum transfer volume (ML/d	ey)
Southern Regional Water Pipeline	Northerly flow	, 25
	Southerly flow	/ 20
Northern Pipeline Interconnnector	Southerly flow	, 20
Eastern Pipeline Interconnector	Easterly flow	w 4
	Westerly flow	w 4

The SEQ Regional Water Balance Model provided by the QWC reflects water resource planning constraints.

Committed infrastructure

Committed infrastructure projects will increase the available capacity within the timeframe of the Operating Strategy. Key commitments are:

- Hinze Dam upgrade (end 2010)
- Northern Pipeline Interconnector Stage 2, including installation of reverse flow capacity (end 2011)
- Wyaralong Dam (end 2011)
- Wyaralong Water Treatment Plant and associated pipelines (mid 2012, subject to review).

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5.0 Operating Strategy

5.1 Security

Key changes from the previous Operating Strategy

This version of the Operating Strategy builds on the (interim) Operating Strategy, which was submitted to the QWC in May 2010. The key change is that a higher trigger has been specified for the desalination facility to commence operation at full capacity.

The (interim) Operating Strategy complied with the risk criteria contained in the SOP, due in part to the high starting storage level. However, future versions would have needed to adopt a different approach, due to lower starting storage levels. In particular, the trigger for the desalination facility to commence operation at capacity would have needed to be increased. Figure 9 shows the storage level at which changes would have been required, in order to avoid breaching the risk criteria specified in the SOP. It shows that changes would have been required when key Water Grid storages fell to around 55% of combined capacity. This level would have increased in time with demand growth.

There was a very low probability of key Water Grid storages falling to a level that would have required change within the five year assessment period of the SOP, based on the (interim) Operating Strategy. This is illustrated in Figure 9, where the transition point is overlain with the probability of storages falling to specified levels.

This October 2010 version of the Operating Strategy has altered the trigger to pre-empt future changes.

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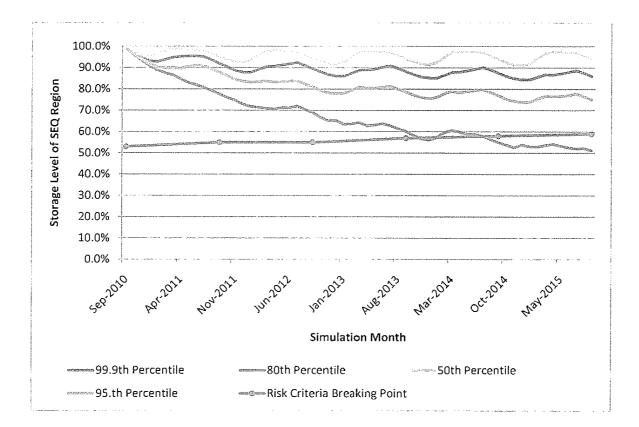


Figure 9: (Interim) Operating Strategy probability of exceeding risk criteria.

October 2010 Operating Strategy Summary

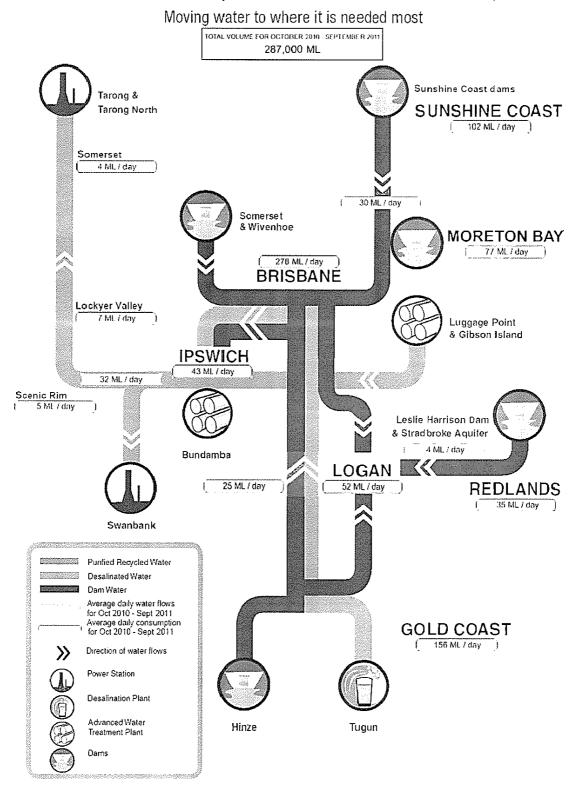
Figure 10 illustrates the overall operation of the Water Grid based on typical demand, including the amount of water treated and used within each subregion and the transfers between them. At this scale, the key elements of the Operating Strategy are:

- Transfer of approximately 30 ML/day from the Sunshine Coast to the Caboolture,
 Morayfield and Narangba areas via the Northern Pipeline Interconnector. Transfers will
 be reduced to the minimum flow requirements if Sunshine Coast dams are at a level
 equal to or less than 70% or are less full than Wivenhoe, Somerset and North Pine dams.
 In these circumstances, the Narangba reservoir complex will be supplied from the North
 Pine water treatment plant.
- Transfer of 25 to 30 ML/day from the Gold Coast to Brisbane and Logan via the Southern Regional Water Pipeline, to maintain minimum flow requirements and to supply a small volume to the area south of Greenbank. About another 20 ML/day will be transferred from the Gold Coast through the Logan network. The operating mode will be varied to manage water quality or asset reliability issues.
- Operation of the desalination plant at a minimum of one-third of capacity (approximately 44 ML/day). Production will be increased when needed to manage water quality or asset reliability issues elsewhere in the Water Grid.
- Operation of the Western Corridor Recycled Water Scheme to match demand and commissioning constraints (typically 35 ML/day).

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Figure 10: Key elements of the Operating Strategy.

SOUTH EAST QUEENSLAND WATER GRID



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The Operating Strategy within each subregion and for key demand zones is described later in this section. Attachment 3 outlines options for supplying each demand zone in the Water Grid and key issues to be considered in making Grid Instructions. The attachment states the current or preferred option for supplying each demand zone, as part of the overall Operating Strategy for the coming 12 months.

Based on this Operating Strategy, the maximum and minimum capacity required of key assets is summarised for each entity in Attachments 4, 5 and 6. These attachments are a key output from the Operating Strategy. The capacity requirements reflect current availability, based on information previously provided by Grid Service Providers. These requirements will be refined in future versions of the Operating Strategy, in consultation with the providers. In the meantime, the Water Grid Manager will work with the Grid Service Provider to assess the need for any proposed changes to available capacity.

In time, as more information becomes available, the attachments will also state reliability required of each asset and potentially also additional water quality specifications to those contained in the SEQ Water Grid Quality Management Plan.

Trigger to re-mobilise assets

The Operating Strategy reflects that, from current storage levels, the critical risk criteria in the SOP is that all reasonable actions be taken to maintain the probability of key Water Grid storages reaching 40% of combined capacity at less than 5%. From that point, water needs to be managed across the region in a way that minimises the risk of dams falling to 40% of capacity. This would be achieved by modifying the system operation prior to reaching 40% of capacity, such as by:

- maximising production from the Desalination Plant and other climate resilient sources, such as the North Stradbroke Island borefield
- transferring water from parts of the region where storages are highest to parts where they are least (just as occurred during the recent drought)
- increasing the take of water from dams that are most likely to receive inflows, within water resource planning limits.

In addition, this version of the Operating Strategy specifies that, based on stochastic modelling of draw down probabilities and assessment of appropriate early response trigger levels:

- the Desalination Plant will be operated at capacity from when key Water Grid storages fall to 60% of capacity
- local water treatment plants that are not required over the next five years will be remobilised when key Water Grid storages fall to 45% of capacity.

The probability of re-mobilising the local water treatment plants, and incurring associated capital costs, will be minimised by commencing supply from the Desalination Plant when key Water Grid storages are at a slightly higher level than would otherwise be required (refer Figure 9 above). Preliminary analysis indicates that this arrangement reduces the probability

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weighted cost of the overall portfolio. In effect, the early operation of the Desalination Plant is an insurance policy, incurring realised operational expenditure as a means of avoiding potential capital expenditure. More specifically, we consider that:

- the increase in the probability weighted cost of operating the Desalination Plant at capacity (both earlier and for longer) is less than
- the reduction in the probability weighted costs of recommissioning the local facilities (including both the probability that recommissioning can be avoided through inflows and ongoing return of and on capital, once expended).

The trigger to recommence supply from the Desalination Plant may be further increased, should significant other water treatment plants be de-mobilised. Alternatively, it may be reduced should there be a decision to de-mobilise the plant.

Security assessment

Figure 11 forecasts the combined level of key Water Grid storages, based on this Operating Strategy, the high demand scenario and various levels of inflows. It illustrates that, based on the Operating Strategy and the high demand forecast, there is:

- approximately 80% probability that storages will remain above 80% of capacity over the next five years
- about 1 to 2% probability of storages falling to 60% of capacity within the next five years, triggering the operation of the Desalination Plant at full capacity at all times
- less than 0.1% probability of storages falling to 40 % of capacity within the next five years, triggering the use of purified recycled water to augment Wivenhoe Dam and the reintroduction of Medium Level Restrictions.

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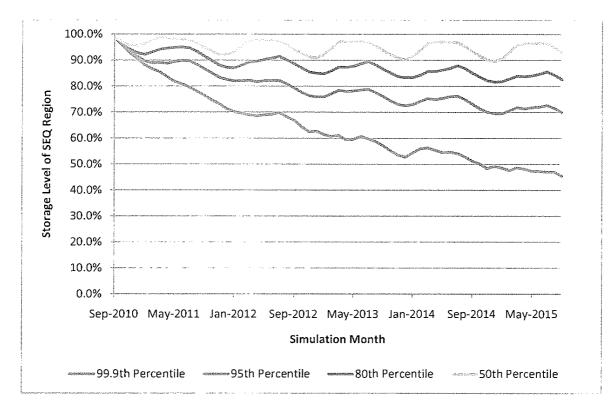


Figure 11: Forecast dam levels (high demand scenario).

In addition to the information provided above that relates to regional storage volumes, information is presented below related to the key subregional storages across South East Queensland. Based on this Operating Strategy proposed and the high demand scenario the following graphs and probability statistics relate to the northern, eastern and southern subregions:

- for northern South East Queensland Baroon Pocket Dam is full, with the probability of it remaining above 70% of capacity in the next five years greater than 80%
- for eastern South East Queensland Leslie Harrison Dam is full, with the probability of it remaining above 80% of capacity in the next five years greater than 80%
- for southern South East Queensland Hinze and Little Nerang dams are full with the probability of them remaining above 70% of capacity in the next 5 years greater than 80%.

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Figure 12: Forecast levels of Baroon Pocket Dam (high demand scenario).

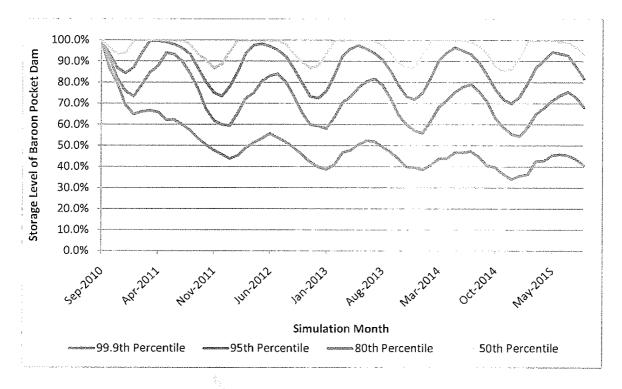
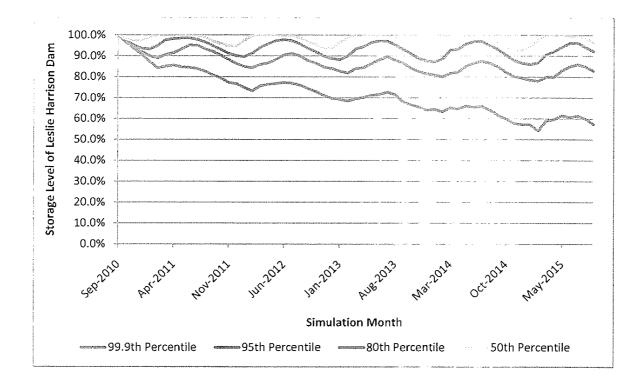


Figure 13: Forecast levels of Leslie Harrison Dam (high demand scenario)



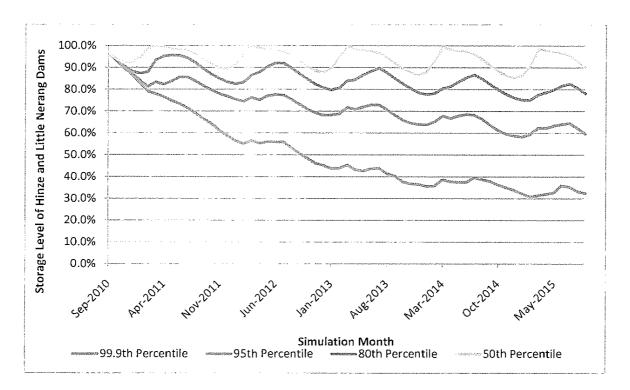


Figure 14: Forecast levels of Hinze and Little Nerang dams (high demand scenario).

5.2 Cost

Short-run variable costs

Based on the Operating Strategy, the short run variable costs of operating Water Grid over the next year is estimated at about between \$4 million and \$5 million per month, depending upon demand. This estimate includes energy and chemicals for water treatment plants, as listed in Table 4. They do not include staffing or administrative costs, or the return on and of capital. These estimates are expected to be refined as an input to economic regulation by the Queensland Competition Authority, including by determining whether costs vary at different levels of production.

Table 4: Short-run variable operating costs of existing water treatment plants (2010–11).

Source	Short-run variable operating cost (\$/ML)
Landers Shute WTP	\$61.74
Noosa WTP	\$112.75
Molendinar WTP	\$72.20
Mudgeeraba WTP	\$88.78
North Pine WTP	\$121.21
Mt Crosby Eastbank & Westbank WTPs	\$95.40
Smaller plants	\$178.24
Source: Based on 2010-2011 Ministerial determination for	the purchase of services by the WGM.

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In this version of the Operating Strategy, short-run variable operating costs have been optimised by:

- Minimising production from climate resilient sources. For example, production from the
 Desalination Plant will generally be maintained at one-third capacity, when available.
 This represents a saving of about \$1,500,000 per month, compared to operation at
 capacity (based on a variable cost of \$643/ML).
- Minimising transfers between subregions, subject to minimum flow requirements. For example, transfers through the Southern Regional Water Pipeline will generally be maintained at about 25 ML/day, when the Desalination Plant is operating. This represents a saving of about \$120,000 per month, compared to operation at capacity (based on a variable cost of \$55/ML).
- Minimising production at relatively expensive water treatment plants, subject to
 operational constraints. For example, water will be supplied to the Morayfield and
 Caboolture areas via the Northern Pipeline Interconnector from the Landers Shute Water
 Treatment Plant (\$50/ML) in preference to operating the Caboolture Water Treatment
 Plant (\$135/ML). This represents a saving of up to \$20,000 per month.

Other costs

Short-run variable costs represent a relatively small proportion of the overall costs of the Water Grid, as illustrated in Figure 15. More significant savings can be achieved by reducing or avoiding fixed operating costs (30 % of total costs) and capital costs (62%).

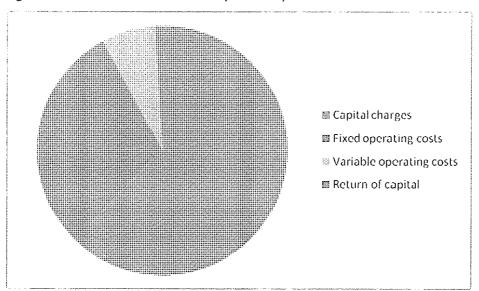


Figure 15: Costs of the Water Grid (2010–11).

In particular, given the current level of water security, we will use the Operating Strategy to avoid and defer capital expenditure whenever possible. This version of the Operating Strategy avoids fixed operating and capital costs by specifying that some water treatment plants are not required over the next five years, enabling them to be placed in standby mode or demobilised. It specifies that, at least over the next five years, the:

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- Woorim Water Treatment Plant is not required, avoiding the need for extensive capital expenditure
- Maleny Water Treatment Plant is not required once the pipeline from the Landers Shute Water Treatment Plant is commissioned, avoiding fixed operating costs and the need for extensive capital upgrades
- Brisbane Aquifer Project is not required, subject to operational requirements, avoiding fixed operating costs and asset renewals costs.

To compensate, supply will be increased from larger, more efficient water treatment plants. For example, the Mt Crosby Water Treatment Plant can supply water to Brisbane at about 18% of the short run variable cost of the Brisbane Aquifer Project, and without any additional staff or maintenance costs.

We are investigating the future operational and operating costs of other smaller and aged water treatment plants to understand the implications of closure and availability of alternate sources (refer Section 6). These investigations will be undertaken in partnership with the relevant Grid Service Providers. Once investigated, they will be assessed as a portfolio, taking into account option value. The portfolio will include a combination of:

- base supplies
- peaking supplies, which will ensure that sufficient capacity is available during peak demand periods and when large base supplies are unavailable due to maintenance or asset failure
- standby supplies, which can be re-mobilised within a short period
- demobilised or demolished supplies, which will be re-mobilised at predetermined triggers and usually involving capital expenditure.

Base supplies will include:

- large water treatment plants taking water from large storages, including Landers Shute,
 North Pine, Mt Crosby and Molendinar
- water treatment plants that supply areas that are not connected to the Water Grid, such as at Esk and Dayboro. Because they are not connected, these supplies must also have the capacity to meet peak demands, and must be reliable.

Given current and forecasts demands, these facilities will generally be operated below capacity, meaning that they may also provide peaking capacity. This increases the scope for small and aged water treatment plants to be used as standby supplies or demobilised, subject to other considerations.

5.3 Water quality

The Operating Strategy has been developed in parallel with the forthcoming version of the SEQ Water Grid Quality Management Plan, which includes the SEQ Water Grid Water Quality Monitoring Plan (Grid Monitoring Plan) for the first time. The Grid Monitoring Plan identifies approximately 60 Key Interface Points that have been selected to describe the

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quality of water being supplied from the Water Grid. It is anticipated that future editions of the Grid Monitoring Plan will specify a minimum verification monitoring program for each of these points, with verification testing to be undertaken by the relevant entity as part of routine monitoring. In doing so, it will provide a practical and cost efficient mechanism for the routine and periodic reporting of water quality to inform whole-of-Grid decision making. The draft Key Interface Points are shown in Attachment 2.

Future versions of the SEQ Water Grid Quality Management Plan will also include:

- A Grid Risk Assessment, which will summarise water quality risks by asset and evaluate risks associated with each available operating mode within a supply zone.
- A Grid Improvement Plan, which will provide a prioritised list of actions to improve water quality across the Water Grid. The risk assessment will focus on acute health risks over chronic health and aesthetic risks. The improvement plant may constrain the Operating Strategy, such as through an action to not operate an aged water treatment plant until capital improvements are undertaken.

For the coming summer period, the main risks to supply from the Water Grid are associated with water quality. The warmer weather and the increased likelihood of high rainfall events can increase a range of risks to water quality, from increased rates of chlorine decay to increased pressure on filtration processes from increased turbidity or algal content. The Operating Strategy has been prepared taking account of these risks, based on the forthcoming version of the SEQ Water Grid Quality Management Plan and the draft Grid Participant risk assessments. More specifically, the summer risk assessment highlighted the following potential events:

- taste and odour events caused by blooms of algae, cyanobacteria and actinomycetes
- total dissolved solids/electrical conductivity events
- manganese events
- decreased disinfection residual through biological and chemical decay in the warmer months, exacerbated by low usage during wet weather events.

Operational responses are being updated and developed to respond to these risks. For example, triggers to commence blending water from the Mt Crosby water treatment plant with water transferred up from the Gold Coast are being defined. These triggers are being set in consultation with relevant SEQ Distributor-Retailers, taking into account the levels at which customers have typically complained about the taste and odour of water.

Disinfection by-product risks

The Grid Monitoring Plan will also specify target minimum and maximum disinfectant residual concentrations for each key interface point and each mode of operation. These levels are to be set in consultation with water quality officers, and are intended to initially reflect how the Water Grid currently operates. Over time, water quality values will be set for other water quality parameters in a similar fashion.

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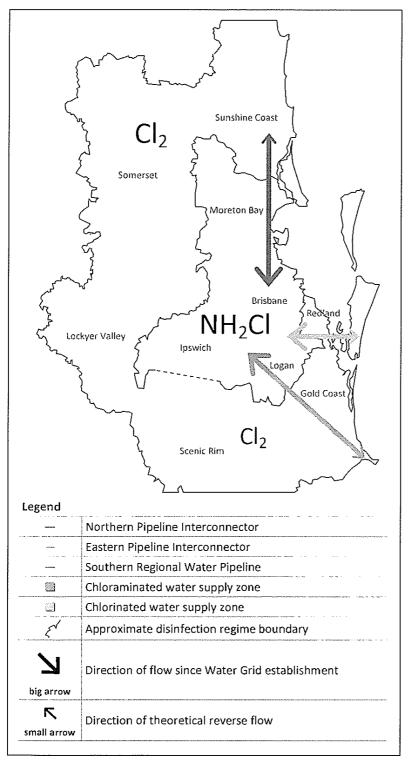
While maintaining the specified levels of disinfection residual, we are mindful of operating the Water Grid so as to minimise the generation of disinfection by-products. The Operating Strategy was developed considering the potential risk from breakpoint chlorination contributing to disinfection by-products formation. For example, by generally operating:

- the Southern Regional Water Pipeline in a northerly direction
- the Eastern Pipeline Interconnector in a westerly direction.

Figure 16 illustrates the disinfection process used in parts of the Water Grid, showing current and theoretical flow directions of major pipelines, where bulk water must be converted from one disinfection method to another. As a priority, investigations are being undertaken into the preferred disinfection process and specific issues, such as chlorate generation.

Beyond these requirements, due to water quality risks the Operating Strategy states that water will not be required from the Woorim Water Treatment Plant until capital upgrades are undertaken.

Figure 16: Disinfection processes.



Other chronic health and aesthetic risks

The Operating Strategy includes a range of actions to address chronic health and aesthetic issues through the operation of the Water Grid. Specifically, the Operating Strategy seeks to isolate, blend or transfer water from impacted sources by using the major interconnections and the excess treatment capacity that is currently available.

Aesthetic water quality issues are often related to physical and chemical changes, such as algal blooms and turbid raw water. These changes can be managed by not taking water from an affected source or by blending it with water from a desalination plant or another source. Aesthetic related issues are also managed by minimising changes to the source of water to an area, thereby minimising taste changes.

A range of asset specific issues have also been taken into account, as outlined in Section 5.5. For example, due to historic water quality issues, production from the Capalaba Water Treatment Plant will be minimised and regular monitoring undertaken.

Managing water quality by blending

From December 2008 through January 2009, the Mt Crosby Weir received water with significant levels of geosmin, a parameter affecting the taste and odour of water. From December 2009 through April 2010, the Mt Crosby Weir received water with significant levels of 2-methylisoborneol (MIB), a similar parameter.

During these two events, the Water Grid Manager decreased the supply output of the Mt Crosby water treatment plants, and imported water from the Southern Regional Water Pipeline. While the Mt Crosby water treatment plant continued to provide drinking water to Brisbane in order to meet supply requirements; this water was blended with water from the Southern Regional Water Pipeline in order to achieve a better aesthetic result at consumers' taps.

Without use of the drinking water supplied by the Desalination Plant and the Molendinar water treatment plant, the levels of MIB present at consumers tap would have closely mimicked that of the Mt Crosby water treatment plant. This means the peak concentration experienced by consumers would have been double what it was, and the average experienced by consumers from March 2010 to May 2010 would have been one third greater.

The pipeline transmitted drinking water from the Desalination Plant and the Molendinar water treatment plant. The water from these two water treatment plants had negligible levels of MIB and geosmin during this time.

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5.4 Reliability

South East Queensland has a relatively high level of system reliability at present, due to:

- the amount of excess water treatment capacity available
- the construction of major interconnections, enabling most demand zones to be supplied from multiples water treatment plants
- reduced extent and persistence of peak demands.

This version of the Operating Strategy seeks to maintain system reliability by requiring that the major interconnecting pipelines be available to operate at capacity within hours of an incident occurring. These pipelines provide the capacity to isolate, blend or transfer water following asset failure, just as they do for water quality incidents.

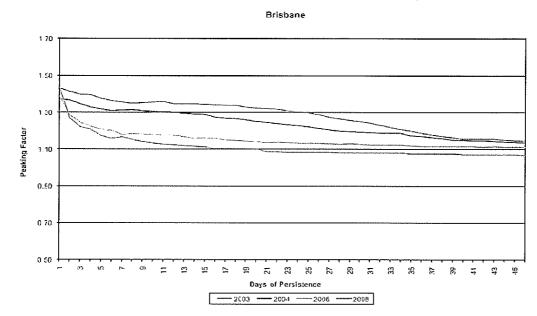
In future versions of the Operating Strategy, Attachments 4, 5 and 6 will specify the reliability required by asset, based on a whole of system analysis. Some of these specifications may necessitate capital expenditure.

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Peak demand and system reliability

Peaking demands are primarily influenced by garden watering. As illustrated in Figure 17, peak demands and the duration of peak periods has reduced in Brisbane City between 2003 and 2008. Similar reductions have been achieved in other areas. With reduced peak demands, the same volume of emergency storage will last for a longer period of time, thereby increasing system reliability.

Figure 17: Extent and persistence of peak demands in Brisbane City.



Peaking factors also reduce as the contributing population increases, as shown in Figure 18. With the construction of the Water Grid, many areas are connected to the same supply system, reducing the requirement for emergency storage.

Figure 18: Peak demands by population served. 2 20 Mean Day Maximum Week Peaking Factor (x Average Day) 2 00 1 90 1 60 1.40 1.20 1.90 200 000 600 000 1 000,000 1,250,000 Population # 2006 2005 — — Trend Lna

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5.5 Key elements by subregion

Key aspects of the Operating Strategy are described below, by subregion and demand zone.

Northern South East Queensland

- Supply to the southern part of the Sunshine Coast will continue to be from the three
 local sources, being the Landers Shute, Image Flat and Ewen Maddock water treatment
 plants. The costs associated with producing water at the Image Flat and Landers Shute
 water treatment plants are comparable, and lower than for the Ewen Maddock Water
 Treatment Plant.
- The Ewen Maddock Water Treatment Plant will be operated at a low production rate, allowing for ongoing performance testing and defects rectification activities.
- This operating mode provides flexibility to increase production at the Landers Shute Water Treatment Plant, for transfer south via the Northern Pipeline Interconnector.
- Over the coming summer, the main risk to this area relates to water quality. In
 particular, the growth of blue green algae in Baroon Pocket Dam can affect the capacity
 of the Landers Shute Water Treatment Plant. Increased algae content results in
 increased pressure on filtration leading to increased frequency of backwashing cycles.
 This decreases the time available to produce treated water for supply to Unitywater.

Noosa demand zone

- The SOP requires the WGM to utilise the raw water sources available for use at Noosa WTP in accordance with a particular order of preference. This order of preference includes a statement which requires the use of Lake MacDonald as first preference when the dam is above 95%. The frequency of Lake MacDonald overtopping over the last 8 to 10 months has resulted in a high level of use.
- In the current Operating Strategy this use of Lake MacDonald will be balanced with the
 water supplied from Mary Valley Water Supply Scheme, due to the capacity constraint of
 the raw water pipe from the Mary Valley. That is, the capacity of the Mary Valley
 pipeline is, under most demand scenarios, insufficient to meet the full requirements of
 Noosa. There is also frequently water quality issues associated with the water from the
 Mary Valley Water Supply Scheme in terms of increased treatment effort required.
- Depending upon demand, between 5 and 15 ML/d will need to be accessed from the Mary Valley Water Supply Scheme regardless of the level in Lake MacDonald to ensure demand can continue to be met and the Lake MacDonald water entitlement is not breached.

Maleny demand zone

- Once the pipeline from the Landers Shute Water Treatment Plant is proven reliable and free from defects, no water will be required from the existing Maleny Water Treatment Plant within the timeframe of this Operating Strategy.
- The variable operating cost of treating water at the Landers Shute Water Treatment Plant and transporting it to the town of Maleny is less than the cost of variable operating cost of the Maleny Water Treatment Plant. High water quality risks are also avoided.

 Options for the future management of the Maleny Water Treatment Plant are being assessed in partnership with relevant stakeholders. Investigations have highlighted that capital expenditure could be deferred or avoided, should future versions of the Operating Strategy confirm that the allocation from the weir not be required over the next five years.

Moreton Bay demand zones

- The Caboolture, Morayfield and Narangba areas will generally be supplied from the Sunshine Coast via the Northern Pipeline Interconnector Stage 1. This arrangement is lower cost than supply from local sources, with superior taste and odour and lower risk of water quality incidents.
- The local Caboolture and Banksia Beach water treatment plants will contribute as needed, albeit at low production amounts due to cost and start-up requirements. In general, other supply options will be used in preference to the Caboolture Water Treatment Plant, due to water quality risks associated with development in the catchment of the Caboolture River. In addition, the contribution from Caboolture WTP is subject to the raw water quality being of a suitable standard. For example, once turbidity exceeds a set trigger level in the Caboolture River the production of treated water from that plant ceases.
- Subject to these operational constraints, the North Pine and Caboolture water treatment
 plants will supply the Narangba and Morayfield areas, should the combined level of
 Sunshine Coast storages be less than 70% or lower than the combined storage level of
 Wivenhoe, Somerset and North Pine dams (as a percentage of the total storage volume).

Bribie Island demand zone

No water will be required from the Woorim Water Treatment Plant within the timeframe
of this Operating Strategy. As noted in Section 4.3, significant capital expenditure is
required in order to maintain potable water treatment capacity at this location. This
expenditure is not needed at this time, due to the negligible impact of this source upon
regional water security and the presence of two other existing sources to supply Bribie
Island.

Dayboro demand zone

The summer risk assessment has identified a high risk of needing to cease supply from
the Dayboro Water Treatment Plant due to flooding events resulting in potentially poor
raw water quality effecting treated water quality. Options to urgently improve
treatment capacity of the plant are being investigated, including by transferring
equipment from the Brisbane Aquifer Project. Carting will be investigated as a
temporary supply measure.

Central South East Queensland

- The majority of Central South East Queensland will be supplied from the Mt Crosby and North Pine water treatment plants.
- No or limited supply will be required from the Brisbane Aquifer Project within the timeframe of this Operating Strategy. Supply from these assets ceased in September 2010, due to the high cost of operation relative to the Mt Crosby Water Treatment Plant.

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The Water Grid Manager and Seqwater are investigating the optimal operating mode over the next five years, including suitable plans and processes to enable remobilisation. Preliminary advice is that operation of one plant may be cost efficient, while also ensuring that Seqwater maintains the skills and knowledge required to operate all of the facilities.

The Gap demand zone

- The Gap area can suffer from low chlorine residuals, particularly in summer when supplied from the Mt Crosby/Green Hill system. This was traditionally managed by supplying the Gap Reservoir from the Enoggera Water Treatment Plant.
- The Enoggera Water Treatment Plant has recently been upgraded, with a chloramination disinfection system installed. The Water Grid Manager has been working with Queensland Urban Utilities and Seqwater to test disinfection residuals and nitrification in the water supplied to the Gap under the two supply options. Preliminary data to date proves inconclusive in terms of definitively answering whether Enoggera WTP provides an improved chlorine residual and free ammonia level in the Gap area. Data on disinfection residuals and the resulting compounds of nitrification when using the two sources will be further analysed to determine the preferred supply over summer in consultation with Seqwater and Queensland Urban Utilities.

Eastern South East Queensland

- Supply from the North Stradbroke Water Treatment Plant to the Redlands area will be maximised, due to it being less expensive than other local sources.
- Supply from the North Stradbroke Water Treatment Plant limits the need for water from
 the Capalaba Water Treatment Plant. Historically, trihalomethanes (THMs) have been
 detected in the bulk and distribution network in the Redlands area at concentration
 levels approaching, and in some cases exceeding, the guideline value specified in the
 ADWG. There are a number of contributing factors including the characteristics of water
 treated at Capalaba WTP and the retention time in the water supply network. To reduce
 the production of THMs, supply from the Capalaba Water Treatment Plant is generally
 minimised.
- This mode of operation will continue subject to any further detection of THMs. Should total THMs be detected at a concentration level of 200 ug/L or above in two consecutive samples, an expert panel will be reconvened to determine the appropriate mitigating strategy.
- The guideline value for total THMs is 250 ug/L. An incident will be declared should total THMs be detected above this concentration level.
- The Eastern Pipeline Interconnector will be used to supply water to the Kimberley Park
 area while that reservoir continues to undergo maintenance work that has required that
 reservoir to be taken out of service. Past this point, it is envisaged that the Eastern
 Pipeline Interconnector will continue to transfer the minimum volume of about 4
 ML/day in a westerly flow direction.

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Southern South East Queensland

- The Desalination Plant will be operated at one third of capacity when it is available, subject to performance testing requirements and event based water quality and system reliability needs.
- The production of desalinated water will be maximised when the volume of water stored by key Water Grid storages falls below 60% of the storage capacity of key Water Grid storages, in order to comply with the SOP risk criteria in accordance with the probability assessments described earlier in this section and Section 7.
- The Southern Regional Water Pipeline will be operated at least at the minimum transfer (20 ML/day) capacity, in order to maintain suitable water quality within the pipeline and to allow an immediate response to an asset or water quality related issue within the Brisbane area.
- The Southern Regional Water Pipeline will be utilised to manage health and taste and odour (aesthetic) related water quality issues as needed. Current practice is that contact is made with the SEQ Distributor Retailers to determine the level of customer enquiries once the sampling detects concentration above the generally acknowledged taste threshold, and Seqwater taste panel experiences consistent samples above their threshold. The options for mitigating the issue is then determined based on the severity and extent of the taste issues experienced and number of complaints received.
- Due to the costs incurred, water will be taken from the Molendinar and Mudgeeraba water treatment plants for this purpose in preference to the Desalination Plant. The electricity costs of using the Desalination Plant for periods of high production are significant, under the current electricity purchasing arrangements. A cost assessment was undertaken to determine the additional costs associated with operating the Southern Regional Water Pipeline at full capacity over a base scenario of operating the Desalination Plant at 33% and moving minimum required volumes north in the Southern Regional Water Pipeline. To operate the Desalination Plant at 66% of capacity to provide additional water to be transported north in the Southern Regional Water Pipeline adds approximately \$50,000 per day to the variable operation costs of the Water Grid. To provide the additional water all from the Molendinar and Mudgeeraba water treatment plants to operate the Southern Regional Water Pipeline at full capacity adds approximately \$10,000 per day to the variable operating costs of the Water Grid.
- To ensure compliance with the long-term LOS criteria, transfers north in the Southern Regional Water Pipeline will generally cease if Hinze and Little Nerang Dams fall to 40% of capacity. QWC's response to the (interim) Operating Strategy raised the issue of how the triggers for the Desalination Plant and the Southern Regional Water Pipeline interact. In most cases the proposed Operating Strategy will result in the Desalination Plant being operated at high production volumes and the Southern Regional Water Pipeline will be operating in a northerly direction. In situations where the Hinze and Little Nerang Dams fall below 40%, the relative storage volumes across the region and the operation of the Desalination Plant will determine the direction and extent of utilisation of the Southern Regional Water Pipeline. It should be noted that the SEQ Regional Water Balance Model as provided only has the fidelity to simulate a change in operation of the Southern Regional Water Pipeline based on the volume in the Gold Coast dams. This does not allow all operational scenarios to be modelled specifically.

Logan Greenbank demand zone

• The Southern Regional Water Pipeline will also be used to supply a small amount of water to the area supplied from Greenbank Reservoir. Historically, this area has experienced low chlorine residuals and has experienced multiple detections of coliforms. It is deemed necessary that to manage the risk associated with low residuals and potential resulting bacteriological activity that some supply from the Southern Regional Water Pipeline should be provided. This comes at a very small increase in variable operating cost but provides a significant water quality benefit.

Logan Bridge Pump Station Zone

Allconnex are currently reviewing their internal operating options for the use of this
connection between Beenleigh and the central Logan area. Discussions will occur over
the next few months to assess the available options to determine a preferred approach
for the use of this connection and hence the implications for the operation of LinkWater
and Seqwater's facilities.

Demand zones with stand-alone supplies

A number of rural communities rely on local supplies that are not connected to the remainder of the Water Grid. The security levels of these towns are determined by the performance of the local storages and transport infrastructure. The ongoing security associated with these areas will continue to be managed by:

- monitoring and assessment of raw water availability, by Seqwater and the Water Grid Manager
- drought response plans, developed by the QWC in collaboration with Seqwater
- contingency plans, developed by Seqwater
- planning and delivery of system augmentations.

Other

- The Western Corridor Recycled Water Scheme will be operated to meet the demands of the power station and the purified recycled water customers of Queensland Urban Utilities. There may also be a requirement to operate the scheme at higher production volumes for commissioning activities and to ensure that it is ready to augment drinking water supplies when key Water Grid storages as required.
- The supply of manufactured water to Wivenhoe Dam from the Western Corridor Recycled Water Scheme will be maximised when key Water Grid storages fall below 40% of combined storage capacity, subject to appropriate approvals.
- The Tarong Energy Corporation may take up to 100 ML/a from Wivenhoe Dam to ensure that its pumps from the dam remain in working order. No further water is to be taken from the Wivenhoe Dam unless the purified recycled water is not available.
- Water will continue to be supplied in accordance with rules 8.3, 8.7 and 8.8 of the SOP.

6.0 Program for optimisation and future investigations

The Operating Strategy will be refined over time to ensure that the portfolio of available supplies delivers the LOS objectives and risk criteria as efficiently as possible, while preserving water quality and system reliability. Given the current water security position, this will involve a combination of de-mobilising some facilities and minimising production from some others. In doing so, the Operating Strategy will also need to include a planned approach for bringing the range of available sources online at gradually increasing rates as the available water in storage decreases.

The Operating Strategy must reflect a plan of augmentations and upgrades to enable the Water Grid to operate consistently at 485,000 ML/a, being the LOS system yield in the SEQ Water Strategy. This will involve consideration of works beyond the five year timeframe of the Operating Strategy.

To inform this future refinement, a range of detailed assessments will be undertaken for specific assets and for parts of the overall system. Each of these assessments will need to address a range of issues, as summarised in Section 3.1.

The Water Grid Manager will continue to undertake these assessments in partnership with the Grid Service Providers and the SEQ Distributor-Retailers, building upon the range of planning related activities that are already underway in each of the Grid Participants. Many of the assessments will be informed by detailed reports prepared by the entities, with the Water Grid Manager synthesising the results.

The Water Grid Manager will also seek to refine the Operating Strategy in collaboration with the entities. It will seek endorsement from relevant Grid Participants before making significant changes.

The further development of the Operating Strategy is planned to be refined over two key phases, being:

- resolution of existing operational and capital management issues, to be addressed in the April 2011 version of the Operating Strategy (Phase 1)
- longer-term optimisation issues, to be addressed in the April 2011 version of the Operating Strategy (Phase 2).

The scope of these two phases is outlined below. This scope has been developed in consultation with planning officers from relevant entities, but may be further refined. For Phase 1, additional tasks may be identified. For Phase 2, the process and timeframes will be refined to reflect the outcomes of current reviews of the planning and delivery process by the QWC and Chief Executive Officers of the Grid Service Providers and Water Grid Manager.

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6.1 Existing issues (Phase 1)

Phase 1 will resolve how best to operate selected assets, and the implications for asset maintenance and capital upgrades. The Operating Strategy will specify whether water will be required within the timeframe of the Operating Strategy and if so, the triggers and conditions for supply. Once these requirements have been specified, Grid Service Providers can plan accordingly.

Issues to be addressed as part of Phase 1 relate to:

- improvements for assets that are not capable of meeting water quality or reliability requirements, including demobilisation options
- management of redundant or duplicated assets
- short-term capacity constraints, as identified in the forthcoming SEQ Water Grid Capacity Assessment.

Specific issues are the:

- Maleny Water Treatment Plant
- Brisbane Aquifer Project
- supply to the Central Logan area, and in particular the operation of the Logan Bridge pump station
- Woorim Water Treatment Plant
- Aratula Water Treatment Plant
- Toogoolawah Water Treatment Plant
- Albert River Water Treatment Plant.

A consolidated report will be prepared for each issue, based on more detailed advice from entities. The consolidated report will identify operational and capital options, and assess their relevant advantages and disadvantages. It will make recommendations to achieve the efficient and cost effective operation of the Water Grid, taking into account current water security.

A range of options may be considered, including utilisation at minimum levels, demobilisation or demolition. These options will be assessed against a consistent set of criteria, as outlined below.

Issues associated with the Maleny Water Treatment Plant, Brisbane Aquifer Project and supply to the Central Logan area are explained in Section 4.3.

As stated in this version of the Operating Strategy, the Woorim Water Treatment Plant is not required for potable supply within the next five year period. Short-term issues relate to the potential use of the existing plant for uses other than potable supply. Long-term issues relate to the capital works required to recommence supply to the Water Grid.

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These last three water treatment plants listed in the dot points above are decommissioned plants that will not be required to treat water, at least within the timeframe of the Operating Strategy. There is some final assessment work required to be undertaken with Seqwater to determine what state they are currently in and what role they should have in the future, if any. Preliminary advice is that each of the water treatment plants should be removed from Seqwater's asset portfolio. Some parts of the water treatment plants could potentially be used elsewhere in the Water Grid.

6.2 Optimisation (Phase 2)

There is a clear need for all relevant parties such as the WGM, all Grid Service Providers and the SEQ Distributor-Retailers to be involved in a collaborative planning process that contributes to an overarching blueprint for the ongoing operation and continued development of the Water Grid.

The process for undertaking these types of assessment needs to be developed over time in consultation with relevant entities. For example, it could be based on subregional planning forums. The Operating Strategy will not outline the process required for these types of assessments, as this needs to be developed over time with the input from the relevant stakeholders. Future versions of the Operating Strategy will reflect any agreed framework. This framework will need to address:

- needs, including what each entity requires from the process
- outputs
- scope and timeframes
- priority
- process for including new issues and for updates
- governance.

Notwithstanding the need for an overarching framework there is the need to advance the optimisation of the operation of various Water Grid facilities in the shorter term. The program for these investigations will be refined whilst Phase 1 is underway. However, early discussions with representatives from Grid Service Providers have focused on discussing areas that have a range of supply options. Area specific investigations will provide a means of coordinating the large amount of work that has already been undertaken by entities on specific issues. The proposed areas are listed below, along with key issues within them.

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Northern South East Queensland: Sunshine Coast

Detailed review of potential operating modes for the following water treatment plants:

- Noosa
- Image Flat
- Ewen Maddock.

Other issues to be considered in developing an optimal Operating Strategy for this area include:

- operation of the Northern Pipeline Interconnector Stage 2, including maintenance of minimum flows and triggers for changed direction of flow
- potential supply to the Maroochy system from the Northern Pipeline Interconnector
- review of maximum available operating capacity of Landers Shute Water Treatment Plant.

These investigations will be undertaken in collaboration with Unitywater, as well as relevant Grid Service Providers.

Northern South East Queensland: Moreton Bay

Detailed review of potential operating modes for the following Water Treatment Plants:

- Petrie
- Woorim
- Dayboro
- Banksia Beach
- Caboolture
- Woodford.

Other issues to be considered in developing an optimal Operating Strategy for this area include:

- delivery of LOS security and suitable water quality to Dayboro Water Treatment Plant, including options to construct pipeline from Petrie (in partnership with the QWC)
- options for meeting growth in the area supplied by Petrie Water Treatment Plant, including consideration of disinfection regimes
- supply to Bribie Island Water Treatment Plant, including reliability risks associated with
 the single pipe crossing of Pumicestone Passage and the time at which the capacity of
 that connection is reached and Bribie Island is effectively reliant on the sources on the
 island
- options to supply Woodford Water Treatment Plant, including the future role of the existing water treatment plant and pumped assets.

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These investigations will be undertaken in collaboration with Unitywater, as well as relevant Grid Service Providers.

Central South East Queensland

Detailed review of potential operating modes for the following water treatment plants:

- Mt Crosby West Bank
- Enoggera
- North Pine.

These investigations will be undertaken in collaboration with Queensland Urban Utilities, as well as relevant Grid Service Providers.

Eastern South East Queensland

Detailed review of potential operating modes for the following facilities:

- Capalaba
- North Stradbroke Island
- Eastern Pipeline Interconnector.

Other issues to be considered in developing an optimal Operating Strategy for this area include specific risks faced at North Stradbroke WTP, including access in times of asset failure.

These investigations will be undertaken in collaboration with Queensland Urban Utilities, as well as relevant Grid Service Providers.

Southern South East Queensland

Detailed review of potential operating modes for the Mudgeeraba Water Treatment Plant, including alternative supply options to areas that can currently only be supplied from here.

Other issues to be considered in developing an optimal Operating Strategy for this area include:

- the Southern Regional Water Pipeline operation for mitigation of water quality issues in Brisbane
- the Southern Regional Water Pipeline operation to supply the South MacLean area via the Teviot Road connection, taking into account the outcomes of current QWC investigations
- the minimum production requirements from Mudgeeraba Water Treatment Plant (some areas can only be supplied from Mudgeeraba Water Treatment Plant)
- electricity purchasing arrangements for Desalination Plant.

TRIM reference: D/10/6232

6.3 System analysis

Regional planning and investigations will also continue, through future versions of the plans listed in Section 1.1.

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7.0 SOP compliance

The Operating Strategy complies with all SOP requirements.

7.1 LOS objectives and risk criteria

The SEQ Regional Water Balance Model has been used to test the proposed Operating Strategy for compliance with the LOS Objectives and risk criteria. The Operating Strategy decision templates contained in Attachment 9 define the key decisions on transfer rules and alternative sources necessary for undertaking modelling runs in the SEQ Regional Water Balance Model. Key results of the model runs are shown in Table 5 (low demand scenario) and Table 6 (high demand scenario). More detailed outputs are contained in Attachment 10.

Table 5: Compliance with risk criteria (low demand scenario).

Volume of water	Probability (of reaching volume of t	water stored
stored by key Water Grid storages	Within 1 year	Within 3 years	Within 5 years
40%	<0.01%	Not specified	0.01%
30%	Not specified	<0.01%	<0.01

Table 6: Compliance with risk criteria (high demand scenario).

Volume of water	Probability (of reaching volume of v	water stored
stored by key Water Grid storages	Within 1 year	Within 3 years	Within 5 years
40%	<0.01%	Not specified	0.02%
30%	Not specified	<0.01%	0.01%

It should be acknowledged that much of the detail provided above in Section 5 cannot be specifically addressed in the SEQ Regional Water Balance Model.

Results for the long term assessment are included in Table 7.

Table 7: Compliance with long-term criteria (low demand scenario).

Level of Service objective	SOP requirements	Operating Strategy
	— (frequency of reaching	
	ingger, measured as average	trigger, measured as
	Tunica of years	average indicates of years.
T1		50

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Level of Service objective	SOP requirements (frequency of reaching trigger, measured as average number of years)	Operating Strategy (frequency of reaching trigger, measured as average number of years)
T2	100	116
SEQ 10%	1,000	NA
SEQ 5%	NA	NA
Brisbane Dead Volume	NA	NA
Baroon Dead Volume	NA	NA
Gold Coast Dead Volume	NA	NA

This modelling confirms that the Operating Strategy would achieve medium-term water security requirements and the long term level of service objectives, were this mode of operation to continue over several years. In practice, the Operating Strategy will be substantially reviewed and refined over the next year as additional information becomes available (refer Section 5). In the meantime, the six monthly reviews provide a suitable timeframe to respond to any major changes to our water security position.

7.2 Operating rules

The Operating Strategy complies with all SOP operating rules, as summarised in Table 8. The rules are explained in Section 2.2.

Table 8: Compliance with Operating Rules.

Operating rule	Operating Strategy compliance
8.1 Efficient and cost- effective operation rule	Estimated operating costs are explained in Section 4.5. Costs have been minimised through a range of decisions, including: operation of the Desalination Plant at one third capacity minimum transfers north in Southern Regional Water Pipeline prioritisation of cheaper sources, such as Image Flat and Landers Shute water treatment plants over Ewen Maddock Water Treatment Plant. Options to further reduce costs are being investigated (refer Section 5).
	*

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Operating rule	Operating Strategy compliance
8.2 Water security rule	In accordance with the SOP, the Operating Strategy states that, when the volume of water stored by key Water Grid storages falls below 40% of the storage capacity of these storages:
	 the supply of manufactured water from the Desalination Plant shall be maximised, in fact the Operating Strategy proposes to increase production from the Desalination Plant prior to this point.
	the supply of manufactured water to Wivenhoe Dam from the Western Corridor Recycled Water Scheme shall be maximised, subject to appropriate approvals.
8.3 Rule for the supply of water to power stations	Purified recycled water will be the predominant source of supply to the power stations. Alternatives will only be accessed if it is unavailable, except for small volumes required to ensure that pumps remain in working order.
8.4 Rule for the supply of manufactured water from the Desalination Plant	The Operating Strategy states that the Desalination Plant will be operated at one third of production capacity, subject to operational constraints and will provision to supply higher volumes as needed for water quality and asset reliability issues. Below 60% in the key regional storages, supply from the Desalination Plant will be increased to up to 100% of its capacity subject to operational constraints and system storage levels.
8.5 Rule for supply via the Northern Pipeline Interconnector Stage 1	Due to water quality issues, the minimum transfer volume south through the Northern Pipeline Interconnector is 20 ML/day. The Operating Strategy pipeline will operate at this minimum level when:
	 the volume of water stored by Baroon Pocket, Ewen Maddock, Cooloolabin, Poona and Wappa dams as a proportion of the total storage capacity of these dams is less than or equal to the volume of water stored by Wivenhoe, Somerset and North Pine dams as a proportion of their total storage capacity the volume of water stored by Baroon Pocket, Ewen Maddock, Cooloolabin, Poona and Wappa dams is less than 70% of the total storage capacity of these dams.

Operating rule	Operating Strategy compliance
8.6 Rule for supply from Lake MacDonald and the Upper	The Operating Strategy states that, subject to operational constraints and water entitlements:
Mary Water Supply Scheme	 water is to be supplied from Lake MacDonald while the dam is overflowing and may continue to be supplied until the total volume of water stored by Lake MacDonald falls below 95% of capacity after an overflowing event, before
	 water is to be supplied from the Upper Mary Water Supply Scheme, before
	 water is to be supplied from Lake MacDonald.
8.7 Rule for supply within the Warrill Valley Water Supply Scheme	The supply of water under water entitlement numbers 103187, 103184 and 103203 shall be taken meeting the following conditions:
	water take is sourced from run of river flow; andBerry's Lagoon Weir is overflowing.
8.8 Rule for supply within the Logan River Water Supply Scheme	Water shall not be supplied under water entitlements located within the Logan River Water Supply Scheme, to meet demands other than those of the towns of Beaudesert, Kooralbyn, Rathdowney, South Maclean and Jimboomba, when Maroon Dam is at or below elevation 193.23 meters Australian Height Datum.

Attachment 1: SEQ Water Strategy context

The SEQ Water Strategy explains the context for key concepts contained in the SOP, as summarised below.

LOS objectives

The LOS objectives are performance objectives for the delivery of bulk water supplies from the Water Grid.

The LOS approach acknowledges that future severe droughts will occur, and that water restrictions are an effective and efficient way of managing the impact of these droughts—but restrictions can have a significant impact on the community. The SEQ Water Strategy explains that the LOS objectives for South East Queensland have been developed on the basis that in order to maintain a comfortable lifestyle, the community would prefer to use Permanent Water Conservation Measures coupled with Medium Level Restrictions in times of drought. In normal times, this means that water will be used wisely. In periods of drought, Medium Level Restrictions will be introduced early enough and at such a level that they avoid negative impacts on community amenity and the regional economy. For instance, in future droughts it is expected that restrictions would not require a ban on handheld hosing and water efficient sprinklers.

LOS system yield

The LOS system yield is the volume of water that can be supplied from the Water Grid every year and still achieve the LOS objectives.

The LOS system yield is less than is permitted under water resource plans and resource operations plans. The SEQ Water Strategy explains that this is because in order to achieve the LOS objectives, water must be 'banked' in the wetter periods so that it is available during droughts that may be worse or more frequent than has occurred in the last 100 years. Fully using the available allocation could place the urban community at risk of supply failure during extended drought, especially from droughts worse than those that have been experienced since records were kept.

While the LOS system yield of the Water Grid is less than the sum of the allocations held by the Water Grid Manager for urban use, it is larger than the sum of the LOS yields of the individual systems.

Using less urban water than permitted under water allocations issued in compliance with water resource plans generally results in dam levels being higher than would otherwise be the case, because additional reserves are held in storage. In turn, this results in an increased likelihood of overflows from dams with associated environmental benefits and higher announced allocations for rural irrigation.

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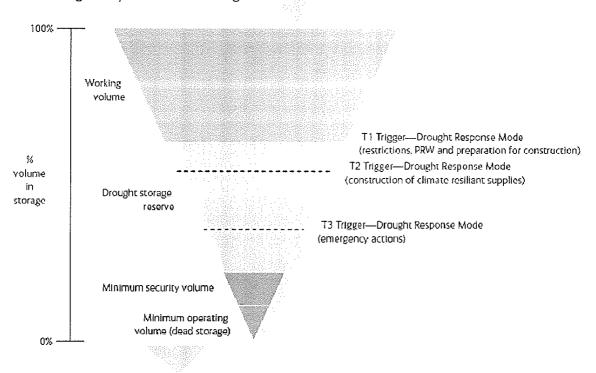
Drought response triggers

The SEQ Water Strategy partitions the water storage compartment in South East Queensland dams both individually and as a combined total South East Queensland system into:

- · working volume
- drought storage reserve
- · minimum security volume
- minimum operating volume (dead storage).

Figure below illustrates the partitioning of the water storage compartment of South East Queensland's dams. These partitions apply both to individual dams and across the Water Grid as a whole. Many individual dams are also constructed with a flood storage compartment that sits above the water storage compartment.

Partitioning of key Water Grid storages.



The normal operating mode applies when the Water Grid is within the working volume. This mode will apply over most periods in the long-term, consistent with the LOS objectives. Below the working volume is the drought storage reserve. The combined Water Grid drought storage reserve underpins the drought response plan. The drought storage reserve is sized to provide, in conjunction with climate resilient sources, a minimum of 36 months supply of water at a restricted demand.

At this time, the partitioning of individual dams defined as key Water Grid storages will be the same as the partitioning of the overall Water Grid. That is, the working volume of each dam will be between 40% and 100% of storage capacity. The actual volume of the drought

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storage reserve may vary over time according to the mix of supplies and the demand for water.

Within the combined Water Grid drought storage reserve there are three trigger levels:

- T1 is the trigger to enter the drought response mode (preparation phase). It applies
 when regional storage volumes drop down into the drought storage reserve. Preplanned Medium Level Restrictions will be introduced and purified recycled water will be
 added to Wivenhoe Dam at this time. This phase provides time to prepare for
 construction, in the event of continued drought conditions.
- T2 is the trigger to enter the drought response mode (construction phase). It applies when construction of new climate resilient or climate independent water supplies, such as desalination plants, is required to commence to ensure that the restricted water demands for the community can be met for the duration of a long, severe drought.
- T3 is the trigger to enact emergency measures.

For the Water Grid, the risk of drawing down to operationally significant storage levels, such as T1 or T2, will depend on the current storage volume within the system. Larger storage volumes, coupled with the increased opportunity for conjunctive system operation, result in a reasonably long period over which supply can be maintained with below average inflows without drawing down to these trigger levels. However, operational decisions made when storage volumes are relatively high can still have a significant effect on regional water security (and potential infrastructure expenditure) if extended periods of low inflows are experienced.

Risk criteria in the SOP enable timely modification of system operation to ensure that these risks are maintained within acceptable levels to the extent that is possible.

Climate change assumption

The maximum volume that the Water Grid Manager is permitted to sell under contract represents the LOS system yield of existing infrastructure with an immediate 10% reduction in the LOS yield of surface storages due to climate change.

This is a conservative assumption. The SEQ Water Strategy explains that the impacts of climate change are likely to occur over decades. It states that, as a conservative estimate, a 10% reduction in surface water availability is likely to occur by 2030. This contrasts with Perth, where there is evidence that a change in inflows has already occurred.

More analysis is necessary to improve our understanding of climate change impacts. Such work is being progressed by the Queensland Government Climate Change Centre of Excellence and the CSIRO, through the SEQ Urban Water Security Research Alliance. Over time, this work will downscale the CSIRO global model simulations, and simulations from six other international modelling groups, to a 14 to 20 kilometre resolution for South East Queensland. It will result in a better integration between the climate change models and hydrologic modelling.

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In the meantime, case studies indicate that by 2031 the annual stream flow for the Brisbane River downstream of Mt Crosby Weir could be reduced in a dry scenario by up to 28% or increased by up to 14% in a wet scenario. Such impacts are expected to be highly variable across the whole of South East Queensland.

Attachment 2: Key Interface Points

Figure 42.1: Northern Key Interface Points



Figure A2.2: Southern Key Interface Points



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Table A2.1: KIP register extract

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Assettype	Reservoir	Water Treatment Plant	Raw Water	Reservoir	Water Treatment Plant	Water Treatment Plant	Trunk Main	Trunk Main	Trunk Main
Area that water quality/is representative of	Water in north Brisbane, It is a conduit for water travelling north from Mt Crosby/SRWP via Sparkes Hill Reservoir to Moreton and Redcliffe and water travelling South to Brisbane from North Pine and NIP.	Water leaving WTP to supply the QUU's Gap Reservoir	Raw water in the Mid-Brisbane River flowing to the Mt Crosby Weir	Water supplying Logan and South Brisbane. Water from Mt Crosby/SRWP and possibly water from the Logan Zone via the Trinder Park Pump Station.	Water leaving the WTP to supply Cameron's Hill Reservoir and the Ipswich Western Main	Water leaving the WTP to supply Cameron's Hill Reservoir and the Ipswich Western Main	Water from Cameron's Hill Reservoir combine with water from the SRWP if operating in a northerly direction It represents water supplying Brisbane and Itswich, Logan and the Gold Coast if the SRWP is operating in southerly direction.	Water entering the reservoir from either Aspley in the north or Mt Crosby/SRWP (possibly via the Green Hill Res).	Water leaving the Sparkes Hill Reservoir supply Brisbane and/or travelling North to the Aspley Reservoir or south to the Brisbane bulk distribution.
Grid Service Provider sample point ID	LW-BTA01-R007	Enoggera WTP		LW-BTA01-R004	Mt Crosby East Bank	Mt Crosby West Bank	LW-BTA01-TM024	LW-BTA01-TM026	LW-BTA01-TM025
KIP name	Aspley Reservoir Outlet	Enoggera WTP KIP	Kholo (Mid Brisbane River) KIP	Kuraby Reservoir Outlet	Mt Crosby East Bank WTP KIP	Mt Crosby West Bank WTP KIP	Mt Crosby WTP & SRWP Mixed Water	Sparkes Hill Reservoirs Combined Inlet	Sparkes Hill Reservoirs Combined Outlet
Grid Service Provider region	Brisbane	Moreton	Mt Crosby	Brisbane	Mt Crosby	Mt Crosby	Brisbane	Brisbane	Brisbane
Grid KIP Grid region IB	Brisbane	Brisbane	Brisbane	Brisbane	. Brisbane	Brisbane	Brisbane	Brisbane	Brisbane
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Trunk Main	Reservoir	Trunk Main	Water Treatment Plant	Water Treatment Plant	Reservoir	Reservoir	Trunk Main	Desalination Plant	Reservoir
Water supplying QUU's Mt Gravatt and Cavendish Rd Res and Brisbane retic	Water supplied Brisbane and the bulk distribution. Receives water from Mt Crosby/SRWP or from the north via Sparkes Hill Reservoir. Can supply water to Sparkes Hill, Wellers Hill and Kuraby Reservoirs.	Mixed water from Molendinar WTP/NIP and SRWP.	Water from the WTP entering the Molendinar Reservoirs.	Water from the WTP supplying the southern Gold Coast and mixing with the desalinated water at the Robina Mixing Tank.	Water supplying the southern Gold Coast. Water in the reservoir is received from the Mudgeeraba WTP or water from the Mudgeeraba blended with desalinated water.	Water travelling north or south along SRWP. Either chlorinated water from Molendinar Reservoirs (north) or water that has been break-point chlorinated at the Chambers Flat Pump Station (south).	Water being supplied north in the NIP, post Robina Mixing Tank. Water is from the Mudgeeraba WTP or from Mudgeeraba blended with desalinated water.	Water leaving the Tugun Desalination Plant.	Water travelling north in SRWP post chloramination. In a southerly direction water from Mt Crosby supplied to the Logan and to be break-point chlorinated at Chambers Flat Pump Station.
LW-BTA01-TM020	LW-8TA01-R001	LW-SRP-TM014	Molendinar WTP	Mudgeeraba WTP	LW-BTA02-R001	LW-SRP-R003	LW-NIP-TM006	Tugun DP	LW-SRP-R001
Wellers Hill Reservoirs Combined Outlet	Green Hill Reservoir Outlet	Molendinar Key Interface Point	Molendinar WTP KIP	Mudgeeraba WTP KIP	Robina Reservoir Outlet (Clover Hill)	Stapylton Balance Tank Outlet	Tarrant Drive Pump Station (Robina Mixing Tank Outlet)	Tugun DP KIP	North Beaudesert Balance Tank 1
Brisbane	Brisbane	SRWP	Gold Coast	Gold Coast	Gold Coast	SRWP	NIP	Gold Coast	SRWP
Brisbane	Brisbane	Gold Coast	Gold Coast	Gold Coast	Gold Coast	Gold Coast	Gold Coast	Gold Coast	Ipswich
10		12	13	14	15	16	17	18	19

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Trunk Main	Reservoir	Water Treatment Plant	Water Treatment Plant	Water Treatment Plant	Water Treatment Plant	Trunk Main	Trunk Main	Water Treatment Plant
Water that has been break-point chlorinated at the chambers Flat PS and is supplied to Logan or the NBBT.	Water leaving the Kimberley Park res and supply either Logan retic (inc the Springwood Res(Allconnex Water), Kuraby Res (via Trinder Park Pump Station) or the EPI (in an easterly flow). Water can be received from the EPI {westerly flow}, from Kuraby Reservoir (via Daisy Hill PS) or possibly from the Allconnex Water Logan River Pump Station (chloraminated water from North Gold Coast).	Water leaving WTP to supply South Maclean and Logan zones.	Water leaving WTP supplying the Bribie Island zone.	Water leaving WTP supplying the Caboolture zone.	Water supply to Dayboro zone	Water leaving the Narangba Res supplying the North Pine PS and LinkWater Caboolture Zone (including the Unity Water Morayfield Reservoir) Water from the reservoir is received from the NPI south (Lander's Shute WTP) and Byrnes Road PS and in some scenarios the Unity Water Morayfield Res.	Mixed water (NPI and North Pine WTP water and possibly water from north Brisbane) being pumped north to Caboolture (including UnityWater Morayfield Reservoir) and the Narangba Reservoir.	Water leaving WTP to supply Pine Rivers, Aspley Res and possibly Redcliffe.
LW-SRP-TM009	LW-BTA04-R001	South Maclean WTP	Banksia Beach WTP	Caboolture WTP	Dayboro WTP	LW-NPI-R004	LW-NPI-TM007	North Pine WTP
Chambers Flat WQMF North Panel*	Kimberley Park Reservoir Outlet	South Maclean WTP KIP	Banksia Beach WTP KIP	Caboolture WTP KIP	Dayboro WTP KIP	Narangba Reservoirs Combined Outlet	North Pine WTP & NPI Mixed Water (Byrnes Road PS)	North Pine WTP KIP
SRWP	Logan	Logan	Moreton	Moreton	Moreton	۵N	I N N	Moreton
Logan	Logan	Logan	Moreton Bay	Moreton Bay	Moreton Bay	Moreton Bay	Moreton Bay	Moreton Bay
20	21	22	23	24	25	26	27	28

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Water Treatment Plant	Water Treatment Plant	Water Treatment Plant	Trunk Main	Trunk Main	Trunk Main	Water Treatment Plant	Water Treatment Plant	Water Treatment Plant	Reservoir	Trunk Main
Water leaving WTP to supply Petrie, AMCOR and Redcliffe	Water leaving WTP supplying Woodford.	Water leaving WTP supplying Bribie Island. Not operational.	Water coming in from the Capalaba WTP and leaving the reservoir to Capalaba retic. Water in the reservoir can come from the Heinemann Rd Res (via Mt Cotton).	Water leaving the reservoir and supplying Capalaba. Water in the reservoir can come from the Heinemann Rd Res (via Mt Cotton).	Water leaving the reservoir supply Redland retic and Mt Cotton Res. Water in the reservoir can come from the Heinemann Rd Res (via Mt Cotton).	Supplies Amity Point zone	Water leaving WTP supplying Alexandra Hills Reservoir and Capalaba	Supplies Dunwich zone	Water supplied to the EPI (westerly flow), Redland retic and Mt Cotton Reservoir (possibly to Alexandra Hills Res) Water from the NSI WTP, EPI (in an easterly flow) and possibly the Capalaba WTP (via Mt Cotton Res).	Water supplied to the EPI (westerly flow), Redland retic and Mt Cotton Reservoir (possibly to Alexandra Hills Res) Water from the NSI WTP, EPI (in an easterly flow) and possibly the Capalaba WTP (via Mt Cotton Res).
Petrie WTP	Woodford WTP	Bribie Island WTP	LW-BTA03-TM001	LW-BTA03-TM002	LW-BTA03-TM003	Amity Point WTP	Capalaba WTP	Dunwich WTP	LW-BTA03-R007	LW-BTA03-TM004
Petrie WTP KIP	Woodford WTP KIP	Woorim WTP KIP	Alexandra Hills Reservoirs Capalaba Inlet/Outlet	Alexandra Hills Reservoirs Combined Outlet - North	Alexandra Hills Reservoirs Combined Outlet - South	Amity Point WTP KIP	Capalaba WTP KIP	Dunwich WTP KIP	Heinemann Rd Reservoir 1 Outlet	Heinemann Rd Reservoirs 2 & 3 Combined Outlet
Moreton	Moreton	THE PROPERTY OF THE PARTY OF TH	Redlands	Redlands	Redlands	Rediands	Redlands	Redlands	Redlands	Rediands
Moreton Bay	Moreton Bay	Moreton Bay	Redlands	Redlands	Redlands	Redlands	Redlands	Redlands	Redlands	Redlands
29	30	31	32	33	34	35	36	37	38	39

40	Redlands	Redlands	Mount Cotton Reservoir Inlet/Outlet	LW-BTA03-R006	Water supplied to the Redland retic, Heinemann Rd. and Alexandra Hills Reservoir. Water from the NSI WTP and the Capalaba WTP.	Reservoir
41	Rediands	Redlands	North Stradbroke WTP KIP	NSI WTP	Water from the WTP supplying the bay island and mainland via the Heinemann Rd Res.	Water Treatment Plant
42	Redlands	Redlands	Point Lookout WTP KIP	Point Lookout WTP	Water supplied to point Lookout.	Water Treatment Plant
43	Scenic Rim	Scenic Rim	Canungra WTP KIP	Canungra WTP	Water supplied to Canungra.	Water Treatment Plant
44	Scenic Rim	Scenic Rim	Helen St WTP KIP	Helen Street WTP	Water supplied to Beaudesert.	Water Treatment Plant
45	Scenic Rim	Scenic Rim	Kalbah WTP KIP	Boonah-Kalbah WTP	Water supplied to Boonah & Kalbah.	Water Treatment Plant
46	Scenic Rim	Scenic Rim	Kooralbyn WTP KIP	Kooralbyn WTP	Water supplied to Kooralbyn,	Water Treatment Plant
47	Scenic Rim	Scenic Rim	Rathdowney WTP KIP	Rathdowney WTP	Water supplied to Rathdowney.	Water Treatment Plant
48	Somerset & Lockyer	Somerset	Esk WTP KIP	Esk WTP	Water supplied to Esk	Water Treatment Plant
49	Somerset & Lockyer	Somerset	Jimna WTP KIP	Jimna WTP	Water supplied to Jimna	Water Treatment Plant
20	Somerset & Lockyer	Somerset	Kilcoy WTP KIP	Kilcoy WTP	Water supplied to Kilcoy	Water Treatment Plant
51	Somerset & Lockyer	Somerset	Linville WTP KIP	Linville WTP	Water supplied to Linville.	Water Treatment Plant
52	Somerset & Lockyer	Somerset	Lowood WTP KIP	Lowood WTP	Water supplied to Lowood.	Water Treatment Plant
53	Somerset & Lockyer	Somerset	Somerset Dam WTP KIP	Somerset Dam township WTP	Water supplied to Somerset township.	Water Treatment Plant
54	Sunshine Coast	Sunshine Coast	Ewen Maddock WTP KIP	Ewen Maddock WTP	Water supplied to Caloundra.	Water Treatment Plant
55	Sunshine Coast	Sunshine Coast	Image Flat WTP KIP	Image Flat WTP	Water supplied to the north of the Sunshine Coast: Nambour, Woombye, Palmwoods and possibly Peregian Beach and/or Maroochydore.	Water Treatment Plant
56	Sunshine Coast	Sunshine Coast	Kenilworth WTP KIP	Kenilworth WTP	Water supplied to Kenilworth,	Water Treatment Plant

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57	Sunshine Coast	Sunshine Coast	nine Coast Landers Shute WTP KIP	Landers Shute WTP	Water supplied to Maroochydore (Tanawha Water Treatment Plant Res), Caloundra and the NPI. Also supplies the NPI to the south.	Water Treatment Plant
58	Sunshine Coast	NPI	Landsborough WQMF South Panei**	LW-NPI-TM002	Water travelling south along the NPI following Trunk chloramination and represent the Elimba and Morayfield off-takes.	Trunk Main
59	Sunshine Coast	Sunshine Coast Sunshine Coast Maleny WTP KIP		Maleny WTP	upplied to Maleny.	Water Treatment Plant
90	Sunshine Coast	Sunshine Coast Sunshine Coast Noosa WTP KiP			Water supplied to Noosa.	Water Treatment Plant

Attachment 3: Preferred and alternative supply options by demand zone

Grid region	Demand zone	Supply option	Status	Key considerations	Trigger to implement option	Comment
Redland	LinkWater Capalaba Zone	Capalaba WTP only (EPI west)	Current	THM potential in water from Capalaba		Part of the Capalaba WTP zone is supplied directly from the main going from the WTP to the Alexandra Hills reservoir.
Redland	LinkWater Capalaba Zone	Blend: Capalaba and North Stradbroke Island WTPs (EPI westerly flow direction)	Current	Cost of production at Capalaba vs North Stradbroke Island (including pumping from Capalaba to Alex Hills res and from North Straddle to the mainland)		The remainder of the zone is supplied with blended water with water coming via the Bunker Road connection to the Alexandra Hills reservoir.
Redland	LinkWater Capalaba Zone	Blend: Capalaba, North Stradbroke Island WTPs and EPI (easterly flow direction)	Option	Cost of pumping westward in the EPI at Gramzow Rd	Significant failure of North Stradbroke Island or Capalaba WTP	
Redland	LinkWater Capalaba Zone	0	0	Risk associated with break point chlorination in water from EPI going eastward	Storage levels in Leslie Harrison Dam reach low levels and the NSI WTP was at risk of being unable to meet demand	
Redland	LinkWater Capalaba Zone	0	0	Potential taste changes associated with water that has been break point chlorinated.		
Redland	LinkWater North Stradbroke Island Zone	North Stradbroke Island WTP only (EPI west)	Current			
Redland	LinkWater North Stradbroke Island Zone	Blend: North Stradbroke Island WTP and EPI easterly flow direction	Option	Risks associated with break point chlorination in water from EPI eastward, such as chlorate	Significant failure of North Stradbroke Island or Capalaba WTPs. Storage levels in Leslie Harrison Dam reaches low levels and the NSI WTP was at risk of being unable to meet demand.	
Redland	LinkWater North Stradbroke Island Zone	Capalaba WTP only (EPI west)	Current			
Redland	Dunwich Zone	Dunwich WTP only	Current	No option		
Redland	Amity Point Zone	Amity Point WTP only	Current	No option		
Redland	Point Look Out Zone	Point Look Out WTP only	Current	No option	· ·	
Gold Coast	LinkWater Northern Mixed Zone	Molendinar WTP only (SRWP north)	Option	SOP requires that the desalination facility be operated at a minimum of one-third of capacity Aim to maintain average monthly consumption either below or above 125 ML/d, which is the threshold above which Molendinar WTP requires the use of the pumped transfer of raw water from Hinze Dam	Desalination facility is unavailable	Location in this zone will determine the actual composition of water delivered, as there is a degree of connectivity between the northerly and southern mixed zones. Different compositions of water will exist throughout these areas
Gold Coast	LinkWater Northern Mixed Zone	Blend: Desalination facility, Mudgeeraba and Molendinar WTPs (SRWP north)	Current		Desalination Plant utilisation is maximised when key Water Grid storage levels fall to 60% of capacity	
Gold Coast	LinkWater Northern Mixed Zone	Blend: Desalination facility, Mudgeeraba & Molendinar WTPs and SRWP (southerly flow direction)	Option	Major reduction in Gold Coast water security		
Gold Coast	LinkWater Northern Mixed Zone		The second secon	Risk associated with break point chlorination - chlorate levels		

Grid region	Demand zone	Supply option	Status	Key considerations	Trigger to implement option Comment
Gold Coast	LinkWater Southern Mixed Zone	Blend: Desalination facility, Mudgeeraba & Molendinar WTPs (SRWP north)	Current	Maintain consistent blend ratio of desalinated water in the zone, particularly the area fed from the Robina mixing tank which is the area that receives a blend most of the time	
Gold Coast	LinkWater Southern Mixed Zone	Blend: Desalination facility, Mudgeeraba & Molendinar WTPs and SRWP (southerly flow direction)	Option	Availability of Mudgeeraba WTP	Hinze and Little Nerang dams reach low levels
Gold Coast	LinkWater Southern Mixed Zone	Mudgeeraba WTP only (SRWP north)	Option	Aim to maintain average monthly consumption either below or above 125 ML/d, which is the threshold above which Molendinar WTP requires the use of the pumped transfer of raw water from Hinze Dam	Desalination facility is not operating or operating at one-third capacity. In these circumstances, this zone will receive no or very little desalinated water (and then potentially only in Robina)
Gold Coast	LinkWater Southern Mixed Zone	Blend: Tugun and Mudgeeraba (SRWP north)	Current		*
Gold Coast	LinkWater Coolangatta Currumbin Zone	Supplied via the LinkWater Southern Mixed Zone	Current		
Gold Coast	LinkWater Coolangatta Currumbin Zone	Desalination facility only	Option		Failure at Mudgeeraba WTP
Gold Coast	LinkWater Mudgeeraba Zone	Mudgeeraba WTP only	Current	No Option	
Logan	Underwood Road Zone	Supplied by the LinkWater Brisbane Zone	Option		Connection from Brisbane to Logan zone opened should WQ in that connection require it.
Logan	Underwood Road Zone	Supplied by the LinkWater Logan Zone	Current		
Logan	LinkWater Logan Zone	Blend: - Mt Crosby WTP via Brisbane (major) - EPI (moderate) - Logan River Pump Station (moderate) - Pub Lane Pump Station (Minor)	Option	Water quality incidents in Central Logan area	
Logan	LinkWater Logan Zone	Blend: - Mt Crosby WTP via Brisbane (major) - EPI (moderate) - Logan River Pump Station (minor) - Pub Lane Pump Station (Minor)	Current		
Logan	LinkWater Logan Zone	Blend: - Mt Crosby WTP via Brisbane (major) - Logan River Pump Station (minor) - Pub Lane Pump Station (minor) supplying Redland via the EPI (eastward flow)	Option		
Logan	Teviot Rd Zone	Using Teviot Road connection to the area supplied by Greenbank reservoir	Current	WQ outcomes improve chlorine residual in this area. Ecoli and other coli forms have been detected and this supply	
Logan	Teviot Rd Zone	Supply via LinkWater (Logan) - effectively part of LinkWater (Logan)	Option		SRWP was unavailable
Logan	Logan River Pump station Zone	Supplied effectively as part of the LinkWater Logan Zone (with Logan Bridge Pump Station connection supplying south)	Option		Water quality in Logan Central being unacceptable, such as due to low chlorine residuals or multiple ecoli detections
Logan	Logan River Pump station Zone	Supplied by the Logan River Pump Station operating in a northerly	Current		

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Grid region	Demand zone	Supply option	Status	Key considerations	Trigger to implement option	Comment
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Logan	Beenleigh Zone	Supplied via the Gold Coast LinkWater Northern Mixed Zone	Current			
Logan	Beenleigh Zone	Blend: Desalination facility, Mudgeeraba & Molendinar WTPs and Logan River connection moving water south	Option		Water quality improvements be required in the Logan zone Hinze Dam reaches 60% and Wivenhoe Dam	
Logan	South Mclean Zone	South MacLean WTP only	Current		is at a higher level	
Logan Brisbane	LinkWater Brisbane Zone	Mt Crosby WTP only (NPI north &		Likelihaad of receiving inflam to Hissa Dage		
Dispane	LITIK WALET DIBDATE ZOTIE	SRWP south)	Option	Likelihood of receiving inflow to Hinze Dam relative to Wivenhoe Dam		
Brisbane	LinkWater Brisbane Zone	Blend: Mt Crosby WTP and SRWP (NPI north)	Option		NPI operated in northerly direction should Sunshine Coast Dams reach 40% to 60%, subject to the volumes in other dams such as North Pine Somerset and Wivenhoe Dams	NPI Stage 2 required for this option to be implemented
Brisbane	LinkWater Brisbane Zone	Blend: Mt Crosby & North Pine WTPs and NPI (SRWP south)	Option	Contribution of North Pine WTP to the Brisbane zone, taking into account the efficiency of operation of the North Pine WTP		
Brisbane	LinkWater Brisbane Zone	Blend: Mt Crosby & North Pine WTPs, NPI and SRWP	Current			
Brisbane	Enoggera Zone	Enoggera WTP only	Option	Water quality benefits of operating Enoggera WTP compared to supply from Green Hills	Chlorine residual insufficient in supply from LinkWater Brisbane zone during summer	
Brisbane	Enoggera Zone	Supplied by the LinkWater Brisbane Zone	Current	Cost of production at Mt Crosby WTP (plus pumping) compared to cost of production at the Enoggera WTP	Likely mode of operation for winter as chlorine residual is usually suitable at that time	
Brisbane	Brisbane Aquifer Zone	Brisbane Aquifer WTPs only	Option	Costs of production at the Aquifer WTPs compared with the costs of production at Mt Crosby WTP	If there is a need to continue operating one of these plants to maintain necessary skills and knowledge this option will be set in place	Skills and knowledge issues excepted, Aquifer WTPs are not required over the next five years
Brisbane	Brisbane Aquifer Zone	Supplied by the LinkWater Brisbane Zone	Current	Water quality from Brisbane aquifers		
Ipswich	LinkWater Ipswich Zone	Blend: Mt Crosby WTP and SRWP	Current	Dependant on the method of supply to LinkWater Brisbane		Some of this zone will be supplied directly from the Mt Crosby WTP, regardless of whether the SRWP is operating in a northerly direction, due to network configuration
Ipswich	LinkWater Ipswich Zone	Mt Crosby WTP only	Option			
Scenic Rim	Peak Crossing Zone	Supplied by the LinkWater Ipswich Zone	Current	No option		
Scenic Rim	Boonah Kalbar Zone	Kalbar WTP only	Current	No option		
Scenic Rim	Beaudesert Zone	Beaudesert WTP only	Current	No option		
Scenic Rim	Kooralbyn Zone	Kooralbyn WTP only	Current	No option		2
Scenic Rim	Rathdowney Zone	Rathdowney WTP only	Current	No option		Triangle
Scenic Rim	Canungra Zone	Canungra WTP only	Current	No option	The state of the s	
Somerset	Jimna Zone	Jimna WTP only	Current	No option	en in a constant a con	
Somerset	Kilcoy Zone	Kilcoy WTP only	Current	No option	Taxable Control of the Control of th	
Somerset	Lake Somerset Zone (Kilcoy)	Lake Somerset WTP only	Current	No option		4.
Somerset	Esk/ Toogoolawah Zone	Esk WTP only	Current	No option		
Somerset	Somerset Township Zone	Somerset Township WTP only	Current	No option		
Somerset	Linville Zone	Linville WTP only	Current	No option	1	

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Grid region	Demand zone	Supply option	Status	Key considerations	Trigger to implement option	Comment
Somerset	Tarampa Minden Zone	Supplied via the Lowood/ Fernvale Zone	Current	No option		
Somerset	Lowood/ Fernvale Zone	Lowood WTP only	Current	No option		
Lockyer Valley	Lockyer Valley Zone	Supplied via the Lowood/ Fernvale Zone	Current	No option		
Sunshine Coast	Maroochy Kenilworth Zone	Kenilworth WTP only	Current	No option		
Sunshine Coast	Caloundra Maleny Zone	Maleny WTP only	Option			No treatment required at Maleny for at least five years
Sunshine Coast	Caloundra Maleny Zone	Landers Shute WTP	Current	Cost and water quality improvements in supply from Landers Shute WTP		Effectively becomes part of the Caloundra Landers Shute Zone under this option
Sunshine Coast	Noosa WTP Zone	Noosa WTP only	Current	No option		
Sunshine Coast	Maroochy Image Flat Zone	Image Flat WTP only	Current	Image Flat WTP can supply Palmwoods and Woombye, reducing demand on the Landers Shute WTP Cost of treatment at Image Flat WTP compared to Landers Shute WTP		
Sunshine Coast	Maroochy Image Flat Zone	Blend: Image Flat and Landers Shute WTPs	Option	Image Flat WTP supplying Palmwoods Woombye puts more demand on Image Flat and		THE REPORT OF THE PROPERTY OF
Sunshine Coast	Ewen Maddock Zone	Ewen Maddock WTP only	Current	Likelihood of receiving inflow to Ewen Maddock Dam compared to Baroon Pocket Dam		
Sunshine Coast	Ewen Maddock Zone	Lander's Shute WTP only	Option		Full Ewen Maddock Dam water entitlement used within the water year	
Sunshine Coast	Maroochy Lander's Shute Zone	Lander's Shute WTP only	Current			Part of this zone is supplied with water direct from Landers Shute (Railway towns and parts of northern Caloundra area fed by the northern arm of the Stage 2 main) while the rest is supplied with blend from Ewen Maddock and Landers Shute
Sunshine Coast	Caloundra Lander's Shute Zone	Blend: Ewen Maddock and Lander's Shute WTPs	Current	Likelihood of receiving inflow to Ewen Maddock vs Baroon Pocket Dam Higher cost of production at Landers Shute WTP compared to Ewen Maddock WTP Having the Ewen Maddock WTP operating reduces the overall take from Landers Shute WTP Water quality in Baroon Pocket Dam, particularly blue green algae over summer months	If blue green algae occurs and output from Landers Shute WTP is reduced due to increased filter backwash frequency. Likely to be a summer operating mode as most summers Baroon Pocket is affected by blue green algae. Having Ewen Maddock WTP producing will slightly reduce the pressure on the Lander's Shute WTP.	The Annual Continues of the Continues of
Moreton Bay	Dayboro Zone	Dayboro WTP only	Current	No option		1

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Grid region	Demand zone	Supply option	Status	Key considerations	Trigger to implement option	Comment
Moreton Bàỹ	Woodford Zone	Woodford WTP only	Current	Risk associated with customer service standards to those customers taking water directly from the Caboolture to Woodford Pipeline. Very high pressure in the main pipe. If PRV fails customers would to experience dramatic failures.		
Moreton Bay	Woodford Zone	Supply from Caboolture network	Option	Cost comparison between UnityWater pumping up the hill and Seqwater producing at Woodford WTP	If Woodford WTP is unavailable, water available in the Stanley River is insufficient or quality of raw water is poor such that treated water quality is compromised	An assessment of what is best for the Grid as a whole is required for this supply zone, including water quality triggers to cease supply from Woodford WTP
Moreton Bay	LinkWater Caboolture Zone	Lander's Shute WTP only (NPI south)	Option			
Moreton Bay	LinkWater Caboolture Zone	Blend: Lander's Shute and North Pine WTPs (NPI south to Narangba and Byrnes Rd pump station moving water north to Narangba)	Option	Levels in Sunshine Coast dams relative to Wivenhoe, North Pine and Somerset dams. If Sunshine Coast dams are less full (as a percentage then transfer south in NPI needs to be minimised	Levels in Sunshine Coast Dams increases to 70% or are below Wivenhoe, Somerset and North Pine dams	
Moreton Bay	LinkWater Caboolture Zone	North Pine only (NPI north all the way to Caloundra mains)	Option	Cost of producing water and transferring it to Morayfield and Narangba compared to production at the Caboolture WTP Cost of producing water and transferring it to Morayfield and Narangba compared to producing at North Pine WTP and transferring via Byrnes Rd to Narangba	NPI Stage 2 is required for this option	
Moreton Bay	LinkWater Caboolture Zone	Blend: Lander's Shute and Caboolture WTPs with NPI southerly flow supplying to Morayfield, Narangba and to North Pine WTP	Current			
Moreton Bay	LinkWater Caboolture Zone	Landers Shute WTP supply via NPI to Morayfield and Narangba (Caboolture WTP offline)	Option			
Moreton Bay	Bribe Island Zone	Banksia Beach WTP only	Current	Performance of Banksia Beach WTP. If unable to produce enough water some LinkWater supply will need to be made available at Morayfield		
Moreton Bay	Bribe Island Zone	Woorim WTP only - not operational	Option		2 · · · · · · · · · · · · · · · · · · ·	TOTAL STREET, 2 MAIN. 2131 MAIN. MAIN. MAIN. MAIN. MAIN. MAIN. 12 M. M. 2 PAUL MAIN. MAIN. MAIN.
Moreton Bay	Bribe Island Zone	Blend: Banksia Beach and supply via the LinkWater Caboolture Zone	Current		1 · · ·	
Moreton Bay	Caboolture WTP Zone	Caboolture WTP only	Option	Costs of production at Caboolture WTP compared to NPI or North Pine WTP via Byrnes Rd and Narangba to Morayfield		
Moreton Bay	Caboolture WTP Zone	Supply via the LinkWater Caboolture Zone with NPI in Southerly flow direction and Caboolture WTP offline	Option	Costs of production at Caboolture and water quality risks lead to the preferred approach to minimise production from Caboolture WTP	Set in place if Caboolture WTP is unavailable due to poor raw water quality or other reason	
Moreton Bay	Caboolture WTP Zone	Blend: Caboolture WTP and NPI	Current			
Moreton Bay	Petrie Demand Zone	Petrie WTP only	Current	No option		
Moreton Bay	LinkWater Pine Rivers Zone	North Pine WTP only (NPI north)	Option	Water quality in the transition zone where water from the Mt Crosby WTP meets water from the North Pine WTP. The location of the transition zone is dictated by production volumes from North Pine WTP. 40ML/d is		
		THE PROPERTY OF THE PROPERTY O	Person, come of the control of the c	supplied to Aspley but not much further, 100	The state of the s	

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Grid region	Demand zone	Supply option	Status	Key considerations	Trigger to implement option Comment
				ML/d improves the water quality in the Aspley to Sparkes Hill scheme	
Moreton Bay	LinkWater Pine Rivers Zone	Blend: North Pine WTP and NPI (NPI south)	Current		
Moreton Bay	LinkWater Pine Rivers Zone	Blend: Mt Crosby and North Pine WTPs (NPI north)	Option		
Moreton Bay	LinkWater Pine Rivers Zone	Blend: Mt Crosby and NPI south - North Pine turned off	Option	Water quality in raw water in North Pine Dam, especially the presence of Blue Green algae	
Moreton Bay	LinkWater Redcliffe Zone	Blend: North Pine WTP and NPI	Current	For disinfection purposes one supply is better than having some from the Petrie WTP and some from the North Pine WTP	
Moreton Bay	LinkWater Redcliffe Zone	Blend: North Pine & Petrie WTPs and NPI	Option	Water from the North Pine WTP is chloraminated. At Margate the water then only needs to be boosted with the same disinfection type	
Moreton Bay	LinkWater Redcliffe Zone	Blend: Mt Crosby WTP & NPI	Option	Likelihood of North Pine receiving inflow to Lake Kurwongbah	
Moreton Bay	LinkWater Redcliffe Zone	Petrie WTP Only	Option	Chlorinated supply going all the way to Redcliffe to get chloraminated at Margate. UnityWater have previously experienced problems under this mode	
	Western Corridor Recycled Water Scheme			When key Water Grid storages are below 40% of capacity, supply to Wivenhoe Dam is maximised	
	Southern Regional Water Pipeline	Northerly flow - maximum rate	Option		A water quality incident in Brisbane or asset related failure at Mt Crosby WTP would result in this option being implemented. For an aesthetic issue, water would be sourced from Molendinar and Mudgeeraba as a preference to the desalination facility
en twamer recome as a recome a	Southern Regional Water Pipeline	Northerly flow - minimum rate	Current	Costs of operating the SRWP drive the WGM to minimise the use of this pipeline	
• W NAMES CONTROL CONT	Southern Regional Water Pipeline	Southerly Flow maximum rate	Option	Water quality and asset failure risk necessitate keeping the pipeline available.	Should Hinze Dam reach 40% and sufficient water be stored in Central Brisbane Dams. This would be coordinated with production from the desalination facility which may or may not be operating at greater than one-third capacity (depending on regional storage volumes)
All states and a state of the s	Southern Regional Water Pipeline	Southerly Flow minimum rate	Option		
	Northern Pipeline Interconnector	Southerly flow supplying to Morayfield and Narangba and on to North Pine	Current	Levels in Sunshine Coast Dams relative to Brisbane Dams	
•	Northern Pipeline Interconnector	Southerly flow at minimum rate supplying to Morayfield and part of Narangba's demand with North Pine WTP supplying north to Narangba	Option	Costs associated with production at Caboolture and North Pine cf Landers Shute and the NPI.	If Sunshine Coast Dams reach 70% or they are less full than Wivenhoe, Somerset and North Pine Dams (as a proportion)
THE STATE OF THE S	Northern Pipeline Interconnector	Southerly flow maximum volume	Option	WQ risks at Landers Shute WTP particularly in summer.	Water quality incident to be managed in Brisbane or the southern part of Unitywater's area of responsibility
	Desalination facility	Offline	Option	3	
- Aut 99300 1 19900	Desalination facility	33% production	Current		

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Grid region	Demand zone	Supply option	Status	Key considerations	Trigger to implement option	Comment
	Desalination facility	66% production	Option		Regional storage volumes fall to 40% of capacity. If further testing of desalination plants capability was required these options would be considered	
	Desalination facility	100% production	Option		Regional storage volumes fall to 40% of capacity. If further testing of desalination plants capability was required these options would be considered	



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Attachment 7: SEQ Water Balance Model inputs.

Table A7.1: Transfers used in short-term modelling.

Transfer Rules	Storages	Trigger	Above trigger capacity (ML/day)	Below trigger capacity (ML/day)	Difference formula	Minimum difference	Qualifications
SRWP southerly flow	Southern Regional	40%	0	55	Southern minus Central	0	Trigger chosen at a point to ensure Hinze Dam does not reach minimum operating level (dead storage) which is one of the long term level of service objectives that the WGM must ensure are met. Southerly flow will be instigated earlier than this trigger should a water quality or asset failure related incident occur at the WTPs on the Gold Coast and or the desalination plant. This operational approach is subject to further cost information becoming available to allow comparison between northern and southern flow in the SRWP. Actual volume of transfer north will depend on demands and availability of WTPs on the Gold Coast.
SRWP northerly flow	Southern Regional	40%		0	Central minus Southern	0	SRWP direction is assumed to be north bound for the large majority of the period of the operating strategy. This however may be affected by cost and any unplanned incidents at the Gold Coast Plants (WTPs and desal) they may necessitate southerly flow.
NPI southerly flow	Northern Regional	70%	65	0	Central minus Northern	0	Based on maximising supply into the Caboolture area and minimising the extent to which NPI contributes to North Pine WTP flow. Flow south may be increased above this level should there be a need for water quality or asset related issues.
NPI northerly flow	Northern Regional	0	O	0	Northern minus Central	0	**************************************
Brisbane to Toowoomba	Toowoomba	100%	0	10000	NA		Below 100% in Toowoomba's Dams flow to Cressbrook Creek Dam can continue in accordance with model objectives. Over 20% in Toowoomba's dams it is likely that the transfer will not be as high as 10000 ML/a as Toowoomba would be looking to minimise operating costs associated with this pipeline
Toowoomba to Brisbane	Toowoomba	0	0		NA		No transfer from Toowoomba to Wivenhoe envisaged
Desalination facility		60% (of key grid storages)	44	125	NA		

Table A7.2: Demands and Inflows used in short-term modelling.

	Toowoomba borefield	Bribie borefield	Desalination facility*	WCRWS**	Qualifications
Demand		restite — h			See attached Model file
Annual Inflow					Provided in model files attached to Operating Strategy
Monthly Inflow (water year)				*	
1		120	3802	3802	*Desalination production 33% above 60% in key Water Grid Storages and 100% below 60% in key Water Grid Storages (as per trigger in table above).
				Marie Color	** WCRWS trigger for augmenting drinking water supply is
2		120	3802	3802	40% of the regional storage volumes
3		120	3802	3802	
4	Control of the contro	120	3802	3802	
5		120	3802	3802	
6	The second secon	120	3802	3802	
7	1 / / I all table table decided and a table ta	120	3802	3802	
8		120	3802	3802	
9		120	3802	3802	
10		120	3802	3802	An an an an analysis of the second se
11		120	3802	3802	* *** ********************************
12	THE SECTION AND ADMINISTRATION OF THE SECTION AND ADMINISTRATION OF THE SECTION O	120	3802	3802	



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Table A7.3: Transfers used in long-term modelling.

Transfer Rules	Storages	Trigger	Above trigger capacity (ML/day)	Below trigger capacity (ML/day)	Difference formula	Minimum difference	Qualifications
SRWP southerly flow	Southern Regional	40 (of southern storages)	O	55	Southern minus Central	0	Trigger chosen at a point to ensure Hinze Dam does not reach minimum operating level (dead storage) which is one of the long term level of service objectives that the WGM must ensure are met. Southerly flow will be instigated earlier than this trigger should a water quality or asset failure related incident occur at the WTPs on the Gold Coast and or the desalination plant. This operational approach is subject to further cost information becoming available to allow comparison between northern and southern flow in the SRWP. Actual volume of transfer north will depend on demands and availability of WTPs on the Gold Coast.
SRWP northerly flow	Southern Regional	40 (of southern storages)	25	0	Central minus Southern	0	SRWP direction is assumed to be north bound for the large majority of the period of the operating strategy. This however may be affected by cost and any unplanned incidents at the Gold Coast Plants (WTPs and desal) they may necessitate southerly flow.
NPI southerly flow	Northern Regional	70 (of northern region storages)	65	O	Central minus Northern	0	Based on maximising supply into the Caboolture area and minimising the extent to which NPI contributes to North Pine WTP flow. Flow south may be increased above this level should there be a need for water quality or asset related issues.
NPI northerly flow	Northern Regional	0	0	0	Northern minus Central		Northerly flow in the NPI will not be available over the duration of this operating strategy, however it was factored into the assessment at the point it becomes available to ensure all the long term level of service criteria can be met. In this way we can test the operation over the next 12 months to ensure it does not jeopardise the security outcomes past this point once NPI 2 is complete with northerly flow capacity to Caloundra. Without the NPI northerly flow capacity built into the model at the stage of completion the long term level of service objective related to dead storage never being reached in Baroon Pocket could not be met.
Brisbane to Toowoomba	Toowoomba	100	0	10000	NA	MAN AND RESIDENCE OF THE PROPERTY AND AND ADDRESS OF THE PROPERTY ADDRESS OF THE PROPERTY AND ADDRESS OF THE PROPERTY ADDRESS OF THE PROPERTY AND ADDRESS OF THE PROPERTY ADDRESS OF THE PROPE	Below 100% in Toowoomba's Dams flow to Cressbrook Creek Dam can continue in accordance with model objectives. Over 20% in Toowoomba's dams it is likely that the transfer will not be as high as 10000 ML/a as Toowoomba would be looking to minimise operating costs associated with this pipeline
Toowoomba to Brisbane Desalination facility	Toowoomba	0 60% (of key grid	0 44	125	NA NA	The state of the s	No transfer from Toowoomba to Wivenhoe envisaged
		key grid storages)	*			ANTONIO VINN	

Table A7.4: Demands and Inflows used in long-term modelling.

	Toowoomba borefield	Bribie borefield	Desalination facility*	WCRWS**	Qualifications
Demand	CONTRACTOR AND	PARAMANIAN MANAMANANAN MANAMANANAN MANAMANANAN MANAMANA			See attached Model file
Annual Inflow					Provided in model files attached to Operating Strategy
Monthly Inflow (water year)		***************************************			
1		120	2002		*Desalination production 33% above 60% in key Water Grid Storages and 100% below 60% in key Water Grid Storages
<u> </u>		120	3802	3802	The state of the s
2	No.	120	3802	3802	** WCRWS trigger for augmenting drinking water supply is 40% of the regional storage volumes
3		120	3802	3802	
4	And the second	120	3802	3802	
5	The state of the s	120	3802	3802	
6		120	3802	3802	
7	The state of the s	120	3802	3802	
8	u euwana	120	3802	3802	
9		120	3802	3802	
10		120	3802	3802	- The state of the
11	The state of the s	120	3802	3802	
12		120	3802	3802	All Andrews and An

Attachment 4: Operating Strategy requirements – Seqwater

Water Treatment Plant	Forecas	Forecast supply requirement	Capacity reguiremen	Additional water quality	Reliability requirement	Comments
	(ML/d aver mo	(ML/d averaged over a month)	t (ML/day)	requirement S		
	Mean Day Minimum	Mean Day Maximum				
Landers Shute WTP	66.6	E.86	130.0	TBD	TBD	
North Pine WTP	63.1	142.7	220.0	TBD	TBD	and the state of t
Mt Crosby	279.2	486.4	0.006	TBD	TBD	ANA VILLAGARIA SALARA BARRA MARINAMININANI MARINANI ANABANYA ANABAN
North Stradbroke Island WTP	26.0	26.0	26.0	TBD		CONTRACTOR OF THE PROPERTY OF
Capalaba WTP	5.7	30.1	18.0	TBD	TBD	AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
Molendinar WTP	25.4	160.9	160.0	TBD	180	alla i internationale and a such a such a such as such a such as such
Mudgeeraba	47.9	9.66	100.0	180	TBD	
Noosa WTP	16.9	24.5	35.0		TBD	**************************************
Image Flat WTP	16.2	23.1	18.0	TBD	TBD	
Kenilworth WTP	0.3	0.3	0.4	T8D		The same and the same
Ewen Maddock WTP	7.9	7.9	20.0	T8D	TBD	Require availability over summer to assist in managing potential risks associated with raw water quality pressures at Landers Shute

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Mean Day Mea Minimum Max Month Minimum Max Maleny WTP		t (ML/day)	requirement S	V	
0.0 0.0 0.0 0.0 0.0	Mean Day Maximum Month				
(pue					WTP
(pue	0.0	0.0	TBD	ТВD	Once Landers Shute to Maleny pipeline is proven, then the pipeline will be the source of supply.
(pue	4.5	14.3	TBD	TBD	
(pue	0.0	0.0	TBD	TBD	The statement of the st
	4.2	4.2	TBD		** * ***** * * * * * * * * * * * * * *
The state of the s	0.0	0.0	TBD	TBD	Ongoing requirement to maintain skills and knowledge in operating these plants to be discussed further with Seqwater.
Petrie WTP	27.1	45.0	TBD	TBD	
Woodford WTP 2.5	4.3	3.2	TBD	TBD	
Dayboro WTP 0.3	0.6	T.T	TBD	TBD	

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	requii (ML/d aver	requirement (ML/d averaged over a	requiremen t (ML/day)	water quality requirement s	requirement S	
	Mean Day Minimum	Mean Day Maximum				
Pt Lookout WTP			1.7	TBD	TBD	
Dunwich WTP	0.3	0.7	1.0	TBD	TBD	in the second se
Amity Point WTP	0.2	0,5	0.5	TBD	TBD	Монтонициональной мето по помента по помента по помента помента помента помента помента помента помента помент Помента помента
Enoggera WTP	2.5	2.5	3.3	TBD	TBD	A 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
Jimna WTP	0.0	0.0	6.0	TBD	TBD	T m 'to' Malinatonialanamamanananananananananananananananan
Kilcoy WTP	1.5	3.1	1.5	TBD	TBD	enemente un compositorio de la compositorio del constitución de la compositorio de la compositorio de la compo
Somerset Dam WTP (Esk)	0.0	0.1	0.5		TBD	Andrew Communication Communication (Andrews Communication) (Andrews Communicat
Esk WTP	0.5	1.1	0.8	TBD	TBD	
Linville WTP	0.0	0.1	0.7		TBD	NO. ORANGA MANAGAMAN
Lowood WTP	7.8	14.2	20.0	TBD	TBD	
South Maclean Weir WTP	1.9	5.5	6.5	TBD	TBD	AND THE REAL PROPERTY OF THE P
Kooralbyn WTP	0.5	1.5	1.9	TBD	TBD	en construction and a management of the construction of construction of the constructi
Rathdowney WTP	0.1	0.3	2.0	TBD	TBD	······································
Beaudesert WTP	1.6	5.4	4.8	TBD	TBD	· Administration and management of the property of the propert
Albert River WTP	0.0	0.0	0.0	TBD	TBD	THE
Canungra WTP	0.2	8.0	0.4	TBD	TBD	The same and the same species of the same state

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supply Capacity Additional Reliability Comments ment requiremen water quality requirement sed over a t (ML/day) requirement s s	Mean Day Maximum Month		0.0 0.0 TBD TBD	
Forecast s requirer (ML/d averag	Mean Day Minimum Month	0.0	0.0	
Water Treatment Plant		Aratula WTP	Toogoolawah WTP	

Attachment 5: Operating Strategy requirements – LinkWater

Table A5.1: Interconnector requirements.

Pipeline	Likely minimum requirement (ML/d)	Likely maximum requirement (ML/d)	Capacity requirement (ML/d)	Reliability requirement (ML/day)
Northern Pipeline				
Interconnector –	30	65	65	TBD
Southerly flow				****
Southern Regional		4.5		
Water Pipeline –	25	95	95	TBD
Northerly flow		Add 1	194A	
Southern Regional				
Water Pipeline –	20	55	55	TBD
Southerly flow				
Eastern Pipeline	1	4-05-05 14-15-		
Interconnector -	4	10	10	TBD
Westerly flow				
Eastern Pipeline	1		12	All Control of the Co
Interconnector –	4	10	10	TBD
Easterly flow	And the same of th			THE PROPERTY OF SPACE OF THE PROPERTY OF SPACE OF THE PROPERTY OF SPACE OF THE PROPERTY OF THE

Table A5.2: Required take from major water treatment plants (ML/month).

Water treatment plant	Likely minimum requirement based on low demand scenario and operational requirements	Likely maximum requirement based on high demand scenario and operational requirements
Landers Shute	930	2015
Molendinar	2112	3697
Mudgeeraba	1621	3088
SEQ Desal	1279	3875
Mt Crosby	8492	15077
North Pine	2096	4423
Capalaba	423	934
North Stradbroke Island	806	806

Attachment 6: Operating Strategy requirements – WaterSecure

Table A6.1: Manufactured water requirements.

Scheme	Mean Day Minimum month (ML/month)	Mean Day Maximum Month (ML/month)	Capacity requirement (ML/month)	Reliability requirement
Western Corridor Recycled Water Project	665	1127	1130	TBD
SEQ (Gold Coast) Desalination Facility	1279	1279	3875	TBD



Attachment 8: SEQ Regional Water Balance Model outputs

Table A8.1: SOP risk criteria (low demand scenario, short-term model).

Volume of water stored by all Key	1 y	ear .	3 y.	ears	5 y.	ears
Water Grid Storages	SOP	Operating Strategy	SOP	Operating Strategy	SOP	Operating Strategy
40%	< 0.2%	<0.01	NA	. NA	<5%	0.01%
30%	NA	NA	< 0.5% ⁻	<0.01	<1%	<0.01

Table A8.2: SOP risk criteria (high demand scenario, short-term model).

Volume of water stored by all Key	1 y	ear	. Зу	ears	5 у	ears
Water Grid Storages	SOP	Operating Strategy	SOP	Operating Strategy	SOP	Operating Strategy
40%	< 0.2%	<0.01	NA	NA	<5%	0.02%
30%	NA	NA	< 0.5%		<1%	0.01%

Table A8.3: Levels of Service objectives (low demand scenario, long-term model).

		riteria			SOP	Operating Strategy
T1			* . *		25	58
T2			is.	: '	100	116
SEQ 10%	i.				1000	NA
SEQ 5%		14 (18) 1833			NA NA	NA
Grid 3 dea	ad storage	e volume			NA	NA
Baroon Po	ocket Dan	n dead storage	volume		NA VI	NA
Hinze Dar	n dead st	orage volume			NA	NA

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Dan Spiller From: Tuesday, 26 October 2010 9:51 AM Sent: Peter Borrows To: Cc: Jim Pruss Re: Draft Operating Strategy Subject: Thanks Peter - that is all I expected. as your contact for the Operating Strategy. I have spoken to him
I also gave a heads up on it last week. You had previously nominated lim and yesterday briefed I also gave a heads up on it last week. Unfortunately the other CEOs did not nominate a contact - so I have needed to go through them. Dan On 26/10/2010, at 9:42 AM, "Peter Borrows" wrote: > Thanks Dan. > I neither have time available to read this before this afternoon, nor the opportunity to discuss it internally, so I will only be in a position to listen this afternoon, rather than discuss it. > Regards, Peter. > Peter Borrows > Chief Executive Officer > Queensland Bulk Water Supply Authority trading as Seqwater > [cid:image001.png@01CB74F1.F4AA1A40] > Ph > pborrows > Level 3, 240 Margaret St, Brisbane City QLD 4000 PO Box 16146, City > East QLD 4002 Website | > www.seqwater.com.au<http://www.seqwater.com.au/> > From: Dan Spiller > Sent: Tuesday, 26 October 2010 9:01 AM Peter Borrows; > To: > Keith Davies > Cc: Jim Pruss; Barry Dennien > Subject: Draft Operating Strategy > > All, > Attached is the draft Operating Strategy for discussion this afternoon and review by the end of this week. > The Strategy reflects a series a discussions we have had with key officers, including and at Segwater and at Linkwater. > The focus is twofold: It confirms that Maleny, Woorim and Brisbane Aquifer Projects are not required over the next five years (continuing recent Grid Instructions).

	> · It lists a range of priorities for investigation, with the process for those investigations to be agreed (with both Alex and the QWC doing related work).
	> Keith, you will note that this version is based on a continuation of existing operation of the desalination facility and WCRWS. We will amend it to reflect the outcomes of the advice that is currently being prepared.
	Applogies for the tight timeframe for final review – we had intended to distribute earlier but were distracted by the rain.
	> We need to submit a revised version of the Operating Strategy every six months. I expect that it will be refined significantly over the next year or so.
	> Please do not hesitate to call if you have any queries or require any further information. > Regards,
	> Dan > Daniel Spiller
بدسم	> Director, Operations > SEQ Water Crid Management Property Pr
ч	> Email: > daniel.spille
	> Visit: Level 15, 53 Albert Street Brisbane > Post: PO Box 16205, City East QLD 4002 > ABN: 14783 317 630
	> Please consider the environment before printing this email. It takes 10 litres of water to make one sheet of A4 paper.
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- > <image001.png>
- > <SEQ Water Grid Operating Strategy Version 2 October 2010(2).docx>

Rob Drun

Sent:

Sunday, 12 December 2010 2:47 PM

To:

Dan Spiller

Cc:

Mike Foster; Jim Pruss; Peter Borrows;

Subject:

Technical Report W1

Attachments:

Technical Stuation Report W1.docx

Dan,

Attached is the Technical Report for our release from Wivenhoe planned to start tomorrow.

The WGM, Councils and Dam Regulator have all been informed but this will meet our obligations under the Protocol as it stands, the Protocol will no doubt be adjusted after Council comments but this meets the technical requirements.

It is really an update report and will send another one when we start releasing and then when we make any major change, probably shutdown as the releases will be fairly constant. Communications will still occur regardless.

Councils are aware of the plans and I have sent them an email asking if they want to submit any assessment however considering the low level impact of the release apart from bridge closures, they probably won't. No assessment from the BoM as it is not impacting on flood levels however they have been given the information.

The Protocol mentions sending the Report as per the ERP which may mean going to the emergency email address but as we discussed last week, I will send to you as it does not require emergency actions and is more of a heads up. However let me know if you want it sent there in the future or elsewhere, I think that was in the Protocol to ensure it was not lost and we had a process during emergencies.

Rob

Robert Drury

Dam Operations Manager

Water Delivery

Queensland Bulk Water Supply Authority trading as Seqwater



Swimming in weirs and t flowing water is FA1





Wivenhoe Dam, Brisbane Valley Highway, via Fernvale Q4306 Australia

PO Box 37, Fernvale QLD 4306

Website | www.segwater.com.au

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TSR Number W1	Date of TSR 12.12.2010	Time of TSR 2pm
	release	release

Segwater status of inflows and dam operations

Somerset/Wivenhoe Dams

Operational releases have been made from Wivenhoe and Somerset Dams over the last week discharging water that has come into the dams, however this is not sufficient to handle the current inflows. Rainfall in the last 24 hours will result in significant inflows to Somerset and Wivenhoe Dams which will require gate operations in the next few days.

At Somerset, two regulators have been opened around midday Sunday and remain open until at least Thursday. This will release approximately 45,000ML into Wivenhoe Dam. Water level in Somerset Dam is expected to peak around 99.7m AHD during Monday.

There is a peak flow of about 150m3/s expected in the mid Brisbane during Monday, mostly resulting from Lockyer Ck. This will be similar to, if not slightly higher than, the peak of 130 m3/s which occurred on Monday 6/12/2010.

Some 30,000 ML is expected to flow into Wivenhoe Dam from the upper Brisbane R during the next week. Coupled with the Somerset release, this will result in a rise at Wivenhoe during the next 24 to 48 hours with a peak water level around 67.6 m AHD. Releases from Wivenhoe will not be made until the runoff from the Lockyer and local areas has passed Savages Crossing so as not to exacerbate local flooding.

Releases from Wivenhoe are expected to commence on Monday afternoon depending on flows downstream and further possible rainfall, ramping up from the current release of 50m3/s to 300m3/s. The regulator will be closed and Gate 3 will be progressively opened to 3.0m. It is expected to remain at this level until Thursday when it will be reduced back to 50m3/s, at which stage the water level in the dam is expected to be below 67.25m AHD. Low level releases of 50m3/s through the hydro and regulator will then continue

It should be noted that a release of 300m3/s will impact upon Twin Bridges, Savages Crossing and Colleges Crossing. The release strategy is to discharge the stored floodwaters as quickly as possible to return the flood buffer in the dams in case there is further rainfall but in a manner that attempts to minimize disruption downstream.

The Dam Regulator has been advised of the planned actions to confirm the suitability of the planned release strategy.

Councils were contacted by phone and a follow up email sent however their phone advice is considered sufficient considering the minor actions required of councils. They can offer further comments if they desire at any stage.

The planned release strategy has been provided around 10am on 12.12.2010 by phone to Bribsane City Council – Chris Lavin Ipswich City Council – Tony Trace Somerset Regional Council – Tony Jacobs

Although informal operational advice to Councils occurs at other times.

Issues raised by Councils were only a request to be advised when releases began to enable bridge closures. Somerset requested Burton's Bridge to remain open if possible or notice provided if we intend to release sufficient water to close it on purpose.

Actions taken will be to mobilise the flood centre on Monday and advise Councils as requested regarding releases.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager

BoM assessment

(consisting of references to latest Flood Warning for the Brisbane River and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

BoM was advised of planned releases via their flood information email. No formal advice is required of them as the release is a minor drawdown however there is ongoing advice provided by them on predicted rainfall and flows.

Actions taken will be to mobilise the flood centre on Monday and advise Councils as requested regarding releases and keep BoM up to date.

BoM Technical Officer name	
BoM Technical Officer position title	
BoM Technical Officer contact details	

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

BCC will advise internally for information purposes mainly re bridge closures in other council areas that may affect Brisbane residents.

Actions taken will be to mobilise the flood centre on Monday and advise Councils as requested regarding releases.

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Ipswich will coordinate closure of Colleges Crossing as necessary and any other actions.

Actions taken will be to mobilise the flood centre on Monday and advise Councils as requested regarding releases

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the infarmation)

Somerset Council will coordinate closure of Twin Bridges and Savages Crossing as necessary and any other actions.

Actions taken will be to mobilise the flood centre on Monday and advise Councils as requested regarding releases

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due D	Date 13.12.2010	Time	or Event	
described 5	13.22.2010	'''''		

Sent:

Rob Drury Monday, 13 December 2010 2:27 PM

To:

Dan Spiller

Cc:

Peter Borrows; Jim Pruss; Mike Foster

Subject:

Technical Report W2

Attach ments:

Technical Stuation Report W2.docx

Attached is Technical Report No 2.

It is basically an update upon the gate opening.

Next up date will be on any major change or when there is a strategy prepared for gate closure.

Rob

Robert Drury

Dam Operations Manager

Water Delivery

Queensland Bulk Water Supply Authority trading as Segwater



Swimming in weirs and t flowing water is FA1





Wivenhoe Dam, Brisbane Valley Highway, via Fernvale Q4306 Australia PO Box 37, Fernvale QLD 4306 Website | www.seqwater.com.au

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TSR Number	W2	Date of TSR	13.12.2010	Time of TSR	1pm
		release		release	

Seqwater status of inflows and dam operations

Somerset/Wivenhoe Dams

As highlighted in the previous Report, releases commenced from Wivenhoe Dam today.

Wivenhoe Dam Lake Level was 67.30 m AHD and rising slowly at 0630 Monday 13/12/2010. Two regulators are open at Somerset Dam releasing about 138m3/s into Wivenhoe.

One gate is being opened at Wivenhoe Dam commencing at 1.00pm and being fully opened by 3:30pm and releasing approximately 290m3/s, adding to the small ongoing release from the hydro plant gives a total of 300m3/s.

At this stage, it is expected that this gate setting will be maintained until at least Thursday afternoon 16/12/2010.

It should be noted that a release of 300m3/s will impact upon Twin Bridges, Savages Crossing and Colleges Crossing.

Councils were contacted this morning to provide a heads up and contacted again when the gate was opened.

A follow up email has been sent however their phone advice is considered sufficient considering the minor actions required of councils. They were advised they can offer their own assessments if they wish and can ring the Flood Centre for further information.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager

BoM assessment

(cansisting of references to latest Flaad Warning for the Brisbane River and other relevant Bureau farecasts and warnings (e.g. weather/rain forecasts, Trapical Cyclone Warning etc) and other updates/camments if needed)

BoM was advised of planned releases via their flood information email. No formal advice is required of them as the release is a minor drawdown however there is ongoing advice provided by them on predicted rainfall and flows. They were also provided advice of the releases that are occurring.

Action taken was to mobilise the flood centre and advise Councils as requested regarding releases and keep BoM up to date.

BoM Technical Officer name	
BoM Technical Officer position title	
BoM Technical Officer contact details	

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

BCC will advise internally for information purposes mainly re bridge closures in other council areas that may affect Brisbane residents.

Action taken was to mobilise the flood centre and advise Councils as requested regarding releases and keep BoM up to date.

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths af inundation based on the information)

Ipswich will coordinate closure of Colleges Crossing as necessary and any other actions.

Action taken was to mobilise the flood centre and advise Councils as requested regarding releases and keep BoM up to date.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Somerset Council will coordinate closure of Twin Bridges and Savages Crossing as necessary and any other actions.

Action taken was to mobilise the flood centre and advise Councils as requested regarding releases and keep BoM up to date.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due	Date	Time	or Event	Update on
				closure
			· 11 144 (11 11 11 11 11 11 11 11 11 11 11 11 11	strategy

Rob Drury

Sent:

Wednesday, 15 December 2010 8:44 PM

To:

Dan Spiller

Cc:

Peter Borrows; Jim Pruss; Mike Foster;

Subject:

Technical Report W3

Attachments:

Technical Stuation Report W3.docx

Attached is report no.3 which is just confirmation of closing sequence.

Note closure will be around 10am tomorrow re the Toowoomba pipeline but will confirm with you if it changes.

Rob

Robert Drury

Dam Operations Manager

Water Delivery

Queensland Bulk Water Supply Authority trading as Seqwater



Swimming in weirs and t flowing water is FA1





Ρh

Wivennoe Dam, Brisbane valley Highway, via Fernvale Q4306 Australia PO Box 37, Fernvale QLD 4306 Website | www.segwater.com.au

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TSR Number	W3	Date of TSR release	15.12.2010	Time of TSR	6pm
		(Giggso)		TOTOTOE	-

Segwater status of inflows and dam operations

Somerset/Wivenhoe Dams

As highlighted in the previous Reports, releases continued from Wivenhoe Dam and will cease around 10am on 16th December 2010.

At this stage it is planned that the radial gate will be closed by 10am Thursday morning with the closing sequence starting around 8am.

Once the radial gate is closed, releases from the hydro will continue during fish recovery operations. Once they are completed, the cone valve will also be opened to continue to release at a combined rate of around 4200ML per day until the water level in both dams falls to near full supply levels. At this time normal operational releases to the Mt. Crosby WTP will re-commence.

The release from Wivenhoe dam continues to impact upon Twin Bridges, Savages Crossing and Colleges Crossing and these crossings will clear as the river level drops. It is likely that Colleges Crossing will be opened sometime Friday morning, although this will depend on flows in the river and any rainfall.

Councils were contacted this morning to provide advice on closing sequences and will be contacted again when the gate is finally closed.

A follow up email will not be sent as no assessment is required.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager

BoM assessment

(consisting of references to latest Flood Warning for the Brisbane River and other relevant Bureau forecasts and warnings (e.g. weather/rain farecasts, Tropical Cyclone Warning etc) and other updates/camments if needed)

BoM was advised of planned releases via their flood information email. No formal advice is required of them as the release is a minor drawdown however there is ongoing advice provided by them on predicted rainfall and flows. They were also provided advice of the releases that are occurring and closing.

Action taken was to mobilise the flood centre and advise Councils as requested regarding releases and keep BoM up to date.

BoM Technical Officer name	
BoM Technical Officer position title	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
BoM Technical Officer contact details	

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

BCC will advise internally for information purposes mainly re bridge closures in other council areas that may affect Brisbane residents.

Action taken was to mobilise the flood centre and advise Councils as requested regarding releases and keep BoM up to date.

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Ipswich will coordinate closure of Colleges Crossing as necessary and any other actions.

Action taken was to mobilise the flood centre and advise Councils as requested regarding releases and keep BoM up to date.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Somerset Council will coordinate closure of Twin Bridges and Savages Crossing as necessary and any other actions.

Action taken was to mobilise the flood centre and advise Councils as requested regarding releases and keep BoM up to date.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due Date	16.12.2010 Tir	5697.5	or Event	Closing of
				event

Rob Drury

Sent:

Thursday, 16 December 2010 4:29 PM

To:

Dan Sniller

Cc:

Jim Pruss:

eter Borrows; Mike Foster

Lechnical Report W4 Subject:

Attachments:

Technical Stuation Report W4.docx

Final report attached.

Rob

Robert Drury

Dam Operations Manager Water Delivery

Queensland Bulk Water Supply Authority trading as Segwater



Swimming in weirs and t flowing water is FA1





Wivenhoe Dam, Brisbane Valley Highway, via Fernvale Q4306 Australia PO Box 37, Fernvale QLD 4306 Website | www.seqwater.com.au

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TSR Number	W4	Date of TSR release	16.12.2010	Time of TSR release	4pm
		· ·		Contractor.	!

Seqwater status of inflows and dam operations

Somerset/Wivenhoe Dams

Releases ceased from Wivenhoe Dam at 10am on 16th December 2010.

Releases from the hydro continued during fish recovery operations.

Once they were completed, the cone valve was also opened to release at a combined rate of around 4200ML per day until the water level in both dams falls to near full supply levels. At this time normal operational releases to the Mt. Crosby WTP will re-commence.

Twin Bridges, Savages Crossing and Colleges Crossing will clear as the river level drops. It is likely that Colleges Crossing will be opened sometime Friday morning, although this will depend on flows in the river and any rainfall.

Releases from Somerset to Wivenhoe will be wound back during today and tomorrow.

Councils were contacted when the gate was closed this morning.

A follow up email will not be sent as no assessment is required.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager

BoM assessment

(consisting of references to latest Flood Warning for the Brisbane River and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

BoM was advised of the closure.

Action taken was to demobilise the flood centre.

Technical Officer name	
Boly Technical Officer position title	

BoM Technical Officer contact details	

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council was advised of the closure.

Action taken was to demobilise the flood centre.

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council was advised of the closure.

Action taken was to demobilise the flood centre.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council was advised of the closure.

Action taken was to demobilise the flood centre.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due	Date	Nil	Time	or Event	
	1970 \$ 300 \$			医二氯化物 医电影表演员	

Rob Drury

Sent:

Friday, 17 December 2010 1:28 PM

To:

Dan Spiller

Cc:

Barry Dennien; Peter Borrows; Jim Pruss; Mike Foster

Subject:

Technical Report W5

Attachments:

Technical Stuation Report W5.docx

Attached is the Technical Report W5.

Barry,

It should cover off on your questions in your email before as well.

Hadn't sent this through earlier as for such minor releases, I send the Technical Report through when we have contacted Councils and have a fairly clear understanding of where we are heading so the technical info has been shared and there is communication with Councils and then rely on the Communications process to give the early update to WGM and others as was done this morning.

(Clob

Robert Drury Dam Operations Manager Water Delivery

Queensland Bulk Water Supply Authority trading as Seqwater



Swimming in weirs and t flowing water is FA1





Vivennoe Dam, Brisbane valley Highway, via Ferrivale Q4306 Australia.

PO Box 37, Fernvale QLD 4306 Website | www.segwater.com.au

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TSR Number	W5	Date of TSR 17.1	12.2010	Time of TSR release	12pm
		Reference		release	I

Segwater status of inflows and dam operations

Somerset/Wivenhoe Dams

The previous release plan was to get Wivenhoe dam as close to FSL as possible without inundating Burtons bridge and balance this off against opening Colleges Crossing as soon as possible. The BOM forecasts on Wednesday when the decision was made to proceed with closure on Thursday morning indicated a low chance of significant rainfall until Sunday and unfortunately these forecasts did not prove correct and were revised upwards on Thursday.

A decision to commence a release tonight was made this morning by Duty Flood Engineers to provide as much notice to impacted Councils as possible. Due to the large storms experienced yesterday afternoon and night, the current rain on the ground will result in over 60,000ML needing to be released from Wivenhoe and Somerset Dams to achieve FSL. Additionally BOM are forecasting an additional 20 to 50 millimetres of rain tonight, with further rain forecast through the weekend. If this rain eventuates, substantial flood releases will occur impacting a number of bridges along the river.

The extent of the release commencing tonight will depend on the rain that falls in the catchment over the next 72 hours. This could vary between 10 and 100+ millimetres and the release strategy will be developed in accordance with the Manual of Flood Mitigation as the situation develops. The objectives of the release will be to protect the safety of the dam while minimising flooding impacts on the crossings downstream of the dam in the Brisbane River.

Councils were contacted this morning to advise of the strategy and they had no concerns with the strategy and agreed with the strategy.

Twin Bridges, Savages Crossing and Colleges Crossing may be impacted by releases but it depends to some extent on the rainfall tonight and weekend. Significant rainfall could result in other bridges being impacted by releases.

A follow up email will be sent in case Councils want to provide an assessment.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager

BoM assessment

(consisting of references to latest Flood Warning for the Brisbane River and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

BoM has been advised of the strategy.

Action taken was to mobilise the flood centre.

BoM Technical Officer name	
BoM Technical Officer position title	
BoM Technical Officer contact details	
manantanantanantanantanantanantanantana	

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council was advised of the strategy.

Action taken was to mobilise the flood centre.

BCC Technical Officer name	Chris Lavin
	Disaster Operations Manager
BCC Technical Officer contact details	

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council was advised of the strategy.

Action taken was to mobilise the flood centre.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council was advised of the strategy.

Action taken was to mobilise the flood centre.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator

SRC Technical Officer contact details

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due Date 17.12.2010 Tim	e or Event	Gate opening	
----------------------------------	------------	--------------	--

Rob Drun

Sent:

Friday, 17 December 2010 6:29 PM

To:

Cc:

Don Chiller

Jim Pruss; Peter Borrows; Mike Foster

Subject:

recnnicai report W6

Attachments:

Technical Stuation Report W6.docx

Attached is Report W6 indicating gate opening at 6pm.

Release only 63m3/s.

This will increase through the night possibly to 300m3/s however depends on flows downstream.

Councils are aware and are okay with strategy.

Rob

Robert Drury
Dam Operations Manager
Water Delivery

Queensland Bulk Water Supply Authority trading as Seqwater



Swimming in weirs and t flowing water is FA1





Ph

Wiveninge Dain, prispane valley riighway, via Ferrivale Q4506 Australia

PO Box 37, Fernvale QLD 4306 Website | www.seqwater.com.au

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TSR Number W6	Date of TSR 17.12.2010 release	Time of TSR 6pm release

Seqwater status of inflows and dam operations

Somerset/Wivenhoe Dams

At 18:00 tonight the regulator was closed and Gate 3 opening initiated.

By 18:30, Gate 3 will be open 0.5 metres and releasing approximately 50m3/s.

It is noted that the hydro will continuing releasing 13 m3/s, making a total release from Wivenhoe Dam just over 63m3/s.

Based on levels in the creeks and ongoing rain, releases will most likely increase during the night depending on the flow in Lockyer Creek and inflows. It is planned at this stage that releases could increase to 300m3/s depending on downstream flows. This is similar to last week and will impact Twin Bridges, Savages Crossing and Colleges Crossing.

Councils were contacted tonight prior to release to advise them of the strategy and they had no concerns with the proposed release strategy.

A follow up email will be sent in case Councils want to provide an assessment.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager

BoM assessment

(consisting of references to latest Flood Warning for the Brisbane River and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

BoM has been advised of the releases.

Action taken was to mobilise the flood centre.

BoM Technical Officer name	
BoM Technical Officer position title	
BolVI Technical Officer contact details	

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council was advised of the strategy.

Action taken was to mobilise the flood centre.

ESTATE OF THE PARTY OF THE PART		
BCC	Technical Officer name	Chris Lavin
nemma		***************************************
BCC	Technical Officer position title	Disaster Operations Manager
mrama	urany ary many 1990 ilay any mirana any ary ary ary ary ary ary ary ary ary ar	
BCC	Technical Officer contact details	
***************************************	transport of the contract of t	·

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council was advised of the strategy.

Action taken was to mobilise the flood centre.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	***************************************

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council was advised of the strategy.

Action taken was to mobilise the flood centre.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator

SRC Technical Officer contact details	

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due Date	18.12.2010	Time 9am	or Event	Change in
				strategy

Rob Drury

Sent:

Saturday, 18 December 2010 7:26 AM

To:

Rob Drury: Dan Spiller

Cc:

Jim Pruss; Peter Borrows; Mike Foster

Subject:

RE: Technical Report W7

Attachments:

Technical Stuation Report W7.docx

See attached Technical Report.

No real change, ramping up Wivenhoe releases to 300m3/s or just above as the Lockyer drops.

Twin Bridges and Savages are under and Colleges Crossing should go under later today but depends on local runoff as well.

Rob

Robert Drury

[™]Dam Operations Manager

Water Delivery

Queensland Bulk Water Supply Authority trading as Seqwater



Swimming in weirs and t flowing water is FA1





Ph

Witennoe pain, phobane vaisey inghway, via i emvale katoo Australia

PO Box 37, Fernvale QLD 4306 Website | www.seqwater.com.au

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this email in error please contact the sender immediately and delete the material from your email system.

QLD Bulk Water Supply Authority ABN75450239876 (Trading as Seqwater).

TSR Number W7 Date of TSR release	18.12.2010	Time of TSR release	7am
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Segwater status of inflows and dam operations

Somerset/Wivenhoe Dams

Since Thursday falls of 40-50 mm have fallen over the catchment with isolated falls of up to 80 mm. It is estimated that this inflow will result in approximately 100,000 MI of flood water flood storage that will need to be drained over the next four days. The total flow in the Brisbane River will be maintained at between 300-350 m3/s, depending on further rain. Somerset Dam is currently transferring water to Wivenhoe Dam through two regulators. Overnight Wivenhoe Dam releases where increased to 150m3/s and will increase to 300 m3/s as the flows from Lockyer Creek subside over the next twenty-four hours. Lockyer Creek is currently peaking at approximately 130 m3/s.

Currently twin Bridges and 5avages crossing are closed by the flood releases. Colleges crossing will be impacted from late afternoon.

This is in accordance with the strategy advised to Councils previously however a follow up advice will be sent.

A follow up email will be sent in case Councils want to provide an assessment.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager

BoM assessment

(consisting of references to latest Flood Warning for the Brisbane River and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

BoM has been advised of the releases.

Action taken was to mobilise the flood centre.

BoM Technical Officer name	
and an interpretation to a neighbor of the constraint of the con	
Low Technical Officer position title	
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BoM Technical Officer contact details	
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Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council was advised of the strategy.

Action taken was to mobilise the flood centre.

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	***************************************

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council was advised of the strategy.

Action taken was to mobilise the flood centre.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based an the information)

Council was advised of the strategy.

Action taken was to mobilise the flood centre.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due	Date	Time	or Event	Any significant change in
				strategy

Rob Drury

Sent:

Sunday, 19 December 2010 7:26 Aivi

To:

Dan Spiller

Cc:

Jim Pruss; Mike Foster; Peter Borrows

Subject:

Technical Report

Attach ments: -

Technical Stuation Report W8.docx

Dan,

This is just an update, no change to the strategy but just in case anyone was wondering if there were any changes. Of course if we get more rain, releases may go longer or increase.

Rob

Robert Drury

Dam Operations Manager

Water Delivery

Queensland Bulk Water Supply Authority trading as Seqwater



Swimming in weirs and I flowing water is FA1





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Wivenhoe Dam, Brisbane Valley Highway, via Fernvale Q4306 Australia PO Box 37, Fernvale QLD 4306 Website | www.seqwater.com.au

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TSR Number	W8	Date of TSR 19.12.2 release	2010 Time of TSR 7am release
		12.00.00	arca con a constant

Seqwater status of inflows and dam operations

Somerset/Wivenhoe Dams

This is just an update and does not include further discussions with Councils unless the strategy changes.

There is no change in the current strategy however storms on Saturday afternoon dumped 20 to 30mm in the Monsildale area in the upper Brisbane River but elsewhere in the Upper Brisbane and Stanley Rivers falls were much lower.

At 0600 Sunday, two regulators remain open at Somerset Dam, giving a release of around 12,000 ML/day into Wivenhoe. These releases are expected to continue for several days, especially as further rain is forecast in the next 24 hours.

The storms on Saturday afternoon caused renewed river rises in the Upper Brisbane. Significant inflows to Wivenhoe will continue for several days.

There is currently has one gate open at Wivenhoe Dam at 3.5 metres providing a release of about 350 m3/s. This release is expected to continue until at least Wednesday and perhaps longer depending on forecast rain in the next 36 hours.

Twin Bridges, Savages Crossing and Colleges Crossing are closed. Savages Crossing and Colleges Crossing are expected to remain closed until at least Wednesday with Twin Bridges closed for a much longer period.

The current strategy is to drain Somerset and Wivenhoe back to full supply level by mid week and keep Kholo and Burtons Bridge remaining open, but this may change depending on the rainfall experienced in the catchments in the next 24 hours.

This is in accordance with the strategy advised to Councils and they will be advised of any change.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager

BoM assessment

(consisting of references to latest Flood Warning for the Brisbane River and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Trapical Cyclone Warning etc) and other updates/comments if needed)

BoM has been advised of the releases.

Action taken was to mobilise the flood centre.

BoM Technical Officer name	
aranna en maria anta anta anta anta anta anta anta an	
BoM Technical Officer position title	
	
BoM Technical Officer contact details	

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the informatian)

Council was advised of the strategy.

Action taken was to mobilise the flood centre.

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council was advised of the strategy.

Action taken was to mobilise the flood centre.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council was advised of the strategy.

Action taken was to mobilise the flood centre.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due Date	Time	or Event Any significant
		change in
	26: 4:40 3:48 66: 1: 1: 1: 1: 1: 1: 1: 1: 1: 1: 1: 1: 1:	strategy

From: Sent:

Mike Foster

Sunday 10 December 2020 Deve 450

Peter Borrows

Barry Dennien;

Subject:

To: Cc:

> SEQWGM Media; Dan Spiller Re: FOC Situation Report #3 0630 19/12/2010

Agreed

From:

Cc:

To: Mike Foster

eter Borrows

Barry Dennien

; SEQWGM Media -

Dan Spiller

Sent: Sun Dec 19 09:14:00 2010

Subject: Re: FOC Situation Report #3 0630 19/12/2010

Thanks Mike,

I think we can maintain our intended position of not putting out an update until tomorrow AM. Regards Mike

Sent from my iPhone

On 19/12/2010, at 9:16 AM, "Mike Foster

wrote:

Michae

See update below

Hotline will be updated to reflect the below

Chrs mike

From: Rob Drury To: Mike Foster Cc: Jim Pruss

Sent: Sun Dec 19 07:10:09 2010

Subject: FW: FOC Situation Report #3 0630 19/12/2010

Mike,

See below for details but main points are

NPD operated last night but closed and good chance again in next few days

W/S

Continuing current strategy of release from Somerset into Wivenhoe and Wivenhoe downstream. Would not use too many actual volumes as could change.

And the three bridges closed for several days to come. But further rain may change release strategy.

1

Rob

Robert Drury

Dam Operations Manager

Water Delivery

Queensland Bulk Water Supply Authority trading as Seqwater

<image001.jpg>

<image002.png>

Ρŀ

Wivenhoe Dam, Brisbane Valley Highway, via Fernvale Q4306 Australia PO Box 37, Fernvale QLD 4306

Website | www.seqwater.com.au

From: Duty Engineer

Sent: Sunday 10 December 2010 6:38 AM

To: flood.qld Mike Foster; Rob Drury;

John.Ruffini@

John Tibaldi; Rob.ayrı

Terry Malone; Brett Schultz

Keegan;

Subject: FOC Situation Report #3 0630 19/12/2010

North Pine Dam

No significant rain was recorded in the 24 hours to 0700 Sunday 19/12/2010 and upstream gauges are continuing to fall slowly. At 0600, the North Pine Dam level was at 39.50 m AHD and all gates will be closed by 0700. Approximately 4,500 ML was drained from the dam overnight. A fish recovery team is in place.

MBRC were advised at 0615 that all gates will be closed by 0700 Sunday.

However, further rainfall is expected overnight Sunday into Monday and a catchment average in excess of just 30mm may require renewed gate openings during Monday.

Somerset/Wivenhoe Dams

In the Upper Brisbane River, storms on Saturday afternoon dumped 20 to 30mm in the Monsildale area but elsewhere in the Upper Brisbane and Stanley Rivers falls were much lower.

At 0600 Sunday, Somerset Dam was 99.56 m AHD (ALERT gauge) and falling slowly. Two regulators remain open at Somerset Dam, giving a release of around 12,000 ML/day into Wivenhoe. These releases are expected to continue for several days, especially as further rain is forecast in the next 24 hours.

The storms on Saturday afternoon caused renewed river rises in the Upper Brisbane and at 0700 Sunday 19/12/2010, the Brisbane River at Gregors Ck was nearing a peak. Significant Inflows to Wivenhoe will continue for several days.

Wivenhoe Dam was 67.30 m AHD at 0600 Sunday and falling very slowly. Water levels are expected to remain around this level for the next 24 hours. There is currently has one gate open at 3.5 metres providing a release of about 350 m3/s. This release is expected to continue until at least Wednesday and perhaps longer depending forecast rain in the next 36 hours.

Twin Bridges, Savages Crossing and Colleges Crossing are closed. Savages Crossing and Colleges Crossing are expected to remain closed until at least Wednesday with Twin Bridges closed for a much longer period.

The current strategy is to drain Somerset and Wivenhoe back to full supply level by mid week and has Kholo and Burtons Bridge remaining open, but this may change depending on the rainfall experienced in the catchments in the next 24 hours

Forecast for Brisbane area:

Sunday overnight.

Increasing rain periods, some moderate to heavy falls possible, especially late afternoon and

Monday

Becoming dry, windy

Tuesday

Fine

Wednesday Mostly fine, possible shower

Thursday

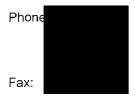
A shower or two

Friday Saturday Showers Showers

Terry Malone

Duty Engineer

Flood Operations Centre



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From:

Rob Drury

Sent:

Sunday, 19 December 2010 6:45 PM

To:

Rob Drury; Dan Spiller

Cc:

Jim Pruss; Mike Foster; Peter Borrows

Subject:

RE: Technical Report

Affach ments:

Technical Stuation Report W9.docx

Attached is another update.

The rain this afternoon has resulted in further inflows.

Although the current strategy has not changed, depending on the size of these inflows and any further rain tonight. there may be a need to increase releases and inundate Burtons and Kholo Bridges. Councils have been advised of this possibility however a decision will be made in the morning. Councils will be advised if this is necessary and options discussed with them to ensure they have time for any actions and they will be advised in email and asked for any assessments of impacts.

 λ decision should be evident by ${f 10}$ m tomorrow morning on any changes to the current strategy.

Rob

Robert Drury Dam Operations Manager

Water Delivery

Queensland Bulk Water Supply Authority trading as Seqwater



Swimming in weirs and t flowing water is FA1





Wivenhoe Dam, Brisbane Valley Highway, via Fernvale Q4306 Australia PO Box 37, Fernvale QLD 4306 Website | www.seqwater.com.au

From: Rob Drury

Sent: Sunday, 19 December 2010 7:26 AM

To: 'Dan Spiller'

Cc: Jim Pruss; Mike Foster; Peter Borrows

Subject: Technical Report

Dan,

This is just an update, no change to the strategy but just in case anyone was wondering if there were any changes. Of course if we get more rain, releases may go longer or increase.

Rob

Robert Drury
Dam Operations Manager
Water Delivery

Queensland Bulk Water Supply Authority trading as Seqwater



Swimming in weirs and t flowing water is FA1





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Wivernine Dani, Dispane valley Highway, via i entivale 144000 Australia

PO Box 37, Fernvale QLD 4306 Website | www.seqwater.com.au

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TSR Number W9	Date of TSR 19.12.2010	Time of TSR 6pm
	RELEGIE	INGIGABLE

Segwater status of inflows and dam operations

Somerset/Wivenhoe Dams

This is a further update.

Somerset Dam remains relatively steady with two regulator valves discharging around 140 cumecs. Inflows have risen slightly during the afternoon and so Somerset Dam lake level should remain steady until late tonight.

The only change with Wivenhoe Dam was to reduce the gate opening from 3.5m to 3.0m due to the Lockyer flows. Wivenhoe Dam also remains steady with Gate 3 open 3.0 m discharging approximately 300 cumecs. Rises in the Upper Brisbane are expected to result in the Lake level increasing to around 67.4 m AHD over the next two days.

Under the current operational strategy the release from Wivenhoe Dam will be maintained at 300 cumecs (Lockyer Creek flows permitting) to enable Burtons Bridge to remain open. This may mean releases from Wivenhoe Dam will be throttled back to ensure the bridge is not inundated prematurely. It is anticipated that if no further rainfall occurs, Wivenhoe and Somerset Dam will continue to operate until early Friday 24 December.

If more rainfall occurs this evening or further inflows occur, the current strategy will need to be revised and the closing of Burtons Bridge and Kholo Bridge will be considered. A decision on this will be made by 10:00 on Monday 20 December 2010. Councils have been advised of this possibility and further discussions with Councils will take place in the morning.

Twin Bridges, Savages Crossing and Colleges Crossing are closed. Savages Crossing and Colleges Crossing are expected to remain closed until at Friday.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager

BoM assessment

(consisting of references to latest Flood Warning for the Brisbane River and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

BoM has been advised of the releases.

Action taken was to mobilise the flood centre.

BoM Technical Officer name	
	<u></u>
BoM Technical Officer position title	
tacana ana ana ana ana ana ana ana ana an	***************************************
BoM Technical Officer contact details	<u>.</u>

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Action taken was to mobilise the flood centre.

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager

BCC Technical Officer contact details	

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current situation with further advice before the current strategy is changed.

Action taken was to mobilise the flood centre.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current situation with further advice before the current strategy is changed.

Action taken was to mobilise the flood centre.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due Date	0040040	Any significant
		change in
		strategy

From:

Rob Drur

Sent:

Monday, 20 December 2010 7:30 AM

To:

Dan Spiller

Cc:

Mike Foster; Peter Borrows; Jim Pruss

Subject: Attachments: Technical Report W10
Technical Stuation Report W10.docx

Please find attached Technical Report W10.

It is an update to advise of current situation and a further one will be forwarded after further discussions with Councils.

Rob

Robert Drury

Dam Operations Manager

Water Delivery

Queensland Bulk Water Supply Authority trading as Seqwater



Swimming in weirs and I flowing water is FA1





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Wivenhoe Dam, Brisbane Valley Highway, via Fernvale Q4306 Australia PO Box 37, Fernvale QLD 4306 Website | www.seqwater.com.au

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**************************************	W10	Date of TSR 20.12.201 release	.0 Time of TSR 7an release	n
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Seqwater status of inflows and dam operations

Somerset/Wivenhoe Dams

This is a further update.

Somerset and Wivenhoe Dam

Somerset Dam has risen steadily overnight to currently be at around 100.2m AHD. A sluice gate will be opened at 0700 this morning, with a further sluice gate opened later today. Sluice gate releases are projected to continue until around Wednesday morning, when the dam level will approach FSL. Dam inflow should peak today at around 700 cumecs.

Wivenhoe Dam has risen steadily overnight, with the level projected to reach 68.0m AHD by this afternoon. The proposed strategy is to ramp up releases to have the dam drained to FSL by Saturday. This will require both Burtons and Kholo bridges to be inundated, with dam discharges in excess of 1200 cumecs. This strategy will be discussed with the impacted Councils this morning with a decision on the strategy to be made by 1000. Dam inflow excluding Somerset Dam outflows should peak tomorrow at around 1800 cumecs.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager

BoM assessment

(consisting of references to latest Flood Warning for the Brisbane River and ather relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

BoM will be advised of the releases.

BoM Technical Officer name	
BoM Technical Officer position title	
BoM Technical Officer contact details	

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

BCC is being contacted again to discuss situation and get their comment.

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	***************************************

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

ICC is being contacted again to discuss situation and get their comment.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Somerset Council is being contacted again to discuss situation and get their comment. Their were advised yesterday of the possibility.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due Date	20.12.2010	Time Mor	ning or Eve	nt	After strategy
					is finalised with
			1.5		Councils

From:

Rob Drur

Sent:

Monday, 20 December 2010 8:56 AM

To:

Dan Spiller

Cc:

Peter Borrows; Jim Pruss; Mike Foster

Subject: Technical Report W12

Attachments:

Technical Stuation Report W12.docx

Attached is further report to earlier one.

Strategy unchanged but all Councils have been contacted.

Somerset Regional Council has requested a media release via the WGM to advise of Burtons and Kholo Bridge closures rather than have them do one as well.

Rob

Robert Drury

Dam Operations Manager

Water Delivery

Queensland Bulk Water Supply Authority trading as Seqwater



Swimming in weirs and t flowing water is FA1





Ρ'n

Wivenhoe Dam, Brisbane Valley Highway, via Fernvale Q4306 Australia PO Box 37, Fernvale QLD 4306 Website | www.seqwater.com.au

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TSR Number W12	Date of TSR 20.12.2010 release	Time of TSR 9am release
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Segwater status of inflows and dam operations

Somerset/Wivenhoe Dams

Somerset Dam has risen steadily overnight to currently be at around 100.2m AHD. A sluice gate will be opened at 0700 this morning, with a further sluice gate opened later today. Sluice gate releases are projected to continue until around Wednesday morning, when the dam level will approach FSL. Dam inflow should peak today at around 700 cumecs.

Wivenhoe Dam has risen steadily overnight, with the level projected to reach 68.0m AHD by this afternoon. The proposed strategy is to ramp up releases to have the dam drained to FSL by Saturday. This will require both Burtons and Kholo bridges to be inundated, with dam discharges in excess of 1200 cumecs. This strategy has been discussed with the impacted Councils this morning. Dam inflow excluding Somerset Dam outflows should peak tomorrow at around 1800 cumecs.

Currently Somerset and Wivenhoe are storing around 140,000ML above FSL with further inflows occurring.

Releases from Wivenhoe are being reduced slightly this morning to prevent Burtons Bridge being affected by flows down Lockyer Creek. Releases are then expected to increase from Wivenhoe Dam late this afternoon once Somerset Regional Council have had time to advise residents affected by Burtons Bridge being inundated.

Releases will then be increased overnight to around 1200m3/sec or higher (possibly 1500m3/s) depending on ongoing inflows to the dams and flows downstream of the dam.

A heads up was provided to Somerset Regional Council on Sunday and they were advised again at 8am of the strategy. They did not have a concern as long as there was a lead time and releases were not ramped up until Monday afternoon and media releases were made.

Ipswich City Council and Brisbane City Council wee both advised at 8am today and had no concerns with the strategy.

Emails have been sent to all Councils requesting an assessment if they want to forward one in.

The BoM has been advised.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager

BoM assessment

(consisting of references to latest Flood Warning for the Brisbane River and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

The Flood Centre has spoken to the Duty Flood Engineer (Jimmy Stewart) at the BoM FWC at 8.15am today and discussed the proposed release strategy for Wivenhoe Dam. They will incorporate the new advice into their warning system. Proposed releases will be provided to BoM and Councils when model scenarios are complete.

BoM Technical Officer name	Jimmy Stewart	
BoM Technical Officer position title	Duty Flood Engineer	
BolM Technical Officer contact details		

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

BCC has been contacted to advise and discuss.

Email sent to request any assessment.

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

ICC has been contacted to advise and discuss. Email sent to request any assessment.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

SRC has been contacted to advise and discuss. Email sent to request any assessment.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due Date	20.12.2010	Time	Late	or Event	
			afternoon		

From: Rob Drury

Sent: Tuesday, 21 December 2010 8:00 AM

To: Dan Spiller

Cc: Jim Pruss; Peter Borrows; Mike Foster

Subject: Technical Report W13

Attachments: Technical Stuation Report W13.docx

Please find attached report W13.

Again, all discussions and communications with Councils have indicated no issues at this stage other than those everyone is aware of and managing.

Rob

Robert Drury

্বিল Operations Manager

Nater Delivery

Queensland Bulk Water Supply Authority trading as Seqwater



Swimming in weirs and f flowing water is FA1





Рh

Wivennoe Dam, Brisbane valley Highway, via Fernivale Q4306 Australia PO Box 37, Fernivale QLD 4306

Website | www.seqwater.com.au

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TSR Number W13	Date of TSR 21.12.2010	Time of TSR 7.30am
	Helegge	MAIGENE

Segwater status of inflows and dam operations

Somerset/Wivenhoe Dams

Somerset Dam

Gate operations are occurring at Somerset Dam and are expected to continue until at least Wednesday 22 December 2010 assuming no further rainfall. Two sluice gates are currently releasing about 410 m3/s from the dam into Lake Wivenhoe.

Somerset Dam peaked at EL 100.43 m AHD at around 13:00 on Monday 20 December 2010 and the lake level is slowly falling. Somerset Dam is currently at EL 100.23 m AHD, (114 % of capacity).

The estimated inflow into Somerset Dam to date is 110,700 ML, of which 67,500 ML has been discharged into Wivenhoe Dam.

Continued gate operations may be necessary if forecast rainfall from Wednesday to Monday results in subsequent river rises.

Wivenhoe Dam

Gate operations are occurring at Wivenhoe Dam and are expected to continue until Thursday 23 December 2010 assuming no further rainfall. Releases from the dam have been steadily increased overnight with a maximum release rate of about 1,280 m3/s being established at 05:00 today. This flow rate will be maintained until early Thursday 23 December 2010, when releases will be reduced as the flood storage compartment is emptied.

Wivenhoe Dam peaked at a level of EL 68.24 m AHD at approximately 04:00 this morning. The current level is EL 68.22 m AHD (112% of capacity) and falling slowly.

The estimated inflow into Wivenhoe Dam to date (excluding releases from Somerset Dam) is 157,900 ML, of which 103,000 ML has been released. The total estimated inflow into both dams for this event, based upon rainfall to date is 310,000 ML.

Continued gate operations may be necessary if forecast rainfall from Wednesday to Monday results in subsequent river rises.

Impacts of Releases

The increased release from Wivenhoe Dam has resulted in elevated levels in the Lower Brisbane River. Twin Bridges, Savages Crossing and Colleges Crossing were inundated earlier in the event. As a consequence of the increased release from Wivenhoe Dam, Burtons Bridge was inundated at around 00:40 on Tuesday 21 December 2010. Kholo Bridge is also expected to be inundated by mid-morning today as the increased releases reach the lower Brisbane River. In accordance with the adopted

operational strategy these bridges should be back in service by late Thursday and all bridges (with the possible exception of Twin Bridges) should be trafficable for Christmas providing no further rainfall occurs.

Advice from the BoM regarding predicted tides in the Brisbane River at the City Gauge, suggest that peak levels (1.6 to 1.8 m AHD) may reach or slightly exceed the minor flood level of 1.7 m AHD. The effect of the Wivenhoe release on these high tide values is estimated to be only 0.1 m. Peak levels will coincide with high tides which are expected at about 11:00 am on Wednesday 22 December and around noon on Thursday 23 December. Tide levels will be monitored over the next few days and these estimates may be adjusted in light of changed observations.

BCC had similar advice from BoM yesterday that releases plus other fresh water flows would only have 100mm impact on tides. The Flood Centre discussed with BCC yesterday and requested if they had any concerns to advise or any need to change release strategy and none received to date.

Emails have been sent to BCC, ICC and SRC this morning with similar information and requesting any assessments or concerns. If any are received they will be forwarded.

The BoM is aware of all releases.

Seqwater Technical Officer name	Robert Drury
Segwater Technical Officer position title	Dam Operations Manager

BoM assessment

(consisting of references to latest Flood Warning far the Brisbane River and ather relevant Bureau forecasts and warnings (e.g. weather/rain farecasts, Trapical Cyclane Warning etc) and ather updates/comments if needed)

As above.

BoM Technical Officer name

BoM Technical Officer position title

BoM Technical Officer contact details

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based an the information)

BCC has been contacted by Flood Centre on ongoing basis.

Email sent to request any assessment.

BCC Technical Officer name Chris Lavin

BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

ICC has been contacted by Flood Centre on ongoing basis. Email sent to request any assessment.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

SRC has been contacted by Flood Centre on ongoing basis. Email sent to request any assessment.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due Date	21.12.2010	Time	Late	or Event]
			afternoon		

From:

Rob Drury

Sent:

Wednesday, 22 December 2010 8:38 AM

To:

Dan Spiller

Cc:

David Poperts; Peter Borrows; Jim Pruss; Mike Fo**s**ter;

Subject:

Technical Report W14

Attachments:

Technical Stuation Report W14.docx

Attached Report W14.

Rob

Robert Drury

Dam Operations Manager

Water Delivery

Queensland Bulk Water Supply Authority trading as Seqwater



Swimming in weirs and t flowing water is FA1





Ph

Wivenhoe Dam, Brisbane Valley Highway, via Fernvale Q4306 Australia PO Box 37, Fernvale QLD 4306 Website | www.segwater.com.au

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TSR Number W14	Date of TSR 22.12.2010 release	Time of TSR 8.30am release	
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Segwater status of inflows and dam operations

Somerset/Wivenhoe Dams

Rainfall

No rainfall has occurred over the catchment of the dams since 03:00 on Monday 20 December 2010. All major streams have now peaked and inflows are receding.

Wednesday 22 December Rain developing
Thursday 23 December Rain easing to showers
Friday 24 December Showers tending to rain at times
Saturday 25 December Showers tending to rain at times
Sunday 26 December Rain increasing
Monday 27 December Rain at times
Tuesday 28 December Rain at times

Somerset Dam

Gate operations are occurring at Somerset Dam and are expected to continue until at least Wednesday 22 December 2010 assuming no further rainfall. Two sluice gates are currently releasing about 410 m3/s from the dam into Lake Wivenhoe.

Somerset Dam peaked at EL 100.43 m AHD at around 13:00 on Monday 20 December 2010 and the lake level is slowly falling. Somerset Dam is currently at EL 99.68 m AHD, (108 % of capacity).

The estimated inflow into Somerset Dam to date is 121,500ML, of which 103,000 ML has been discharged into Wivenhoe Dam.

Continued gate operations may be necessary if forecast rainfall from Wednesday to Monday results in subsequent river rises.

Wivenhoe Dam

Gate operations are occurring at Wivenhoe Dam and are expected to continue until Thursday 23 December 2010 assuming no further rainfall. Releases from the dam were increased slightly late yesterday as other river flows dropped and have been steady at a maximum release rate of about 1,440 m3/s since 18:00 Tuesday 21/12/2010. This flow rate will be maintained until early Thursday 23 December 2010, when releases will be reduced as the flood storage compartment is emptied.

Wivenhoe Dam peaked at a level of EL 68.24 m AHD at approximately 04:00 on Tuesday 21/12/2010. The current level is EL 67.71 m AHD (107% of capacity) and falling slowly.

The estimated inflow into Wivenhoe Dam to date (excluding releases from Somerset Dam) is 181,000 ML, of which 221,500 ML has been released. The total estimated inflow into both dams for this event, based upon rainfall to date is 310,000 ML.

Continued gate operations may be necessary if forecast rainfall from Wednesday to Monday results in subsequent river rises.

Impacts of Releases

The increased release from Wivenhoe Dam has resulted in elevated levels in the Brisbane River from Wivenhoe to Colleges Crossing. Twin Bridges, Savages Crossing and Colleges Crossing were inundated earlier in the event. As a consequence of the increased release from Wivenhoe Dam, Burtons Bridge was inundated at around 00:40 on Tuesday 21 December 2010. Kholo Bridge was inundated around midday Tuesday 21 December 2010. In accordance with the adopted operational strategy these bridges should be back in service by late Thursday or Friday and all bridges (with the exception of Twin Bridges) should be trafficable for Christmas providing no further rainfall occurs. No future rainfall is currently included in these forecasts.

Advice from the BoM regarding predicted tides in the Brisbane River at the City Gauge, suggest that peak levels (1.7 to 1.8 m AHD) may reach or slightly exceed the minor flood level of 1.7 m AHD. The effect of the Wivenhoe release on these high tide values is estimated to be about 0.1m. Peak levels will coincide with high tides which are expected at about 11:00 am on Wednesday 22 December and around noon on Thursday 23 December. Tide levels will be monitored over the next few days and these estimates may be adjusted by BoM in light of changed observations. It is anticipated that this advice will be updated sometime today but no significant change to this advice is expected.

Emails have been sent to BCC, ICC and SRC this morning with similar information and requesting any assessments or concerns. If any are received they will be forwarded.

The BoM is aware of all releases.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager

BoM assessment

(consisting of references to latest Flood Warning for the Brisbane River and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and ather updates/comments if needed)

As above.

BoM Technical Officer name	Peter Baddiley
BolVI Technical Officer position title	
ordina communicamental de la companie de la compani	
BoM Technical Officer contact details	

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

BCC has been contacted by Flood Centre on ongoing basis. Email sent to request any assessment.

ris Lavin
aster Operations Manager

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

ICC has been contacted by Flood Centre on ongoing basis. Email sent to request any assessment.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

SRC has been contacted by Flood Centre on ongoing basis. Email sent to request any assessment.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	<u>Local Disaster</u> Response Coordinator
SRC Technical Officer contact details	

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due Date	Time	or Event	Closing
			strategy

From

Rob Drury

Sent:

Wednesday, 22 December 2010 4:31 PM

To

Dan Spiller

Cc:

Peter Borrows;

Mike Foster; Jim Pruss

Subject:

Technical Report W15

Attachments:

Technical Stuation Report W15.docx

Please find attached Report W15 outlining closing sequence.

Rob

Robert Drury

Dam Operations Manager

Water Delivery

Queensland Bulk Water Supply Authority trading as Seqwater



Swimming in weirs and 1 flowing water is FA1





Ph

Wivennoe Dam, Brisbane valley Highway, via Fernyale Q4306 Australia

PO Box 37, Fernvale QLD 4306 Website | www.seqwater.com.au

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TSR Number W15	Date of TSR 22.12.2010 release	Time of TSR 4.00pm
	(CICCIA)	(POLICICAL)

Segwater status of inflows and dam operations

Somerset/Wivenhoe Dams

Closing Sequence

In order to close by 1400 Thursday and allow bridges to be accessible prior to the weekend and achieve an acceptable recession, closing of Wivenhoe gates commenced at 1600 Wednesday.

This will result in Wivenhoe finishing at a level slightly above FSL.

The BoM is aware of all releases.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager

BoM assessment

(consisting of references to latest Flood Warning for the Brisbone River ond other relevant Bureou forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Worning etc) ond other updates/comments if needed)

BoM has been advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised and is in line with previous strategy.

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BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised and is in line with previous strategy.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised and is in line with previous strategy.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

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	(2)	1 S. M. S. M	

From

Rob Drury

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Thursday, 23 December 2010 8:39 AM

To

Dan Spiller

Cc: Subject: Peter Borrows; Jim Pruss; Mike Foster

Technical Report W16

Attachments:

Technical Stuation Report W16.docx

Technical Report W16 is attached.

It is covering the strategy up until early this morning.

However rain has been falling in the Lockyer during the night and is continuing this morning. The Creek has now started to rise and it is possible that it may flood enough to affect our plan of getting the bridges out as planned.

If the Lockyer is going to affect the bridges anyway, we may have to change our strategy.

We will monitor and provide updates.

Rob

Robert Drury

Dam Operations Manager

Water Delivery

Queensland Bulk Water Supply Authority trading as Seqwater



Swimming in weirs and t flowing water is FA1





Wivenhoe Dam, Brisbane Valley Highway, via Fernvale Q4306 Australia PO Box 37, Fernvale QLD 4306

Website | www.seqwater.com.au

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TSR Number W16	Date of TSR 23.12.2010 release	Time of TSR 8.00am release
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Segwater status of inflows and dam operations

Somerset/Wivenhoe Dams

Somerset Dam

Sluice Gate operations are continuing with once sluice gate currently open. This gate will be closed at around 9:00am this morning. At this time the lake level will be around 99.10m or 100mm above the dam full supply level. A regulator may then be used to maintain the lake level near full supply level. The estimated inflow into Somerset Dam to date is 135,000ML, the majority of which has been discharged into Wivenhoe Dam.

Further gate operations may be necessary in coming days if forecast rainfall results in subsequent river rises.

Wivenhoe Dam

Radial Gate operations are occurring at Wivenhoe Dam with the gate closure sequence currently underway. The gate closure sequence has been developed to minimise adverse river bank impacts downstream of the dam, while also aiming to allow downstream river crossings to be open for Christmas day. All gates are currently scheduled to be closed by 1500 on Thursday 23 December 2010 (today) to allow for fish recovery in daylight hours. This assumes that no further significant rainfall occurs during the day. When the gates are closed, the lake level will be around 67.20m or 200mm above the dam full supply level and 50mm below the radial gate opening trigger level of 67.25m. A regulator will then be used to maintain the lake level near to or below this level. The estimated inflow into Wivenhoe Dam to date (excluding releases from Somerset Dam) is 204,000 ML. A total of 324000 ML has been released. The total estimated inflow into both dams for this event, based upon rainfall to date is 340,000 ML.

There is also the possibility of using a gate to make a low level ongoing release that may affect low levels bridges but keep the dam levels under control. Again this is rain dependent and will be decided later today.

Continued gate operations may be necessary if forecast rainfall results in subsequent river rises. The gate closure sequence will be reviewed throughout today and discussions with impacted Local Authorities will be ongoing.

Impacts of Wivenhoe Dam Releases

The releases from Wivenhoe Dam have resulted in elevated levels in the Brisbane River downstream to Colleges Crossing. Twin Bridges, Savages Crossing, Colleges Crossing, Burtons Bridge and Kholo Bridge are currently all closed due to inundation resulting from these releases. In accordance with the

current operational strategy all bridges (with the exception of Twin Bridges) should be trafficable by Friday. Projected "early side" times for bridges becoming clear of water based on the current gate closure sequence and no Lockyer Creek outflows are as follows. (Note that rainfalls of up to 33mm have been observed in the Lockyer Creek Catchment over the last 24 hours, but no significant stream rises have been observed as yet). These are estimates only.

Burtons Bridge – 18:00 Thursday 23 December 2010. Savages Crossing – 19:00 Thursday 23 December 2010 Kholo Bridge – 21:00 Thursday 23 December 2010 Colleges Crossing – 08:00 Friday 23 December 2010

Tide levels continue to be monitored closely with peak tide estimates being adjusted by BOM to account for Wivenhoe Dam outflows.

The BoM is aware of all releases.

Segwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager

BoM assessment

(consisting of references to latest Flood Warning for the Brisbane River and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

BoM has been advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
DOM reclinear Officer position rule	
BoM Technical Officer contact details	

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised and is in line with previous strategy.

Chris Lavin
Disaster Operations Manager

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised and is in line with previous strategy.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised and is in line with previous strategy.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due Date	Time	or Event Closure
	5 5 7 7 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	

From:

Rob Drury

Sent:

Thursday, 23 December 2010 11:37 AM

To:

Dan Spiller

Cc:

Mike Foster; Jim Pruss; Peter Borrows

Subject:

Update

Due to the rainfall last night and today and ongoing inflows, the strategy has been adjusted.

Instead of closing off totally this afternoon, gates will release at around 350m3/sec until tomorrow. Councils are on board with this as it will give more security leading into the weekend but still allow the other bridges to come out of water as they isolate communities. It will keep Twin Bridges, Savages and Colleges Crossing out for longer.

I will send off another Report later this afternoon when the details have been worked out.

Rob

Robert Drury

Dam Operations Manager

Water Delivery

Queensland Bulk Water Supply Authority trading as Seqwater



Swimming in weirs and f flowing water is FA1





Ρh

Wivennoe Dam, Brisbane valley Highway, via Fernvale Q4306 Australia PO Box 37, Fernvale QLD 4306 ∖Vebsite | www.segwater.com.au

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Rob Drury

Thursday, 23 December 2010 2:55 PM

Jim Pruss;

Dan Spiller

Co: Subject: Peter Borrows; Mike Foster

Technical Report W17

The changes.

Technical Stuation Report W17.docx

Follow Up Flag:

Follow up

Flag Status:

Flagged

Categories:

T11: PB

Dan,

Attached report with updated strategy as per my earlier heads up.

Rob

Robert Drury

Dam Operations Manager

Water Delivery

Queensland Bulk Water Supply Authority trading as Seqwater



Swimming in weirs and f flowing water is FA1





Vvivennoe Dam, Brispane valley Highway, via Fernvale Q4306 Australia

PO Box 37, Fernvale QLD 4306 Website | www.seqwater.com.au

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release release	ight a Mü mber	W17	Date of TSR release	23.12.2010	Time of TSR release	2.30pm
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Segwater status of inflows and dam operations

Somerset/Wivenhoe Dams

Somerset Dam

Sluice gate operations ceased at 09:00 today with the lake level at 99.10 m AHD. Base flows will result in the lake level rising over the next few days.

Further gate operations may be necessary in coming days if forecast rainfall results in subsequent river rises.

Wivenhoe Dam

Wivenhoe Dam is currently discharging around 350 m³/s with Gate 3 open 3.5 m. The scheduled cessation of gate operations at Wivenhoe Dam has been extended until tomorrow afternoon (Friday 24 December 2010) with a target of 1.00pm as base flows and the overnight rain has meant the lake level has not dropped as quickly as anticipated. The current lake level is 67.23 m AHD.

Continued gate operations may be necessary if forecast rainfall results in subsequent river rises. The gate closure sequence will be reviewed throughout today and discussions with impacted Local Authorities will be ongoing.

Impact of Wivenhoe Dam Releases

The releases from Wivenhoe Dam have resulted in elevated levels in the Brisbane River downstream to Colleges Crossing. Twin Bridges, Savages Crossing, Colleges Crossing, Burtons Bridge and Kholo Bridge are currently all closed due to inundation resulting from these releases. In accordance with the current operational strategy Kholo Bridge and Burtons Bridge should be trafficable by this evening.

Projected "early side" times for bridges becoming clear of water based on the current gate closure sequence and concurrent Lockyer Creek flows are as follows:-

Burtons Bridge – 18:00 Thursday 23 December 2010. Kholo Bridge – 21:00 Thursday 23 December 2010.

The remaining bridges will most likely remain closed until Christmas Day.

Rainfall

There have been falls of between 10 and 30 mm in the catchments over the last 24 hours. This has led to small rises in the Stanley, Pine, Lockyer and Bremer Rivers. The Lockyer Creek flow is likely to impact the middle-Brisbane River tomorrow and this may prevent the opening of Savages Crossing and Colleges Crossing.

Rainfall across the region is expected to increase up to 06:00 on 25 December 2010 before easing and further heavy rainfall may commence late on 29 December 2010.

Tide levels continue to be monitored closely with peak tide estimates being adjusted by BOM to account for Wivenhoe Dam outflows.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager

BoM assessment

(consisting of references to latest Flood Warning for the Brisbone River and other relevant Bureau forecasts and warnings (e.g. weother/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

BoM has been advised.

the annual management of the state of the st	***************************************
BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised and do not have a problem with the new strategy.

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised and do not have a problem with the new strategy.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	

Somerset Regional Council (SRC) assessment (if required) (to include predicted local inundation areas and depths of inundation based on the infarmation)

Council has been advised and do not have a problem with the new strategy.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due Date	Time	or Event	Closure
Addition of the second	· 中国的特别的企业的	The state of the second	

From:

Rob Drury

Sent:

Friday, 24 December 2010 6:49 AM

To:

Dan Spiller

Cc:

Peter Borrows; Jim Pruss Mike Foster;

Subject:

Technical Report W18 Technical Stuation Report W18.docx

Follow Up Flag:

Attachments:

Follow up

Flag Status:

Flagged

Categories:

T11: PB

Dan,

Wouldn't normally do one as no change from yesterday but thought would update adding the extra info at top you requested as a trial.

Rob

Robert Drury

Dam Operations Manager

Water Delivery

Queensland Bulk Water Supply Authority trading as Seqwater



Swimming in weirs and t flowing water is FA1





Wivennoe Dam, Brisdane Valley Highway, via Fernyale Q4306 Australia

PO Box 37, Fernvale QLD 4306 Nebsite | www.segwater.com.au

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|--|

Seqwater status of inflows and dam operations

Current status but could change based on inflows or rainfall.

Current objectives		of Wivenhoe as close as possible and still close off today rther bridge openings (dependent on other inflows).
Strategy	Wivenhoe releasing around 300 to 3S0m3/s through one gate but reducing during the day based on Lockyer flows to prevent Burtons Crossing going under.	
		eleases through valves and hydro after gate is closed at 1pm ed on Lockyer flows.
	 Monitor inflo 	ows and need for further gate releases.
Key considerations	Storage levels:	See below
	Inflows:	Ongoing base flows
	Rainfall:	See below
	Lockyer/Bremer:	Flows increasing. With further rainfall, may inundate local bridges with further rainfall.
	Brisbane River:	Any minor impact on tides will start decreasing.

Rainfall

Little to no rainfall has been experienced in the dam catchments since yesterday morning. However BOM commenced issuing severe weather warnings last night for scattered showers, thunderstorms and general rain areas over eastern Queensland for the coming week.

Some locally heavy falls are expected to commence developing about the southeast coast during this evening. The current BOM forecast is:

Friday 24 December Rain Increasing Saturday 25 December Rain at times Sunday 26 December Rain at times Monday 27 December Rain at times Tuesday 28 December Rain easing Wednesday 29 December Showers Thursday 30 December Showers

With the current wet catchments, there is a high probability that the forecast rain will result in further flood releases from the dams over the coming week.

Somerset Dam

Sluice Gate operations ceased at 0900 yesterday and since that time the lake has risen around 100 millimeters. A regulator will be opened this morning to drain the lake to near full supply level. Further

gate operations may be necessary in coming days if forecast rainfall results in subsequent river rises. The estimated total inflow into the dam for the event is in excess of 135,000ML, the majority of which has been released into Wivenhoe.

Wivenhoe Dam

Radial Gate operations are currently continuing at Wivenhoe Dam with the release being reduced by one gate increment every 5 to 6 hours to ensure that Brisbane River flows are not increased by the increasing Lockyer Creek outflows and to maintain Burtons Bridge open (water ceased to flow over Burtons Bridge at approximately 2030 yesterday). All gates are currently scheduled to be closed by 1300 today. When the gates are closed, the lake level will be around 67.07m or 70mm above the dam full supply level and 180mm below the radial gate opening trigger level of 67.25m. A regulator will then be used to maintain the lake level near to or below this level. The estimated inflow into Wivenhoe Dam for the event (excluding releases from Somerset Dam) is now 250,000 ML. A total of over 360,000 ML will have been released downstream from Wivenhoe Dam into the Brisbane River by this afternoon. The total estimated inflow into both dams for this event is now approaching 390,000 ML.

Further gate operations may be necessary in coming days if forecast rainfall results in subsequent river rises.

Impacts of Wivenhoe Dam Releases

Twin Bridges, Savages Crossing and Colleges Crossing are currently closed and should remain so for some time due in part to current outflows into the Brisbane River from Lockyer Creek that will peak in excess of 200 cumecs late today. All other crossings downstream of the dam are currently open. Tide levels continue to be monitored closely with peak tide estimates being adjusted by BOM to account for Wivenhoe Dam outflows but will decrease continuously.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager

BoM assessment

(consisting of references to latest Flood Warning for the Brisbane River and other relevant Bureau forecasts ond warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

BoM has been advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised and do not have a problem with the new strategy.

BCC Technical Officer name	Chris Lavin
	Disaster Operations Manager
BCC Technical Officer contact details	

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised and do not have a problem with the new strategy.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths af inundation based on the information)

Council has been advised and do not have a problem with the new strategy.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due Date	Jime	or Event Closure
Thought to the color		O' LYCILC

From: Rob Drury

Sent: Friday, 24 December 2010 1:41 PM

To: Dan Spiller

Cc: Mike Foster; Jim Pruss; Peter Borrows

Subject: Technical Report W19

Attachments: Technical Stuation Report W19.docx

Follow Up Flag: Follow up Flag Status: Flagged

Categories: T11: PB

Attached quick summary advising of closure and ongoing monitoring.

Depending on inflows and rainfall we may be operational again tomorrow or Sunday.

Rob

Robert Drury
Dam Operations Manager
Water Delivery

Queensland Bulk Water Supply Authority trading as Seqwater



Swimming in weirs and t flowing water is FA1





Vvivenitue Datti, onspatie valiey nigriway, via retrivale Q4300 Australia

PO Box 37, Fernvale QLD 4306 Website | www.seqwater.com.au

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TSR Number W19 Date of TSR release	24.12.2010	Time of TSR release	1 .30pm
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Seqwater status of inflows and dam operations

Current status but could chonge based on inflows or rainfall.

Current objectives	Monitor the rain overnight and ongoing inflows.	
Strategy	 Close gates at Wivenhoe at 1.00pm Wivenhoe continues to release 4,200ML per day through hydro and valves. 	
Key considerations	Storage levels:	Just above FSL
	Inflows:	Ongoing base flows
Rainfall:		
	Lockyer/Bremer:	Flows increasing. With further rainfall, may inundate local bridges with further rainfall.
	Brisbane River:	Any minor impact on tides still decreasing.

Somerset Dam

Sluice Gate and valve operations have ceased for the time being.

Wivenhoe Dam

Radial Gate operations ceased at 1.00pm.

A regulator and hydro will be opened to release around 4,200ML per day.

The Flood Centre will monitor overnight and consider options tomorrow morning based on inflows and rainfall.

Further gate operations may be necessary in coming days.

Impacts of Wivenhoe Dam Releases

Twin Bridges, Savages Crossing and Colleges Crossing may still be affected by flows from the Lockyer.

Segwater Technical Officer name	Robert Drury
Sequater Technical Officer position title	Dam Operations Manager

BoM assessment

(consisting of references to latest Flood Warning for the Brisbane River and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/camments if needed)

BoM has been advised.

BoM Technical Officer name	Peter Baddiley	
BoM Technical Officer position title		
BoM Technical Officer contact details		

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised and do not have a problem with the new strategy.

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised and do not have a problem with the new strategy.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised and do not have a problem with the new strategy.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due Date	Time	or Event	Gate opening	
建建筑等的			' '	

Mike Foster

Sent:

Friday, 24 December 2010 2:45 PM

To:

Adcock: Dan Sniller: Barry Dennien

Cc: Subject: Peter Borrows; Rob Drury

Re: Kholo Bridge damage

As discussed as long as sequater operates in accordance with the flood manual any liability for damage etc rests with state. Emergency services qld is the contact in relation to any damage claims

Chrs mike

From: John Adcock

To: Dan Spiller

Barry Dennier

Mike Foster

Sent: Fri Dec 24 14:29:10 2010 Subject: Kholo Bridge damage

iscussion with Barry – initial key messages to consider

- Water Grid is concerned about potential for property damage associated with dam releases
- Damage to downstream infrastructure and property would be significantly greater in heavy weather events if the dam wasn't there
- Water Grid performs an important role balancing flood mitigation and water security
- The Kholo Bridge is designed to be covered by water from dam releases
- Any current damage to Kholo Bridge may be contained to the approaches to the bridge (suggested by Scott based on photos - TBC)

Mike F: can you confirm the Seqwater legal liability status associated with dam releases (I think this is fine if made in accord with gazetted flood release plans).

Media plan at this stage

- No proactive work
- draft preparatory talking points in case request for response after BCC release their announcement

To offer no comment may appear uncaring or seen to be dodging the issue

Cheers

John Adcock

Stakeholder Relations Manager

SEQ Water Grid Manager

Phone

Email:

Visit: Level 15, 53 Albert Street Brisbane Post: PO Box 16205, City East QLD 4002

ABN: 14783 317 630

Please consider the environment before printing this email. It takes 10 litres of water to make one sheet of A4 paper.



Swimming in weirs and t flowing water is FA1



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Rob Drury

Sent:

Saturday, 25 December 2010 10:09 AM

To:

Dan Spiller

Cc:

Peter Borrows;

Foster

Subject:

Technical update W20

Attachments:

Technical Stuation Report W20.docx

Follow Up Flag: Flag Status:

Follow up

Flagged

Categories:

T11: PB

Attached is report W20.

As considered on Friday, we will need to begin release tomorrow as the Lockyer is dropping and more inflows and rain have been experienced.

(lob

Robert Drury

Dam Operations Manager

Water Delivery

Queensland Bulk Water Supply Authority trading as Seqwater



Swimming in weirs and f flowing water is FA1



Mike



Vivenhoe Dam, Brisbane Valley Highway, via Fernvale Q4306 Australia

PO Box 37, Fernvale QLD 4306 Website | www.segwater.com.au

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TSR Number W2	0 Date of TSR release	25.12.2010	Time of TSR release	9.30am

Segwater status of inflows and dam operations

Current status but could change based on inflows or rainfall.

Current objectives	Begin discharging tomorrow now Lockyer is dropping		
Strategy	 Monitor today and begin releases Sunday morning to maximise release but not affecting anything more than low level bridges. 		
	Planned release is 300-400m3/s		
	Currently still releasing 4200ML per day from valve and hydro		
Key considerations	Storage levels: Above FSL		
	Inflows: Ongoing inflows plus last nights rain		
	Rainfall:		
	Lockyer/Bremer: Flows decreasing		
	Brisbane River:		

Somerset Dam

All regulators and sluices are currently closed at Somerset Dam.

In the 24 hours to 0600 25/12/2010 rainfall totals have varied from 10 to 20mm with an average of about 20mm. Some small rises have being recorded at Peachester, Woodford and Mt Kilcoy. Lake level has risen from 99.18m at 0600 24/12/2010 to 99.33 at 0730 25/12/2010. The runoff from the overnight rain plus baseflow will result in approximately 13,000 ML over the next few days. Without gate ops, water level could reach 99.5m later on Sunday 26/12/2010.

Wivenhoe Dam

Wivenhoe Dam is currently releasing 4,200ML through the hydro and regulator.

In the 24 hours to 0600 25/12/2010 rainfall totals have varied from 10 to 20mm with an average of about 20mm. Recessions are expected to be prolonged. An additional 15,000ML is expected to flow into Wivenhoe just from the upper Brisbane in the next few days. Downstream of Wivenhoe, water levels are continuing to fall in Lockyer Ck and the overnight rain is not expected to cause renewed rises. Some small rises are expected in the Bremer and Warrill systems during today. Lake level has risen from 67.12m when gates were closed at 1400 24/12/2010 to 67.28m at 0600 25/12/2010.

Twin Bridges, Savages and Colleges Crossing remain impacted by Wivenhoe releases and Lockyer and local runoff. Burtons and Kholo Bridges would be currently unaffected. Kholo will no doubt still be closed by Council regarding repairs.

Strategy is to begin operation Sunday morning of Wivenhoe gates and probably Somerset valves. Councils have been notified and are fine with strategy.

Burtons and Kholo (apart from repairs) will not be affected by this release strategy at this stage however it depends on rainfall over next few days.

Rainfall Forecast for SEQId

Sat 25/12/2010 10-15mm Sun 26/12/2010 25-50mm Mon 27/12/2010 50-100mm Tue 28/12/2010 50-100mm Wed 29/12/2010 15-25mm

BOM confirm that heaviest rain is likely to be Sunday/Monday.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager

BoM assessment

(consisting of references to lotest Flood Warning for the Brisbone River ond other relevant Bureou forecasts and warnings (e.g. weother/rain forecasts, Tropical Cyclone Warning etc) ond other updotes/comments if needed)

BoM has been advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	
BOW reclinical officer contact details	•••••••••••••••••••••••••••••••••••••••

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation bosed on the information)

Council has been advised and do not have a problem with the new strategy.

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised and do not have a problem with the new strategy.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator

ICC Technical Officer contact details

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised and do not have a problem with the new strategy.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Rob Drui

Sent:

Sunday, 26 December 2010 8:41 AM

To:

Dan Spiller

Cc:

Peter Borrows Mike Foster:

Subject:

Technical Report W21

Attachments:

Technical Stuation Report W21.docx

Follow Up Flag:

Follow up

Flag Status:

Flagged

Categories:

T11: PB

Attached is Report W21.

Current strategy as of this morning is for releases from Somerset into Wivenhoe and from Wivenhoe through one gate commencing this morning at around 9am.

Councils are aware, plan is to maximise discharge, impacting low level bridges but not Burtons, about 300-350cumecs depending on downstream inflows.

Until Tuesday at least but depends on the rain that is predicted.

Rob

Robert Drury Dam Operations Manager Water Delivery

Queensland Bulk Water Supply Authority trading as Seqwater



Swimming in weirs and f flowing water is FA1





PO Box 37, Fernvale QLD 4306 Website | www.seqwater.com.au

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TSE/Number W	Date of TSR release	26.12.2010	Time of TSR release	8.00am
			777777	

Segwater status of inflows and dam operations

Current status but could change based on inflows or rainfall.

Current objectives	Begin releases to drain stored flood waters only impacting on low level bridges and monitoring predicted rainfall	
Strategy	Begin releases of around 300m3/secMonitor rainfall	
Key considerations	Storage levels: Above	FSL
	Inflows: Ongoi	ng inflows plus last nights rain
	Rainfall:	
	Lockyer/Bremer: Flows	decreasing.
	Brisbane River:	

Rainfall

Only relatively minor rainfall has been experienced in the dam catchments in the last 24 hours, with a catchment average of around 10mm experienced at all three dams. However the QPF issues at 1600 yesterday was for 40 to 60mm and BOM radar indicates that rain is approaching the catchments from the north. Additionally at 0445, BOM issued a severe weather warning that takes in the dam catchment areas that is associated with a rain depression moving down from Mackay towards the NSW border. The current BOM forecast is:

Sunday 26 December Rain Monday 27 December Rain periods Tuesday 28 December Rain at times Wednesday 29 December Rain at times Thursday 30 December Rain easing to showers Friday 31 December Mostly fine Saturday 31 December Mostly fine

With the current wet catchments, there is a high probability that the forecast rain will result in further flood releases from the dams over the coming week.

Somerset Dam

Spice Gate operations ceased on 23 December 2010 and since that time the lake has risen steadily to currently be around 99.46m or 460mm above the full supply level. At least two regulators will be expensed later today to drain the lake to near full supply level, plan is for 9.00am at a discharge of about 140m3/s. Draining will take at least until Tuesday. Further gate operations may be necessary in coming days if forecast rainfall results in subsequent river rises.

Wivenhoe Dam

Radial Gate operations ceased on 24 December 2010 and since that time the lake has risen steadily to currently be around 67.37m or 370mm above the full supply level. A radial gate will be opened later today following discussions with the impacted Local Authorities to drain the lake to near full supply level. Draining will take at least until Tuesday. Further gate operations may be necessary in coming days if forecast rainfall results in subsequent river rises.

Impacts of Wivenhoe Dam Releases

With no radial gate releases from Wivenhoe dam since 24 December 2010, the crossings downstream of the dam are currently impacted primarily by non-controlled river flows only. Lockyer Creek outflows into the Brisbane River are currently in the order of 60 cumecs.

Twin Bridges, Savages and Colleges Crossings will be inundated but the plan is to release around 300-350cumecs depending on flows downstream so as to not impact Burtons Bridge.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager

BoM assessment

(consisting of references to lotest Flood Warning for the Brisbane River and other relevant Bureau forecasts and wornings (e.g. weather/rain forecosts, Tropical Cyclone Warning etc) and other updates/comments if needed)

BoM has been advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised and do not have a problem with the new strategy.

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	
	MODELLO MARCON (MARCON

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised and do not have a problem with the new strategy.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised and do not have a problem with the new strategy.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due Date	Time	or Event Sign	nificant
		Cha	inge

Rob Dru

Sent:

Monday, 27 December 2010 8:12 AM

To:

Rob Drury; Dan Spiller

Cc:

Peter Borrows;

Mike Foster

Subject:

Lechnical Report W22

Attachments:

Technical Stuation Report W22.docx

Follow Up Flag: Flag Status:

Follow up Flagged

Categories:

T11: PB

Attached is Report W22.

Current strategy as of this morning is to increase releases later today or early tomorrow depending on inflows and discussions with Councils and as Lockyer rises and inundates Burtons.

Releases will result in river flow being around 1500cumecs as previous events.

Probably until Thursday at earliest.

Councils are aware.

Rob

Robert Drury

Dam Operations Manager

Water Delivery

Queensland Bulk Water Supply Authority trading as Seqwater



Swimming in weirs and 1 flowing water is FA1





Ρ'n

Wivennoe Dam, Brisbane Valley Highway, via Fernvale Q4306 Australia PO Box 37, Fernvale QLD 4306

Website | www.segwater.com.au

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TSR Number	W22	Date of TSR release	27.12.2010	Time of TSR	8.00am
		reigabe		(IGIGGE)	i

Seqwater status of inflows and dam operations

Current status but could change based on inflows or rainfall.

Current objectives	Continue reducing releases until Lockyer increases to flow sufficient to inundate Burtons and then begin releasing stored water during week.	
	Continue to store floodwaters to minimise impacts downstream and then release in a controlled manner	
Strategy	 Begin increasing release from Wivenhoe later today or early tomorrow as Lockyer rises to give overall river flow of around 1500cumecs and drain flood compartments within 7 days. 	
Key considerations	Storage levels: Above FSL	
	Inflows: Ongoing inflows plus last nights rain	
	Rainfall:	
	Lockyer/Bremer: Flows increasing significantly due to rain last 24 hours	
	Brisbane River:	

Rainfall

Reasonably significant rainfalls in the order of 40 to 50 mm have been experienced in the dam catchments in the last 24 hours, but the rainfall has only been in the order of 5 to 10mm in the last 6 hours. The QPF issued at 1600 yesterday was for 50 to 100mm and the severe weather warning associated with possible widespread rainfall in the dam catchments remains current and was re-issued by BOM at 0445 today. The current BOM forecast is:

Monday 27 December Rain periods Tuesday 28 December Rain at times Wednesday 29 December Rain at times Thursday 30 December Shower or two Friday 31 December Fine Saturday 31 December Fine Sunday 1 January Fine

With the current wet catchments, there is a high probability that the forecast rain will result in further flood releases from the dams over the coming week.

Somerset Dam

Two regulators were opened yesterday morning, to provide a release of 12000ML/day. Since that time the lake has continued to rise steadily to currently be around 99.60m or 600mm above the full supply level. Further gate operations may be necessary today if forecast rainfall results in subsequent river rises. Draining will take at least until Wednesday.

Currently at 107.7% with 30,000ML over FSL.

Wivenhoe Dam

Radial Gate operations recommenced yesterday at 0900 and since that time the lake has risen steadily to currently be around 67.57m or 570mm above the full supply level. Because of outflows from Lockyer Creek, outflows from Wivenhoe Dam have been steadily reduced during the night to ensure Burtons Bridge remained open. Radial gates at Wivenhoe Dam have been progressively wound back this morning as the Lockyer Creek outflows into the Brisbane River increase above 250 cumecs. This will keep Burtons Bridge open until late this afternoon. However it is anticipated that Lockyer Creek outflows will peak above 500 cumecs later today/tomorrow and these flows will inundate Burtons Bridge. As this occurs, outflows from Wivenhoe Dam will be increased to drain the lake to near full supply level. Draining will take at least until Thursday. Further gate operations may be necessary in coming days if forecast rainfall results in subsequent river rises.

Wivenhoe is around 105.6% and 65,000ML over FSL.

Impacts of Wivenhoe Dam Releases

Twin Bridges, Savages Crossing and Colleges Crossing are currently closed and will remain so until at least Thursday. Burtons Bridge is currently open, but will be closed later today/tomorrow and is likely to remain closed until at least Wednesday. However, the length of time that Burtons Bridge will be closed is dependant upon the rainfall experienced over the next several days. Kholo Bridge remains unserviceable due to flood damage. There is no current expectation that either Mt Crosby Weir Bridge or Fernvale Bridge will be impacted by the current event.

An updated estimate of the time of closure of Burtons Bridge this afternoon will be provided to Council, but at this stage it is not expected to be before 1600 today. This will change as rainfall is experienced during the day.

Tide levels in Brisbane are decreasing generally so Wivenhoe releases should have minimal impact.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager

BoM assessment

(consisting of references to latest Flood Warning for the Brisbane River and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

BoM has been advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised and do not have a problem with the new strategy.

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised and do not have a problem with the new strategy.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised and do not have a problem with the new strategy.

in the second se	***************************************
SRC Technical Officer name	Tony Jacobs

SRC Technical Officer position title	Local Disaster Response Coordinator

SRC Technical Officer contact details	

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

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Dan Spiller

Sent:

Monday, 27 December 2010 1:43 PM

To:

Martin.PeterJ Debbie Best (

Cc: Subject: Martin.PeterJ

Preparation and distribution of Technical Situation Report

Peter Borrows

Peter,

As agreed, I will include you and any other officers you nominate on the distribution list for the daily Technical Situation Reports.

We will also ensure that an appropriate contact is consulted as part of the preparation of the sechnical Situation Report, and the results of that consultation noted in the report.

When you have an opportunity, can you please advise me of:

- · any other officers we should include in the distribution list, besides yourself
- the officer that Seqwater should consult when preparing the report.

As background, the purpose of the protocol and technical report is to ensure that there is appropriate coordination and consultation about dam operate. It ensures that BoM and Councils:

- are advised of proposed operations and can request refinements to them
- provide feedback to us on likely impacts
- can formally raise concerns about proposed actions.

Our part of the protocol relates to dam operations. However, the local impacts of those releases, including local flooding and road closures, are the responsibility of the Councils. As you appreciate, Council roads may be closed for a range of reasons aside from our dam operations and may not be trafficably immediately after river levels fall (as Kholo Bridge has demonstrated).

We will expand the protocol to ensure that you are consulted at appropriate times. We are happy to distribute it to any other organisations you consider appropriate.

The 1800 number may also be of assistance - it was established by Seqwater in the last couple of weeks and provides details about dam releases. It is updated twice daily. The number is 1800 613 122.

My details are below. Please contact me at any time if you require any further information.

Regards,

Dan

Daniel Spiller

Director, Operations

SEQ Water Grid Manager

Phone

Email:

Visit: Level 15, 53 Albert Street Brisbane

Post: PO Box 16205, City East QLD 4002

ABN: 14783 317 630

Please consider the environment before printing this email. It takes 10 litres of water to make one sheet of A4 paper.

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Rob Drury

Sent:

Tuesday, 28 December 2010 7:17 AM

To: Rob Drury; Dan Spiller

Cc:

Peter Borrows;

Mike Foste

Subject:

RE: Technical Report W22

Attachments:

Technical Stuation Report W23.docx

Attached is Report W23.

Releases have yet to be ramped up as the Lockyer has had large inflows over last day or so.

Once the Lockyer outflows are decreasing, Wivenhoe releases will increase, probably later today some time but again dependant on downstream impacts.

Releases will still result in the river flow being around 1500cumecs as previous events. But won't get to the lower Brisbane until Thursday sometime by which time other impacts will have passed or are decreasing.

The aim is to close off by Sunday having the dam back at FSL.

Councils have been advised.

Rob

Robert Drury
Dam Operations Manager
Water Delivery

Queensland Bulk Water Supply Authority trading as Seqwater



Swimming in weirs and t flowing water is FA1





Ρh

Wivennoe Dam, Brisbane valley Highway, via Fernyale Q4306 Australia PO Box 37, Fernyale QLD 4306

Website | www.segwater.com.au

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TSR Number W23	Date of TSR 28.12.2010 release	Time of TSR 7.00am
	HEIGERS	(GIGGE)

Seqwater status of inflows and dam operations

Current status but could change based on inflows or rainfall.

Current objectives	Lockyer flows flows decrease	mpartment as quickly as possible without impacting Mt
Strategy	 Begin increasii today but dep 	re still minimal of 4,000Ml per day ng releases from current minimal release, probably later endant on Lockyer flows. nost of floodwaters drained by end of week.
Key considerations	Inflows:	Above FSL Ongoing inflows plus yesterdays rain
	Rainfall: Lockyer/Bremer:	Flows beginning to decrease
		Releases planned to start late today will not impact on Brisbane River downstream until Thursday when other impacts have decreased. As per BoM advice, impact on tides minimal.

Rainfall

Rainfalls in the order of 20 to 40 mm have been experienced in the dam catchments in the last 24 hours, but the rainfall has only been in the order of 5 mm in the last 12 hours. The QPF issued at 1600 yesterday was reduced to 25 to 35mm and the severe weather warning associated with possible widespread rainfall in the dam catchments is no longer current. The current BOM forecast is:

Tuesday 28 December Shower or two.
Wednesday 29 December Shower or two.
Thursday 30 December Fine.
Friday 31 December Fine
Saturday 31 December Mostly Fine
Sunday 1 January Few showers
Monday 27 December Showers

Although the dam catchments are saturated, BOM forecasts are currently indicating that dam inflows have peaked for the current event.

Somerset Dam

A flood release through the regulator cone valves at the dam commenced at 0900 on Sunday 26 December 2010. The current release rate is 18000ML/day. Since commencing the release the lake has continued to rise steadily to currently be around 99.96m AHD or 960mm above the full supply level. Inflows into the dam are subsiding and unless further rainfall in the dam catchment is experienced, the lake will soon start to fall slowly to be back near the dam full supply level by Thursday. Sluice gate operations will commence this morning as Wivenhoe levels are approaching the point at which the regulator cone valves should not be used due to back water impacts. The total volume of water released since the release commenced on 26 December 2010 is 37,000ML, with the current projected total release volume for this event may be as high as 80,000ML. Somerset is currently storing around 42,000ML above FSL.

Wivenhoe Dam

Radial Gate operations for the current event commenced at 0900 on Sunday 26 December 2010. After scaling up to an initial release rate of 30,000ML/day, the release was scaled back yesterday to the minimum radial gate release rate of 4,000ML/day to ensure that Burtons Bridge remained open until yesterday afternoon and to reduce flooding impacts in the Brisbane River caused by outflows into the river from Lockyer Creek. The current release rate remains at 4,000ML/day, but will be scaled up later today as Lockyer Creek flows subside. The timing still depends on Lockyer flows. The current lake level is 68.55m AHD or 1550mm above the full supply level. Inflows into the dam are subsiding and unless further rainfall in the dam catchment is experienced, the lake will fall slowly once the release rate is scaled up, for the level to be back near the dam full supply level by around Sunday. The total volume of water released since the release commenced on 26 December 2010 is 28,000ML, with the current projected total release volume for this event being in the order of 375,000ML (includes inflows from Somerset Dam). The next update will be provided at around 1600 today.

Wivenhoe currently is storing 172,000ML above FSL.

Impacts of Wivenhoe Dam Releases

Twin Bridges, Savages Crossing, Colleges Crossing, Burtons Bridge and Kholo Bridge are currently closed and will remain so until at least Friday. There is no current expectation that either Mt Crosby Weir Bridge or Fernvale Bridge will be impacted by the current event, but Lockyer Creek outflows are being closely monitored and may come close to impacting upon the Mt Crosby Weir Bridge. An updated estimate of the likely time of opening of Burtons Bridge will be provided tomorrow. England Creek access is not impacted yet but will be at some stage today or tomorrow.

Tide levels in Brisbane are decreasing generally so Wivenhoe releases should have minimal impact.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager

BoM assessment

(consisting of references to latest Flaad Warning for the Brisbane River and other relevant Bureau farecasts and warnings (e.g. weather/rain farecasts, Trapical Cyclone Warning etc) and other updates/comments if needed)

BoM has been advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	
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Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised and do not have a problem with the new strategy.

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised and do not have a problem with the new strategy.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised and do not have a problem with the new strategy.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

	Next TSR due	Date 29.12.2010	Time	or Event	
--	--------------	------------------------	------	----------	--

Rob Drury

Sent:

Wednesday, 29 December 2010 7:37 AM

To:

Rob Drury; Dan Spiller

Cc:

Peter Borrows Mike Foster;

Subject:

RE: Technical Report W24

Attachments:

Technical Stuation Report W24.docx

Follow Up Flag: Flag Status:

Follow up Flagged

-

Categories:

T11: PB

Attached is Report W24.

Aim now is to release the stored flood waters as quickly as possible without affecting Mt Crosby or Fernvale Bridges.

Releases are ramping up with around 60,000ML per day from Wivenhoe at the moment going up to around 130,000ML as the Lockyer drops away.

This will continue through the rest of the week with Twin Bridges, Savages, Burtons, Kholo and Colleges inundated until about Sunday.

As before, impact on tides minimal based on BoM advice. Other inflows such as the Bremer now dropping away quickly so our releases will not be a concern when they do get to the lower Brisbane by Thursday/Friday.

The aim is to close off around Sunday having the dam back at FSL.

Councils have been advised.

Rob

Robert Drury

Dam Operations Manager

Water Delivery

Queensland Bulk Water Supply Authority trading as Seqwater



Swimming in weirs and t flowing water is FA1





Ρh

Wivenhoe Dam, Brisbane Valley Highway, via Fernvale Q4306 Australia PO Box 37, Fernvale QLD 4306 Website | www.seqwater.com.au

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Date W24 Date release	e of TSR 29.12.2010 ase	Time of TSR 7.00am release
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Seqwater status of inflows and dam operations

Current status but could change based on inflows or rainfall.

Current objectives	Drain flood compartment as quickly as possible (by about Sunday) without impacting Mt Crosby or Fernvale bridges.	
Strategy	Continue increasing releases from current release as Lockyer drops up to maximum of 1500cumecs.	
	 Twin Bridges until Sunday. 	, Savages, Burtons, Kholo and Colleges will be inundated
Key considerations	Storage levels:	Above FSL
	Inflows:	Ongoing inflows plus yesterdays rain
	Rainfall:	
	Lockyer/Bremer:	Flows beginning to decrease
	Brisbane River:	Releases increasing from yesterday, other inflows downstream dropping away rapidly so releases will not impact on Brisbane River downstream. As per BoM advice, impact on tides minimal.

Rainfall

No rainfall has fallen in the past 12 hours to 0600 Wednesday with the exception of 2-4 mm in the upper Somerset Dam catchment.

The rainfall forecast issued by BOM at 1600 Tuesday indicated only 3-5 mm in the Somerset and Wivenhoe catchments and 5-10mm in the North Pine catchment for the next 24 hours. The current BOM forecast for SE Qld over the next few days is mostly fine with a few showers

However, catchments remain saturated and are primed for additional runoff in the event of rain.

Somerset Dam

A flood release through the regulator cone valves at the dam commenced at 0900 on Sunday 26 December 2010. Early Tuesday the regulators were closed and sluices progressively opened throughout the day. At 1800 Tuesday 2 sluices were open, releasing about 35,000 ML/day into Wivenhoe. A further two sluice gates where opened overnight in an attempt to bring the lake level down to 99.75 to enable recreational use of Somerset water activities to resume on Wednesday. At 1300, the lake level was 99.83m AHD and falling slowly. Two sluice gates will be closed by 12:00 29/12/2010 and two sluice gates are expected to remain open until Thursday and will be closed when the lake returns to the full supply level of 99m AHD. The total volume of water released since the event commenced on 26 December 2010 is 66,000ML, with the current projected total release volume for this event approaching 110,000ML (includes inflows still coming in).

Currently Somerset is at around 110% with 36,000ML above FSL.

Wivenhoe Dam

Radial gate operations for the current event commenced at 0900 on Sunday 26 December 2010. After scaling up to an initial release rate of 30,000ML/day, the release was scaled back Monday to the minimum radial gate release rate of 4,000ML/day to ensure that Burtons Bridge remained open and to reduce flooding impacts in the Brisbane River caused by flows from Lockyer Creek. Lockyer Ck outflow peaked at midday Tuesday and Wivenhoe gates were commenced to be re-opened at 1500 Tuesday, releasing on the back of the Lockyer recession. It is intended to gradually increase the Wivenhoe releases during Tuesday and Wednesday so that the combined release and Lockyer flow is maintained at about 1600m3/s (140,000 ML/day) in the mid Brisbane R. Note this is similar to the flows in the mid Brisbane in mid October and mid December 2010. This will be maintained until at least Saturday when it is expected that shut down procedure will commence. Gate closure sequencing will be such that the releases will mimic the natural pre-dam flows.

At 0600, the Wivenhoe water level was 69.26m AHD and rising slowly with the current release rate at 60,000ML/day. Inflows into the dam are subsiding and the lake will fall slowly once the release rate is scaled up 130,000 ML/day during Wednesday. It is aimed to return the dam to full supply level by Sunday. The total volume of water released since the event commenced on 26 December 2010 is 56,000ML, with the current projected total release volume for this event being in the order of 385,000ML (includes inflows from Somerset Dam).

Currently Wivenhoe is at 122.3% about 260,000ML above FSL.

Impacts of Wivenhoe Dam Releases

Twin Bridges, Savages Crossing, Colleges Crossing, Burtons Bridge and Kholo Bridge are currently closed and will remain so until at least Sunday. There is no current expectation that either Mt Crosby Weir Bridge or Fernvale Bridge will be impacted by the current event. At this stage, it is estimated that the flow at Burtons Bridge will fall below the bridge deck on Sunday morning.

Wivenhoe releases should have minimal impact on tides based on planned releases. BoM advice confirmed this. Impacts from Bremer and other inflows should have mostly passed by the time any release from Wivenhoe gets to downstream river reaches.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager

BoM assessment

(consisting of references to latest Flood Warning for the Brisbane River and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

BoM has been advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	

BoM Technical Officer contact details

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised and do not have a problem with the new strategy.

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised and do not have a problem with the new strategy.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised and do not have a problem with the new strategy.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Dod 500 dva Dota 2010	14 14 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		
Next is route Date 50.12.2010	i ime	or event	

Rob Drury

Sent:

Thursday, 30 December 2010 7:05 AM

To:

Rob Drury; Dan Spiller

Cc:

Peter Borrows Mike Foster;

Subject:

RE: Technical Report W25

Attachments:

Technical Stuation Report W25.docx

Attached is Report W24.

Aim now is to continue releases of the stored flood waters as quickly as possible without affecting Mt Crosby or Fernvale Bridges.

Releases are around 130,000ML at the moment.

This will continue through the rest of the week with Twin Bridges, Savages, Burtons, Kholo and Colleges inundated. Burtons may come out on Sunday morning.

Councils have been advised.

Next Report not until we have begun closing sequence.

Rob

Robert Drury
Dam Operations Manager
Water Delivery

Queensland Bulk Water Supply Authority trading as Seqwater



Swimming in weirs and f flowing water is FA1





Ρh

Wivennoe Dam, Brisbane Valley Highway, via Fernvale Q4306 Australia PO Box 37, Fernvale QLD 4306 Website | www.seqwater.com.au

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TSR Number W25 Date of release	f TSR 30.12.2010 Time of TSR 7.00am release
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Segwater status of inflows and dam operations

Current status but could change based on inflows or rainfall.

Current objectives	Drain flood compartment as quickly as possible (by about Sunday) without impacting Mt Crosby or Fernvale bridges.		
Strategy	 Continue current releases of around 1500cumecs. Twin Bridges, Savages, Burtons, Kholo and Colleges will be inundated until Sunday. 		
Key considerations	Storage levels: Above FSL		
	Inflows: Ongoing inflows		
	Rainfall:		
	Lockyer/Bremer: Flows continue to decrease		
	Brisbane River: Releases increased from yesterday, other inflows downstream dropping away rapidly so releases will not impact on Brisbane River downstream. As per BoM advice, impact on tides minimal.		

Rainfall

There has been no significant rainfall in the North Pine, Somerset and Wivenhoe catchments since 09:00 on Wednesday 29 December 2010. The current BOM forecast for SE Qld over the next few days is mostly fine with a few light showers, although there is a chance of storms on Tuesday and Wednesday next week.

The catchments remain saturated and are primed for additional runoff in the event of rain.

Somerset Dam

At 06:00 Thursday 30 December 2010, two sluices remain open, releasing about 35,000 ML/d into Lake Wivenhoe and are expected to remain open until Thursday afternoon when the lake returns to the full supply level of 99.00m AHD. The total volume of water released since the event commenced on 26 December 2010 is 104,000ML, with the current projected total release volume for this event approaching 123,000ML.

Wivenhoe Dam

Releases were gradually increased during Wednesday and Thursday morning until the combined release and Lockyer flow reached about 1,600m3/s (140,000 ML/d) in the middle Brisbane River. (Note this is similar to the flows in the releases made in mid-October and earlier in December 2010). This release will be maintained until mid-day Friday 31 December 2010, when the shut down procedure will commence and gates are expected to be fully closed by Sunday morning 2 January 2010. The proposed gate closure sequence will be such that the releases will mimic the natural pre-dam

recessional flows.

Gauge board readings indicate that the Wivenhoe dam water level peaked at 69.33m at noon Wednesday 29 December 2010, about 2.3m above the full supply level. At this level, the dam was temporarily storing over 270,000ML of flood water. At 06:00 on Thursday 30 December 2010, the level had fallen slightly to 69.07m AHD and was releasing about 1,530m3/s (132,000ML/d). The total volume of water released from Wivenhoe dam since the event commenced on 26 December 2010 is 160,000ML, with the current projected total release volume for this event being in the order of 425,000ML (includes inflows from Somerset Dam).

Impacts of Wivenhoe Dam Releases

Twin Bridges, Savages Crossing, Colleges Crossing, Burtons Bridge and Kholo Bridge are currently closed due to inundation and will remain so until at least Sunday 2 January 2011. There is no current expectation that either Mt Crosby Weir Bridge or Fernvale Bridge will be impacted by this event. At this stage, it is estimated that the flow at Burtons Bridge will fall below the bridge deck on Sunday morning.

Wivenhoe releases should have minimal impact on tides based on planned releases. BoM advice confirmed this earlier in the week. Impacts from Bremer and other inflows should have mostly passed by the time any release from Wivenhoe gets to downstream river reaches.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager

BoM assessment

(consisting of references to latest Fload Warning for the Brisbane River and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Trapical Cyclone Warning etc) and other updates/comments if needed)

BoM has been advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised and do not have a problem with the new strategy.

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised and do not have a problem with the new strategy.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the informatian)

Council has been advised and do not have a problem with the new strategy.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due Date	Time	or Event	Closing
			sequence or
			change in
			strategy

Rob Drury

Sent:

Friday, 31 December 2010 6:53 AM

To:

Rob Drury; Dan Spiller

Cc:

Peter Borrows; Mike Foster;

Subject:

RE: Technical Report W26

Attachments:

Technical Stuation Report W26.docx

Attached is Report W26.

Releases are around 130,000ML at the moment.

This will continue until a closing sequence is started later today early tomorrow. Final closure is still planned for Sunday.

Twin Bridges, Savages, Burtons, Kholo and Colleges will remain inundated until the weekend.

Burtons may come out on Sunday morning.

Councils have been advised.

Next Report at final gate closure.

Rob

Robert Drury

Dam Operations Manager Water Delivery Queensland Bulk Water Supply Authority *trading as* Seqwater



Swimming in weirs and 1 flowing water is FA1





Pi

Wivenhoe Dam, Brisbane Valley Highway, via Fernvale Q4306 Australia PO Box 37, Fernvale QLD 4306 Website | www.seqwater.com.au

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j

TSR Number	W26	Date of TSR 31.12.2010	Time of TSR 7.00am
		release	release

Segwater status of inflows and dam operations

Current status but could change based on inflows or rainfall.

Current objectives	Drain flood compartment as quickly as possible (by about Sunday) without impacting Mt Crosby or Fernvale bridges.	
Strategy	 Continue current releases of around 1500cumecs. Twin Bridges, Savages, Burtons, Kholo and Colleges will be inundated until Sunday. 	
Key considerations	Storage levels:	Above FSL
	Inflows:	Ongoing inflows
	Rainfall:	
	Lockyer/Bremer:	Flows continue to decrease
	Brisbane River:	Releases not changing greatly, other inflows downstream dropping away rapidly so releases will not impact on Brisbane River downstream. As per BoM advice, impact on tides minimal.

Rainfall

There has been no significant rainfall in the North Pine, Somerset and Wivenhoe catchments since 0900 on Wednesday 29 December 2010. The current BOM forecast for SE Qld over the next few days is mostly fine with a few light showers, although there is a chance of storms on Tuesday and Wednesday next week.

The catchments remain wet and are likely to generate additional runoff in the event of rain.

Somerset Dam

At 0500 on Friday 31 December 2010, the lake level was 99.01m AHD falling from a peak of 100.0m AHD reached around noon Tuesday 28 December 2010. Two regulators are currently operating and will remain open until the lake returns to the full supply level of 99.00m AHD. The total volume of water released since the event commenced on 26 December 2010 is 126,000 ML, with the current projected total release volume for this event approaching 130,000ML.

Wivenhoe Dam

Releases were gradually increased during Wednesday and Thursday morning until the combined release and Lockyer flow reached about 1,600m3/s (140,000 ML/d) in the middle Brisbane River. (Note this is similar to the flows in the releases made in mid-October and earlier in December 2010). Flow measurement carried out by the Department of Environment and Heritage during Thursday has confirmed this flow. This release will be maintained until late Friday 31 December 2010, when the shut down procedure will commence and gates are expected to be fully closed by Sunday 2 January 2010.

The proposed gate closure sequence will be such that the releases will mimic the natural pre-dam recessional flows.

At 0500 on Friday 31 December 2010, the level had fallen slightly to 68.40m AHD and was releasing about 1,550m3/s (132,000ML/d). The total volume of water released from Wivenhoe dam since the event commenced on 26 December 2010 is 293,000ML, with the current projected total release volume for this event being in the order of 450,000ML (includes inflows from Somerset Dam).

Impacts of Wivenhoe Dam Releases

Twin Bridges, Savages Crossing, Colleges Crossing, Burtons Bridge and Kholo Bridge are currently closed due to inundation and will remain so until at least Sunday 2 January 2011. There is no current expectation that either Mt Crosby Weir Bridge or Fernvale Bridge will be impacted by this event. At this stage, it is estimated that the flow at Burtons Bridge will fall below the bridge deck on Sunday morning.

Wivenhoe releases should have minimal impact on tides based on planned releases. BoM advice confirmed this earlier in the week. Impacts from Bremer and other inflows should have mostly passed by the time any release from Wivenhoe gets to downstream river reaches.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager

BoM assessment

(consisting of references to lotest Flood Warning for the Brisbane River and other relevant Bureau forecosts and warnings (e.g. weather/rain forecasts, Trapical Cyclone Warning etc) and other updates/comments if needed)

BoM has been advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	

Brisbane City Council (BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised and do not have a problem with the new strategy.

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised and do not have a problem with the new strategy.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised and do not have a problem with the new strategy.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due Date	Time	or Event Final closing of	
		gates	

From:

Rob Drury

Sent:

Thursday, 20 January 2011 9:36 AM

To:

Rob Drury; Dan Spiller; Peter Borrows;

Mike Fosto

Cc:

seqwgm

Subject:

RE: Technical Report Woz

Attachments:

Technical_Situation_Report_W64.docx

Report W64

Robert Drury

Dam Operations Manager

Water Delivery

Queensland Bulk Water Supply Authority trading as Seqwater



Swimming in weirs and t flowing water is FA1

Jim Pruss; Peter.Aller





Ph

Wivening Dam, brisbane valley highway, via Ferrivale Q4306 Australia PO Box 37, Ferrivale QLD 4306

Website | www.seqwater.com.au

From: Rob Drury

Sent: Wednesday, 19 January 2011 7:09 AM

To: Rob Drury; 'Dan Spiller'; Peter Borrows:

Spiller': Peter Borrows: Im Pruss; 'Peter.Aller

Mike Foster

Cc: 'seqwgn

Subject: RE: Technical Report W62

Attached report W62.

Main changes are related to holding a higher release rate for some hours over night due to Lowood water access issues.

Also we intend to close down today sometime rather than tomorrow morning partly for same reason and also as BCC no longer has concerns re Coro Drive.

This also means final level for Wivenhoe may be between 95% and 99%, with some ongoing base flows that may bring it back up slightly.

Rob

Robert Drury

Dam Operations Manager

Water Delivery

Queensland Bulk Water Supply Authority trading as Seqwater

Jim Pruss;



Ρh

Wivenhoe Dam, Brisbane Valley Highway, via Fernvale Q4306 Australia PO Box 37, Fernvale QLD 4306 Website | www.segwater.com.au

From: Rob Drury

Sent: Tuesday, 18 January 2011 6:50 AM

To: Rob Drury: 'Dan Spiller': Peter Borrows

'Peter.Alle

ိင: 'seqwgn

Subject: RE: Technical Report W61

Attached Report W61.

Still aiming for final closure Thursday morning.

Releases slowed over night to assist water supply pumping at Lowood but recommencing this morning.

Rob

Robert Drury

Dam Operations Manager

Water Delivery

Queensland Bulk Water Supply Authority trading as Seqwater



Swimming in weirs and t flowing water is FA1





Ph

DO Boy 27. Formusio OLD 1206

PO Box 37, Fernvale QLD 4306 Website | www.segwater.com.au

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this email in error please contact the sender immediately and delete the material from your email system. QLD Bulk Water Supply Authority ABN75450239876 (Trading as Seqwater).

Seqwater status of inflows and dam operations

Current status but could change based on inflows or rainfall.

Current objectives	Monitor onge	oing rainfall and inflows.
Strategy	 Somerset closed down. Wivenhoe closed all gates at 12pm yesterday and one gate opening used for ongoing releases. 	
Key considerations	Storage levels:	
	Inflows:	Total event inflows expected around 2,600,000ML.
	Rainfall:	Some storms overnight
	Lockyer/Bremer:	Monitoring
	Brisbane River:	

Rainfall

Severe thunderstorms again delivered rainfall over Wivenhoe, Somerset and North Pine dam catchments overnight. Catchment average rainfalls of 55 mm occurred in the Pine River, with isolated falls of 93 mm recorded at Mt Glorious.

The forecast rainfall indicates that falls of between 25 to 50mm are expected in the next 24 hours.

North Pine

North Pine Dam commenced gate operations at 01:00 on Thursday 20 January 2011 due to the runoff generated from the overnight storm. Currently five gates are open, releasing 150 m3/s. The lake level was 39.52m AHD at 09:00 and falling slowly.

Youngs Crossing remains closed.

Somerset Dam

All regulators were closed at 20:00 Tuesday 18 January 2011. The dam level was 99.07 m AHD at 06:30 on Thursday and rising slowly. Further regulator releases may take place over the next few days to maintain the dam at Full Supply Level (FSL).

Wivenhoe Dam

All gates were closed at Wivenhoe at 12:00 on Wednesday 19 January 2011. The current lake level is just below FSL and rising slowly due to the overnight storm inflows.

Operational releases are being made through the centre gate to account for ongoing small inflows, downstream water supply constraints and requirements, etc.

Strategy

A summary of the bridge status along the Brisbane River between Wivenhoe Dam and Moggill is as follows, with the exact timing of water coming clear of bridges depending on the fresh in the Lockyer Creek (peak flow~200-250 m3/s) and any further rainfalls.

- · Water is clear of Fernvale Bridge, Mt Crosby Weir Bridge, Kholo Bridge and Burtons Bridge
- Water from the fresh in the Lockyer Creek is likely to keep Savages Crossing and Colleges Crossing inundated for at least the next 24 hours.
- It is not yet certain when water will be clear of Twin Bridges as this will depend on base flow
 draining requirements and a decision will be made on this later Friday.

The Flood Operations Centre is re-mobilised for the North Pine Dam operations, but control of the Somerset and Wivenhoe dams has reverted to normal Sequater operations. However, the FOC will continue to monitor rainfalls and water levels throughout the Brisbane and Pine River catchments.

North Pine

North Pine will be closely monitored and if any heavy rainfall eventuates, further gate operations may be required.

Strategy

Councils have been informed of the current release strategy. The bridges below Wivenhoe Dam will progressively come out of water.

Leslie Harrison Dam:

Gates closed.

Hinze Dam:

Closed.

Segwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager

BoM assessment

(consisting of references to latest Flood Warning for the BrisbaneRiver and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

BoM has been advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	

Brisbane City Council(BCC) assessment

(to include predicted local inundation areas and depths af inundation based on the information)

Council has been advised of the current strategy

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due Date	Time	or Event Change in
		Strategy

Erom:

Mike Foster

Sauc

Thursday, 200 1000000 4000 p:18 PM

To:

Dan Spiller; SEQWGM Media Barry Dennien; Peter Borrows; EL

Cc: Subject:

Segwater response to public queries in relation to the flood event

Folks,

Please note Sequater response to public/community queries in relation to the flood event. This includes third party organisations including universities etc. Response has been approved by Segwater legal.

Media queries will be dealt with as per the approved interim protocol.

"The requested information is relevant to matters being considered by the announced Commission of Inquiry. Seqwater will be providing all relevant information to the Commission and it is therefore not appropriate for us to release or comment upon such information to third parties in the interim."

Cheers Mike

Mike Foster

Manager Strategic Relations & Communication Queensland Bulk Water Supply Authority trading as Seqwater



Ρh

Level o, 270 margaret ot, brisbaric oity QED 4000

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

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From:

Rob Drury

Sent:

Friday, 21 January 2011 10:43 AM

To:

Rob Drury; Dan Spiller; Peter Borrows;

Mike Foster

Cc:

seqwgm

Subject: Attachments: RE: Technical Report W65

Technical_Situation_Report_W65.docx

Attached latest report.

Basically

- Releasing from Somerset cone to drop to FSL until tomorrow
- Start releasing around 12pm from gate at Wivenhoe back to 100cumecs that was happening yesterday for water supply needs at Lowood and Mt Crosby and to drop to FSL. Maybe until Wednesday next week.
- All Councils have been informed, BCC have no issues re tides.

Rob

Robert Drury

Dam Operations Manager

Water Delivery

Queensland Bulk Water Supply Authority trading as Segwater



Swimming in weirs and t flowing water is FA1

Jim Pruss; Peter.Allen





Ρ'n

Wivenhoe Dam, Brisbane Valley Highway, via Fernvale Q4306 Australia

PO Box 37, Fernvale QLD 4306

Website | www.segwater.com.au

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TSR Number	W65	Date of TSR	21.1.11	Time of TSR	10am
		Helesse		Marecon	

Sequater status of inflows and dam operations

Current status but could change based on inflows or rainfall.

Current objectives	Maintain flows in the Brisbane River for water supply requirements and continue to reduce levels in the dams	
Strategy	Open a cone valve at Somerset to reduce back to 100% after base flow has increased levels.	
	Reinstate release from Wivenhoe via a minor gate opening as cone valve is damaged and hydro cannot release sufficient water.	
Key considerations	Storage levels:	
	Inflows:	
	Rainfall:	
	Lockyer/Bremer:	
	Brisbane River:	

North Pine

All gates closed.

Somerset Dam

One regulator will be opened at Somerset to discharge 69cumecs and reduce back to FSL by sometime tomorrow.

Somerset is currently 101.6% and 385,809ML.

Wivenhoe Dam

An operational release will be initiated to reinstate flows downstream for water supply purposes and dropping levels back to FSL. There is a need to ensure consistent flows at Lowood while emergency pumps are in use. Water releases for Mt Crosby are also required to assist in water quality issues.

Wivenhoe Dam is currently 100.4% and 1,169,571ML.

The release will be around 100cumecs through one central gate opening which will keep Twin Bridges inundated. Savages and Colleges bridges depend on the recession of the Lockyer flows.

This flow will continue until Tuesday or Wednesday next week depending on base flows and then may need to be reduced however it depends on water supply and quality issues.

Strategy

Councils have been informed of the current release strategy.

ECC advised they have no concerns regarding the flows in terms of tides. The release will not reach the lower Brisbane until Saturday night or early Sunday morning.

ICC and Somerset are both aware of the strategy and Somerset has no concerns re Twin Bridges remaining out and accept that Savages may become inundated depending on the Lockyer flows...

Leslie Harrison Dam:

Gates closed.

Hinze Dam:

Closed.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager

BoM assessment

(consisting of references to latest Fload Warning for the BrisbaneRiver and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updotes/comments if needed)

No need to advise BoM of operational flows of this size.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	

Brisbane City Council(BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areos and depths of inundation based on the information)

Council has been advised of the current strategy.

ICC Technical Officer name	Tony Trace
ICC Technical Officer recition title	Local Diseases Deserving Constitution
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due Date	Time	or Event	Change in	
	基達		Strategy	

From:

Rob Drur

Sent:

Saturday, 22 January 2011 9:06 AM

To:

Rob Drury; Dan Spiller; Peter Borrows;

Mike Foster

Cc:

Subject: Attachments: RE: Technical Report W66

Technical_Situation_Report_W66.docx

Dan

I thought there were discussions yesterday that we wouldn't do one unless we changed but I have attached one anyway.

Unless there is a change, I will skip tomorrow as we intend to do exactly the same, 100cumecs out of Wivenhoe and cone valve releases from Somerset of varying minor amounts to drain into Wivenhoe depending on base flows. Dam levels will only change slightly until the base flows die off.

No real rain forecast for a while.

rob

Robert Drury

Dam Operations Manager

Water Delivery

Queensland Bulk Water Supply Authority trading as Seqwater



Swimming in weirs and t flowing water is FA1

Jim Pruss; Peter.Aller





Ρh

Miverinoe Dani, prispane valley riignway, via rentvale Q4000 Australia

PO Box 37, Fernvale QLD 4306

Website | www.seqwater.com.au

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TSR Number	W66	Date of TSR	22.1.11	Time of TSR	9am
		renease		IGIGGSG	

Seqwater status of inflows and dam operations

Current status but could chonge based on inflows or rainfall.

Current objectives	Maintain flows in the Brisbane River for water supply requirements and continue to reduce levels in the dams
Strategy	Open a cone valve at Somerset to reduce back to 100% after base flow has increased levels.
	Reinstate release from Wivenhoe via a minor gate opening as cone valve is damaged and hydro cannot release sufficient water.
Key considerations	Storage levels:
	Inflows:
	Rainfall:
	Lockyer/Bremer:
	Brisbane River:

.North Pine

All gates closed.

Somerset Dam

One regulator will be opened at Somerset discharge varying minor amounts to reduce back to FSL over next few days.

Somerset is currently 101.1% and 384,106ML.

Wivenhoe Dam

Currently releasing 90cumecs through one gate and also using the hydro to release a total of around 100cumecs downstream for water supply purposes and dropping levels back to FSL.

Wivenhoe Dam is currently 101.1% and 1,178,238ML.

Twin Bridges is inundated. Savages and Colleges bridges depend on the recession of the Lockyer flows.

This flow will continue until Tuesday or Wednesday next week depending on base flows and then may need to be reduced however it depends on water supply and quality issues.

Strategy

Councils have been informed of the current release strategy.

BCC advised they have no concerns regarding the flows in terms of tides. ICC and Somerset are both aware of the strategy and Somerset has no concerns re Twin Bridges remaining inundated.

Leslie Harrison Dam:

Gates closed.

Hinze Dam:

Closed.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager

BoM assessment

(consisting of references to latest Flood Warning for the BrisboneRiver and other relevant Bureou farecosts and warnings (e.g. weather/roin forecosts, Tropicol Cyclone Worning etc) and other updates/comments if needed)

No need to advise BoM of operational flows of this size.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	

Brisbane City Council(BCC) assessment

(to include predicted local inundation oreas ond depths of inundation based on the information)

Council has been advised of the current strategy

BCC Technical Officer name	Chris Lavin
	Disaster Operations Manager
BCC Technical Officer contact details	

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation oreas ond depths of inundation bosed on the information)

Council has been advised of the current strategy.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
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ICC Technical Officer contact details	
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Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	***************************************

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due Date	Time	or Event	Change in	
		一种特別技術等的方式。	Strategy	

Litsupport Brisbane

From:

Dan Spiller

Sent:

Saturday, 22 January 2011 9:10 AM

To:

Rob Druny: Peter Borrows

Cc:

seqwgm

Subject:

RE: Technical Report W66

Thanks Rob. I cannot recall the conversation. That said, from our perspective, we do not require an update tomorrow unless there is a change to the strategy. I will mention this when I distribute it.

Jim Pruss; Peter.Aller

lim Pruss; Peter.Aller

Regards,

Dan

From: Rob Drury

Sent: Saturday, 22 January 2011 9:06 AM

To: Rob Drugg: Dan Spiller: Poter Perrower

Cc: seqwgm

Subject: RE: Technical Report W66

Dan,

I thought there were discussions yesterday that we wouldn't do one unless we changed but I have attached one anyway.

Unless there is a change, I will skip tomorrow as we intend to do exactly the same, 100cumecs out of Wivenhoe and cone valve releases from Somerset of varying minor amounts to drain into Wivenhoe depending on base flows. Dam levels will only change slightly until the base flows die off.

No real rain forecast for a while.

rob

Robert Drury
Dam Operations Manager
Water Delivery

Queensland Bulk Water Supply Authority trading as Seqwater



Swimming in weirs and fast flowing water is FATAL

Mike Foster

rehink it.

Mike Foster



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Wivenhoo bani, brisbane valley riignway, via i enivale 94500 Australia

PO Box 37, Fernvale QLD 4306 Website | <u>www.segwater.com.au</u>

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Rob Drury

Sent To

Monday, 24 January 2011 7:01 AM

Rob Drury; Dan Spiller; Peter Borrows;

Mike Foster

Cc:

seqwgm Subject:

Attachments:

RE: Technical Report VVo/

Technical_Situation_Report_W67.docx

Report W67.

Same release story as Saturday.

Robert Drury

Dam Operations Manager

Water Delivery

Queensland Bulk Water Supply Authority trading as Seqwater



Swimming in weirs and t flowing water is FA1

lim Pruss; Peter.Aller





Wivennoe Dam, Brisbane Valley Highway, via Fernyale Q4306 Australia PO Box 37, Fernvale QLD 4306

Website | www.seqwater.com.au

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TSR Number	W67	Date of TSR release	24.1.11	Time of TSR release	6am
		COLLEC		COCCOC	

Seqwater status of inflows and dam operations

Current status but could change based on inflows or roinfall.

Current objectives	Maintain flows in the Brisbane River for water supply requirements and continue to reduce levels in the dams
Strategy	Make releases via cone valve at Somerset as required to reduce back to 100% after base flow has increased levels.
	 Continue a minor gate opening at Wivenhoe as cone valve is under water and hydro cannot release sufficient water by itself
Key considerations	Storage levels:
	Inflows:
	Rainfall:
	Lockyer/Bremer:
	Brisbane River:

.North Pine

All gates closed.

Somerset Dam

One regulator will be opened at Somerset discharge varying minor amounts to reduce back to FSL over next few days.

Somerset is currently 100.7% and 382,409ML.

Wivenhoe Dam

Currently releasing 90cumecs through one gate and also using the hydro to release a total of around 100cumecs downstream for water supply purposes and dropping levels back to FSL.

Wivenhoe Dam is currently 101.2% and 1,179,321ML.

Twin Bridges is inundated.

This flow will continue during this week depending on base flows and then may need to be reduced however it depends on water supply and quality issues.

Strategy

Councils have been informed of the current release strategy.

BCC advised they have no concerns regarding the flows in terms of tides. ICC and Somerset are both aware of the strategy and Somerset has no concerns re Twin Bridges remaining inundated.

Leslie Harrison Dam:

Gates closed.

Hinze Dam:

Closed.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager

BoM assessment

(consisting of references to latest Flood Warning for the BrisbaneRiver and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

No need to advise BoM of operational flows of this size.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	

Brisbane City Council(BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy.

ICC Technical Officer name Tony Trace

ICC Technical Officer position title	Local Disaster Response Coordinator

ICC Technical Officer contact details	

Somerset Regional Council (SRC) assessment (if required) (to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due Date	Time	or Event Change in	
		Strategy	

From:

SEQWGM Media

Sent:

Monday, 24 January 2011 4:19 PM

To:

Mike Foster

Cc:

Dan Spiller; Barry Dennien

Subject:

RE: Media enquiry - The Australian

Thanks Mike, we have responded along these lines...

From: Mike Foster

Sent: Monday, 24 January 2011 2:46 PM

To: SEOWGM Media; Paul Bird

Cc: Dan Spiller; Barry Dennien;

Subject: RE: Media enquiry - The Australian

eter Borrows

Peter Borrows:

Thanks

It is pointless providing data without context and comment.

This is the information we will be providing the inquiry.

Suggested response (and for all future similar requests).

Data sought by the Australian is now the subject of a Commission of Inquiry and will be included in the Seqwater's submission to the inquiry.

Cheers Mike

From: SEQWGM Media [

Sent: Monday, 24 January 2011 2:34 PM

To: Mike Foster

Cc: SEQWGM Media; Dan Spiller; Barry Dennien

Subject: Media enquiry - The Australian

Hi and Mike

The Australian is after the figures for the inflow into Wivenhoe Dam and outflow from the dam on the 9th, 10th, 11th and 12th of January.

Deadline is close of business today. Journalist is Michael McKenna.

Thanks

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From:

Rob Drury

Sent:

Tuesday, 25 January 2011 8:10 AM

To:

Rob Drury; Dan Spiller; Peter Borrows;

Mike Foster

Cc:

seqwgm

Subject: Adachments: RE: Technical Report W68

Technical_Situation_Report_W68.docx

Attached latest report.

No real change. May stop releasing from Somerset today but Wivenhoe will continue for some days.

Will do another report on Thursday.

Rob

Robert Drury

Dam Operations Manager

Vater Delivery

Queensland Bulk Water Supply Authority trading as Seqwater



Swimming in weirs and f flowing water is FA1

im Pruss; Peter.Allen





Ρh

Wiveninoe Dani, brisbane valley nigriway, via Ferrivale Q4300 Australia

PO Box 37, Fernvale QLD 4306

Website | www.seqwater.com.au

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TSR Number W6	Date of TSR 25	7.1.11 Time of TSR 8am
	1.G.G.E.E.	Manage

Seqwater status of inflows and dam operations

Current status but could change based on inflows or rainfall.

Current objectives	 Maintain flows in the Brisbane River for water supply requirements and continue to reduce levels in the dams 	
Strategy	 Make releases via cone valve at Somerset as required to reduce back to 100% after base flow has increased levels. 	
	 Continue a minor gate opening at Wivenhoe as cone valve is under water and hydro cannot release sufficient water by itself 	
Key considerations	Storage levels:	
	Inflows:	
	Rainfall:	
	Lockyer/Bremer:	
	Brisbane River:	

North Pine

All gates closed. May make valve releases.

Somerset Dam

One regulator will be opened at Somerset discharge varying minor amounts to reduce back to FSL, should close off today at around 100% in dam but may be used to keep levels constant in future.

Somerset is currently 100.2% and 380,700ML.

Wivenhoe Dam

Currently releasing 90cumecs through one gate and also using the hydro to release a total of around 100cumecs downstream for water supply purposes and dropping levels back to FSL.

Wivenhoe Dam is currently 101.2% and 1,179,321ML.

Twin Bridges is inundated.

This flow will continue depending on base flows and then may need to be reduced however it depends on water supply and quality issues. At this stage the dam is maintaining a constant level from large base flows.

Strategy

Councils have been informed of the current release strategy.

Leslie Harrison Dam:

Gates closed.

Hinze Dam:

Closed.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager

BoM assessment

(consisting of references to latest Flood Warning for the BrisbaneRiver and other relevant Bureau forecasts and warnings (e.g. weather/rain farecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

No need to advise BoM of operational flows of this size.

BoM Technical Officer name	Peter Baddiley
indiana manana manan	
BoM Technical Officer position title	
BoM Technical Officer contact details	

Brisbane City Council(BCC) assessment

(to include predicted local inundation areas and depths of inundation bosed on the information)

Council has been advised of the current strategy

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy.

ICC Technical Officer name Tony Trace
,

ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due Date	Time	or Event	Change in	1
	1 1 1 1 1 1 1		Strategy	

From:

Rob Drur

Sent:

Friday, 28 January 2011 1:54 PM

To:

Rob Drury; Dan Spiller; Peter Borrows

Mike Foster

Cc:

segwam Subject:

Attachments:

RE: Technical Report Wos Technical_Situation_Report_W69.docx

Last Technical Report for this event.

Currently just using small gate release (cone valve cannot work at moment due to high backwater at base of dam) and hydro to release 30cumecs. Will go to just hydro as inflows die off.

Somerset will just use cone valve occasionally to keep at FSL.

Twin Bridges should be out of water this afternoon but depends on Council re any repairs for re-opening. They were advised.

₹ob

Robert Drury

Dam Operations Manager

Water Delivery

Queensland Bulk Water Supply Authority trading as Seqwater



Swimming in weirs and t flowing water is FA1

Jim Pruss; Peter.Aller





Ρh

Nivennoe Dam, Brisbane Valley Highway, via Fernvale Q4306 Australia PO Box 37, Fernvale QLD 4306

Website | www.seqwater.com.au

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TSR Number	W69	Date of TSR release	28.1.11	Time of TSR	1pm	
		TOICGOC		Henerese		

Seqwater status of inflows and dam operations

Current status but could chonge based on inflows or rainfall.

Current objectives	Maintain flows in the Brisbane River for water supply requirements and continue to reduce levels in the dams	
Strategy	Make releases via cone valve at Somerset as required to reduce back to 100% as base flow increases levels.	
	 Continue any operational releases at Wivenhoe via minor gate opening or hydro until cone valve is operational 	
Key considerations	Storage levels:	
	Inflows:	
	Rainfall:	
	Lockyer/Bremer:	
	Brisbane River:	

North Pine

All gates closed. Making minor valve releases.

Somerset Dam

No releases but may by cone valve if level increases slowly..

Somerset is currently 100.7%.

Wivenhoe Dam

Currently releasing 30 cumecs total through one gate and hydro for water supply purposes and maintaining FSL.

Wivenhoe Dam is currently at FSL but may fluctuate slightly depending on inflow versus release.

Twin Bridges is should be out of water this afternoon. Council advised.

Leslie Harrison Dam:

Gates closed.

Hinze Dam:

Closed.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager
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BoM assessment

(consisting of references to latest Flood Warning for the BrisbaneRiver and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and ather updates/comments if needed)

No need to advise BoM of operational flows of this size.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BolVI Technical Officer contact details	

Brisbane City Council(BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due Date Time or Event Next release	Next release
--	--------------

From: Rob Drury

Sent: Thursday, 3 February 2011 4:08 PM To: Peter Borrows; Jim Pruss; Dan Spiller

Cc: Mike Foster

Subject: RE: Operational Releases

Dan,

As per our rushed phone call (no need to ring back),

The level is slowly creeping up at Wivenhoe and Somerset due to base flows and the cone valve cannot be used until we reinstate a channel downstream of Wivenhoe (the rocks are backing up water over the valve), hence we will continue to use the gates for minor releases as we have done in last few weeks.

Lowood still has work happening so we will manage in relation to that but intend tomorrow afternoon to do small incremental increases in one gate at Wivenhoe.

The small opening would basically be as previous releases and just fill the flip bucket and slowly run over. Plan would be to increase to around a total of 3,000ML/d including the hydro (which is what the cone valve normally does anyway).

Will take several days from tomorrow lunchtime.

The level at Wivenhoe is fluctuating at the moment due to Splityard generating regularly and withdrawing and discharging into Wivenhoe daily.

Didn't intend to do a Technical Report or alert as just operational and only using gates as cone valve is out of action for time being.

Rob

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Litsupport Brisbane

From: Dan Spiller

Sent: Thursday, 3 February 2011 5:47 PM

To: Bradley John; 'Martin.PeterJ(; Best Debbie;

Cc: Peter Borrows; Rob Drury; SEQWGM Media; Barry Dennien

Subject: Wivenhoe Dam gate operation

All,

For information, Sequater intends to commence a small gate release tomorrow afternoon to bring Wivenhoe Dam back to FSL. The gate release is required because the cone valve cannot be used until a channel is reinstated downstream of Wivenhoe Dam.

Seqwater plans to increase releases to around a total of 3,000ML/day, including from the hydro scheme. Releases will continue for several day.

We do not intend to provide Technical Situation Reports for this minor release.

Regards,

Dan

Daniel Spiller

Director, Operations

SEQ Water Grid Manager

Phone Email:

Visit: Level 15, 53 Albert Street Brisbane Post: PO Box 16205, City East QLD 4002

ABN: 14783 317 630

Please consider the environment before printing this email. It takes 10 litres of water to make one sheet of A4 paper.

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Seat

Rob Drury Sunday, 20 February 2011 9:25 AM

To: Cc: Rob Drury; Dan Spiller

Peter Borrows; Jim Pruss;

Mike Foster

Subject: Attachments: RE: Technical Report W71 Technical_Situation_Report_W71.docx

Attached is Technical Report W71 just to confirm planned releases started this morning as scheduled.

Rati

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TSR Number	W71	Date of TSR release	20.2.11	Time of TSR release	9.30am
		TOTOGER		Melecase	į

Seqwater status of inflows and dam operations

Current status but could change based on inflows or rainfall.

Current objectives	Reduce level in Wivenhoe dam to 75%	
Strategy	Initiate low level releases at around 350 to 400cumecs.	
	This will inundate Twin Bridges, Savages and Colleges Crossings.	
er en	Maintain access to Burtons bridge	
Key considerations	Storage levels:	
	Inflows:	
	Rainfall:	
	Lockyer/Bremer:	
	Brisbane River:	

Wivenhoe Dam

Releases commenced this morning at 6am.

Currently they are 330cumecs. Burtons Bridge will be checked later today and releases may be increased to 380cumecs or similar depending on how the flows are downstream.

Current level is just above FSL.

This will take approximately 9to 10 days.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager

BoM assessment

(consisting of references to latest Flood Warning for the BrisbaneRiver and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

BoM were advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	

Brisbane City Council(BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

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Date Date	1 71 7 11		! '⊊'a' [-;',
) : I KNP #	LOGEVENISHER
CACHE CALLED			1 01 2 7 0 1 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2

Rob Drury

Sent:

Tuesday, 22 February 2011 11:29 AM

To:

Rob Drury; Dan Spiller

Cc: Subject: Peter Borrows; Jim Pruss

RE: Technical Report W72

Attachments:

Technical_Situation_Report_W72.docx

Attached is Technical Report W72 just to confirm planned releases were reduced slightly last night to allow for the classic activity.

Mike Foster

the will increase the release time as may the rain that fell in the catchment as there are some flows occurring in the upstream areas but hard to quantify impact yet.

Roh

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TSR Number	W72	Date of TSR release	22.2.11	Time of TSR release	10.30am

Seqwater status of inflows and dam operations

Current status but could change based on inflows or rainfall.

Current objectives	Reduce level in Wivenhoe dam to 75%	
Strategy	Initiate low level releases at around 350 to 400cumecs.	
	This will inundate Twin Bridges, Savages and Colleges Crossings.	
	Maintain access to Burtons bridge	
Key considerations	Storage levels:	
	Inflows:	
	Rainfall:	
	Lockyer/Bremer:	
	Brisbane River:	

Wivenhoe Dam

Releases commenced Sunday morning 20.2.11 at 6am.

Releases were increased slightly to 380cumecs as planned however due to the rain in the Lockyer last night, they were reduced to 325cumecs late last night.

Currently they are still 325cumecs while we monitor the Lockyer, it may be necessary to reduce another 50cumecs depending on the flows. Once the Lockyer flow has passed, releases will be increased back to around 380cumecs. This will increase the release period slightly.

Level this morning was 96.7%.

There are also flows occurring in the upper Brisbane and Stanley Rivers (which will need to be released into Wivenhoe). This will further increase the release period however an estimate is not available yet until there is a better indication of what impacts the rain will have on flows.

Segwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager

BoM assessment

(consisting of references to latest Flood Warning for the BrisbaneRiver and other relevant Bureau forecasts and warnings (e.g. weother/rain forecasts, Tropical Cyclone Warning etc) and ather updates/comments if needed)

BoM were advised.

BoM Technical Officer name	Peter Baddiley
na na manana na manan	<u>,</u>
BoM Technical Officer position title	
BoM Technical Officer contact details	

Brisbane City Council(BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
	Local Bibaster response Coordinator
SRC Technical Officer contact details	
tariana mining tanggan ang ang ang ang ang ang ang ang a	

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due Date	Time	or Event	Change
Next TSR due Date	Ime	or Event	Cilalige

Rob Drun

Sent:

Wednesday, 23 February 2011 5:07 PM

To:

Rob Drury; Dan Spiller

Cc:

Peter Borrows; Jim Pruss;

Subject:

RE: Technical Report W72

Attachments:

Technical_Situation_Report_W73.docx

Attached is Technical Report W73 advising of increase in flows back to 371cumecs after Mondays rainfall and impacts of rain on releases generally.

Mike Foster

Rob

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TSR Number	W73	Date of TSR	23.2.11	Time of TSR	5.00pm
		release		release	

Segwater status of inflows and dam operations

Current status but could change based on inflows or rainfall.

Current objectives	Reduce level in Wivenhoe dam to 75%	
Strategy	Initiate low level releases at around 350 to 400cumecs.	
[4] W. O. Karabani, Surface and J. G. Grander, Phys. Lett. B 50, 100 (1994).	This will inundate Twin Bridges, Savages and Colleges Crossings.	
of particular section (Section) in the section of	Maintain access to Burtons bridge	
Key considerations	Storage levels:	
	Inflows:	
	Rainfall:	
	Lockyer/Bremer:	
	Brisbane River:	

Wivenhoe Dam

Releases commenced Sunday morning 20.2.11 at 6am.

Releases were increased slightly to 380cumecs as planned however due to the rain in the Lockyer Monday night they were reduced to 325cumecs as flows coming in from surrounding streams and the Lockyer could have inundated Burtons Bridge with no warning. The flows from local creeks and down the Lockyer have passed sufficiently to increase releases again from 325cumecs to 371cumecs as of this afternoon.

This has put us just over half a day behind in releases.

This will further increase as water coming down creeks and streams flow into Wivenhoe and Somerset (inflows into Somerset that are coming down the Stanley River may need to be released into Wivenhoe as well). Although relatively minor, they will add to the storage. It is difficult to determine exact amounts as they are from minor flows from various spots.

Level this afternoon was 93.4%.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager

BoM assessment

(consisting of references to latest Flood Warning for the BrisbaneRiver and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

BoM were advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	

Brisbane City Council(BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the infarmation)

Council has been advised of the current strategy

BCC Technical Officer name	Chris Lavin
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the infarmation)

Council has been advised of the current strategy.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the infarmation)

Council has been advised of the current strategy.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

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Rob Drury

Sent:

Monday, 28 February 2011 2:23 PM

To:

Rob Drury; Dan Spiller; SEQWGM Emergency

Cc:

Peter Borrows; Jim Pruss;

Subject:

RE: Technical Report W74

Attachments:

Technical Situation Report W74.docx

Attached is Technical Report W74 advising of extension of releases strategy to Wednesday afternoon.

Rob

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Mike Foster

TSR Number	W74	Date of TSR release	28.2.11	Time of TSR release	2.00pm	
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Seqwater status of inflows and dam operations

Current status but could change based on inflows or rainfall.

Current objectives	Reduce level in Wivenhoe dam to 75%
Strategy	Initiate low level releases at around 350 to 400cumecs.
	This will inundate Twin Bridges, Savages and Colleges Crossings.
	Maintain access to Burtons bridge
A control of the second of the	 Extend releases until the afternoon of Wednesday 2nd March 2011
Key considerations	Storage levels:
	Inflows:
	Rainfall:
2.70	Lockyer/Bremer:
	Brisbane River:

Wivenhoe Dam

- Water releases to reduce Wivenhoe Dam to 75 per cent of Full Supply Level (FSL) commenced Sunday 20 February 2011 at 6.00 am and was scheduled to continue for nine days.
- The 9 day release period to reduce Wivenhoe Dam to 75 per cent of FSL was always
 dependent on further rainfall across the dam and catchment as well as rainfall downstream.
- Storm activity across the Wivenhoe Dam catchment and Brisbane River catchment below the dam on Monday, 21 February 2011 impacted on the release strategy. Wivenhoe Dam release rates were reduced to allow flows down the Lockyer to sufficiently pass.
- As a result of this storm as of 9.00am Monday 28 February 2011, Wivenhoe Dam had received inflows of up to 40,000 megalitres (or the equivalent of about four per cent capacity) from the surrounding catchment, with minor inflows continuing.
- As of 9.00 am, Monday 28 February 2011, Wivenhoe Dam is 82.2 per cent of full supply level.
 Wivenhoe Dam FSL has been reduced by total of about 208,000 megalitres.
- Releases have averaged between 350 cumecs to 400 cumecs.
- The current Bureau of Meteorology forecast is for 10-15 millimetres of rainfall until Thursday, 3
 March 2011. Storm activity is forecast from Friday, 4 March 2011 with 50-100 millimetres of
 rainfall forecast over the following four days until Tuesday, 8 March 2011.

Current Strategy

- The nine day release strategy was scheduled to be completed in the morning of Tuesday, 1
 March 2011. By this stage, Seqwater estimates Wivenhoe Dam levels will between 79-80 per
 cent of FSL (depending on further inflows).
- Seqwater estimates the impact of storm activity on Monday 21 February 2011 added at least 36 hours to the release strategy.

- Based on the current BoM forecasts, Seqwater will now be extending the current release strategy for Wivenhoe Dam until close of business, Wednesday, 2 March 2011 to get as close to 75% as possible and so that any ongoing releases do not coincide with potential rainfall events and increased river flows downstream of Wivenhoe Dam. After closure, minor releases only will be made of about 25 to 30 cumecs to get exactly 75% and allow water to be released from Somerset Dam through Wivenhoe.
- By continuing releases until close of business Wednesday, 2 March 2011, Seqwater estimates Wivenhoe Dam will be between 75-77 per cent of FSL.

Impacts

- Somerset Regional Council, Ipswich Regional Council and Brisbane City Council have been consulted and had raised no issues with the extended release strategy.
- Under the extended release strategy it is expected Twin Bridges and Savage's Crossing will no longer by inundated by Thursday, 3 March 2011 and College's Crossing no longer inundated by Friday, 4 March 2011. The extended release strategy has extended inundation time by around 36 hours.
- Local Councils are responsible for road closures as a result of spilling dams or controlled releases.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager

BoM assessment

(consisting of references to latest Flaad Warning for the BrisbaneRiver and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Trapical Cyclone Warning etc) and other updates/camments if needed)

BoM were advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	***************************************

Brisbane City Council(BCC) assessment

(ta include predicted lacal inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy

BCC Technical Officer name	Jason Cameron
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the infarmation)

Council has been advised of the current strategy.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due Date	Time	or Event Change	

Rob Drur

Sent:

Tuesday, 1 March 2011 4:16 PM

To:

Rob Drury; Dan Spiller; SEOWGM Emergency

Cc:

Peter Borrows; Jim Pruss; Mike Foster; 'Allen Peter'

Subject:

Peter Borrows; Jim Pruss; RE: Technical Report W75

Attachments:

Technical_Situation_Report_W75.docx

Attached is Technical Report W75 advising of closing strategy.

Rob

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TSR Number W75 Date of TSR 1.3.11 Time of TSR release 4.00p	m
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Seqwater status of inflows and dam operations

Current status but could change based on inflows or rainfall.

Current objectives	Reduce level in Wivenhoe dam to 75%	
Strategy	Initiate low level releases at around 350 to 400cumecs.	
	This will inundate Twin Bridges, Savages and Colleges Crossings.	
	Maintain access to Burtons bridge	
	Extend releases until the afternoon of Wednesday 2 nd March 2011	
Key considerations	Storage levels:	
	Inflows:	
	Rainfall:	
	Lockyer/Bremer:	
	Brisbane River:	

Wivenhoe Dam

- Seqwater will now be start closing the gate at Wivenhoe early Wednesday morning 2 March 2011 finishing around 3pm Wednesday afternoon for fish recovery.
- This will get Wivenhoe down to between 75% and 77%.
- Releases then will be made through a minor gate opening releasing around 30cumecs to release down to 75% and also to release any water from Somerset Dam that may be required.
- This should get all crossings out of water by late Thursday.

Impacts

- Somerset Regional Council, Ipswich Regional Council and Brisbane City Council have been consulted and had raised no issues with the extended release strategy.
- Local Councils are responsible for road closures as a result of spilling dams or controlled releases.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager

BoM assessment

forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

BoM were advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	

Brisbane City Council(BCC) assessment

(to include predicted local inundation areas and depths of inundation based an the information)

Council has been advised of the current strategy

BCC Technical Officer name	
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due Date	Time	or Event Change	

Rob Drury

Sent:

Wednesday, 2 March 2011 3:53 PM

To:

Rob Drury; Dan Spiller; SEOWGM Emergency

Cc:

Peter Borrows; Jim Pruss

Subject:

RE: Technical Report W76

Attachments:

Technical_Situation_Report_W76.docx

Attached is Technical Report W76 advising of closing of Wivenhoe gates down to minor ongoing releases with bridges coming out of water during the next 24 hours or so.

Current level is about 76.3% and releases of 30 to 40 cumecs will continue until 75% is reached, dependent on further rain.

Rob

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TSR Number	W76	Date of TSR release	2.3.11	Time of TSR release	3 .00pm
		31.00			

Seqwater status of inflows and dam operations

Current status but could change based on inflows or rainfall.

Current objectives	Reduce level in Wivenhoe dam to 75%	
Strategy	Initiate low level releases at around 350 to 400cumecs.	
	This will inundate Twin Bridges, Savages and Colleges Crossings.	
	Maintain access to Burtons bridge	
a proposition and appropriate and account of the second of	Conclude releases at 3pm Wednesday 2 nd March 2011	
Key considerations	Storage levels:	
	Inflows:	
	Rainfall:	
	Lockyer/Bremer:	
	Brisbane River:	

Wivenhoe Dam

- Gates at Wivenhoe have now been closed down to ongoing releases of around 30 to 40cumecs.
- This flow will continue to reduce Wivenhoe down to closer to 75% (it is currently around 76.3%) which may take a week or more.
- As Somerset has risen due to recent rains, it will be slowly released in next few days or so through Wivenhoe hence the 30 to 40 cumecs release could extend longer, rainfall dependent.
- This release will not inundate any bridges however the low level Twin Bridges will be monitored.
- It should be noted that Wivenhoe Power Station (Splityard Creek owned by Tarong Energy) is generating and releasing/withdrawing water hence levels in Wivenhoe may fluctuate at times.
- The gates will be used for ongoing normal releases for some time even at low levels as the
 cone valve is not yet operational until the rocks are removed downstream of Wivenhoe and
 Stanwell are working on the hydro hence it is not operational either at the moment.

Seqwater Technical Officer name	Robert Drury
Seqwater Technical Officer position title	Dam Operations Manager

BoM assessment

(consisting of references to latest Flood Warning for the BrisbaneRiver and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updotes/comments if needed)

BoM were advised.

Bowstedinical Officer name	Peter Baddiley
A CONTROL OF THE PROPERTY OF T	reter baudiley
BoM Technical Officer position title	
BoM Technical Officer contact details	

Brisbane City Council(BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy

BCC Technical Officer name	
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the informatian)

Council has been advised of the current strategy.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the infarmation)

Council has been advised of the current strategy.

SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

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	1 + 505 5 5 7 7 1		

Rob Drury

Sent:

Monday, 7 Iviarch 2011 3:36 Pivi

To:

Rob Drury; Dan Spiller

Cc:

Peter Borrows; Jim Pruss

SEQWGM Emergency; Paul Biro

Subject:

RE: Technical Report W77

Forgot to mention although it is in the report, that it was discussed with Somerset and Ipswich and both preferred this option.

Impact re BCC is negligible but they have been advised.

Rob

From: Rob Drury

Sent: Monday, 7 March 2011 3:32 PM

To: Rob Drury; 'Dan Spiller'

Cc: Peter Borrows; Jim Pruss;

; Mike Foster; 'Peter.Alle

'emergence

Mike Foster; 'Peter.Aller

συρμέστ: κΕ: Technical Report W77

Attached is Technical Report W77 to confirm increased releases to reduce Wivenhoe level.

Releases will be increased (as the Lockyer drops) from 35cumecs up to 100cumecs. This depends to some extent on the capacity of Savages which may have changed after the floods.

It could take up to 2 weeks to reduce Wivenhoe and Somerset however this depends on the ongoing base flows and any further rain or inflows.

Release this afternoon is now about 60cumecs and Savages will be monitored.

Rob

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This email has been scanned by the MessageLabs Email Security System. For more information please visit http://www.messagelabs.com/email

Rob Drury

Sent:

Monday, 7 March 2011 3:32 PM

To:

Rob Drury; Dan Spiller

Cc:

Peter Borrows; Jim Pruss;

SEQWGM Emergency; Paul Bird

Subject:

RE: Technical Report W77

Attachments:

Technical_Situation_Report_W77.docx

Attached is Technical Report W77 to confirm increased releases to reduce Wivenhoe level.

Releases will be increased (as the Lockyer drops) from 35cumecs up to 100cumecs. This depends to some extent on the capacity of Savages which may have changed after the floods.

Mike Foster; 'Peter.Aller

It could take up to 2 weeks to reduce Wivenhoe and Somerset however this depends on the ongoing base flows and any further rain or inflows.

Release this afternoon is now about 60cumecs and Savages will be monitored.

Rob

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TSR Number W77	Date of TSR 7.3.11 release	Time of TSR 11.00am release
----------------	----------------------------	-----------------------------

Seqwater status of inflows and dam operations

Current status but could change based on inflows or rainfall.

Current objectives	Reduce level in Wivenhoe dam back to 75%	
Strategy	 Recent rain has increased Wivenhoe by 4 to 5% with inflows continuing for some time. 	
	Rain has also increased Somerset levels.	
	 Options were a release of up to 400cumecs for 3 or 4 days (with opening and closing sequences) taking out Twin Bridges, Savages and Colleges or a slow release over 2 weeks or so but only affecting Twin Bridges. 	
	 Councils preferred the latter and it seems reasonable considering no significant rain is forecast for a week or more. 	
	 Increase release from 35cumecs to 100cumecs as the Lockyer flows drop and dependent on the capacity of Savages after the floods. 	
	 This should return Wivenhoe to 75% in a couple of weeks if 100 cumecs can be maintained. 	
	 Strategy depends on how much continues to flow into Wivenhoe, any further rain in the catchments and any further flows in the Lockyer 	
Key considerations	Storage levels:	
	Inflows:	
	Rainfall:	
	Lockyer/Bremer:	
	Brisbane River:	

Wivenhoe and Somerset Dams

- Increase release from Wivenhoe to around 100cumecs as the Lockyer decreases from recent rains, starting increased releases today.
- Start slow release from Somerset in next day or so to drop levels.
- This will only affect Twin Bridges which has minimal impact on Councils.
- Continue for up to around 2 weeks depending on inflows, rain and downstream flows...

Segwater Technical Officer name	Robert Drury
Sequater Technical Officer position title	Dam Operations Manager
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BoM assessment

(consisting of references to latest Flood Warning for the BrisbaneRiver and other relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and other updates/comments if needed)

BoM were advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	

Brisbane City Council(BCC) assessment

(to include predicted local inundation areas ond depths of inundation bosed on the information)

Council has been advised of the current strategy

BCC Technical Officer name	
BCC Technical Officer position title	Disaster Operations Manager
BCC Technical Officer contact details	

Ipswich City Council (ICC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy.

ICC Technical Officer name	Tony Trace
ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	

Somerset Regional Council (SRC) assessment (if required)

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy.

SRC Technical Officer name	Tony Jacobs	

SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

Next TSR due Date	Time	or Event	
-------------------	------	----------	--

Rob Drury

Sent:

Thursday, 24 March 2011 8:20 AM

To:

Rob Drury; Dan Spiller

Cc:

Peter Borrows; Jim Pruss;

Mike Foster; 'Peter.Aller

Subject:

RE: Technical Report W78

Attachments:

Technical_Situation_Report_W78.docx

Categories:

T7: FOC

Attached is Technical Report W78 just to confirm continuing releases as previous few weeks of round 90-100cumecs to reduce Wivenhoe to 75%.

Rob

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TSR Number W78 Date of TSR release	24.3.11 Time of TSR 8am release	
------------------------------------	---------------------------------	--

Seqwater status of inflows and dam operations

Current status but could change based on inflows or rainfoll.

Current objectives	Reduce level in Wivenhoe dam back to 75% using same strategy as 2 weeks ago	
Strategy	 Releases had reduced Somerset to almost 100% and Wivenhoe close to 75% when rain occurred last weekend. 	
	• Wivenhoe has gone back up to almost 79 and Somerset to 103%.	
	Release from Wivenhoe at around 100cumecs as the Lockyer flows drop	
	 This should return Wivenhoe to 75% within 1 to 2 weeks depending on inflows into both dams and further rain. 	
er in Layren Sause in Suna King Levil	Will inundate Twin Bridges	
Key considerations	Storage levels:	
	Inflows:	
	Rainfall:	
	Lockyer/Bremer:	
	Brisbane River:	

Wivenhoe and Somerset Dams

- Rainfall of 30 to 60mm occurred over various areas of the catchments over last weekend.
- Releases from Wivenhoe were slowed over the weekend due to flows in the Lockyer, they are
 now being increased through this week (up from 10 to 70cumecs over last couple days) and will
 be back to 90 to 100cumecs in a day or so as the Lockyer continues to drop.
- Continue release from Somerset of around 35cumecs until levels approach 100%.
- This will only affect Twin Bridges which has minimal impact on Councils.
- Continue for up to around 2 weeks depending on inflows, rain and downstream flows.
- Discussed with Somerset Council and no real issues.

अवनुwater Technical Officer name	Robert Drury
Segwater Technical Officer position title	Dam Operations Manager

BoM assessment

(consisting of references to latest Fload Warning for the BrisbaneRiver and ather relevant Bureau forecasts and warnings (e.g. weather/rain forecasts, Tropical Cyclone Warning etc) and ather updates/comments if needed)

BoM were advised.

BoM Technical Officer name	Peter Baddiley
BoM Technical Officer position title	
BoM Technical Officer contact details	

Brisbane City Council(BCC) assessment

(to include predicted local inundation areas and depths of inundation based on the information)

Council has been advised of the current strategy

BCC Technical Officer name	
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BCC Technical Officer position title	Disaster Operations Manager
របស់លោក បានប្រជាពលរបស់ មានប្រជាពលរបស់ បានបង្ហាយ បានបង្ហាយ បានបង្ហាយ បានបង្ហាយ បានបង្ហាយ បានបង្ហាយ បានបង្ហាយ បា	
BCC Technical Officer contact details	

Ipswich City Council (ICC) assessment (if required)

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ICC Technical Officer position title	Local Disaster Response Coordinator
ICC Technical Officer contact details	

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SRC Technical Officer name	Tony Jacobs
SRC Technical Officer position title	Local Disaster Response Coordinator
SRC Technical Officer contact details	

Contact Officer signature	
Contact Officer name	Rob Drury
Contact Officer position title	Dam Operations Manager

	Next TSR due Date	Time	or Event
--	-------------------	------	----------

Documents subject to Cabinet confidentiality

No	Document	Date	Time
1	Email to Dan Spiller and others re optimal operating strategy for the SEQ Water Grid	12.11.2011	5.09pm

Dan Spiller

Sent:

Thursday, September 23, 2010 10:32 AM

To:

Brett Salisbury

Subject:

FW: Correspondence from Minister Robertson

Attach:

Minister Robertson to Commissioner Boydell - Water Security. PDF;

ATT00001..htm

As discussed.

From: Barry Dennien

Sent: Thursday, 23 September 2010 8:28 AM

To: Dan Spiller

Subject: Fwd: Correspondence from Minister Robertson

Regards

Barry Dennien

Begin forwarded message:

From

Date: 23 September 2010 8:11:48 AM AEST

To: Barry Dennien

Subject: Correspondence from Minister Robertson

Hi Barry

Sorry for the delay, letter as requested.

Kind regards.

Rosemarie McMaster

A/Executive Assistant to the Chief Executive Officer - Karen Waldman

and the Commissioner - Mary Boydell

Queensland Water Commission

Level 16, 53 Albert Street, Brisbane QLD 4000

PO Rox 15087 City Fact Of D 4002



M

From: Barry Dennien

Sent: Wednesday, 22 September 2010 1:16 PM

To:

Subject



As discussed

Barry Dennien

Chief Executive Officer SEQ Water Grid Manager

Phone:

Email:

Visit: Level 15, 53 Albert Street, Brisbane Post: PO Box 16205, City East Qld 4002

ABN: 14783 317 630

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RECEIVED

0 9 SEP 2010





Ref CTS 13479/10

0 1 SEP 2010

Ms Mary Boydell Commissioner Queensland Water Commission PO Box 15087 CITY EAST QLD 4002



Minister for Natural Resources, Mines and Energy and Minister for Trade

Dear Ms Boydell

The Queensland Water Commission's (QWC) South East Queensland (SEQ) Water Strategy reiterates that the optimal operating strategy for the SEQ Water Grid consists of using purified recycled water (PRW) to augment drinking water supplies only when combined storages fall to 40 % capacity.

In view of the short to medium-term water security outlook for SEQ, I am seeking your advice on the optimal operating arrangements for the Water Grid.

Advice is also being sought by Responsible Ministers from WaterSecure and the SEQ Water Grid Manager on optimal operating arrangements for the Gold Coast Desalination Project, the Western Corridor Recycled Water Project, and the SEQ Water Grid, as well as current and expected demand scenarios for the Water Grid, particularly in relation to PRW.

I understand that the Water Grid Manager and WaterSecure will be working closely together in responding to the request and I encourage QWC to liaise directly with representatives of these entities.

Should you have any further enquiries, please do not hesitate to contact
Manager, Strategic Water Entities Governance of the Department of
Environment and Resource Management on telephone

Yours sincerely

STEPHEN ROBERTSON MP

Level 17
61 Mary Street Brisbane Qld 4000
PO Box 15216 City East
Queensland 4002 Australia
Telephone +61 7 3225 1861
Facsimille +61 7 3225 1828
Email nrmet@ministerial.qld.gov.au

ď.

Subject:

FW: Chairs and CEOs letter Meeting No 3

Location:

Karen Waldman's Office, Level 16, 53 Albert Street Brisbane

Start: End: 11/11/2010 4:00 PM 11/11/2010 5:30 PM

Show Time As:

Tentative

Recurrence:

(none)

Meeting Status:

Not yet responded

Required Attendees:

Dan Spiller

Resources:

Karen Waldman's Office, Level 16, 53 Albert Street Brisbane

---Original Appointment---

From:

On Behalf Of

Commissioner QWC

Sent: Friday, 8 October 2010 11:21 AM

Subject: Updated: Chairs and CEOs letter Meeting No 3

When: Thursday, 11 November 2010 4:00 PM-5:30 PM (UTC+10:00) Brisbane.

Where: Karen Waldman's Office, Level 16, 53 Albert Street Brisbane

Attendees:

QWC

Karen Waldman Mary Bodyell SEQWGM

Barry Dennien

Water Secure Keith Davies

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From:
Sent: Friday, December 10, 2010 4:06 PM
To:
Cc: Mary Boydell Waldman Karen
Dan Spiller

Subject: RE: Recommended draw down of Hinze Dam

Gary

IN RESPONSE - YOUR DISCUSSION WITH MARY BOYDELL EARLIER TODAY;

The QWC has considered the request to allow drawdown of Hinze Dam to continue at a rate of 65 cubic metres per second until mid-week to draw down an additional 12,000 ML to assist in allowing construction to be finalised.

Noting that the Water Grid Manager has no concerns and advises that the drawdown will not infringe the risk criteria in the System Operating Plan or the interim operating strategy the Queensland Water Commission also endorses the action.

It is noted also that such releases are an operational matter for Seqwater, within the context of the Resource Operations Plan, where there is no condition in the System Operating Plan that regulates releases from Hinze Dam. It is recommended that Seqwater liaise with the Department of Environment and Resource Management to confirm their understanding of any conditions that apply.

It is suggested that consideration be given to maximising the use of water from Hinze Dam during the release period providing this is in accord with the interim operating strategy.

Acting General Manager Regional Planning and Policy Queensland Water Commission L16 53 Albert Street Brisbane OLD 4000 Phone: Mobile:

www.qwc.qld.gov.au

From: Mary Boydel

Sent: Friday 10 December 2010 1:53 PM

To:

Subject: Fwd: Recommended draw down of Hinze Dam

Begin forwarded message:

Date: To December ZUTU TRANIA PM AEST

To: < mary. boydell

Subject: FW: Recommended draw down of Hinze Dam

Mary

As discussed

Ps Barry is away at present on A/L.

Kind regards

From: Dan Spiller

Sent: Friday, 10 December 2010 1:12 PM

To:

Cc: Barry Dennier

Subject: Recommended draw down of Hinze Dam

ror information and advice, pending a more detailed brief for approval this afternoon. Background

Seqwater has requested permission for the draw down. It proposes to release an additional 12,000 ML. Subject to our approval today, water would be released at the current rate until mid next week (about 65 cubic metres per second).

The drawdown has been requested to enable excavation of rockfill on the upstream side of the spillway. The lower storage level would allow conventional excavators to be used, which would complete the work in about three days.

Due to wet weather, project completion has now been delayed by one month to end January. The drawdown will assist in avoiding further delays.

Seqwater requires approval today, if it is to continue to release at 65 cubic metres per second. If it is not approved today, Seqwater will reduce releases over the weekend. At lower rates, the drawdown will not occur in sufficient time to complete the works before Christmas.

A similar request was considered last year, at which time the QWC had concerns about the public perception issues associated with releasing water at a time when the community was being actively encouraged to be water efficient. The context is now significantly different, with downstream flood immunity a significantly more important issue.

WGM assessment

The drawdown is needed for construction reasons.

Timely completion of the Hinze Dam upgrade is important, given rainfall forecasts for the remainder of the current wet season. Project completion provides the opportunity to fill the dam to the new full supply level and, more importantly, improved flood security for downstream areas.

WGM modelling has confirmed that the drawdown would have no impact on regional water security. Modelling indicates that there would be no change to the likelihood of storages falling to 60 or 40 per cent of capacity within either three or five years. The probability of storages falling to these levels remains significantly less than the targets specified in the System Operating Plan.

With this security, it is recommended that the release and works be undertaken as soon as possible. This would minimise the delays to project completion and maximise the probability of the dam filling to the new full supply level within the current wet season. Releases at 65 cubic metres per second is consistent with this approach.

Roles and responsibilities

The water security impacts are an operational matter for the WGM. In considering these impacts, we must comply with the System Operating Plan.

Seqwater as dam operator has the ability to release the additional water.

Consultation

Ministerial advisers have no objections to the proposed drawdown. The advisers consider this to be an operational decision for the WGM. Should the WGM endorse the drawdown, they have request a brief <u>for information only</u>. However, they have noted that they are concerned regarding any potential delays to project completion. Seqwater officers are assisting in drafting briefing material and are briefing the Ministers advisers directly on the project delays.

I seek your guidance on consultation with the QWC. Beyond the risk criteria, the SOP and Operating Strategy do not contemplate this request.

Regards,

Dan

Daniel Spiller

Director, Operations

SEQ Water Grid Manager

Phone Email:

Visit: Lever 13, 33 Arbert Street Brisbane Post: PO Box 16205, City East QLD 4002

ABN: 14783 317 630

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Barry Dennien

Sent:

Thursday, 27 January 2011 11:48 AM

To:

Dan Spiller; Cc:

Subject:

FW: SEQ Water Grid Risk Management Plan

Attachments:

signed by Commissioner Boydell. Commissioner Letter to

Water Grid Risk Management Plan.PDF

re SEQ

Some light reading

Fron

Sent: Thursday, 27 January 2011 11:38 AM

To: Barry Dennien

Subject: FW: SEQ Water Grid Risk Management Plan

As discussed, Mary has issued the attached letter for WGM consideration.

I need to re - read the letter and then discuss the detail with you. In the meantime I think our people can start the in epth consideration and response.

It would also be useful at some stage in the near future to sit down with Mary and Karen to provide them with our initial response and the way forward.

Regards

From

On Behalf Of Commissioner QWC

[Commissioner

Sent: Tuesday. 25 January 2011 4:32 PM

Cc: mary.boydell Waldman Karen **Subject:** Re: SEQ Water Grid Risk Management Plan

Dear

Thank you for your time yesterday and our useful discussion. I understand Karen had already (pre Christmas) foreshadowed the attached with Barry. We will send the original as well and suggest Karen and I would be happy to meet with you and Barry next week should that be helpful? (ind regards

Mary

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1



Our ref: Your ref: ME/10/0311 D/10/2844 Securing our water, together.

21 January 2011

Mr Chairman SEQ Water Grid Manager PO Box 16205 City East QLD, 4002

Dear Mi

Thank you for your letter of 14 May 2010 providing a revised draft of the South East Queensland Water Grid Risk Management Plan (the Draft Plan). I apologise for the delay in sending this formal response. Please be assured that the Queensland Water Commission (Commission) appreciates your organisation's efforts in preparing the revised Draft Plan and is grateful to your officers for various subsequent discussions with our staff on its purpose and detailed content.

As you will be aware, the requirements related to the Water Grid Risk Management Plan are stated in section 4.34 of the South East Queensland Water Market Rules (the Market Rules), which themselves operate within the hierarchy of statutory instruments covered within section 1.10 of the Market Rules.

Section 4.34 requires that the Water Grid Risk Management Plan must provide an "integrated framework for identification, analysis, evaluation and management of risks related to the operation of the Water Grid and the achievement of the Market Outcomes" (Key Risks) and that the Plan also include analysis and evaluation of the likelihood of Key Risks occurring, the expected level of impact of each Key Risk and mitigation strategies for each Key Risk.

The Commission has decided not to approve the Draft Plan as provided, as it does not satisfy the purpose and requirements for a plan as stipulated in section 4.34 of the Market Rules. In particular the Draft Plan:

- does not appropriately identify, analyse and evaluate Key Risks to the operation of the Water Grid and the achievement of the Market Outcomes;
- does not appear to include sufficient analysis in relation to the expected level of impact of each Key Risk; and
- does not clearly identify mitigation strategies which address what actions will be taken in the event of a Key Risk occurring.

Queensland Water Commission PO Box 15087 City East Qld 4002 Ph: 461 7 3227 8207 Fax: +61 7 3227 8227 ABN 65 242 908 936 web: www.qwc.qld.gov.au The Commission's specific concerns with the Draft Plan include the following:

- In stipulating a detailed risk framework for all Grid Participants, the Draft Plan undermines Grid Participants' responsibility, and ability, to assess and manage their own risks. The Draft Plan approach is inconsistent with the existing legal obligations of those entities to manage their strategic and operational risks, including water quality, dam safety, occupational health and safety, and those obligations arising from the *Financial Accountability Act 2009*. The approach is also inconsistent with the intent of the Market Rules which was for the Draft Plan to focus on the Key Risks rather than to impose a single risk framework on all entities.
- When read in conjunction with the grid contracts and draft operating protocols, the Draft Plan would change the existing operating, governance and risk allocation framework for South East Queensland (SEQ) Water Grid entities. Some of the legal and commercial implications of the Draft Plan may not emerge until the Grid Participants attempt to comply with the plan, at which point the Commission considers the arrangements might prove to be unworkable.
- A strategic risk within a Grid Participant or the SEQ Water Grid Manager will not be a Key Risk under the Market Rules unless it creates risks to the operation of the Water Grid or achievement of the Market Outcomes. Key Risks (such as risks to water quality or volume) and treatments should be identified in the Water Grid Risk Management Plan, so that each Grid Participant can ensure that its own risk management planning includes appropriate strategies to address those risks (Grid Participant Risk Management Strategies).
- Limiting the SEQ Water Grid Risk Register to strategic risks for only Grid Service Providers is inappropriate. Some Key Risks for the grid might not be identified as strategic risks within an individual Grid Service Provider; and other Key Risks may require a response by a Grid Customer, for example through compliance with guidelines, protocols, information sharing and emergency response arrangements in relation to water quality risks.

Way forward

For these reasons, the Commission considers that a compliant Water Grid Risk Management Plan would differ considerably from the Draft Plan as submitted. The plan should be straightforward in content and structure. It should identify, analyse and evaluate Key Risks and their management; it should not deal with the internal risks of each Grid Participant.

The Commission recognises the value and expertise offered by the Water Grid Risk Officer's Committee, and encourages you to continue to utilise the Committee to revise the Plan. The Plan should also be tested with the legal and regulatory officers, and ultimately with the Chief Executive Officers, of the Grid Participants in order to ensure that it is workable and to satisfy the requirements of section 4.34d of the Market Rules. In the context of a new regulatory framework, it is important that participants' formal feedback informs future revisions and development of the Water Grid Risk Management Plan.

The Commission requests that a revised draft South East Queensland Water Grid Risk Management Plan be resubmitted by 30 April 2011 and that the SEQ Water Grid Manager provide the Commission with details of its consultation with Grid Participants in relation to the Draft Plan.

The Commission recognises there is scope to improve the clarity of intent of the relevant provisions of the Market Rules, and to reduce ambiguity about the relationship between those provisions and the remainder of governance frameworks applying to Grid Participants. These provisions will be revised when the next significant amendments are made to the Market Rules, and you will be closely consulted during that process.

If you require any further information or clarification regarding the Market Rules and policy intent, please contact Ms Karen Waldman, Chief Executive Officer on 322 78203.

Yours sincerely

Mary Boydell

Commissioner



Documents subject to Cabinet confidentiality

No	Document	Date	Time
1	Email to Commissioner QWC and others cc Dan Spiller re TRIM document; D/10/051962; operating strategy for manufactured water	05.11.2010	2.53pm
2	Email on behalf of Karen Waldman to Dan Spiller and others re QWC optimum operating strategy 101110	11.11.2010	8.48am
3	Email Dan Spiller to Karen Waldman and others re draft letter of advice	11,11.2010	1.31pm
4	Email Karen Waldman to Dan Spiller re QWC optimum operating strategy 101110	12.11.2010	9.54am

Barry Dennien

Sent:

Thursday, September 23, 2010 3:23 PM

To:

'Karen Waldman

Cc:

Dan Spiller

Subject:

FW: Chairs and Commisioners letter to Minister

Attach:

Chairs letter to responsible Ministers - advice on optimal strategy for climate

resilient sources.docx

Karen

Mary, WaterSecure's chair and my chair received a letter from the Minister asking advice from QWC, Water Grid Manager and Water Secure on optimising WaterSecure's asset operations. I note Mary has responded generally to the Minister. See attached letter that gives a little more detail on the timing of the response. We have consulted WaterSecure and seek your advice to the suitability of the response time. Both WaterSecure and Grid Manager are well advanced on the assignment and will consult QWC shortly.

Your advice would be appreciated

Barry Dennien

From

Sent: Thursday, 23 September 2010 10:44 AM

To: Barry Dennien

Subject: Chairs and Commisioners letter to Minister

Barry,

As discussed, please find attached the draft correspondence to Ministers office, for the QWC approval.

Kindest regards

Senior Correspondence Officer
SEQ Water Grid Communications Unit

SEQ Water Grid Manage

Phone:

Email: j

Visit: Level 15, 53 Albert Street Brisbane Post: PO Box 16205, City East QLD 4002



23 September 2010

Hon Andrew Fraser MP Treasurer of Queensland, Minister for **Employment and Economic Development** GPO Box 611 Brisbane Q 4001

Hon Stephen Robertson MP Minister for Natural Resources, Mines and Energy, and Minister for Trade PO Box 15216 Brisbane Q 4001

Dear Sirs

We refer to your letters of 13 September 2010, seeking advice regarding the demand for purified recycled water and the optimal operating strategy for climate resilient supply projects.

We propose to consider this advice at a joint Board session with the Queensland Water Commissioner, to be held at the end of October 2010, before providing advice to you in mid November 2010.

I trust that this timeframe is suitable. Please do not hesitate to contact either of us if you have any queries or require any further information. Alternatively, your staff may wish to contact Mr Barry Dennien, Chief Executive Officer, SEQ Water Grid Manager via telephone on

Yours sincerely,

David Gray Mary Boydell

Chair Chair Commissioner

WaterSecure SEQ Water Grid Manager Queensland Water Commission

safe secure sustainable

Barry Dennien

Sent:

Friday, September 24, 2010 9:00 AM

To:

Waldman Varen

Cc:

Dan Spiller

Subject:

RE: Chairs and Commissioners' letter to Minister

Karen

I have next week off, Dan is in the chair. I will set a meeting up today for Dan to brief you on the progress with WaterSecure.

The disconnect on this one is we had no cc on the Mary letter from the Minister.

Regards

Barry

----Original Message

From: Waldman Kare

Sent: Friday, 24 September 2010 8:48 AM

To: Barry Dennien

Cc:

Subject: Fw: Chairs and Commissioners letter to Minister

Ні Вапу

I have just seen a copy of letter to you for which you have sent us a draft reply.

I have discussed your draft reply with Mary, but not yet had a chance to do in context of original letter.

We would appreciate meeting with you prior to you sending a response outlining timeframes, since we have not been consulted on this to date. We also want to ensure we are all clear on the scope of the question given QWC's role in developing advice on the optimal operating arrangements for the grid as a whole.

We look forward to meeting with you shortly on this since our undertaking to the Minister was to work closely with you and WaterSecure on this, and this has not yet occurred as your draft letter also points out.

I am on leave today but Mary and I would be happy to meet next week to agree questions, scope and appropriate timeframe.

Regards Karen

---- Original Message --

From:

To: Waldman Karen

Sent: Thu Sep 23 15:33:29 2010

Subject: FW: Chairs and Commissioners letter to Minister

From

In Behalf Of Barry Dennien

Thursday 23 September 2010 3:31 PM

Subject: FW: Chairs and Commisioners letter to Minister

Regards

Executive Assistant to Barry Dennien

Chief Executive Officer

SEQ Water Grid Manager

Phone:

Email:

Visit: Level 15, 53 Albert Street, Brisbane

Post: PO Box 16205, City East Qld 4002

ABN: 14783 317 630

Please consider the environment before printing this email. It takes 10 litres of water to make one sheet of A4 paper.

From: Barry Dennien

Sent: Thursday, 23 September 2010 3

To: 'Karen Waldman

Cc: Dan Spiller

Subject: FW: Chairs and Commissioners letter to Minister

Karen

Mary, WaterSecure's chair and my chair received a letter from the Minister asking advice from QWC, Water Grid Manager and Water Secure on optimising WaterSecure's asset operations. I note Mary has responded generally to the Minister. See attached letter that gives a little more detail on the timing of the response. We have consulted WaterSecure and seek your advice to the suitability of the response time. Both WaterSecure and Grid Manager are well advanced on the assignment and will consult QWC shortly.

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Barry,

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Kindest regards

Senior Correspondence Officer

SEQ Water Grid Communications Unit

SEQ Water Grid Manager

Phone

Email

Visit: Level 15, 53 Albert Street Brisbane

Post: PO Box 16205, City East QLD 4002

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Barry Dennien

Sent:

Monday, January 10, 2011 6:00 PM

To:

Dan Spiller

Subject:

FW: Assistance

From: Waldman Karen

Sent: Monday, 10 January 2011 5:50 PM

To: Barry Dennien
Subject: Assistance

Hi Barry

I have seen the various alerts come through and your advice on ABC today. Just to let you know that if there is any assistance QWC can provide, please let me know.

Regards, Karen.

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Sent:

Friday, January 14, 2011 1:35 PM

To:

Karen Waldman

Dan Spiller

SEQWGM Medi

Subject:

Flood DM approach

Attach:

Restrictions powers.docx; Demand Management Options to meet flood

impacts.docx

Hi all

Very first draft of Demand Management options which will try to finalise today. As I get personal email addresses for others I will send to them.

Cheers

final words, Karen.

--- Original Message ---

Date: 1/13/2011

From:

Subject: FW: Wording of media release re use of water for clean up

Tim

Additional line about health and safety on Karen's advice. Please advise when you want it to go on the web site.

Thanks

From:

Sent: Thursday, 13 January 2011 2:13 PM

Subject: RE: Wording of media release re use of water for clean up

Further to our discussion, we can put a heading and text box on the OWC

page, not able to do the rotating banner without a suitable graphic at

stage (my web man is not a designer)

Suggested Words

Heading

No restrictions to clean up after floods

Copy

Residents and business owners affected by the floods are not subject to

restrictions concerning the use of water necessary to assist them in their clean-up efforts.

Water can be used wherever there are health and safety concerns relating

property damage or debris in and around homes and businesses.

Caution should be exercised to ensure that their premises and residents

safe, and certified by a qualified tradesperson where necessary, before using water in any cleaning capacity.

ENDS

From:

Sent:

Wording of media release re use of water for clean up

Thanks for the advice Karen.

I have spoken to the Minister who mentioned that an update to the permanent

water conservation measures fact sheet and web site to clearly state that water can be used for any flood clean-up purpose might be a good idea. Would that be possible?

I imagine it would just be a bold sentence in both cases.

Policy Advisor

Office of the Minister for Natural Resources, Mines and Energy and Minister

for Trade

Phone: Mobile Fax:

From

Sent 13 January 2011 10:54 AM

To:

Cc:

Subject: Fwd: Wording of media release re use of water for clean up

Ηi

As reviewed b our A/General Counsel, she has suggested change to first paragraph we did, second is OK, but recommended the safety message.

However as we discussed this needs to be really part of a whole of Government message with our Minister liaising with State disaster/recovery coordinator before any messages released.

Regards, Karen.

--- Original Message ---

Date:

From:

Subject: Wording of media release re use of water for clean up

Hi Karen and

I would suggest the first paragraph be replaced by the following wording:

Residents and business owners affected by the flooding are not subject to any restriction concerning use of water necessary to assist their clean up efforts.

This differs slighly from Karen's wording in that it makes it clear that it

is only relates to those "affected by the flooding" and it is only about water useage "necessary" for the clean up.

I would also suggest that an additional message be included that people affected by the flooding should ensure that their premises and residences are safe before using any water in clean up efforts.

Kind regards

A/General Counsel

Queensland Water Commission

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Demand Management Options - Flood Recovery Period

Initial Communications

- Positive recovery message
- There are many ways to help
- The water quality in the reticulated system remains safe
- Community to appreciate that there is stress on and damage to the water supply system.
- Difficult to safely access and treat water as sources are in high flow and contain sediment and debris
- To return system to 'normal' we may need to shut down some parts temporarily for safety reasons or to do repairs – listen and watch for advice/information.
- Work to minimise impacts and times
- If needed we will look at arrangements to roster or rotate use for residential and nonresidential access
- Those affected by inundation will need to use water for cleaning and to make safe also looking at ways to minimise any impacts on cost and high use triggers for those flooded
- We can all assist by taking care and using water wisely. This will be a great help in ensuring
 the system is back to normal as quickly as possible but more importantly that it is available
 for those who need to clean up their homes and businesses.
- Please think twice and only use what you need. This is one way to assist those who need help.

Hard DM options

Residential

- Where possible use rainwater tanks with showers they will recharge
- Use high pressure devices or efficient nozzles
- Move large concentrations of mud by shovel or broom before hosing
- If you are outside flood affected zones remember and apply Target 140 for the next week

Non Residential

- Try and smooth your demand and avoid placing peak loads on the system
- Focus on achieving WEMP targets
- Be prepared for supply being interrupted
- Liaise closely with your Retailer

General

- Emergency powers are most efficient way to implement restrictions (see attached)
- Perhaps implement staggered operating times
- Look at temporarily using S25 powers to over-ride PWCM provisions

Operational

- What are options for redirecting/moving water including using reservoirs and creating a T140 zone in surrounding areas until replenished
- SOP focus on water security and cost effective applied to optimising flood relief capacity

Sent:

Tuesday, February 1, 2011 1:14 PM

To:

Dan Spiller

Subject:

Msg from Barry: 2pm with Karen Waldman for 15 minutes at her office

Sent:

Thursday, March 31, 2011 9:11 AM

To:

Waldman Karen

; Barry Dennien Dan Spiller

Cc:

Best Debbie

Subject:

AGENDA - NOTE VENUE DETAILS PLS

Attach:

ToR derm qwc wgm.doc

Morning all

today our meeting will be held on Level 10 of 400 George Street - due to security we will need to meet you on the Ground floor or Level 3 - Pls phone either myself or Judith and we will arrange for someone to come down and meet you.

Please find attached our Agenda - and note that in future this will be sent out a few days prior to the meeting.

See you all soon

Kind regards

Director, Sustainable Water Entity Governance Urban Water Policy and Management Department of Environment and Resource Management Ph: [07] 3330 5775 Visit us at: www.derm.qld.gov.au

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1 ream of paper = 6% of a tree and 5.4kg CO2 in the atmosphere

3 sheets of A4 paper = 1 litre of water

L15

Monthly Meetings – DERM, QWC, WGM

Agenda

- Issues of Significance each entity
- Consistency of Key messages institutional roles
- Rationalisation of PPQ's
- Process to review WGM contracts
- Forward work program and emerging issues

Monthly Meetings - DERM, QWC, WGM

Purpose:

- To provide stronger working relationships between the 3 entities;
- To provide an avenue to discuss emergent, immediate and emergency issues;
- To provide a proactive avenue for comment and discussion of policy decisions and supporting documentation;
- To assist in the provision of consistent and timely advice to the Director-General (DERM) and Minister
- To provide a clearer understanding of operational and strategic issues facing SEQ Water Grid by Departmental and Commission Officers.

Membership:

The Meetings will be Chaired by the Deputy Director General, DERM. In addition. expected attendance would be:

- CEO Water Grid Manager and appropriate staff
- CEO Queensland Water Commission and appropriate staff
- General Manager, UWPM, DERM
- Director, SWEG, DERM

Administration:

Meetings will be held monthly for maximum of 1 hour duration. DERM will provide a summary of action items following each meeting as confirmation.

Sent:

Monday, 11 October 2010 12:11 PM

To:

Waldman Karen

Cc: Subject:

review of wivenhoe supply level

Dan Spiller; Barry Dennien

Hi Karen

The Minister has asked for some advise ASAP.

Are you able to provide advice on the progress of the review of Wivenhoe's full supply level under the water strategy? What work has been undertaken?

How far through the process is the QWC?

When is the work scheduled to be completed?

What are the key stages in the assessment?

Policy Advisor

Office of the Minister for Natural Resources, Mines and Energy and Minister for Trade

Phone Mobile

Fax:

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Sent:

Monday, 11 October 2010 12:29 PM

To:

Çc:

Waldman Karei

Dan Spiller

Subject:

FW: review of wivenhoe supply level

Importance:

High



As discussed, can you please start pulling something together using the existing PPQ that was updated for the last sittings. We also have a copy of the SEQWGM PPQ and dam levels and spilling which you can use.

Dan Spiller is not available at the moment but will call back soon so we can determine a process to incorporate any information required by the SEQWGM.

Kind regards

Manager, Policy and Correspondence

Corporate Services

Department of Environment and Resource Management servicing the Queensland Water Commission Telephone:

Email:

53 Albert Street, Brisbane Q 4000 PO Box 15087, City East Q 4002

----Oniginal Mossage

From:

Sent: Monday, 11 October 2010 12:11 PM

To:

Cc: spiller daniel @ SEQWGM; Dennien Barry

Subject: review of wivenhoe supply level

Ηi

The Minister has asked for some advise ASAP.

Are you able to provide advice on the progress of the review of Wivenhoe's full supply level under the water strategy?

What work has been undertaken?

How far through the process is the QWC?

When is the work scheduled to be completed?

What are the key stages in the assessment?

Policy Advisor

Office of the Minister for Natural Resources, Mines and Energy and Minister for Trade

Phone:

1



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3 sheets of A4 paper = 1 litre of water

Sent:

Monday, 11 October 2010 4:57 PM

To:

Dan Spiller

Subject:

TRIM Document: D/10/049623: Increasing Wivenhoe Dam Full Supply Level Ministerial

Brief

Attachments:

Increasing Wivenhoe Dam Full Supply Level Ministerial Brief.DOC

Hi Dan

Karen has approved this version. Can you please advise if you have any comments?

----- TRIM Record Information >-----

Record Number

: D/10/049623

Title :

Increasing Wivenhoe Dam Full Supply Level Ministerial

Brief

+----+

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+-----

CTS 18474/10

QUEENSLAND WATER COMMISSION MINISTERIAL BRIEFING NOTE

TO: Minister Robertson

FROM: Karen Waldman, Chief Executive Officer

SUBJECT: Progress of the Wivenhoe Dam full supply

level review

Advisor . Dated	OK / /					
Approved/Not Approved/Noted Further information required						
Minister Dated	/ /					

Noted / Further information required							
DG DERM Dated							
Dated		- 1					

TIMEFRAME

Noting of this brief is required urgently as requested by the Minister's Office.

RECOMMENDATION

 It is recommended that the Minister note the progress of the review of Wivenhoe Dam's full supply level being conducted by the Queensland Water Commission (QWC) and Seqwater.

BACKGROUND

- One of the recommended planning activities to be undertaken by the QWC identified in the South East Queensland Water Strategy (the Strategy) is a review of the operation of the Brisbane River system to optimise the water supply yield and to balance the flood storage and water supply storage volume requirements.
- The Wivenhoe Dam is operated with a normal storage capacity at full supply level (FSL) of 1.165 million megalitres (ML). It is able to hold back a further 1.45 million ML during a flood situation. This additional storage is used to provide flood mitigation benefits along the Brisbane River downstream of the dam by spreading release over a large period.
- An investigation into increasing the yield from Wivenhoe and Somerset Dams was
 undertaken by Seqwater. Seqwater's March 2007 report, *Provision of Contingency Storage*in Wivenhoe and Somerset Dam, investigated three levels of possible increases to the
 current FSL of Wivenhoe Dam of two metres, three metres and four metres. This report,
 which is available on the QWC's website, did not consider the requirements of the Moreton
 Water Resource Plan in terms of environmental flow.

CURRENT ISSUES

- A detailed investigation is being conducted by the QWC in conjunction with Seqwater and in consultation with the Brisbane and Ipswich City Councils to determine the maximum level to which the FSL of Wivenhoe Dam could be raised without raising the dam wall.
- In addition, a study will be undertaken to identify alternative options to access additional water from the Brisbane River system to identify the most advantageous option.

Key stages in the assessment

- Pre-feasibility study a desk top study using existing models is anticipated to be completed by March 2011. It involves:
 - assessing the maximum yield within the environmental parameters of the Moreton Water Resource Plan;
 - assessing the upstream and downstream flooding impacts;
 - undertaking a cost benefit assessment of these impacts against the value of the water sourced:
 - identifying alternative options to access water in the system;
 - peer review of the work undertaken; and
 - preparing a report on the study.

Contact:	VSenior Director, Regional Planning and Policy, QWC	Date: 11 October 2010
elephone:	Mobile:	
ile Number: I		Page 1 of 3

- Cost impacts would be based on the Brisbane City Council's Brisbane River Flood
 Damages Study and would be undertaken in conjunction with Brisbane and Ipswich City
 Councils.
- Based on the pre-feasibility investigation, the QWC will recommend to the Minister whether the option warrants further investigation through a feasibility study or not to proceed.
- Feasibility study This will be at a more detailed level and will involve refinement of the models and may involve some site inspections. The feasibility study is anticipated to take 12 months and would involve:
 - upstream and downstream flood hydrology sufficient to clearly identify flood risks including infrastructure impacts and upstream land acquisition (amend leases);
 - identifying dam structure impacts;
 - identifying environmental impacts including fauna and flora:
 - quantifying the project costs and yield benefits; and
 - identifying the project delivery time frame including environmental approvals.
- A report will be prepared including briefing material to advise the Minister of the outcome of the studies with a recommendation to proceed or not proceed with the preparation of a business case.

Current status of project

- Preliminary investigations have been undertaken by QWC using the Integrated Quantity and Quality Model (IQQM) and the WATHNET model to determine the additional yield meeting both the environmental requirements under the Moreton Water Resource Plan and the Level of Service criteria adopted for supplies in south east Queensland.
- The investigations also indicate that an additional 5,000 ML per annum could be accessed with a 1 metre raising of Wivenhoe Dam's FSL.
- The investigations indicate that any raising of FSL above one metre actually results in a lower overall yield from the system due to higher evaporation losses.
- The Wivenhoe system is nearly at its limit in terms of the end of system environmental flow objective (EFO) which is set under the Moreton Water Resource Plan at 67.22%. The one metre raising results in a 67.28% end of system flow whereas two metres results in 67.03%.
- QWC is currently awaiting costs from Seqwater to undertake components of the work but Segwater will fund all its internal costs.
- The project will be overviewed by a Project Steering Committee which will include representatives from the QWC, Department of Environment and Resource Management, Seqwater, Brisbane City Council, Ipswich City Council and two independent experts in hydrology and water engineering.
- Once the costing from Seqwater is received, work on the pre-feasibility study will commence and should be completed by March 2011.
- If the pre-feasibility study indicates that a proposal is viable, at least another 12 months of further detailed technical studies at an estimated cost of \$500,000. This cost would be incurred by the QWC.
- Consultation with stakeholders and the community will be undertaken during the feasibility study, but ultimately this could easily add to that timeframe, given the complex nature of the impacts to be investigated.
- Until this work has been completed, and in consideration of the safety of the community, flood waters will be cleared in accordance with the existing Flood Operations Manual developed by Seqwater and approved by the Dam Safety Regulator.

RESOURCE/IMPLEMENTATION IMPLICATIONS

 The pre-feasibility investigations are expected to be finalised in March 2011 at an estimated cost of \$100,000. If the pre-feasibility study indicates that a proposal is viable, at least another 12 months of further detailed technical studies at an estimated cost of \$500,000. This cost would be incurred by the QWC.

PROPOSED ACTION

 The QWC will continue to work with Seqwater to undertake a pre-feasibility study on the viability of raising the Wivenhoe Dam FSL or an alternative option if identified.

OTHER INFORMATION

- Consultation: Meetings have been held with Seqwater and discussions have been arranged with Brisbane City Council and Ipswich City Council.
- Legislation: Any option considered will be compliant with the Moreton Water Resource Plan.
- Key Communication Messages: As indicated in the Strategy, the QWC, in conjunction with Seqwater, will be investigating the maximum level to which the storage level of Wivenhoe Dam could be raised without raising the dam wall, while still remaining within acceptable risk levels. Until the detailed investigations have been completed, flood waters will be cleared in accordance with the existing gazetted Flood Operations Manual developed by Seqwater and approved by the Dam Safety Regulator. It is vital the Government takes all the time needed to get it right and the Government will not be rushed into making hasty decisions in the area of public safety. Getting this wrong has the potential to endanger homes, property and livelihoods of residents both upstream of the dam and downstream as far as Brisbane City.

MINISTER'S COMMENTS

File Number: D/10/049623

Contact: Senior Director, Regional Planning and Policy, QWC Date: 11 October 2010
Telephone Mobile:

М7

Page 3 of 3

From: Sent: To: שם Spiller; Cc: vvaluttlatt Natet Subject: RE: review of wivenhoe supply level Attachments: Increasing Wivenhoe Dam Full Supply Level Ministerial Brief signed by CEO 11 October 2010.PDF Good evening Please find attached a Ministerial Brief on increasing Wivenhoe Dam's Full Supply Level approved by Karen Waldman, CEO, QWC. The brief has also been progressed urgently via MECS: CTS 18474/10. Kind regards A/Senior Policy and Project Officer Corporate Policy Unit - Queensland Water Commission Department of Environment and Resource Ma<u>nagement</u> From: Sent: Monday, 11 October 2010 12:11 PM To: <u>Waldman Karen</u> spiller daniel @ SEQWGM; Dennien Barry Subject: review of wivenhoe supply level Hi Karen The Minister has asked for some advise ASAP. Åre you able to provide advice on the progress of the review of Wivenhoe's full supply level under the water strategy? What work has been undertaken? How far through the process is the QWC? When is the work scheduled to be completed? What are the key stages in the assessment?

Policy Advisor

Minister for Natural Resources, Mines and Energy and Minister for Trade Office Phone Mobil

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CTS 18474/10

QUEENSLAND WATER COMMISSION MINISTERIAL BRIEFING NOTE

TO:

Minister Robertson

Loven Waldman 11.10.10

FROM:

Karen Waldman, Chief Executive Officer

SUBJECT: Progress of the Wivenhoe Dam full supply

level review

Advisor . Dated	OK
	ed/Not Approved/Noted r information required
Minister Dated	

Noted /					
Further inf	Further information required				
DG DERM					
Dated	1	- 1			

TIMEFRAME

Noting of this brief is required urgently as requested by the Minister's Office.

RECOMMENDATION

It is recommended that the Minister note the progress of the review of Wivenhoe Dam's full supply level being conducted by the Queensland Water Commission (QWC) and Segwater.

BACKGROUND

- One of the recommended planning activities to be undertaken by the QWC identified in the South East Queensland Water Strategy (the Strategy) is a review of the operation of the Brisbane River system to optimise the water supply yield and to balance the flood storage and water supply storage volume requirements.
- The Wivenhoe Dam is operated with a normal storage capacity at full supply level (FSL) of 1.165 million megalitres (ML). It is able to hold back a further 1.45 million ML during a flood situation. This additional storage is used to provide flood mitigation benefits along the Brisbane River downstream of the dam by spreading release over a large period.
- An investigation into increasing the yield from Wivenhoe and Somerset Dams was undertaken by Seqwater. Seqwater's March 2007 report, Provision of Contingency Storage in Wivenhoe and Somerset Dam, investigated three levels of possible increases to the current FSL of Wivenhoe Dam of two metres, three metres and four metres. This report. which is available on the QWC's website, did not consider the requirements of the Moreton Water Resource Plan in terms of environmental flow.

CURRENT ISSUES

- A detailed investigation is being conducted by the QWC in conjunction with Segwater and in consultation with the Brisbane and Ipswich City Councils to determine the maximum level to which the FSL of Wivenhoe Dam could be raised without raising the dam wall.
- In addition, a study will be undertaken to identify alternative options to access additional water from the Brisbane River system to identify the most advantageous option.

Key stages in the assessment

- Pre-feasibility study a desk top study using existing models is anticipated to be completed by March 2011. It involves:
 - assessing the maximum yield within the environmental parameters of the Moreton Water Resource Plan:
 - assessing the upstream and downstream flooding impacts;
 - undertaking a cost benefit assessment of these impacts against the value of the water sourced:
 - identifying alternative options to access water in the system;
 - peer review of the work undertaken; and
 - preparing a report on the study.

Contact:	VSenior Director, Regional Planning and Policy, QWC	Date: 11 October 2010
Telephone:	Mobile:	
File Number D/10/049bZ3		Page 1 of 3

- Cost impacts would be based on the Brisbane City Council's Brisbane River Flood
 Damages Study and would be undertaken in conjunction with Brisbane and Ipswich City
 Councils.
- Based on the pre-feasibility investigation, the QWC will recommend to the Minister whether the option warrants further investigation through a feasibility study or not to proceed.
- Feasibility study This will be at a more detailed level and will involve refinement of the models and may involve some site inspections. The feasibility study is anticipated to take 12 months and would involve:
 - upstream and downstream flood hydrology sufficient to clearly identify flood risks including infrastructure impacts and upstream land acquisition (amend leases);
 - identifying dam structure impacts;
 - identifying environmental impacts including fauna and flora;
 - quantifying the project costs and yield benefits; and
 - identifying the project delivery time frame including environmental approvals.
- A report will be prepared including briefing material to advise the Minister of the outcome of the studies with a recommendation to proceed or not proceed with the preparation of a business case.

Current status of project

- Preliminary investigations have been undertaken by QWC using the Integrated Quantity
 and Quality Model (IQQM) and the WATHNET model to determine the additional yield
 meeting both the environmental requirements under the Moreton Water Resource Plan and
 the Level of Service criteria adopted for supplies in south east Queensland.
- The investigations also indicate that an additional 5,000 ML per annum could be accessed with a 1 metre raising of Wivenhoe Dam's FSL.
- The investigations indicate that any raising of FSL above one metre actually results in a lower overall yield from the system due to higher evaporation losses.
- The Wivenhoe system is nearly at its limit in terms of the end of system environmental flow objective (EFO) which is set under the Moreton Water Resource Plan at 67.22%. The one metre raising results in a 67.28% end of system flow whereas two metres results in 67.03%.
- QWC is currently awaiting costs from Seqwater to undertake components of the work but Segwater will fund all its internal costs.
- The project will be overviewed by a Project Steering Committee which will include representatives from the QWC, Department of Environment and Resource Management, Seqwater, Brisbane City Council, Ipswich City Council and two independent experts in hydrology and water engineering.
- Once the costing from Seqwater is received, work on the pre-feasibility study will commence and should be completed by March 2011.
- If the pre-feasibility study indicates that a proposal is viable, at least another 12 months of further detailed technical studies at an estimated cost of \$500,000. This cost would be incurred by the QWC.
- Consultation with stakeholders and the community will be undertaken during the feasibility study, but ultimately this could easily add to that timeframe, given the complex nature of the impacts to be investigated.
- Until this work has been completed, and in consideration of the safety of the community, flood waters will be cleared in accordance with the existing Flood Operations Manual developed by Segwater and approved by the Dam Safety Regulator.

RESOURCE/IMPLEMENTATION IMPLICATIONS

The pre-feasibility investigations are expected to be finalised in March 2011 at an estimated cost of \$100,000. If the pre-feasibility study indicates that a proposal is viable, at least another 12 months of further detailed technical studies at an estimated cost of \$500,000. This cost would be incurred by the QWC.

Contact: VSenior Director, Regional Planning and Policy, QWC Date: 11 October 2010
Telephone: Mobile: Page 2 of 3

PROPOSED ACTION

• The QWC will continue to work with Seqwater to undertake a pre-feasibility study on the viability of raising the Wivenhoe Dam FSL or an alternative option if identified.

OTHER INFORMATION

- Consultation: Meetings have been held with Seqwater and discussions have been arranged with Brisbane City Council and Ipswich City Council.
- Legislation: Any option considered will be compliant with the Moreton Water Resource Plan.
- Key Communication Messages: As indicated in the Strategy, the QWC, in conjunction with Seqwater, will be investigating the maximum level to which the storage level of Wivenhoe Dam could be raised without raising the dam wall, while still remaining within acceptable risk levels. Until the detailed investigations have been completed, flood waters will be cleared in accordance with the existing gazetted Flood Operations Manual developed by Seqwater and approved by the Dam Safety Regulator. It is vital the Government takes all the time needed to get it right and the Government will not be rushed into making hasty decisions in the area of public safety. Getting this wrong has the potential to endanger homes, property and livelihoods of residents both upstream of the dam and downstream as far as Brisbane City.

MINISTER'S COMMENTS

Contact: Telephone: File Number: D/10/049623 JSenior Director, Regi<u>onal Planning and</u> Policy, QWC Mobile: Date: 11 October 2010

Page 3 of 3

From:

Dan Spiller

Sent:

Monday, 11 October 2010 6:07 PM

To:

Barry Dennien:

Subject:

FW: review of wivenhoe supply level

Attachments:

Increasing Wivenhoe Dam Full Supply Level Ministerial Brief signed by CEO 11 October

2010.PDF

For info.

----Original

From:

Sent: Monday, 11 October 2010 5:25 PM

To

Cc: Waldman Karen

Dan Spiller;

Subject: RE: review of wivenhoe supply level

Good evening

Please find attached a Ministerial Brief on increasing Wivenhoe Dam's Full Supply Level approved by Karen Waldman, CEO, QWC. The brief has also been progressed urgently via MECS: CTS 18474/10.

Kind regards

A/Senior Policy and Project Officer

Corporate Policy Unit - Queensland Water Commission Department of Environment and Resource

Management

T:

From:

Sent: Monday, 11 October 2010 12:11 PM

Io: Waldman Karen

Cc:

spiller daniel @ SEQWGM; Dennien Barry

Subject: review of wivenhoe supply level

Hi Karen

The Minister has asked for some advise ASAP.

Are you able to provide advice on the progress of the review of Wivenhoe's full supply level under the water strategy?

What work has been undertaken?

How far through the process is the QWC?

When is the work scheduled to be completed?

What are the key stages in the assessment?

1

Policy Advisor
Office of the Minister for Natural Resources, Mines and Energy and Minister for Trade
Phone:
Mobile
Fax: (

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3 sheets of A4 paper = 1 litre of water

CTS 18474/10

QUEENSLAND WATER COMMISSION MINISTERIAL BRIEFING NOTE

TO:

Minister Robertson

FROM:

Loven Waldman 11.10.10 Karen Waldman, Chief Executive Officer

SUBJECT: Progress of the Wivenhoe Dam full supply

level review

Advisor Dated	OK / /
	Not Approved/Noted formation required
Minister Dated	<i>I I</i>

Noted / Further information required					
DG DERM			· • • · · · • • · · ·		
Dated	1	- 1			

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Contact:	Senior Director, Regional Planning and Policy, QWC	Date: 11 October 2010
Telephone:	Mobile:	
File Number: 0/10/049623		Page 1 of 3

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MINISTER'S COMMENTS

Contact: Telephone:

File Number: D/10/049623

A/Senior Director, Regional Planning and Policy, QWC Mobile:

Date: 11 October 2010

Page 3 of 3

M17

From:

Sent:

nonday, it October 2010 0.10 Fig.

To:

Cc:

Subject: KE: review of wivenhoe supply level

If an increase in FSL of above 1m will decrease system yield, why are investigations into increases of 2, 3 and 4m ongoing?

Policy Advisor

Office of the Minister for Natural Resources, Mines and Energy and Minister for Trade

Mobile

Fax: (

----Original Message--

Sent: Monday, 11 October 2010 5:25 PM

To:

Cc: Waldman Karen;

Spiller Daniel (SEQWGM);

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What are the key stages in the assessment?

Policy Advisor
Office for Natural Resources, Mines and Energy and Minister for Trade

Office of the Minister for Natural Resources, Mines and Energy and Minister for Trade Phone:
Mobile
Fax: (

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3 sheets of A4 paper = 1 litre of water

From: Sent:

Monday, 11 October 2010 6:50 PM

To:

Waldman Karen; Dan Spiller;

Cc:

Subject: RE: review of wivenhoe supply level

Tim

Original Seqwater investigation did various levels. At present only looking at 1 and 2 metre options.

Focus is on 1m but need to confirm 2m result.

----Original Message----

From:

Sent: Monday, 11 October 2010 6:18 PM

To: Waldman Karen; Spiller Daniel (SEQWGM);

ر c:

Subject: RE: review of wivenhoe supply level

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Office of the Minister for Natural Resources, Mines and Energy and Minister for Trade

Phone:

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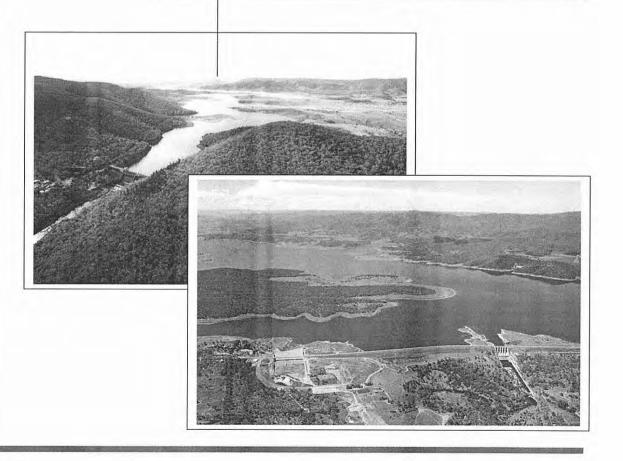
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QUEENSLAND WATER COMMISSION DEPARTMENT OF NATURAL RESOURCES AND WATER

PROVISION OF CONTINGENCY STORAGE IN WIVENHOE & SOMERSET DAMS





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)
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 Optio	ns			
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.

Table 1-2 - Flood Security Costs

Option	Increase in Storage Capacity (ML)	Direct Cost (\$m_)		Total Estimated
		Raising FSL	Flood Security	Cost (\$m)*
W1	228,000	13	40	63
W1A (Operational change)	228,000	NA	5 – 10	5 to 10
W2	481,000	64	40	138
W3	1,066,000	151	40	248
Somerset Raising Option	ons			
S1	92,000	1.5	24	55
S2	202,000	1.5	24	70
S3	332,000	1.5	24	85

Note:

- The total costs include contingencies, design and construction supervision not included in the direct costs.
- The Wivenhoe flood security costs comprise the current estimated costs of the Stage 2 works. This work is required to be undertaken by SEQWater by 2035.
- The works to raise the FSL at Somerset include gate seals, upgrading the crest, and upgrades to the
 controls. This work is constant for the three options as up to 6m additional storage could be held
 against the sector gates after upgrading.
- The MFL for the Somerset Raising Options is similar for all three cases. Therefore, the post tensioning and downstream strengthening work are of a similar order of cost (at this level of assessment).

For Wivenhoe it can be seen that the incremental cost associated with the small increase in the storage capacity is much less than the cost required to upgrade the dam to full PMF Capacity. For Somerset the cost of increasing the storage capacity is much less than the cost to upgrade to full PMF capacity in all cases.

1.3 Limitations

This report is intended to be a preliminary feasibility investigation for options to raise Wivenhoe or Somerset Dam. The investigations carried out for the report have focused on the engineering aspects of raising Wivenhoe and Somerset. There has been no attempt to quantify:-

- The potential impacts of the raising on the end of systems flows.
- The frequency and volumes of the storage to be held above FSL at either or both of the dams.

- The potential benefit of raising Wivenhoe or Somerset on the downstream flood impacts.
- Major environmental impacts.
- Impacts of the additional storage on the levels of service.

1.4 Flood Operational Procedures.

The proposed raising options investigated for Wivenhoe are capable of producing similar outflow hydrographs to the current configuration, thereby preserving the flood mitigation benefits downstream of the dam.

The proposed options for the raising of Somerset reduce the flood mitigation capacity of the storage for downstream stakeholders (impacts on the flood mitigation capacity of both Wivenhoe and Somerset) to limit the impacts of the raised storage levels on Kilcoy and upstream areas. These options would require a substantial revision of the flood operational procedures.

Option W1A has impacts on the flood capacity of the dam for events greater than the 1 in 1,000 AEP event. Given the rarity of this event it considered that this option has potential to be acceptable to the downstream stakeholders as a short term (10 to 15 years) option to capture additional storage in Wivenhoe.

It has been assumed that minor changes to the flood operational procedures and works to the downstream bridges may reduce the adverse impact of this operational change even further. It is proposed that this assumption be investigated further by SunWater, to provide a detailed assessment of the impacts of the raised storage on the downstream flood levels.

1.5 Wivenhoe Raisings.

The raising options W1, W2 and W3 considered involve:-

- Complex work in the spillway which could only proceed one bay at a time and probably only in the dry season months.
- The cost of such complex work with limited time windows is difficult to estimate with reasonable certainty.

Options W2 and W3 involve raising the embankments and a temporary relocation of the Brisbane Valley Highway causing major disruption to traffic. Less significant disruption would be caused to the Wivenhoe - Somerset Road. The indirect cost of these disruptions has not been estimated.

For Option W1A, the increase in downstream flooding is relatively minor but its acceptability would be dependent on consultation with stakeholders. A raising of Kholo Bridge and possibly of Burtons Bridge and Savages Crossing could be required to deal with possible concerns.

For Option W1A, the existing fuse plug will be triggered more frequently (existing 1:5,000 AEP flood). The frequency and consequences will need to be examined in further detail.

1.6 Somerset Raisings

Issues associated with the raising of Somerset include:-

- Flood Mitigation. Each of the options investigated for the raising of Somerset impact on the existing flood mitigation performance. This impact is greater as the proposed raising increases. This is due to constraints on the upstream flood levels imposed by Kilcoy and other upstream development.
- Equipment age. The gates and hoist equipment at Somerset Dam are of considerable age. There is some uncertainty whether it can be adapted as proposed.
- Dam condition. Cracking in a number of the dam monoliths and other stability concerns will be addressed concurrently with the raising proposals.
- Community opposition to the higher raising proposals is likely to be very strong.
- The indirect costs associated with the increased frequency of highway disruption have not been estimated.

1.7 Recommendations

It is recommended that:-

- Raising of the FSL level of Somerset Dam be rejected due to the impacts on the upstream population during flood events. Major flood events already result in inundation of the Kilcoy and surrounding private properties and infrastructure.
- The provision of contingency storage in Wivenhoe is investigated further.
 A 2m raising in the FSL could be achieved with minimal capital costs subject to addressing regulator and stakeholder issues.
- A detailed flood assessment is carried out to develop and asses changes to the flood manual to allow the storage of the additional 2m in Wivenhoe. The impact of the changes should be assessed for the full range of Annual Exceedance Probabilities and Storm Durations. This assessment should also link with the Brisbane River Flood Damages Assessment currently being carried out by Brisbane City Council.
- A detailed review of the structural adequacy of the various components of the dam is carried out to confirm the assumptions of this report. The

review will provide design detail to refine the cost estimates and confirm the feasibility of the proposed increase in storage level.

- A program of consultation with the downstream stakeholders is carried out with the proposed changes to the flood manual once the assessment of flood events is completed.
- SEQWater be provided with the opportunity to instigate a public consultation process prior to the public release of options to raise the storage levels of Wivenhoe.

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2. Glossary

Australian Height Datum (AHD)	Mean sea level at the thirty tide gauges located around Australia
Annual Exceedance Probability (AEP)	The probability of a specified magnitude of a natural event being exceeded in any year.
Dam Crest Flood	The flood event which, when routed through the reservoir, results in a still water reservoir level at the lowest crest level of the dam.
Design Flood Level (DFL)	The peak level in a dam storage derived from routing the critical design flood event through the dam.
Elevation Level (EL)	The elevation relative to a specific datum point. For this report all elevation data is quoted in m AHD.
Full Supply Level (FSL)	The maximum normal operating water surface level of a reservoir when not affected by floods.
Probable Maximum Precipitation (PMP)	The theoretical greatest depth of precipitation for a given duration meteorologically possible for a given size storm area at a particular location at a particular time of the year, with no allowance made for long-term climatic trends.
Probable Maximum Flood (PMF)	The probable maximum flood is the flood resulting from the PMOP and, where applicable, snow melt, coupled with the worst flood producing catchment conditions than can be realistically expected in the prevailing catchment metrological conditions.
Maximum Flood Level (MFL)	The peak water level in a dam storage derived from routing the critical design flood event through the dam. May be the same as the DFL or used to denote a different water level if the dam has a flood capacity deficiency.
Outlet Works	The combination of intake structure, conduits, tunnels, flow controls and dissipation device to allow release of water from a dam.
Right Abutment	The right hand side abutment of a dam looking in the downstream direction
Left Abutment	The left hand side abutment of a dam looking in the downstream direction
Probability	The likelihood of a specific event or outcome.
Revise Generalised Tropical Storm Method (GTSM-R)	A generalised method for the estimation of extreme rainfall events (PMP's) in the northern parts of Australia.
Reservoir	An artificial lake, pond or basin for storage, regulation, control of water, silt, debris or other liquid or liquid borne material.

3. Introduction

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.

3.1 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.

3.2 Assumptions

For the purposes of this study it has been assumed that the raised dam will be required to:

- Maintain the flood mitigation performance of the dam (for more frequent flood events up to the 1 in 500 Annual Exceedance Probability (AEP) flood event) provided by the current spillway facilities. Currently the flood manual for the operation of Wivenhoe and Somerset has four procedures. Procedure 4 marks the change from flood mitigation to ensuring the safety of the dam by passing the flood and occurs at approximately EL74. The intent of the manual is to be maintained for possible raising options. Any change to the manual intent will require extensive stakeholder consultation.
- Comply with the State's requirements on Acceptable Flood Capacity (AFC) for Dams. The Draft Guidelines on Acceptable Flood Capacity were issued by NRW (Dam Safety Regulator) in 2005 and are in the process of being finalised.
- Maintain the current release capability of the outlet works. The Dam is operated to release water supply discharges into the Brisbane River before being extracted by downstream customers. This requires an outlet capacity of approximately 1,500 ML/day.

4. Wivenhoe Dam General Information

4.1 Background

Wivenhoe Dam, as originally constructed, is a 56 m high, zoned earth and rock embankment with a concrete gravity spillway (crest level EL57), controlled by 5 radial gates, each 12.0m wide by 16.0 m high. Two saddle dam embankments are located on the left side of the reservoir. The Brisbane Valley Highway was relocated to pass over the dam.

The dam has four main functions by providing:

- A 1,165GL storage at full supply level (FSL EL67.0) providing water supply for Brisbane and surrounding areas;
- Flood mitigation in the Brisbane River with a dedicated flood storage volume of 1,450GL at a flood level of EL80.0;
- The lower pool for the Wivenhoe Pumped Storage Hydro-Electric power station which has a 500 MW generating capacity;
- A recreation area.

The dam was designed by the then Queensland Water Resources Commission. A design report was compiled by the then Department of Primary Industries for the South East Queensland Water Board (DPI, 1995). It was constructed by a series of contracts between 1977 and 1985, supervised by the Commission.

The dam has a HIGH hazard classification because of the significant development downstream in the Brisbane and Ipswich metropolitan areas, with the population at risk (PAR) numbering in the hundreds of thousands.

The first formal dam safety review was undertaken by Guthridge, Haskins & Davey Pty Ltd in 1997 (GHD, 1997). A concurrent review of the mechanical and electrical equipment was undertaken by HECEC Pty Ltd.

The original spillway capacity, with an Annual Exceedance Probability (AEP) of 1 in 22,000 for the Dam Crest Flood (DCF), was well below current standards for a high hazard dam. The Wivenhoe Alliance was formed by SEQWater to improve the flood security with a long-term goal of providing for the Maximum Probable Flood (PMF). Investigation studies concluded that a two-stage upgrade program outlined below would provide a cost-effective risk reduction program.

Stage 1 Upgrade Works

- Construction of a new secondary spillway on the right abutment that would enable the dam to handle an inflow flood with an AEP of 1 in 100,000 at a Maximum Flood Level (MFL) of EL80. This spillway is controlled by three fuse plug embankments;
- Upgrading of the embankment crest to retain a MFL of EL80 with zero freeboard;
- Upgrading of associated structures as appropriate, including protection of the main spillway gates and bridge and strengthening of the spillway gravity structure.

Stage 2 Upgrade Works

Reconstruction of Saddle Dam 2 as a fuse plug spillway such that the dam can accommodate the PMF.

4.2 Flood Hydrology

The dam failure analysis report, WA (2005) summarises the storage and spillway discharge data, the PMF inflow data and downstream flood parameters for the following PMF scenarios:

- Original dam with dambreak
- The Stage 1 completed works with dambreak
- The proposed Stage 2 works without dambreak
- The proposed Stage 2 works with dambreak for comparison purposes.

The 36 hour PMP rainfall was found to produce the highest peak inflow and outflow at the dam. Details of the methodology used to derive the PMF hydrographs are described at WA (2004B).

The peak inflow for the PMF is 49,000 m3/s, which includes outflows from Somerset Dam. This was derived using the latest GTSM-R PMP rainfall depths and temporal patterns provided by BOM (2003). The PMF has a flood volume of 5,993,000 ML and the peak outflow discharge following Stage 2 construction is 37,400 m3/s.

4.3 Main Embankment

The Wivenhoe main embankment is located on the right hand side of the centrally placed spillway. The 1.2 km embankment is a 56 m high central clay core embankment with both upstream and downstream filters supported by outer shells of compacted sandstone with run of river gravel in the upper portion. The shoulder slopes are 2 horizontal to 1 vertical with a local

steepening in the upper portion to 1.5 horizontal to 1 vertical. Riprap was provided on both upstream and downstream shoulders.

To the left of the spillway structure, the embankment has a sloping upstream core protected by both upstream and downstream filters and supported by a downstream shell of miscellaneous fill. Batter slopes are 3 horizontal to 1 vertical on the upstream face and 2 horizontal to 1 vertical on the downstream face. Riprap was provided on both upstream and downstream shoulders.

4.4 Saddle Dams

Two saddle dams close off low saddles on the left abutment of the dam. These are constructed from miscellaneous fill with some broad zoning of materials. They have a crest level at EL80 and have a maximum height of 10 m. The saddle dams only retain water during flood operation.

4.5 Foundation

A single line grout curtain, 15 m to 35m deep and an 8 m deep grout blanket was installed under the core of the main embankment and the sloping core of the left embankment. Water losses were generally low at depth but high water losses were noted as appearing to "coincide with poorly consolidated sandstone, which is a primary structural feature and is not the result of weathering" (DPI, 1995).

The foundation was cleaned off by removal of loose and shattered material and blasting with water - air jets. This was only done under the core and filter areas as the shoulders were founded on the alluvial materials. Foundation treatment generally comprised slush grout or mortar to seal fractures, fill irregularities and fill fissures. Dental concrete was used where the contact fill could not readily be compacted and to fill cavities and smooth abrupt vertical faces. Areas where the foundation was likely to weather rapidly were mortar treated immediately following clean up.

The contact clay (zone 1A) and filters (zone 2) were placed while the slush grout or mortar was still plastic. The contact clay was compacted with rubber tyred construction machinery.

4.6 Primary Spillway

The spillway is located in a low saddle between the two embankments and is controlled by 5 radial gates supported on a mass concrete ogee crest. The radial gates are 12m wide by 16m high and discharge via a flip bucket spillway to an unlined rock discharge channel.

The five 12m wide by 16m high radial gates in the Wivenhoe spillway structure are operated by hydraulic motor driven wire rope winches, one on each side of each gate. The power units (2) for the spillway gates and penstock gate are located in a winch room in the left abutment of the dam. Also located in the

winch room is an auxiliary diesel operated hydraulic unit capable of operating the gates.

A left bank underground control complex in the dam comprises the winch room, water quality control room, main high voltage substation, main switchboard, fire control equipment, storeroom, diesel alternator set, and ventilation system.

A 79 tonne travelling gantry crane on the service bridge over the spillway structure serves to handle the bulkhead gate used for maintenance of the radial gates. A smaller gantry over the intake structure is used for handling the trash racks and water quality baulks.

4.7 Outlet Works

The following information on the Outlet Works is obtained from the DPI, 1995 report.

"The outlet works extend over 4 monoliths LH11 to LH14 with the entrances to the penstock and river outlet being in Monolith 11 and the regulating valves in Monolith 14. At the entrance to the outlet works in Monolith 11 a 3.6m diameter penstock with a large capacity intake was installed to provide for the future installation of a hydro power station. A 1.905m diameter river outlet was installed directly above the penstock so that one fixed wheel bulkhead gate could command either outlet (but not both outlets) to provide for emergency closure or dewatering" (DPI 1995).

In 2003, a 4.6MW mini hydro plant was constructed on the 3.6m diameter penstock. The GE turbine is utilised to generate electricity from the routine releases from the outlet works. The mini hydro is owned and operated by the Stanwell Corporation. The upper outlet, consisting of a 1.9m diameter pipe is controlled by a 1.5m diameter regulating valve. The regulating valve discharges into a stainless steel lined dispersion chamber. Additional off takes are provided for town water supplies.

"The inlet transition for both penstocks is steel lined because of the high 10m/s flow velocity in the pipes. The internal surfaces of the outlet pipes were coated with coal tar epoxy to a minimum thickness of 500 microns. This paint lining was refurbished in 2003.

A 4.1m wide by 5.25m high fixed wheel type emergency gate serves as a guard gate for the outlets through the dam (one 3.6m diameter penstock, and a 1.9m diameter outlet pipe).

Within the intake structure in the left abutment there is an arrangement of six baulks to allow selective withdrawal of water for quality control purposes" (DPI 1995).

4.8 Electrical Equipment

The electrical power system consists of the following major components:

- 11kV supply system and transformer
- Main switchboard
- Diesel generator
- Load bank
- Distribution boards
- UPS power supplies.

The diesel generator is a self contained skid mounted unit with a six cylinder Mitsubishi engine and a 330kVA Stamford generator providing a three phase 415 volt AC alternative power supply for the main dam distribution board. The rating of the engine is a nominal 250kW, with a continuous rating of 90% and a one hour rating of 110%.

The diesel is automatically started at a preset time delay after the mains power fails and the entire site load is automatically connected to the diesel a short time later. Upon the restoration of the mains power there is a short delay and the diesel is shut down and the load reverted to the mains supply. The instantaneous shutting down of the engine without any cooling down period is detrimental on the diesel and will shorten its service life.

To ensure that the diesel is not operated for prolonged periods of time on light load an automatic load bank has been provided. When the diesel load is below a preset level, the load is connected in one step and once the total loading has increased to another preset loading the load bank will be disconnected. Also the load bank is disabled when the 79 tonne gantry crane is operating form the diesel generator.

4.9 Supporting Services

There are several supporting services, which influence the safety of the asset and the operators and therefore indirectly compromise the gate operation. These services include:

- Fire detection
- Fire control and fighting
- Ventilation
- Security systems

- Communications
- Alarm systems
- Monitoring systems
- · Access and material handling.

4.10 Stage 1 Upgrade Works

The Stage 1 upgrade works carried out by the Wivenhoe Alliance comprised:

- Construction of a secondary spillway in the right abutment. The
 excavation of the chute allowed for concrete works for a 3m high ogee
 crest, apron slabs, chute lining and divider walls to enable construction of
 three fuse plug embankments;
- Temporary diversion of the Brisbane Valley Highway and relocation of services to enable construction of a new road bridge across the new spillway;
- Upgrading of the existing crash barrier on the two main embankments to handle the new Maximum Flood Level (MFL) of EL80;
- Strengthening of the primary spillway with post-tensioned anchors to cater for the increased loading due to the raised flood level. Provision of a steel deflection baffle upstream of the radial gates to ensure the gates clear the flow profile for the raised MFL.
- Modifications to the saddle dams to prevent premature failure while ensuring they are overtopped prior to the main embankment.
- Associated works comprising spoil area, access roads, sediment and erosion controls, site facilities and landscaping.
- Refurbishment of the Visitors information Centre.

This Stage 1 upgrade changes the Dam Crest Flood (DCF) from a 1 in 22,000 AEP event to a 1 in 100,000 AEP flood event. The initial trigger level for the lowest of the fuse plug embankments is at EL76.2m (approximately the 1 in 6,000 AEP event).

4.11 Proposed Stage 2 Upgrade Works

Stage 2 works will involve the reconstruction of Saddle Dam 2 to incorporate a fully lined concrete chute spillway with a single fuse plug embankment. This 100 m wide spillway will provide full PMF protection with a conventional freeboard and will be triggered by the 1 in 50,000 AEP event. The concrete lining and flip bucket protects against erosion of the conglomerate foundation.

Under proposed State guidelines (NRW 2005) the Stage 2 spillway will be required to be in place by 2035 and will increase the flood capacity to cater for the PMF.

4.12 Geology

The following description of the site geology is taken from DPI, 1995 and GHD, 1997. Brief descriptions of the regional and rim geology are provided at GHD, 1995.

"The main dam is located wholly on the Helidon Sandstone (also known as the Wivenhoe Sandstone). The sandstone consists of quartz grains with minor dark chert fragments in a whitish kaolinitic matrix. Structurally, most of the rock foundation consisted of massive undulating layers of sandstone, sometimes cross bedded, which had dips between 2 and 10 degrees and strikes in the general ENE direction. Most of these units were separated by thin layers of shale, shale conglomerate or fine pebbly conglomerates containing minor amounts of fossilised plant material (coal).

An exception occurred on the right bank were up to 9 m of interbedded shales and fine sandstones were found. The sandstone unit above was fairly weathered and contained many thin layers of clay. A continuation of the shale / fine sandstone unit is thought to have been intersected on the left bank. This suggested that the unit was responsible for the incision of the river into the valley floor at the dam site and subsequent control of the alluvial deposition sequences upstream of the dam site.

Up to 20 m of alluvium / colluvium overburden was found to exist above the foundation rock." (DPI 1995)

4.13 Seismology

SEQWater has six monitoring stations throughout the three dam catchments (North Pine, Somerset and Wivenhoe) with seismometers, which measure seismic activity in x, y & z directions in real time. This data is transmitted via radio telemetry to the Wivenhoe Office where the information is analysed. Six accelerometers are installed, two at each dam, one at the crest and one at the base of each dam, to measure the actual dam movement during earthquakes.

A review of earthquakes and earthquake hazard in the Somerset Dam area, northwest of Brisbane was undertaken by Gibson (RMIT, 1995) using earthquake information published to December 1994. The study covers the area bounded by the Somerset and North Pine Dams and includes the Wivenhoe site.

No major earthquakes have occurred in the area since European settlement. The available data suggests the earthquake hazard in the area is above average for Queensland but below the average for eastern Australia.

The Report provides the annual exceedance probability (AEP) for peak ground accelerations as shown in Table 4-1

Table 4-1 - Earthquake Peak Ground Accelerations for the Wivenhoe, Somerset, North Pine Area

AEP	Peak Ground Acceleration
1 in 1	0.006 g
1 in 3	0.010 g
1 in 10	0.017 g
1 in 30	0.030 g
1 in 100	0.052 g
1 in 300	0.088 g
1 in 1,000	0.152 g
1 in 3,000	0.24 g
1 in 10,000	0.392 g
1 in 20,000	0.505 g

5. Raising Options for Wivenhoe Dam

To provide input into the provision of contingency storage in Wivenhoe Dam three different raising levels were selected:-

- Raise FSL by 2 m to EL69.0. This option (W1) provides a significant increase in storage, 228,000ML, for a relatively small capital cost (i.e. compared to a greenfield site) and could be achieved relatively simply. There is an additional opportunity to raise Wivenhoe FSL by 1 to 2m (which could be temporary) without the need to carry out extensive capital works. This is discussed as option W1A in Section 5.3.
- Raise FSL by 4 m to EL71.0. This option (W2) provides a mid point for the cost curve and marks a significant change in the scope of work required to satisfy the flood mitigation, flood security and operational requirements. This raising would provide an additional storage capacity of 481,000ML.
- Raise FSL by 8 m to EL75.0. This option (W3) was selected to provide an upper limit to the raising options and provide an additional 1,066,000ML of storage (effectively doubling the storage volume of Wivenhoe). This option would utilise the limit of land owned by SEQWater for the FSL storage. There would need to be compulsory acquisitions by Government of additional land impacted by flood operations up to at least the 1 in 500 AEP event. There is major capital works required to allow the dam to satisfy the flood mitigation and flood security criteria.

5.1 Summary Table

Key data for the proposed options is summarised in Table 5 - 1. The options are described in Sections 5.2, 5.3, 5.4, and 5.5

5.2 Option W1 - Raise Wivenhoe FSL 2m (EL69.0)

This option involves raising the storage level by 2m to EL69.0. This would provide and additional 228,000ML of contingency storage. The proposed scope of work for this option would involve:-

 Raising the fixed concrete ogee crest of the gated spillway by 1.5m to EL58.5 to preserve the air space controlled by the radial gate above FSL for flood mitigation.

Table 5 - 1 - Wivenhoe: Elevation data for Raising Options

		Da	am Structure		0,	Secondary Spillway	pillway		Tertiary Spillway
Raising Option	FSL	Dam	Service	Top of Radial	Ogee	Fuse P	Fuse Plug initiation	ion	Fuse Plug initiation
		Crest	Spillway	Gates	Crest	Bay 1	Bay 2	Bay 3	Single Bay
Current configuration	29	80	57	73	29	75.7	76.2	76.7	78.3 (100m wide) ²
Option W1 - 2m permanent	69	80	58.5	Approx 74.5	29	76.7	77.2	7.77	78.5 (140m wide)
Option W1A - 2m temporary	69	80	22	73	29	75.7	76.2	76.7	78.3 (120m wide for FSL EL67) 78.3 (120m wide for FSL EL69)
Option W2 - 4m permanent	7.1	84	09	92	69	7.77	78.2	78.7	Not Required
Option W3 - 8m permanent	75	87.5	70	763	73	81.7	82.2	82.7	Not Required

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¹ Ogee crest level the same for both the Secondary and the Tertiary Spillways.

 $^{^2\,\}mathrm{Spillway}$ not required to be finished until 2035 by the NRW Draft Guidelines on AFC

³ Existing radial gates replaced with fuse gates

- Raising of the three fuse plug embankments in the secondary spillway by 1m to preserve the initiation level for the first embankment at approximately the 1 in 5,000 AEP flood event as per the current design constructed in 2004. The initial trigger for the lowest of these fuse plugs would then be EL76.7.
- Construction of the tertiary spillway proposed currently for Stage 2 of the Wivenhoe Flood Security Upgrade at Saddle Dam 2 with a single 140m wide fuse plug initiating at a level of EL78.5.
- Maintaining the current Maximum Design Flood Level (MDL) of EL80m adopted for the Stage 1 upgrade work to avoid any work along the crest of the existing dam.

Drawings of the works required for this option are presented in Appendix D.

5.2.1 Spillway Capacity

Under the Governments proposed guidelines on spillway adequacy, the spillway capacity to allow the dam to safely pass the 2003 estimate of the Probable Maximum Flood (PMF) is required by no later than 1 October 2035. The spillway layout and capacity are discussed in the following sections.

Radial Gated Service Spillway

The flood mitigation benefits obtained for more frequent flood events from Wivenhoe Dam are due to the freeboard against the radial gates above the nominated FSL. To preserve the current flood mitigation performance if the FSL were raised, the air space between FSL and the top of the radial gates will need to be maintained.

The simplest method to achieve this would be keep the existing radial gate arrangement and raise the fixed crest level with reinforced concrete from EL57 to EL58.5. The existing trunnion corbel, bearing and winches would be maintained in their current location.

The bottom gate seal would need to be raised and incorporated in the new concrete. The lower 1.5m of the gate slots would be filled with concrete and a new connection with the bottom gate seal fabricated and installed. Extensive anchoring would be required along the existing crest to secure the new concrete to the underlying original concrete.

The works required to raise the crest will involve the placement of reinforced concrete with grouted anchors at a regular spacing to ensure connectivity to the underlying crest concrete over the length of the crest to a suitable profile (assumed to mirror the current profile with a 1.5m topping layer for the

development of costs). The control systems for the gates would also need to be modified.

Replacement of the radial gates was considered but requires major capital expenditure to fabricate and install new gates as well as modify the existing piers, trunnion corbel and anchoring. Due to the current design of the piers and trunnion anchoring it may not even be a possibility to install new radial gates to achieve the levels specified for this option. Drawings of the works required for this option are presented in Appendix D.

Raising of the fixed crests for the existing radial gated primary spillway will reduce the ultimate discharge capacity from 13,400 m³/s to approximately 12,000m³/s. This lost capacity could be replaced by the provision of an additional 20m of spillway crest length in the Stage 2 works proposed for Wivenhoe.

Secondary Fuse Plug Spillway

The Stage 1 works constructed for the Flood Security Upgrade of Wivenhoe in 2004 consisted of a three bay, 164m wide fuse plug spillway located at the right abutment of the dam. The first fuse plug embankment trigger level was set at EL75.7 (nominally the 1 in 6,000 AEP flood event) to protect the flood mitigation benefits of the storage and minimise the cost of the upgrade.

To preserve the design intent it is possible to raise each of the three fuse plug bays by 1m preserving this initiation AEP for the raised storage level. The divider wall between bay 1 and Bay 3 of the fuse plug would need to be raised by 0.2m which would be achieved using anchor bars and conventional concrete at limited cost. The Left Hand Side of the chute is protected by a concrete gravity wall. This would need to be raised by 0.5m to protect the main dam embankment. As the Maximum Flood Level (MFL) would remain at EL80.0 there would be no need to modify the bridge over the spillway, the ogee crest or the wall lining.

The control crest would remain at EL67.0 resulting in an inability to store water at the new FSL of EL69.0 until the fuse plug embankment was reconstructed.

Tertiary Fuse Plug Spillway

Stage 2 works are proposed to allow Wivenhoe Dam to pass the 2003 estimate of the PMF. The current proposal is to construct a 100m wide tertiary spillway through Saddle Dam 2. The spillway would be controlled by a single fuse plug embankment initiating at a 1 in 50,000 AEP flood event (EL78.3).

To preserve the design intent and pass the PMF for the raised FSL of EL69.0 would require the tertiary spillway width to be increased to 140m from the current proposal of 100m. The initiation level of the fuse plug embankment would be increased from 78.3 to 78.5 (approx 1 in 50,000 AEP event).

5.2.2 Existing Embankments

The Stage 1 flood upgrade works have been designed for the new MFL of EL80.0. Therefore no works are required to raise the embankments, bridges or Saddle Dams for the new FSL.

5.2.3 Key Data for a 2 metre Raising

Item	Proposed EL / Storage	Current EL / Storage
FSL	69m	67m
MFL	80m	80m
Dam Crest Level	80m	80m
Top of Radial Gate	74.5m	73m
Service Spillway Fixed Crest Level	58.5m	57m
Storage Vol FSL to Top of Gates	760GL	761GL
Secondary Spillway		
- Fuse Plug 1 Initiation	76.7m	75.7m
- Approx Initiation AEP	1 in 5,000	1 in 6,000
- Storage Volume FSL to Initiation Level	1122GL	1182GL
Planned Tertiary Spillway Stage 2		
- Crest Length	140m	100m
- Fuse Plug Initiation	78.5	78.3
- Approx Initiation AEP	1 in 50,000	1 in 50,000

5.2.4 Costs

Item	Cost	Comment
Raise the concrete ogee fixed crest of the existing service spillway by 1.5m in reinforced concrete	\$8.7M for the five bays	This assumes anchoring, reinforcement, provision of access, steel work, mechanical system modifications, provision of access to the post tensioned anchors installed by the Alliance.
2. Construct the Stage 2 spillway to provide PMF capacity for the Dam	\$27M	These works have been costed by the Wivenhoe Alliance.
3. Raise the secondary spillway fuse plug embankments, divider wall and the training wall	\$2.5M	This assumes that the fuse plugs are all raised by 1m with works carried out on the downstream face of the embankments
Construction Supervision and Overheads (20%)	\$7.6M	Contract Supervision and Constructors Overheads
5. Design and Approvals (15%)	\$5.7M	Concept Design, Approvals and Detailed Design
7. Contingency (30%)	\$11.5M	
Total	\$63.0M	

A breakdown of the costs estimates is provided at Appendix C.

5.2.5 Inundation Area

The inundation area is presented in Appendix K. SEQWater owns land up to EL75m for operation of the dam during flood events. Currently, large parcels of this land are leased out to adjacent landholders to provide land management. Impacts from the raised storage levels would include:-

- Some reduction of land available to lease holders adjacent to the storage area. When the dam was constructed the landholders subject to resumption were granted favourable lease conditions. While the lease states that an increase in storage level is possible at the discretion of SEQWater there would need to be an early and comprehensive consultation program implemented.
- Loss of environmentally sensitive habitat (minor). There are areas around the storage listed as environmentally significant. The inundation of these areas may require the preparation of an EIS.
- Loss of access to private recreation areas at Billie's Bay and Hay's Landing currently leased from SEQWater. Substantial costs would be incurred to provide alternative access to these areas. This is not a considered a major issue as potentially the recreation areas could be closed after consultation.

 Slightly more frequent flooding of bridges on the Wivenhoe – Somerset Rd and significantly more frequent flooding of the A&PM Conroy Bridge.

5.3 Option W1A – Operational Change of Wivenhoe FSL

To satisfy the upgrading criteria (pass PMF and maintain flood mitigation capability as currently exists) it is necessary to incur significant capital expenditure. However, there is an opportunity to raise the FSL of Wivenhoe Dam without major capital works. Such a raising could provide temporary contingency storage until permanent works are undertaken. This would provide an additional storage of 228,000ML for the regional contingency storage for minimal cost.

5.3.1 Flood Mitigation Capacity

The possibility of increasing the FSL to EL71 was investigated by SEQWater previously in a draft report on the raising of Wivenhoe prepared for discussion with NRW. While this additional storage did not have a major impact on the flood discharges for extreme flood events (events greater than the 1 in 10,000 AEP event) it did have implications for the operation of Wivenhoe and Somerset for more frequent flood events (floods smaller than the 1 in 500 AEP event). This impact (increased discharges) is summarised in a report by SunWater presented in Appendix E. Key outcomes from the SunWater investigations was that the 4m raising of the storage compromised the ability of the Flood Operations Centre to manage small flood events without the initiation of a fuse plug.

As this previous work identified that flood mitigation would be compromised by a 4m raising of the storage without modifying the spillways, significant modification works are proposed for Options W2. The proposed scope of work is presented in Section 5.4.

The flood operation group of SunWater was subsequently engaged during this investigation of contingency storage options to assess the impact of increasing the Wivenhoe FSL to EL69.0 on the more frequent flood events. This report is presented in Appendix F. This assumes that there are no modifications to the existing primary and secondary spillways. The assessment looked at the impact of the raised storage level on the 1 in 100, 1 in 200 and 1 in 500 AEP events. A summary of the results of these investigations is presented in Table 5-2.

It can be seen from the table that the increase in the FSL of 2m has very limited effect on the 1 in 100, 1 in 200 and 1 in 500 AEP events in terms of the peak flow at the Moggill Gauge. These results suggest that 1 to 2m raising of the storage would not compromise the ability of the Senior Flood Operations Engineer to manage a large flood event up to and above the 1 in 500 AEP event. As a short term measure to provide contingency storage it would therefore appear feasible to allow the storage of Wivenhoe to be held at EL

69.0m (2m above the FSL of EL67.0) following a flood event without compromising the flood mitigation ability of the dam for follow up events up to and above the 1 in 500 AEP event.

Subject to a detailed review of the structural adequacy of all elements of the dam, this could be achieved with almost no capital expenditure and minimal impact on flood mitigation and the flood capacity of the dam. Alternatively, a 2 metre raising of Wivenhoe's FSL could become permanent if the Stage 2 spillway (which is required by 2035) were widened to 120 metres

5.3.2 Flood Risk

Holding the storage at EL69 after a flood event presents a small increase in risk due to:-

- Increasing discharges for a limited range of events (from the 1 in 1,000 AEP event to the 1 in 5,000 AEP event) to try and limit fuse plug initiation.
- Increasing the likelihood of initiating a fuse plug embankment from an AEP of 1 in 5,000 to an AEP of approximately 1 in 4,000.
- Increasing the AEP of the Dam Crest Flood from 1 in 100,000 to approximately 1 in 95,000 (peak inflow of approximately 41,000m³/s instead of 42,600m³/s). Note: Under the states Proposed Guidelines on Acceptable Flood Capacity, Wivenhoe Dam would be required to have full PMF capacity by 2035.

It should be noted that the additional storage volume of 228,000ML could be used within 10 months therefore limiting exposure to the increased risk. However, the impact of concurrent flood events and joint probability with storage levels would need to be assessed in more detail to quantify risk. It should be noted that historical precedence has shown follow up events occurring in the same season as major flood events.

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Table 5-2 - Comparison of Wivenhoe Somerset Flood Operations Results

Design Flood Event Centered over Wivenhoe Dam

Peak Values

Flood	Wivenhoe	Wiv	renhoe Dam	am	Sor	Somerset Dam	am		River Flows	lows		Fus
Event	FSL	Elevation (m AHD)	Inflow (m3/s)	Outflow (m3/s)	Elevation (m AHD)	Inflow (m3/s)	Outflow (m3/s)	O'Reillys (m3/s)	Lowood (m3/s)	Breme r (m3/s)	Moggill (m3/s)	Plug Init.
Feb 1999	29	72.836	6862	1552	105.021	3766	1265	132	1553	424	1629	No
	71	74.766	6862	3494	104.804	3766	1645	132	3621	424	3943	No
	Increase (m or %)	1.930	0	125	-0.217	0	30	0	133	0	142	
Jan 1974	29	74.123	5019	3930	105.871	3456	1716	3260	6074	4241	6312	No
	71	74.425	5019	6643	105.595	3463	1490	3260	9001	4241	9562	No
	Increase (m or %)	0.302	0	69	-0.276	0	-13	0	48	0	51	
Feb 1893	29	75.161	9085	9695	107.370	4602	4363	3089	11337	1845	11403	No
	71	75.555	9085	10385	107.075	4602	3494	3089	11992	1845	12105	No
	Increase (m or %)	0.394	0	7	-0.295	0	-20	0	9	0	9	
WD Q100	29	73.094	5397	2392	103.165	1964	541	1921	2853	1349	3608	No
	69	74.501	5397	2503	103.165	1964	541	1921	2958	1349	3645	No
48hr	71	na	na	na	na	na	Na	na	na	na	na	na
ARR(87)	Increase (m or %)	1.407	0	5	0.000	0	0	0	4	0	•	
WD Q200	29	73.377	8433	2863	103.535	2377	615	1334	2974	1069	3197	No
	69	74.825	8433	3013	103.555	2377	614	1334	3116	1069	3164	No
48hr	71	74.820	8433	6037	102.963	2377	946	1334	7332	1069	7684	No
GTSMR	Increase (m or %)	1.448	0	5	0.020	0	0	0	5	0	7	
WD Q500	29	74.219	10543	4452	104.337	2930	968	1886	5922	1487	6193	No
	69	75.645	10543	4545	104.362	2930	980	1886	5862	1487	6123	No
48hr	71	75.664	10543	7649	104.462	2930	1188	1886	9311	1487	9694	No
GTSMR	Increase (m or %)	1.426	0	2	0.025	0	*	0		0	7	

5.3.3 Risk Reduction

There are opportunities to reduce exposure to this minor increase in flood risk such as:-

- Utilising early releases from the storage to take advantage of the flood warning system. Modification of the flood procedures could be made in conjunction with minor capital works to allow discharges to be ramped up earlier.
- Making the use of the additional stored water a priority within the region to draw down the storage quicker.

Early releases

A flood alert system was developed by NRW during the mid 1990's to provide accurate forecasting of the size of flood events and necessary gate operations to optimise the flood management from both Wivenhoe and Somerset Dams. This system was tested during a major flood event in 1999 and proved to be an accurate tool to predict flood levels and releases. The alert system is maintained by SEQWater and provides real time data to a flood operations centre in Brisbane.

This system will provide up to 18 hours advance warning during a flood event which allows the implementation of an early release strategy to lower the storage of Wivenhoe in the event of an imminent flood.

Currently the ability to release significant volumes of water from Wivenhoe Dam is limited by low level bridges across the Brisbane River at Kholo, Savages Crossing and Burton's Bridge. Savage's Crossing is cut by a flow of around 130m³/s, Burtons Bridge at 430m³/s and Kholo Bridge at 550m³/s. If these bridge's were raised to allow a discharge of 1,200 to 1,500 m³/s to be released without submerging them, then the opportunity for early releases becomes more attractive. The Brisbane River Flood Damages Study currently being carried out by Brisbane Water has also identified that these discharges would be non damaging.

A flow of 1,500m³/s equates to a release of 97,000ML in the 18 hour warning time available to the Flood Operations Centre (approximately half of the additional storage held) thereby significantly reducing the flood risk.

The ability to provide early releases is conditional upon concurrent flows in Lockyer Creek and the Bremer River and should be investigated further. It is estimated that for a capital expenditure of \$5M the three bridges could be raised to provide flood immunity up to a flow of 1,500m³/s. Note: The proposed raising of Mt Crosby Weir would require a raising of Kholo Bridge.

Use Additional Storage

A simple method to further reduce the risk associated with this option is to use the additional storage as quickly as possible. With the proposed water grid for South East Queensland being constructed and the operational flexibility it will provide, there is an opportunity to use the additional storage across the region to increase the rate of draw down for Wivenhoe Dam. Additional work is required to assess the rate of draw down possible but it is conceivable that the 228,000ML of additional storage could be used within 9 months.

5.4 Option W2 - Raise Wivenhoe FSL 4m (EL71.0)

This option involves raising the storage level by 4m to EL71m. This would provide and additional 481,000ML of contingency storage. The proposed scope of work for this option would involve:-

- Increasing the Maximum Flood Level from EL80m to EL83.4m to maintain the flood mitigation benefits of the storage.
- Existing Spillway
 - Raising of the fixed crest spillway from EL57 to EL60m and raising the existing spillway radial gates so that the top of the spillway gates is at EL76m. Alternatively the radial gates could be abandoned and a new uncontrolled spillway crest constructed at an EL 71m. Undershot gates could be provided through the fixed crest to reinstate the flood mitigation capacity. This would allow the new crest to replicate the outflow hydrographs for the 1 in 100 and 1 in 200 and 1 in 500 AEP flood events.
 - Raising the service bridge deck and the Brisbane Valley Highway bridge across the existing spillway up to EL82m, above the flow surface.
 - Raising and strengthening the upstream training walls and rockfill bunds.

Secondary Spillway

- Reconstruct a new ogee crest upstream of the existing spillway crest to EL69m and raise the fuse plugs by 2m each to maintain the initiation levels. Other spillway configurations are possible to avoid the loss of storage but this option appeared to be considerable cheaper by avoiding the need for a tertiary spillway.
- Raising the bridge over the secondary spillway by 2.5m to EL 82.8 to lift the underside of the bridge beams above the flow surface.

- Raise and post tension the divider walls and the entrance training walls for the spillway chute.
- Raise both Saddle Dams to EL84m
- Existing Dam Crest
 - Raising the crest of the dam by placing fill on the downstream face of the embankments to achieve a new crest level at EL84m
 - Reconstructing the Cormorant Bay entrance.
- Raising the bridges for the Brisbane Valley Highway away from the dam to EL82m and the bridges on the Wivenhoe - Somerset Road.

Drawings of the works required for this option are presented in Appendix D.

5.4.1 Spillway Capacity

The spillway capacity is required to allow the dam to safely pass the 2003 estimate of the Probable Maximum Flood (PMF) by October 2035. Spillway layout and capacity are discussed in the following sections.

Radial Gated Service Spillway

The flood mitigation benefits obtained for more frequent flood events from Wivenhoe Dam are due to the freeboard against the radial gates above the nominated FSL. To preserve the current flood mitigation performance if the FSL is raised, then an equivalent flood storage volume is required. This is not achievable with the current radial gates if the storage is raised to EL71m as the rate of opening for the gates during a flood event would be controlled by the rise in water level. This limitation is due to the need to avoid overtopping the radial gates as the storage rises. The current gates have 6m of storage rise available before overtopping providing the operational flexibility for flood mitigation. Raising the FSL to RL 71 without modifying the spillways does not provide the flood control centre adequate flexibility to manage the more frequent events.

To provide the required flexibility for flood mitigation it would be necessary to raise the current gates and the fixed crest level from EL57.0 to EL60.0. The proposed construction sequence would involve:-

- Drilling through the concrete pier to insert the necessary stress bars required for the gate loads. Installation and stressing of the bars.
- Construction of a new corbel and trunnion bearing support, winch ledge and modification to the hydraulic controls for the gate.

- Construction of a new upstream pier end to allow the upstream end of the pier to be post tensioned.
- Dewatering of one spillway bay at a time using the bulkhead gate.
- Disconnecting the radial gate from the trunnion bearing and raising the gate clear of the spillway crest to facilitate access to the crest.
- Placement of the concrete and anchoring on the existing spillway crest including new gate sill and cutting new gate slots for the side seals on the gate.
- Lifting the gate and connecting it to the new trunnion bearing support.
- Relocation and connection of the winch motors including modification to the hydraulic control lines. The hydraulic lines would need to be moved from the service bridge deck to another location to facilitate the raising of the service bridge.
- Raising of the service bridge deck and removal of the baffle plate from under the bridge. The baffle plate may be raised and re-used.
- Raising of the road bridge across the existing spillway to maintain the Brisbane Valley Highway across the dam.

The upstream training walls would need to be raised. This would be achieved through the use of anchor bars to join the raised concrete to the existing wall. The walls would then be post tensioned to cater for the increased load from the raised flood level.

Limited works would be required for the dissipator as the discharges from the spillway would be similar to the current design discharges.

The maximum design discharge from the spillway would remain at around 13.000m³/s

Constraints

A major constraint for this work would be the need to maintain at least four gates fully operational for the duration of the works. It is unlikely that works could be carried out during the wet season so the construction works would need to be programmed for the 6 months during the dry season. It is anticipated that this work would require three dry seasons to complete resulting in significant cost penalties.

Secondary Fuse Plug Spillway

The Stage 1 works constructed for the Flood Security Upgrade of Wivenhoe in 2004 consisted of a three bay, 164m wide fuse plug spillway located at the right abutment of the dam. The first fuse plug embankment trigger level was

set at EL75.7m (nominally the 1 in 5,000 AEP flood event) to protect the flood mitigation benefits of the storage and minimise the cost of the upgrade.

To preserve the flood mitigation benefits for more frequent events it will be necessary to raise the three fuse plug embankment initiation levels by 2.0m. This will preserve the initiation AEP at approximately 1 in 5,000.

Flood routing the PMF through the storage including the fuse plug embankments has identified the possibility of improving the flood security of the dam by changing the initiation levels to EL77.7, EL78.2 and EL78.7 and leaving the fixed crest level for the secondary spillway at EL69m. The loss of storage and the changed initiation levels would provide full PMF capacity with a maximum flood level of EL83.4m.

The incremental increases in downstream flood levels for the initiation of each fuse plug embankment need to be determined to asses the acceptability of this proposal. A major change in downstream flood levels (>1m) immediately following initiation of the fuse plug embankments would be unacceptable.

Tertiary Fuse Plug Spillway

The proposed Stage 2 works would not be required as the proposed modifications to the existing spillways would provide full PMF capacity.

5.4.2 Existing Embankments

The new adopted flood level of EL83.4 would require all of the embankments to be raised. Preliminary stability analysis has shown that raising the crest of the dam using a wave wall is not an option. Therefore it is proposed that the dam crest would be raised using placement of fill on the downstream face of the dam.

The proposed construction sequence would involve:-

- Diversion of the Brisbane Valley Highway off the existing crest.
- Stripping and stockpiling the downstream rip rap facing on the embankment.
- Extending the filter blanket on the downstream side of the core and providing an equivalent drainage system under the new downstream material.
- Placement of sandstone fill borrowed from adjacent land (potentially the spoil material from the Stage 1 works)
- Exposure of the clay core and downstream filters once the embankment has reached the height of the existing crest.

- Raising the height of the existing clay core and extending the upstream and downstream filters in the upper 5m of the raised embankment.
- Reinstating the road pavements and the upstream wave wall.

Constraints

There would be major disruption to the Brisbane Valley Highway traffic. An alternative route downstream of the dam would be required for the duration of the raising works for the embankment and the bridges. This would have significant social and environmental impacts on the downstream communities.

5.4.3 Key Data for a 4 metre Raising

ltem	Propose EL / Storage	Current EL / Storage	
FSL	71m	67m	
MFL	83.4m	80m	
Dam Crest Level	84m	80m	
Top of Radial Gate	76m	73m	
Service Spillway Fixed Crest Level	60m	57m	
Storage Vol FSL to Top of Gates	748GL	761GL	
Secondary Spillway (fixed crest at EL69)			
- Fuse Plug 1 Initiation	77.7m	75.7m	
- Approx Initiation AEP	1 in 5,000	1 in 6,000	
- Storage Volume FSL to Initiation Level	1044GL	1182GL	
Tertiary Spillway Stage 2			
- Crest Length	NA	100m	
- Fuse Plug Initiation	NA	78.3	
- Approx Initiation AEP	NA	1 in 50,000	

5.4.4 Costs

Item	Cost	Comment
1. Raise the Embankment Crest	\$24.3M	This includes filters, rip rap and bulk fill borrowed from the Stage 1 spoil.
Raise the existing Spillway Bridges	\$4.7M	This assumes modification to the piers, abutments, concrete works, reinforcement, bearings, deck and roadway.
3 Raise radial gates and modify the concrete crest	\$28.2M for the five bays	This assumes anchoring, reinforcement, provision of access, steel work, mechanical systems modifications, provision of access to the post tensioned anchors, post tensioning, gate modifications.
4. Raise the Saddle Dams	\$2M	This assumes that the embankment dam remain as zones earthfill.
5. Raise the auxiliary spillway crest and the fuse plug embankments	\$14.2M	This assumes that the training walls and raised, new ogee crest is constructed, fuse plug embankments are raised, divider walls are raised and post tensioned.
6. Raise the auxiliary spillway bridge	\$2.5M	This includes strengthening the piers, additional anchoring, new headstocks, jacking the bridge beams and raising the abutments.
7. Somerset Dam Works	\$2.5M	Modify power station and outlet works
8. Road and Bridge Works	\$8.5M	Includes diversion of 14km of road and works to raise three small bridges.
9. Construction Supervision and Overheads (20%)	\$15.7M	Contract Supervision and Constructors Overheads (does not include the road and bridge works away from the dam)
10. Design and Approvals (15%)	\$11.8M	Concept Design, Approvals and Detailed Design (does not include the road and bridge works away from the dam)
11. Contingency (30%)	\$23.5M	(does not include the road and bridge works away from the dam)
Total	\$138M	

Note: Approximately \$30M in savings is realised by the elimination of the Stage 2 works currently proposed

A breakdown of the costs estimates is provided at Appendix C.

5.4.5 Inundation Area

The inundation area for this option is presented in Appendix K. SEQWater owns land up to the EL75.0 contour due to the operation of the dam for flood mitigation. Currently large parcels of this land are leased out to adjacent landholders to provide land management. Impacts from the raised storage levels (not included in the cost estimate) would include:-

- Significant reduction of land available to lease holders.
- Loss of environmentally sensitive habitat (significant) including land at Mt Esk Pocket.
- Loss of recreation areas at Somerset Dam, O'Shea crossing, Captains Flat, Lumley Hill and Cormorant Bay.
- Loss of private recreation areas (Billie's Bay and Hay's Landing).
- Impacts on Somerset Dam outlet works and power station (costs incurred as the cone valves and power station would be inundated).
- Diversion of road required along the Wivenhoe Somerset Road (approximately 14km).
- Tarong Power Station off take would require modification.
- Minor reduction in the generating capacity at the Wivenhoe Pumped Storage Power Station.

5.5 Option W3 - Raise Wivenhoe FSL 8m (EL75.0)

This option involves raising the storage level by 8m to EL75.0. This would provide and additional 1,066,000ML of contingency storage, almost doubling the storage of Wivenhoe Dam. The proposed scope of work for this option would involve:-

- Increasing the Maximum Flood Level from EL80.0 to EL85.0 to maintain the flood mitigation benefits of the storage as well as supply the contingency storage.
- Existing Spillway
 - Removing the radial gates, raising the fixed crest to EL70 in reinforced and mass concrete and installing 6m high concrete fuse gates on the spillway crest.
 - Raising the service bridge and the bridge for the Brisbane Valley Highway across the existing spillway up to EL85.0.

 Raising and strengthening the upstream training walls and rockfill bunds.

Existing Dam Crest

- Raising the crest of the dam by placing fill on the downstream face of the embankments to achieve a new crest level at EL87.5.
- Reconstruct Cormorant Bay entrance.
- Raise both Saddle Dams to EL87.5
- Secondary Spillway
 - Reconstruct a new ogee crest upstream of the existing spillway crest to EL of 73.0 and raise the fuse plug embankments by 6m each to maintain the initiation levels.
 - Raising the bridge over the spillway by 5m.
 - Raise and post tension the divider walls.
- Raising the bridges for the Brisbane Valley Highway and the Wivenhoe
 Somerset Road up to EL85.0.

Drawings of the works required for this option are presented in Appendix D.

5.5.1 Spillway Capacity

The spillway capacity is required to be adequate to allow the dam to safely pass the 2003 estimate of the Probable Maximum Flood (PMF). Spillway layout and capacity are discussed in the following sections.

Radial Gated Service Spillway

It is not feasible to alter the radial gates in the existing spillway to cater for such a large raising of the FSL. The most cost effective alternative would be to abandon the existing spillway radial gates and utilise concrete fuse gates on the raised crest to provide the required spillway capacity. This does not provide as much control over flood events but would still provide significant protection to the downstream areas for the full range of flood events investigated.

The upstream training walls would need to be raised. This would be achieved through the use of anchor bars to join the raised concrete to the existing wall. The walls would then be post tensioned to cater for the increased load from the raised flood level.

Limited works would be required for the dissipator as the discharges from the spillway would be similar to the current design discharges.

The maximum design discharge from the existing spillway would be reduced to around 7,700m³/s.

Constraints

A major constraint for this option again would be the opportunity to work in only one bay at a time for the duration of the works.

The spillway works would need to be programmed after raising the embankment to avoid increasing the risk of failure during an extreme flood event.

Secondary Fuse Plug Spillway

The Stage 1 works constructed for the Flood Security Upgrade of Wivenhoe in 2004 consisted of a three bay, 164m wide fuse plug spillway located at the right abutment of the dam. The first fuse plug embankment trigger level was set at EL75.7 (nominally the 1 in 5,000 AEP flood event) to protect the flood mitigation benefits of the storage and minimise the cost of the upgrade.

To preserve the flood mitigation benefits of Wivenhoe Dam, it has been assumed that the secondary spillway would have the crest level raised to EL73.0 by building a much larger crest structure upstream of the existing spillway. The fuse plug embankment downstream of the new crest would need to be raised to EL81.7 for the first trigger level. This equates to approximately the 1 in 5,000 AEP event. The new MFL for this spillway configuration would be EL87.0.

Other works for the spillway would include:-

- raising of the spillway bridge by 6m.
- raising of the divider walls using post tensioning and reinforced concrete entrance walls.

Tertiary Fuse Plug Spillway

The proposed Stage 2 works would not be required as the existing spillways as modified would provide full PMF capacity.

5.5.2 Existing Embankments

The new adopted flood level of EL87.0 would require all of the embankments to be raised. Preliminary stability analysis has shown that raising the crest of

the dam using downstream stabilising fill is the only viable option. Therefore it is proposed that the dam crest would be raised using placement of fill on the downstream face of the dam.

Main Embankments

The proposed construction sequence would involve:-

- Diversion of the Brisbane Valley Highway off the existing crest.
- Stripping and stockpilling the downstream rip rap facing on the embankment.
- Extending the filter blanket on the downstream side of the core and providing an equivalent drainage system under the new downstream material.
- Placement of sandstone fill borrowed from adjacent land (potentially the spoil material from the Stage 1 works)
- Exposure of the clay core and downstream filters once the embankment has reached the height of the existing crest.
- Raising the height of the clay core and the filters to the new embankment height as the final 8m of raised embankment is constructed.
- Reinstating the road pavements and the upstream wave wall.

Saddle Dams

Saddle Dam 1 and 2 are zoned earthfill embankments constructed in saddles on the left abutment area of the dam. Currently these embankments do not store water at the FSL of EL67.0. Raising the FSL to EL75.0 would result in up to 6m of permanent storage against these embankments.

Given this permanent storage it is considered necessary to install filters within the embankment to minimise the risk of piping. Therefore the raising of the Saddle Dams to EL87.5 would include:-

- Stripping material from the downstream face and toe area.
- Placement of a two stage blanket filter across the embankment footprint downstream of the clay fill core.
- Raising the embankment in locally borrowed earthfill and extending the filter up to the new embankment crest.
- Extending the upstream rip rap and filter to the new crest level.

Coominya Saddle

There is a low saddle 8km along the Brisbane Valley Highway, near the turn off to Coominya, travelling toward Esk from Wivenhoe Dam which has a natural surface level at EL85.0. For the proposed MFL there would need to be a low level embankment constructed (maximum height of 3m to prevent flood flows from leaving the storage basin and discharging into the Lockyer Valley. This embankment would consist of a homogenous earthfill embankment with 1 (v) to 2 (h) slopes and a 5m crest width.

5.5.3 Key Data for an 8 metre Raising

Item	Propose EL / Storage	Current EL / Storage
FSL	75m	67m
MFL	87.0m	80m
Dam Crest Level	87.5m	80m
Top of Radial Gate	76m (6m high Fuse Gates)	73m
Service Spillway Fixed Crest Level	70m	57m
Storage Vol FSL to Top of Gates	164GL	761GL
Secondary Spillway (fixed crest at EL73)		
- Fuse Plug 1 Initiation	81.7m	75.7m
- Approx Initiation AEP	1 in 5,000	1 in 6,000
- Storage Volume FSL to Initiation Level	1218GL	1182GL
Tertiary Spillway Stage 2		
- Crest Length	NA	100m
- Fuse Plug Initiation	NA	78.3
- Approx Initiation AEP	NA	1 in 50.000

5.5.4 Costs

Item	Cost	Comment	
Raise the Embankment Crest	\$32.7M	This includes filters, rip rap and bulk fill borrowed from the Stage 1 spoil.	
Raise the existing Spillway Bridges	\$5.2M	This assumes modification to the piers, abutments, concrete works, reinforcement, bearings, deck and roadway.	
3. Raise the spillway crest, training walls, remove gates and install fuse gates	\$46.7M	This assumes anchoring, reinforcement, provision of access, steel work, provision of access to the post tensioned anchors, post tensioning, fuse gates	
4. Raise the Saddle Dams	\$3.2M	This assumes that the embankment dam remain as zones earthfill.	
5. New Saddle Dam at Coominya	\$0.9M	Zoned earthfill embankment	
Raise the auxiliary spillway crest and the fuse plug embankments	\$26.5M	This assumes that the training walls and raised, new ogee crest is constructed, fuse plug embankments are raised, divider walls are raised and post tensioned.	
7. Raise the auxiliary spillway bridge	\$5M	This includes strengthening the piers, additional anchoring, new headstocks, jacking the bridge beams and raising the abutments.	
8. Upgrade Somerset Dam outlet works and power station	\$15M	Works are required to upgrade the outlets as the FDC Valves and the power station would be 5m below the water surface. The modifications would include new valves and valve chambers.	
9. Road and Bridge Works	\$25M	Includes diversion of 40km of road and works to six bridges.	
10. Construction Supervision and Overheads (20%)	\$27M	Contract Supervision and Constructors Overheads (does not include the road and bridge works away from the dam)	
11. Design and Approvals (15%)	\$20.2M	Concept Design, Approvals and Detailed Design (does not include the road and bridge works away from the dam)	
12. Contingency (30%)	\$40.5M	(does not include the road and bridge works away from the dam)	
Total	\$248M		

Note: Approximately \$30M in savings is realised by the elimination of the Stage 2 works currently proposed

5.5.5 Inundation Area

The inundation area for this option is presented in Appendix K. SEQWater owns land up the EL75.0 due to the operation of the dam for flood mitigation. Currently large parcels of this land are leased out to adjacent landholders to provide land management. Impacts from the raised storage levels would include (not included in costs):-

- Inundation of private land during any flood event. May require the resumption of land by Government (SEQWater does not have any ability to compulsorily acquire land) and major potential for community opposition.
- Loss of environmentally sensitive habitat (high significance) including land at Mt Esk Pocket.
- Loss of recreations areas at Somerset Dam, O'Shea crossing, Captains Flat, Lumley Hill and Cormorant Bay.
- Loss of private recreation areas (Billie's Bay and Hay's Landing).
- Upgrading of the Somerset Dam outlet works and power as raised level would flood both. New outlet works would be required and major structural modifications required for the power station.
- Diversion of the Wivenhoe Somerset Road (approximately 40km) including bridge replacement.
- The Tarong Power Station off take would need to be raised.
- Relocation of residential houses in the Wivenhoe Storage area (three houses are built close to EL 75m.
- Minor reduction in the generating capacity of the Wivenhoe Pumped Storage Power Station.

Flood Impacts

Relatively frequent flood events would impact on key infrastructure including:-

- Land holder residences (up to 50 houses would be impacted).
- The Wivenhoe Pumped Storage Power Station at Wivenhoe owned by Tarong. Additional work would be required to reduce flood risk (the floor level of the generator room is at EL 78m).
- The Brisbane Valley Highway would be cut at several locations for longer durations during flood events.

6. Somerset Dam General Information

6.1 Background

Somerset Dam is a 47m high concrete gravity dam on the Stanley River upstream of Wivenhoe Dam. It is a dual purpose dam providing water supply to Brisbane and adjacent Local Authorities and flood mitigation benefits for the Brisbane and Ipswich areas. A general arrangement of the dam is shown at Figure 2. A dam data sheet is provided at Appendix G.

Water is released as required from Somerset Dam to supplement Wivenhoe Dam which in turn supplements the natural flow of the Brisbane River and maintains an adequate supply of water to the Mt Crosby pumping station, 132 kilometres downstream from Somerset Dam.

The plans of the dam are in imperial units. The level conversion that applies to these plans is:

AHD (m) =
$$EL(ft) \times 0.3048 - 0.124m$$

6.2 Concrete Dam and Spillway

6.2.1 General

The 47m high concrete gravity dam has a central gated overflow spillway, controlled by 8 radial gates and 8 low level sluice gates. Full Supply Level (FSL) is at EL99.00, some 1.45 m below the spillway fixed crest and the gates are used only for flood control purposes. There are 4 low-level outlets through the abutment units and a pipeline leading to the power station downstream of the dam on the right hand side abutment. Water is released as required from Somerset Dam to supplement Wivenhoe Dam.

There are 7 mass concrete abutment units on each side of the central spillway structure supporting a road bridge at EL112.34. The abutment units are constructed with an open overflow section below the bridge at EL107.46. Flood flows passing through these openings flow down the back face of the dam and impact on an unprotected rock foundation, before flowing laterally towards the central spillway channel.

The concrete dam is a conventional mass concrete construction with upstream slopes of 0.05H:1V and downstream slopes of 0.7H:1V in the central overflow section and 0.75H:1V in the abutment units. There is an abrupt "change of slope" above FSL in the abutment units that provides a constant width of nominally 4.3 m in the top section. This "change of slope" discontinuity provides a critical section for dam stability due to the applied flood loads (indicated by the results of previous stability assessments).

6.2.2 Galleries

There are a number of galleries within the dam and there is some inconsistency in nomenclature in the surveillance data. The following terminology is used throughout this Report:

- The Foundation Gallery is located at EL60 and is normally half full of water;
- The Lower Gallery is located at EL66.0;
- The Upper Gallery is located at EL88.9;
- Gate Inspection Chambers for the sluice gates are located within the central portion of the dam near the level of the Upper Gallery.

Concrete cracking has occurred at the Upper Gallery providing the second critical section for dam stability. The cracking has the potential to induce full hydrostatic loads within the dam section impacting on stability. There is considerable horizontal cracking exposed in the gallery walls, presumably from temperature and shrinkage effects. The main cracks are located on the downstream side of the gallery wall, one about 0.4 m above floor level and the other 1.6 m to 1.8 m above floor level. The latter crack extends for most of the length of the gallery and appears to be at the same level as a construction joint in the downstream face of the dam. Cracks can also be seen extending to the downstream face in the two access adits at each end of the dam.

Horizontal hairline cracking can also be seen in the upstream gallery wall and in the stairways to the lower gallery. In one spillway monolith the crack emerges in the upstream face of the gate shaft and there has been long term leakage. There is no indication of leakage elsewhere in the Upper Gallery.

Investigation work by SMEC included horizontally drilled holes into the downstream gallery wall. There was some difficulty in following the cracks with horizontal holes as the cracks deviated around 50 mm along the drilled length. The surface of the cracks was irregular and rough. Drilling water returned along the crack for 0.5m either side of the borehole collar.

The drilling showed the cracks were open for at least 1 to 2 m from the downstream face of the gallery. At some distance from the gallery, they reduce to hairline cracks that appear to extend to the downstream face, as seen in the access adits.

A number of consultants have reviewed the stability of Somerset Dam. Both Commerce (2005) and GHD (2000) assumed that a crack exists across the full width and length of the monolith blocks and if the dam was subjected to unprecedented water levels, the upstream cracks could develop significant

uplift pressures. SKM (2000) took the view that continuous cracking was a conservative assumption but accepted it for stability analyses.

It is not known whether cracking exists above or below the gallery. Cracks that emerge in the gallery walls will be drained by the gallery and are not necessarily a significant stability problem. If similar cracks exist above or below the gallery, these become a plane of weakness with uplift relieved only by the internal drains. Russo (1996) mentions cracking has been observed at EL95.3 and EL97.2.

Cracks have also been observed in the central pier area between the gate units L and M. Inspections and investigatory drilling, SMEC (2004), concluded that these cracks were due to thermal effects and were not significant in terms of adequacy of the dam.

6.3 Staged Construction

The construction of the township and dam began in 1935, but, work was suspended in 1942 due to the war. Work resumed on the construction of the dam in 1948. In 1953, the last structural concrete was placed and the hydroelectric power station on the right abutment of the dam was commissioned.

6.4 Foundation

Recent geological investigation studies (SMEC 2004) recorded the foundations to be generally slightly weathered and assessed visually to be of very high strength and high durability, showing no signs of significant degradation or weathering upon exposure. The dam was excavated into high strength, tight rock and while erosion of near surface materials below the dam could be expected under low to medium flows, the rock mass was tight at depth and was judged to have a high resistance to erosion.

6.5 Spillway Gates and Hoists

6.5.1 General

The dam has twenty-one controlled outlets, eight of which are radial gates (sector gates) installed on the top of the spillway. The remaining thirteen are conduits or sluice-ways through the bottom of the dam wall. One of the conduits supplies a small power station, four connect to fixed cone dispersion valves and the eight sluice-ways constitute the main outlet regulating capacity.

6.5.2 Radial (Sector) Gates

The eight radial gates are each 7m high by 8m long (23ft high by 26ft long), and are installed above full supply level and therefore can only be used to delay the passing of a flood peak that exceeds full supply level. While they do not normally come into operation during minor floods, they have been

considered in this study because they could be employed in a major flood event. The gates are counterbalanced so that the hoist does not have to lift the full weight of the gate.

6.5.3 Sluice Gates

The eight main sluice gates are each 3.7m high by 2.4m wide (12ft by 8ft). The gates are not counterbalanced, and are hoisted by two ropes, each rope being reeved into a four-part system. The sluice tunnels are protected by similar roller gates which are 2.7m high and 2.7m wide (9ft by 9ft) with hoists essentially identical to the main sluice gate hoists, the differences relating to the rope drums.

6.5.4 Radial Gate Winches

Each winch unit comprises a six-pole electric motor close-coupled to a worm reduction gear set. The output of the worm reduction passes through three sets of spur gears, the last spur gear being bolted to the rope drum. The rope is attached directly to the centre of the gate without any intermediate pulleys, while the counterweight is attached to both ends of the gate. An electric thrustor brake operates on the motor-coupling drum. A parking brake is operated by a hand wheel applying a band brake to a drum mounted on the last spur gear drive shaft. To improve level of control and safety, the bank brakes of the drums could be spring applied with actuator and/or manual release when the hoist is operational. This is less significant for the sector gates than the sluice gates, but could be significant if a severe event failure involved loss of a counterweight. There is a connection point on the winch for attachment of a petrol engine to provide emergency power if the electrical system fails.

6.5.5 Sluice Gate Winches

Each winch unit comprises a six-pole electric motor close-coupled to a worm reduction gear set. The output of the worm reduction passes through two sets of spur gears, the last spur gear being bolted to the rope drum. The rope drum is a double drum with two ropes attached. Each rope is reeved through pulleys to create a four-fall rope system connected to an equalising beam on the top of the gate. An electric thrustor brake operates on the motor to worm pinion coupling. A band brake is hand wheel applied to a drum bolted to the rope drum for added security. If there was a component failure within the hoist during operation, the thrustor brake would be ineffective. Higher than desirable gate closure rate could result, depending on the failure point in the drive. To increase safety the band brakes of the drums could be spring applied with actuator and/or manual release when the hoist is operational. There is a connection point on the hoist unit for attachment of a petrol engine to provide emergency power if the electrical system fails.

6.5.6 Brakes

In both hoists the power operated brakes are mounted at the high-speed, low torque end of the drive train. This is often done to minimise the size of the brake. In the case of gate hoists it is not necessarily the best location. If a component in the drive train fails then the gate is liable to drop uncontrolled, unless an operator is immediately available to operate the emergency brake. Alternatively, if the brake tends to drag it can apply sufficient torque to prevent the hoist operating. Both situations are undesirable, with the latter bearing more on the risk of a gate not opening when required to assist in flood releases. Modern practice is to have the main brake as close to the final drive as is practicable, on or close to the rope drum. In the case of both the sector and sluice gate winches this is where the manual emergency brake is located.

6.6 Geology

6.6.1 General

The following assessment of geological conditions at Somerset Dam has been taken from SMEC (2004).

6.6.2 Topography

The dam is oriented northwest-southeast across the Stanley River in a valley section that flows south-west. Natural valley slopes average 25 degrees. The valley sides are wooded with frequent rock outcrops.

6.6.3 Geology

Available Information

The geology of the damsite, as indicated by the regional maps, a map of the immediate area by C.W. Ball and comments included in the SKM and SEQWater reports consists of volcanic and igneous rocks of Triassic Age. These rocks include fine-grained andesite lavas that were intruded by medium to coarse-grained diorite and granite with a later intrusion of fine-grained felsite dykes.

Ball's map indicates a complex distribution of these rock types - presumably exposed during the excavation of the dam foundation in the 1930s and now obscured by the dam structure.

Information on site investigations before construction is restricted to several cross sections with logs of test holes and shafts which identify the depth to "jointed rock" and "hard rock". No rock names are included.

The description of excavation conditions during construction are limited to comments included in the SKM and SEQWater reports that describe the removal of jointed rock and the control of excavation by the presence of joints.

Several joint sets were identified. There is no mention of the presence of low strength rock substance.

Investigations during 1999-2000 and reported in the SEQWater report included the drilling of several holes through the dam into the foundations for the installation of piezometers. The foundation core recovered from these holes was extremely high strength andesite.

Observations During Site Visit by SMEC 2004

"Rock is extensively exposed on the sides of the Stanley River and several outcrops were observed in the riverbed downstream of the dam. In the immediate area of the dam, near the downstream toe, the cliff line formed by the foundation excavation is distinct on the left bank and partly obscured by landscaping on the right bank. Both areas have large outcrops of rock. See photographs 3.1 to 3.3 show rock outcrops on the abutments in SMEC (2004).

The rock substances observed in the outcrops are fine-grained andesite and medium grained diorite. Both rock types are assessed to have a very high strength. The contacts between the two rock types are intrusive with no apparent loss of strength near the contact observed. No felsite dykes were observed during the site visit.

The dominant feature of the rock outcrops near the dam, which is also apparent in other outcrops on the valley sides and riverbed, is the presence of well developed jointing. These joints appear to be concentrated in three sets one near vertical set striking approximately north-south, another near vertical set striking east-west and a third set dipping at about 10 degrees to the west-south-west into the right abutment.

Initial observation indicates that the vertical joints are smooth, often tight with a spacing that ranges from about 0.5m to about 3m. Observed joint continuity is less than 10m on the right bank but the cliff on the left bank appears to be controlled by a near vertical joint that is about 50m long. The low angle joints are irregular and rough with an apparent continuity on some surfaces of at least 20m" (SMEC 2004).

6.6.4 Engineering Geological Assessment

The data on site conditions before and during construction is limited but is supported by the observations made during the site visit. The dam is apparently underlain by a rock mass composed of several volcanic and igneous rock types. All contacts between these rock types are intrusive and therefore should not represent areas of rock mass weakness. The rock substance strength in all rock types is very high.

The feature that governs the engineering properties of the rock mass in the foundations is the rock mass defects and in particular the jointing. The control

of excavation by jointing is mentioned in the construction reports and is obvious in outcrops near the downstream toe.

As is common, near the natural ground surface there is some opening of the joint surfaces due to stress relief and weathering. The foundation excavation during dam construction appears to have been taken below these open joints. This is indicated by the downstream exposures and the core recovered from the recent drilling.

The concerns raised about foundation conditions has speculated that the rock downstream of the dam toe in the non-overflow sections may be eroded to the extent that the stability of the dam structure may be affected.

Features that are relevant include:

- the very high substance strength of the rock;
- the presence of a topographic high of significant height downstream (about 10m high on the left bank);
- the characteristics of the joints in the area location, orientation, spacing, continuity, surface shape, surface condition, opening, infilling; and
- the level of the existing excavation apparently below the level of open joints.

It appears unlikely that the rock substance could be eroded by flood overflow water from the reservoir. High velocity water flow could attack the joints and remove detached blocks. The amount of material that could be displaced would depend on the duration of any overflow and the characteristics of the rock mass defects - the joints.

Based on the available information a preliminary assessment is that flood overtopping could remove some material from the rock outcrops near the downstream toe but the extent of this material removal is unlikely to extend into the dam foundation.

This assessment could be confirmed by a limited amount of additional site investigation.

6.7 Seismology

Refer to Section 4.13.

7. Raising Options for Somerset Dam

Currently the storage at Somerset Dam has a FSL at EL99 and a storage volume of approximately 380,000ML. To provide input into the provision of contingency storage in Somerset Dam three different raising levels were selected:-

- Raise FSL by 2 m to EL101.0. This option provides a significant increase in storage of 92,000ML above the current storage of 380,000ML for a relatively small capital cost (i.e. compared to a greenfield site development) and could be achieved relatively simply.
- Raise FSL by 4 m to EL103.0. This option provides a mid point for the cost curve. Upstream impacts start to become a key issue for this option. This raising would provide an additional storage capacity of 202,000ML.
- Raise FSL by 6 m to EL105.0. This option, selected to provide an upper limit to the raising options, provides an additional 332,000ML (effectively doubling the storage volume of Somerset). At this level, houses upstream of the dam are inundated and would require relocation and Kilcoy is isolated without extensive road works.

SMEC were engaged to investigate the works required to raise the FSL to the above levels. Their report is presented in Appendix J.

7.1 Scope of Works

The proposed scope of works required for all options would include:-

- Modifying the radial gates and hoist to allow them to be removed from the flow for the PMF. This work is required even without raising the storage.
- Provision of side seals, bottom seals, side guide rollers, roller paths for the radial gates to allow them to be used to retain water.
- Post tensioning of the dam for the flood load cases.
- · Upgrading of the spillway dissipator.

There would be a nominal increase in MFL for the 2m raising. The 4m and 6m raisings would increase the MFL by 1.5m and 2.5m to EL113.5m and EL 114.5m respectively

The 4m and 6m raisings would also include:-

- Road diversion and bridge upgrades for the Daguilar Highway at Mary Smokes Creek
- Relocation of picnic facilities and public recreation areas.
- Relocation of the water supply intake and treatment plant for Kilcoy.

The 6m raising would require relocation of low lying houses in Kilcoy

7.1 Spillway Capacity

Increasing the FSL would negatively impact on the MFL and the flood discharge capacity of Somerset Dam. The spillway consists of 8 sluice gates, 4 regulators and eight overflow spillway bays with sector gates (not used to control flow). There is also the potential for the concrete abutments to be overtopped once the storage level exceeds EL107.46. Extensive works are required to strengthen the existing spillway to cater for the PMF. Refer to the SMEC report.

7.2 Key Data for the Raisings

Item	Current Storage	FSL Raised 2m	FSL Raised 4m	FSL Raised 6m
FSL (EL m)	99	101	103	105
MFL (EL m)	112	Approx 112	Approx 113.5	Approx 114.5
Dam Deck Level (EL m)	112.34	112.34	113.0	114.0
Top of Non Overflow Crest (abutments) (EL m)	107.46	107.46	107.46	107.46
Top of Sector Gates (EL m)	107.46	107.46	107.46	107.46
Service Spillway Fixed Crest Level (EL m)	100.46	100.46	100.46	100.46
Storage Vol FSL to Top of Gates	520GL	428GL	318GL	188GL

7.3 Estimated Costs

The estimated cost of physically raising the FSL of Somerset Dam for all options is \$55M. Refer to the SMEC report for a break down of the costs.

For the 4m and 6m raisings additional costs of \$15M and \$30m respectively will be required for the highway diversion, relocation of recreation facilities and relocation of property at Kilcoy.

For the 6m raising additional costs will include the purchase and relocation of low lying houses at Kilcoy and surrounding areas. An allowance of \$50M has been estimated but has not been included in the direct costs.

7.4 Inundation Area

The areas of inundation are presented in Appendix K. Impacts from all raisings of the storage level include:-

- Loss of environmentally sensitive habitat. While the loss is of generally minor significance it becomes major for the 6m increase in FSL.
- Some loss of picnic areas and recreational facilities at the Spit and Kirkleigh.

The 4m increase in FSL causes inundation of the Daguilar Highway at Mary Smokes Creek resulting in the need to relocate the Highway and the 6m increase extends the inundation into Kilcoy.

The 6m increase also inundates low lying houses in Kilcoy

7.5 Flood Impacts

- All options to raise the dam will cause more frequent inundation of private land during flood events with potential for community opposition.
- Kilcoy, which is impacted when water levels reach EL102.5m, will be flooded more frequently. For the 2m and 4m increases in FSL the AEP of flooding Kilcoy will be 1:20 and 1:5 respectively. If the dam is raised 8m Kilcoy will be impacted by any flood event.
- For all increases there is a loss of flood storage volume and an increase in the discharges to Wivenhoe Dam. For the 2m increase the impacts are minor. However, the loss of storage is significant for the 4m and 6m increases with a resulting moderate impact on the performance of the Wivenhoe /Somerset system.
- More frequent disruption to the major roads surrounding Kilcoy including the Daguilar Highway. The impacts are progressively more severe as the raising level is increased.

8. Discussion

Seven options for the provision of contingency storage in Wivenhoe and Somerset Dams have been investigated by SEQWater for the South East Queensland Water Supply Strategy. These options are presented in Table 8-1.

Table 8-1 - Summary of Raising Options

Option	Raising (m)	Raised FSL (m)	Increase in Storage Capacity (ML)	Estimated Cost (\$m)
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 Option	ns			
S1	2	101	92,000	55
S2	4	103	202,000	70
\$3	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 given the size of the catchment and the corresponding probability of capturing the additional contingency storage.

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

8.1 Flood Security Costs

Neither Wivenhoe nor Somerset currently satisfies the State's Guidelines on Acceptable Flood Capacity (2005). 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 tied up in the works to increase flood security. It is arguable as to whether these costs should be included for the provision of contingency storage as SEQWater is likely to incur these costs even if the storage is not raised. An attempt has been made

to separate out the additional costs associated with the provision of additional storage from the likely costs required to upgrade the current dams. These are presented in Table 8-2.

Table 8-2 - Flood Security Costs

Option	Increase in Storage Capacity (ML)	Raising of FSL Direct Costs (\$m)	Flood Security Direct Costs (\$m)	Total Estimated Cost (\$m)*
W1	228,000	13	40	63
W1A (Operational change)	228,000	NA	5 to 10	5 to 10
W2	481,000	64	40	138
W3	1,066,000	151	40	248
Somerset Raising Optio	ns			
S1	92,000	1.5	24	55
\$2	202,000	1.5	24	70
\$3	332,000	1.5	24	85

Note:

- The total costs include contingencies, design and construction supervision not included in the direct costs
- The Wivenhoe flood security costs comprise the current estimated costs of the Stage 2 works. This work is required to be undertaken by SEQWater by 2035.
- The works to raise the FSL at Somerset include gate seals, upgrading the crest, and upgrades to the controls. This work is constant for the three options as up to 6m additional storage could be held against the sector gates after upgrading.
- The MFL for the Somerset Raising Options is similar for all three cases. Therefore, the post tensioning and downstream strengthening work are of a similar order of cost (at this level of assessment).

It can be seen that the incremental costs associated with the small increase in the FSL are much less than the costs required to upgrade the dam to full PMF Capacity.

8.2 Potential benefits.

There has not been as yet, any attempt made to assess the likely benefits of any of the options by for example, assessing the frequency and volumes of storage likely to be held above the existing FSL's at either or both of the dams. Additional water in storage, available only at intervals, could provide an improvement in levels of service but this would need to be quantified before proceeding further with any of the high cost options.

8.3 Flood operational procedures.

The down stream flood impact results presented for the Wivenhoe W1B option are based on minor variations to the operational procedures defined in the existing approved Flood Operations Manual. Whether the impacts and these variations are acceptable will need to be agreed with the regulator and downstream stakeholders.

SunWater, consultants for this work, have reported that other variations to the operational procedures warrant consideration based on this recent work.

8.4 Wivenhoe Raisings.

- Options W1, W2 and W3 each involve complex work in the spillway which could only proceed one bay at a time and probably only in the dry season months.
- The cost of such complex work with very difficult access is difficult to estimate with reasonable certainty.
- Options W2 and W3 involve raising the embankments and therefore an at least temporary relocation of the Brisbane Valley Highway. Less significant disruption would be caused to the Wivenhoe Somerset Road. The cost of these disruptions has not been estimated.
- For Option W1A, the increase in downstream flooding appear to be relatively minor but its acceptability would be dependent on consultation with stakeholders. A raising of at least Kholo Bridge and possibly of Burtons Bridge and Savages Crossing could be required to deal with possible concerns.
- For Option W1A, the existing fuse plug will be triggered somewhat more frequently (existing 1:5,000 AEP flood). The frequency and consequences will need to be examined.

8.5 Somerset Raisings

- Each of the options assumes that the dams existing flood mitigation performance does not need to be maintained. Possible impacts have not been examined.
- The gates and hoist equipment at Somerset Dam are of considerable age. There is some uncertainty whether it can be adapted as proposed.
- Cracking in a number of the dam monoliths and other stability concerns could be addressed concurrently with the raising proposals.
- Community opposition to the higher raising proposals is likely to be very strong.
- Highway dislocation costs have not been estimated.

9. Recommendations

It is recommended that:-

- The provision of contingency storage in Wivenhoe Dam is investigated further. A 2m raising in the FSL could be achieved with minimal capital costs subject to addressing regulator and stakeholder issues.
- A detailed assessment is carried out to develop and asses changes to the flood manual to allow the storage of the additional 2m in Wivenhoe. The impact of the changes should be assessed for the full range of Annual Exceedance Probabilities and Storm durations. This assessment should also link with the Brisbane River Flood Damages Assessment currently being carried out by Brisbane City Council.
- A detailed review of the structural adequacy of the various components of the dam is carried out to confirm the assumptions of this report. This review will provide more design detail to refine the cost estimates and confirm the feasibility of the proposed increase in storage level.
- A program of consultation with the downstream stakeholders is carried out with the proposed changes to the flood manual once the assessment of flood events is completed.
- Raising of the FSL level of Somerset Dam be discounted due to the impacts on the upstream population during flood events. Major flood events will already result in inundation of the Kilcoy and surrounding private properties and infrastructure.
- SEQWater be provided with the opportunity to instigate a public consultation process prior to the public release of options to raise the storage levels of Wivenhoe.

10. References

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GHD, 2002	Somerset Dam Annual Inspection Report, prepared by GHD for inspection on 4 September 2002
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SMEC, 2004	Somerset Dam – Detailed Risk Assessment Stage 2; prepared by SMEC Australia Pty Ltd, March 2004
WA, 2004A	Somerset Dam – Maximum Flood Level Estimates for Various Gate Operation Scenarios; prepared by Wivenhoe Alliance, February 2004.
WA, 2004B	Design Discharges and Downstream Impacts of the Wivenhoe Dam Upgrade; prepared by Wivenhoe Alliance 2004.
WA, 2004C	Wivenhoe Dam Spillway, Augmentation Works: Review and Updating of Risk Assessment, prepared by Wivenhoe Alliance 2004.
WA, 2005	Dam Failure Analysis of Wivenhoe Dam; prepared by Wivenhoe Alliance, Q1091, WIV-RP-HD-006, 2005

11. Figures

WIY/DWG/CG/1003 NORIZENTAL CIATUM - LOCAL GROUP SANDE SANDE POROD IN VERTEAL DATUM - A.H.D. PSA 3142 RL 74.194 SURVEY MDTES VERTEAL BATCH -SADDLE DAM 2 SPILLWAY WIVENHOE DAM UPGRADE SURVEY & SET-OUT CONTROLS Sp. 192 मा ए LAWER MADE D 104 SED WATER INFORMATION

Figure 1 - Wivenhoe Dam General Arrangement

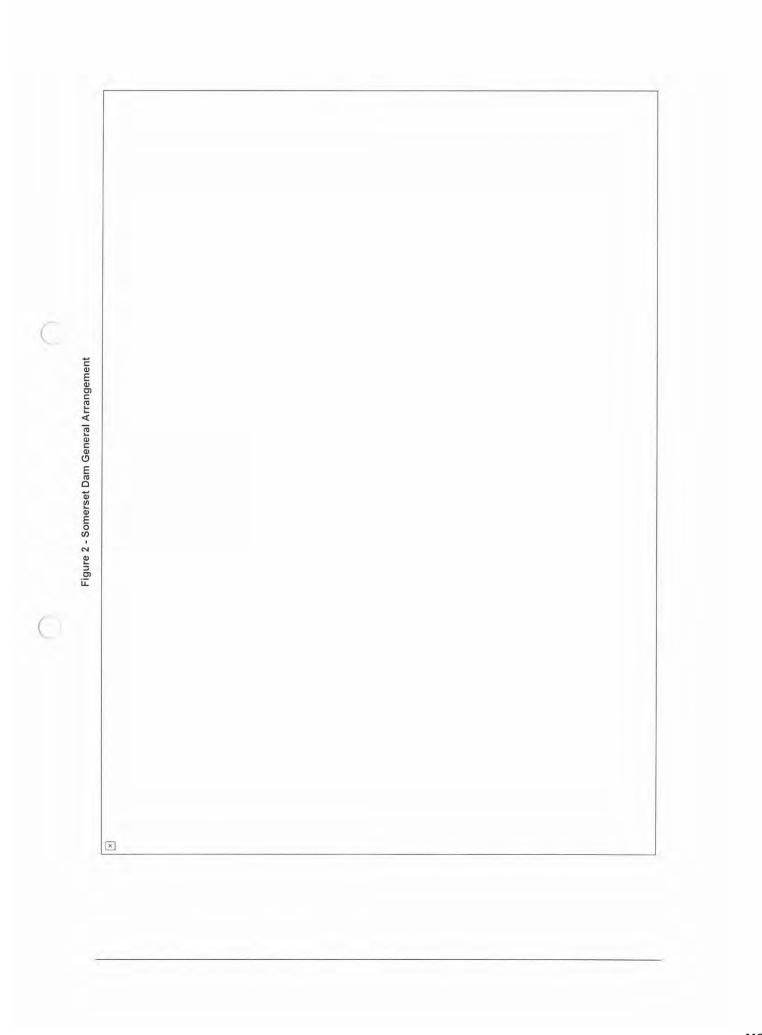


Figure 3 - ANCOLD Total Societal Risk Assessment - from Wivenhoe Alliance, 2004



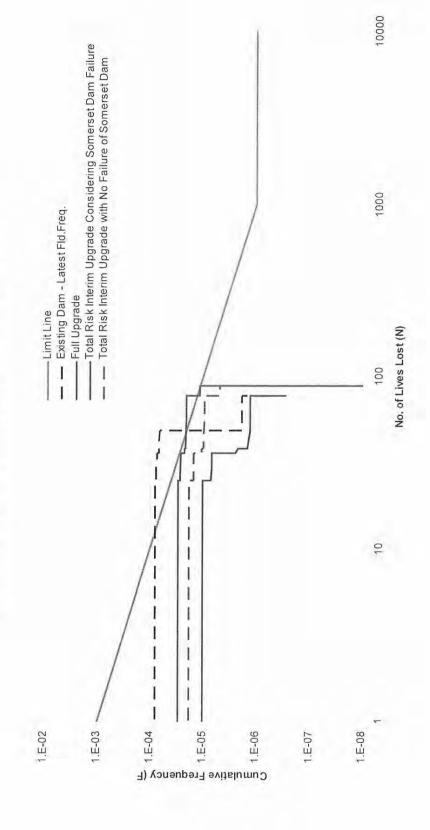


Figure 4 - ANCOLD Incremental Societal Risk Assessment - from Wivenhoe Alliance, 2004

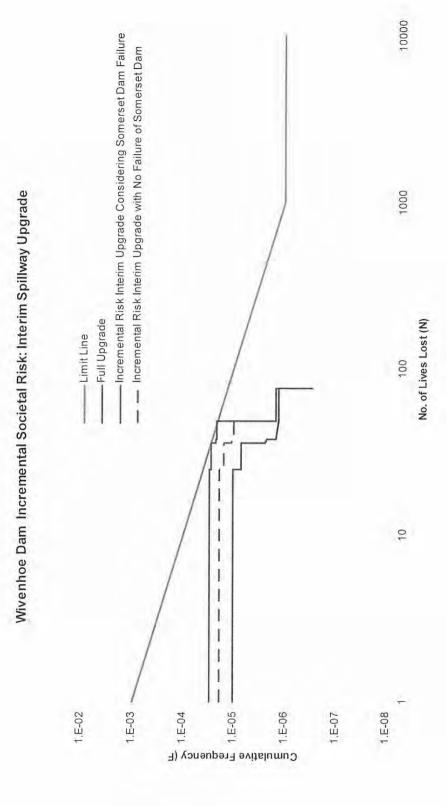
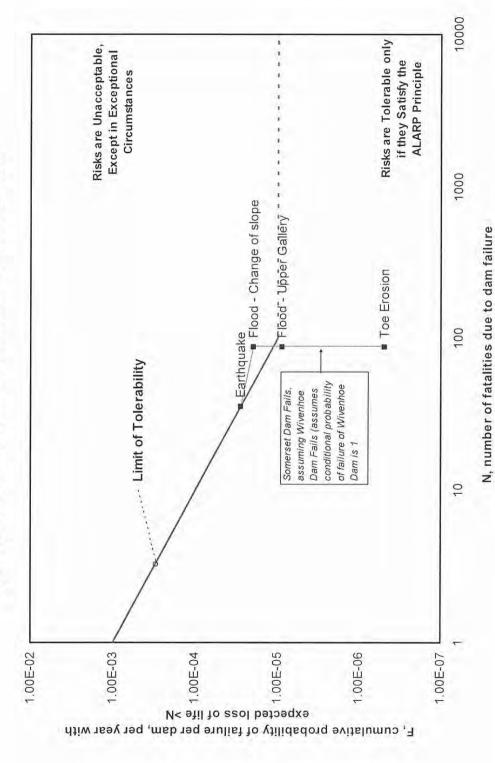


Figure 5 - ANCOLD Societal Risk Assessment – from SMEC, 2004



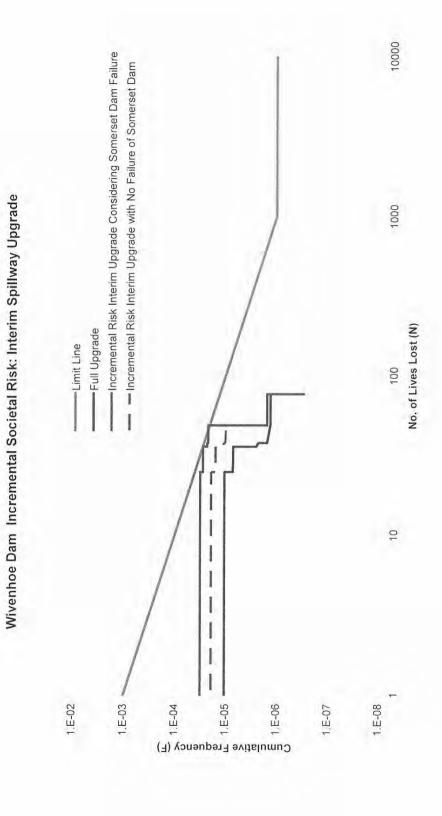
Appendix 5.1 ANCOLD Societal Risk Guidelines: Existing Dams

Figure 6 - ANCOLD Total Societal Risk Assessment, - from Wivenhoe Alliance, 2004

———Full Upgrade
————Total Risk Interim Upgrade Considering Somerset Dam Failure
——— Total Risk Interim Upgrade with No Failure of Somerset Dam 1000 Wivenhoe Dam Total Societal Risk: Interim Spillway Upgrade Existing Dam - Latest Fld. Freq. *Limit Line No. of Lives Lost (N) 100 1 10 Cumulative Frequency (F 1.E-02 1.E-03 1.E-07 1.E-08

10000

Figure 7 - ANCOLD Total Societal Risk Assessment, - from Wivenhoe Alliance, 2004



Appendix A. Wivenhoe Dam Description and Pertinent Data

Reservoir

Full Supply level (FSL) EL67.0

Storage (at FSL) 1,150,000 ML Reservoir Surface Area (at FSL) 10,820 ha

Dam

Type Zoned earth and rockfill dam with a concrete gravity spillway

section and two earthfill saddle dams.

Crest Level EL79.15m excluding the wave wall

Main Dam

Type Earth and rockfill dam

Crest Level EL79.15

Wave Wall EL79.7m (top of wall)

Dam length (including spillway section) 2260m

Dam height (maximum above

downstream toe) 53m

Right embankment Central core embankment Sloping core embankment

Saddle Dam 1

Type Earthfill embankment

Crest Level EL80.0m
Crest width 4.0m
Upstream slope 3H:1V
Downstream slope 2.5H:1V
Embankment height (maximum) 11m
Embankment Length 160m

Saddle Dam 2

Type Earthfill embankment.

Crest Level EL80m
Crest width 4.0m
Upstream slope 3H:1V

Downstream slope 2.5H:1V
Embankment height (maximum) 6m
Embankment Length 225m

Outlet Works – Water Supply Intake

Variable level draw off facility

Penstocks 2

Penstock diameters 1.9m & 3.6m

Outlet Works – Regulators

Number of regulators 2

Type and size of regulators 1.5 m diameter fixed cone

dispersion valve

4.5MW power station owned by

Stanwell Corporation

Level of centreline of regulators

Service Spillway

EL31.5

Type Gated, concrete gravity section

with flip bucket and flanking

retaining walls.

Number of radial gates 5

Size of each gate 12.0m wide x 16.5m high

Top of gates when closed EL73.0
Top of bridge deck EL79.15
Spillway width (excluding piers) 60.0m
Unlined stilling basin invert EL17.0

Peak water level as a result of PMF Embankment overtopped Imminent Failure Flood (IFF) Embankment overtopped 1 in 100,000 AEP event

Maximum flood level (IFF) EL80.0
Peak discharge (IFF) 13,000m3/s

Secondary Spillway

Type Ogee crest spillway with limited

concrete lining controlled by fuse

plug embankments

Number of Fuse Plug Embankments 3

Size of each Fuse Plug Embankment Bay 1 (centre) 34m wide

Bay 2 (LHS) 64m wide Bay 3 (RHS) 65m wide

Initiation Levels Bay 1 (centre) EL75.7

Bay 2 (LHS) EL76.2 Bay 3 (RHS) EL76.7

Height of Ogee Crest 3m Spillway width (excluding piers) 159m Chute Floor Downstream
PMF Peak water level
Imminent Failure Flood (IFF)
Maximum flood level (IFF)
Peak discharge (IFF)

EL64.0 Embankment overtopped 1 in 100,000 AEP event EL80 14,900m3/s

Appendix B. Wivenhoe Dam Risk Assessment, Failure Modes and Consequence Assessments

Risk Assessment Studies

A number of studies have been undertaken in recent years relating to various aspects of Wivenhoe and Somerset Dams. Somerset Dam is relevant in relation to the possibility of a cascade failure of the two dams. These include:

- A preliminary risk assessment of Wivenhoe, Somerset and North Pine Dams by SKM, reported at SKM (2000);
- A detailed risk assessment for Somerset Dam by SMEC;
- A review and updating of the Wivenhoe risk assessment report by the Wivenhoe Alliance, WA (2004C).
- Two short studies for Somerset Dam by Commerce, Commerce (2004 and 2005). These were based on a hydrology study by WRM Water and Environment, WRM (October 2004). It is understood that this Report has been revised and these revisions need to be incorporated in to the Commerce conclusions.

Failure Modes

Wivenhoe Dam, following the completion of the Stage 1 Upgrade works, is designed to handle a 1 in 100,000 flood event centred on the Wivenhoe catchment, assuming that Somerset Dam does not fail. A cascade failure would only result from a major flood event. Wivenhoe reservoir has sufficient capacity to store the normal Somerset storage without initiating the secondary spillway fuse plug.

The impact of a Somerset Dam failure on Wivenhoe Dam was detailed at Commerce (2004). The dominant risk associated with Somerset Dam is structural failure of the non-overflow units at the change in slope during a major flood event. Stability studies indicated, with some reservations over the cracking in the upper gallery, that the dam would satisfy normal stability criteria for the 1 in 100,000 AEP flood event centred on the Somerset catchment.

On this basis it is argued (Commerce, 2005), that any upgrade to Somerset Dam should attract the same degree of urgency as Stage 2 Wivenhoe works and should be examined at that time.

It is noted that there was a later revision of the hydrological studies, WRM (2005). The relevance of this update to the above comments is unclear.

Consequences of Failure for Wivenhoe Dam

Loss of Life Assessments

SKM (2000) provided loss of life estimates for both day and night failures of Wivenhoe Dam for a variety of load cases. SMEC (2004) has used the SKM data for total loss of life at night and adopted the following loss of life figures for the risk assessment:

0	IFF Failure (Main Embankment)	89
	Earthquake	36
	Normal Operating Condition	77

Financial Loss Assessments

SKM (2000) has assessed the financial consequences associated with the failure of Wivenhoe Dam under three broad categories; third party damages, SEQWater direct damages and SEQWater loss of revenue. A major failure of Wivenhoe Dam was valued at \$12B to \$25B.

Environmental & Intangible Consequences

The SKM (2000) study included an assessment of environmental and intangible consequences. SKM assessed the incremental environmental consequences for Wivenhoe Dam as low while the incremental intangible consequences were assessed as high. It concluded that:

"These environmental and intangible consequences were far outweighed by the significant life loss and financial consequences for this portfolio. As such they did not play a significant role in the development of the risk reduction strategy."

Risk Analysis

The original risk analysis for Wivenhoe Dam was developed by SKM and is reported at SKM, 2000.

WA (2004C) reviews the risk to life presented by Wivenhoe Dam in both its existing state and after flood security upgrading works. It is an extension of the risk assessment undertaken by SKM (2000) and starts with a review of the

earlier risk analysis of Wivenhoe Dam. It then considers the effect of the latest (2003) flood hydrology on the dam's risk profile.

The Wivenhoe Alliance further revised this work to incorporate the risks associated with a Somerset failure. The FN Charts for total loss of life are shown at Figure 3 and indicate that:

- The original Wivenhoe Dam plots well above the ANCOLD Limit Line;
- The Stage 1 Upgrade for Wivenhoe brings the risk below the ANCOLD Limit Line provided Somerset does not fail;
- If allowance is included for risks associated with a Somerset Dam Failure, the plot rises just above the Limit Line;
- The Stage 2 Upgrade brings the risk well below the Limit Line.

The total risk to Wivenhoe Dam as a stand-alone construction following the Stage 1 Upgrade works is assessed at 0.84*10⁻⁵. Introducing the risks associated with a Somerset failure increases these risks by a factor of 2,4 to 2.0*10⁻⁵.

The risk to life matrix (F-N Chart) using the incremental loss of life figures is reproduced at Figure 4. This shows the Wivenhoe risks plotting below the ANCOLD Limit Line.

The report recommended that due to its relatively simplistic nature and the way in which judgement was used (in conjunction with deterministic analysis) to estimate conditional probabilities, the risk analysis should not be used to determine the satisfaction of ANCOLD risk criteria in an absolute sense.

However, the risk analysis was useful in comparing the relative risk presented by various states of the dam (existing dam, fully and partially upgraded dam, various levels of radial gate upgrading). It further recommended that consideration be given to further, slightly more rigorous risk analysis. However, the decision for doing this analysis should not be made until the final option is determined and the dambreak studies completed and the consequences re-assessed.

Limitations of Risk Studies

The Wivenhoe Alliance study is a modification of the SKM study and as such is a Preliminary Risk Assessment. If the risk profile is a concern, a detailed risk analysis should be carried out, that includes a detailed assessment of the consequences, particularly loss of life. Previous consequence studies are dated and there has been considerable development in the Brisbane River study since the previous assessment.

Hazard Category

The Dam Safety Management Plan, SEQWater (2005) at Section 6.1 states "The Corporation's dams are classified under the ANCOLD classification guidelines as HIGH hazard because of the significant consequences of a dam failure".

The basis for this classification is outlined at GHD, 1997 and is based on:

- The significant development downstream in the Brisbane and Ipswich metropolitan areas, with the population at risk (PAR) numbering in the tens of thousands.
- The extensive residential and commercial development in the Brisbane along the river banks;
- The investment in infrastructure including key road and rail bridges.

The classification was based on an early version of ANCOLD, 2000B. The current Guideline has a more extensive classification system and it is recommended that the Hazard Classification be reviewed using the current Guideline.

It is anticipated that Wivenhoe Dam would be classified as Extreme Hazard.

Conclusions

The risk assessments for Wivenhoe Dam are Preliminary Assessments only. If the risk profile is a concern, a detailed risk analysis should be carried out, that includes a detailed assessment of the consequences, particular loss of life. Previous consequence studies are dated and there has been considerable development in the Brisbane River since the previous assessment.

Appendix C. Cost Estimates for Raising Wivenhoe Dam

Appendix D. Wivenhoe Dam Drawings

Appendix E. SunWater Assessment of Raised FSL (EL71) on Flood Operations

Appendix F. SunWater Assessment of Raised FSL (EL 69) on Flood Operations

(

Appendix G. Somerset Dam Pertinent Data

Reservoir

Full Supply level (FSL) EL98.93
Storage (at FSL) 369,000 ML
Reservoir Surface Area (at FSL) 4,400 ha

Dam

Type Concrete gravity dam

Crest Level

bridge deck level EL112.34m
non-overflow crest level EL107.46m
spillway crest level EL100.45m
Dam height (maximum) 58m
Embankment Length 308m

Outlet Works - Regulators

Number of regulators 4

Type and size of regulators 2.3 m diameter fixed cone dispersion valves

Level of centreline of regulators EL69.97
Discharge capacity of each regulator with 79m3/s

reservoir at FSL

Spillway

Type Gated spillway with stilling basin and flanking

retaining walls.

Number of radial gates 8

Size of each gate 7.9m wide x 7.0m high

Top of gates when closed EL107.46

Sluice Gates

Type Caterpillar type gates

Number of radial gates

Size of each gate 2.44m wide x 3.66m high

Invert level of sluice entrance EL71.2

Stilling Basin

Concrete basin length 58.2m

Top of stilling basin training walls EL73.02

Basin invert level EL60.83

Baffle height 3.0m Flood Flows Peak water level as a result of PMF EL110.4m all gates open one gate out of service EL110.7m Maximum discharge as a result of PMF all gates open 8140 m3/s 7950 m3/s one gate out of service **Power Station** 4MW

Generating capacity

Appendix H. Somerset Dam Risk Assessment, Failure Modes and Consequence Assessments

Risk Assessment Studies

A number of studies have been undertaken in recent years relating to various aspects of Somerset Dam. These include:

- A preliminary risk assessment of Wivenhoe, Somerset and North Pine Dams by SKM, reported at SKM, 2000;
- A dam safety review of Somerset Dam by GHD, reported at GHD, 2000;
- A detailed risk assessment for Somerset Dam by SMEC. This risk assessment was undertaken in two stages. The initial stage entailed a review of information and identification of deficiencies. Stage 2 provided a detailed assessment of the likelihood of failure of the identified deficiencies. This work is reported at SMEC, 2004.
- This study included an assessment of the reliability of the spillway gates.
- A short review of dam safety issues, based on the above Reports was carried out by Commerce in December 2004 and is reported at Commerce, 2004;
- Further stability assessments of abutment monoliths were carried out by Commerce and are reported at Commerce, 2005.
- The above Commerce Reports were based on a hydrology study by WRM Water and Environment, WRM (October 2004). This Report has been revised (WRM, September 2005) but these revisions have not been incorporated in to the Commerce, 2005 conclusions.

Failure Modes

The following is taken mainly for Commerce (2004) but includes information from all sources referenced above, particularly SMEC (2004).

The detailed risk analysis for Somerset Dam, SMEC (2004), identified three basic failure modes:

- Erosion of the downstream toe due to flood discharges passing through the open sections of the dam abutments and impacting on the foundation at the downstream toe of the dam;
- Structural failure of the dam under extreme water load. The dam was considered stable at the foundation interface for the PMF (albeit approaching the limit of its stability) but liable to failure at two higher locations for smaller flood events;
 - At the change of slope in the back face of the non-overflow sections;
 - At the Upper Gallery.
- Structural failure of the dam under earthquake.

The results obtained from the event tree analyses are summarised at **Table** 11-1. Structural failure of the non-overflow units at the change in slope of the back face was the dominant failure mechanism followed by failure at the Upper Gallery. Gate reliability was assessed and included in the event trees and had a significant effect on the results.

Table 11-1 - Result of Event Tree Analyses

Failure Mode	Probability of Failure (/year)	
Failure at Change of Slope under Flood	110*10-7	
Failure at Upper Gallery; under Flood	80*10-7	
Failure under Earthquake	80*10-7	
Failure due to Toe Erosion	5*10-7	
Total for Somerset Dam	275*10-7	

Reference SMEC (2004)

Failure due to toe erosion at the toe of the dam was not considered to be a major factor. The foundation was assessed as a hard strong andesite with jointing the major defect. While erosion of the surface rock is expected under low to medium flows, the rock mass was judged to be "tighter" at depth and have a high resistance to erosion that is unlikely to lead to dam failure.

Moderate earthquake events are likely to cause distress at the change of slope, but as this is above Full Supply Level, it had no impact on the risk

analysis. Stability analyses, GHD (2000), indicate the dam is unstable at the Upper Gallery for the Maximum Design Earthquake.

Structural Investigation Studies

The critical flood levels adopted for the risk analysis were:

- EL109.7 for the Change of Slope failure;
- EL110.0 for the Upper Gallery failure.

These levels adopted by SMEC (2004) were based on separate stability analyses by GHD (2000) and SKM (2000). SMEC (2004) noted that "the results from the two analyses are at odds" and that "the reasons for the differences are not apparent". In addition, the Report in Appendix 3.6 extracts from DPI (1994) quotes a Ben Russo conclusion that differs from both of these studies.

"Russo also recommends that to ensure the survival of the two portions of two non-overflow monoliths above EL100.0, the reservoir should not exceed EL111.7. He adds that the structural integrity of the spillway gates(if used) would have to be checked for the loads such a reservoir level would impose."

The variations in these three stability assessments cover a range that could have a significant impact on the event trees developed by SMEC and on the overall risk assessment. The differences are presumably due to different assumptions for uplift and for the extent of cracking in the concrete at the Upper Gallery.

Commerce reviewed the stability assessments and concluded that stability criteria were satisfied for:

- Storage levels up to EL111.0 at the change of slope;
- Storage levels up to EL110.9 at the Upper Gallery;

However, if extensive cracking exists above or below the gallery. The dam just satisfies stability criteria for a storage at EL109.7.

Hydrological studies (WRM, 2004) assess the storage level for flood with an AEP if 1 in 100,000 at EL109.75. The above studies indicate that the dam would satisfy normal stability criteria at this level, although there would be little margin if cracked concrete exists above or below the Upper Gallery.

This conclusion needs to be reviewed following the revised hydrology study at WRM, 2005.

Impact of a Somerset Dam Failure on Wivenhoe Dam

The impact of a Somerset Dam failure on Wivenhoe Dam was detailed at Commerce (2004) and summarised below.

The consequences of failure of Somerset Dam are largely dependent on whether it can cause a cascade failure of Wivenhoe Dam. Wivenhoe Dam, with Stage 1 Upgrade works now completed, is designed to handle a 1 in 100,000 flood event centred on the Wivenhoe catchment, assuming that Somerset Dam does not fail.

Somerset Dam, on the basis of its known condition, satisfies stability criteria for a storage level of EL109.75 and will safely handle the 1 in 100,000 AEP flood event. This in turn ensures that the Stage 1 upgrade works for Wivenhoe Dam are not compromised by any Somerset Dam deficiencies.

On this basis upgrade work at Somerset Dam, if required at all, would reasonably attract the same degree of urgency as Stage 2 Wivenhoe works. It is recommended that any upgrading of Somerset Dam be considered at the time that Stage 2 Wivenhoe works are assessed.

Commerce, 2005 raises several issues in relation to the above:

- Cracking observed in the Upper Gallery walls may also exist above or below the Gallery. While such cracked concrete would just satisfy stability criteria for a storage level of EL109.75, stability reduces rapidly for higher storage levels and failure could occur at EL110.1. It was recommended that some exploratory drilling be carried out to determine whether such cracks do exist. A similar recommendation was made in GHD (2000);
- The WIVOPS flood operation program at one time required that the Somerset spillway gates be lowered if Wivenhoe Dam is in danger of being overtopped. This is a difficult procedure that would raise a number of operational and safety issues and require a review of the stability conclusions given above.
- Stability analyses assume that the gallery systems are not flooded by water overtopping the abutment monoliths. The dam layout should be reviewed to ensure this is the case and waterproof doors installed where necessary.

Consequences of Failure for Somerset Dam

Loss of Life Assessments

If Somerset Dam fails without causing a cascade failure of Wivenhoe Dam, the consequences are limited to the area between the two dams.

The SKM (2000) Report predicted no loss of life would occur from a Somerset failure for the following reasons.

- The small population at risk for flood failures;
- Adequate warning times for flood failure;
- The location of the population at risk above peak flood levels caused by normal operational failure.

If failure of Somerset causes a cascade failure of Wivenhoe Dam, then the loss of life figures are substantially increased. This could only occur during an extreme flood event as Wivenhoe reservoir has sufficient capacity to store the normal Somerset storage without initiating the secondary spillway fuse plug.

SKM (2000) provided loss of life estimates for both day and night failures of Wivenhoe Dam for a variety of load cases. SMEC (2004) has used the SKM data for total loss of life at night and adopted the following loss of life figures for the risk assessment:

· IF	Failure	(Main	Embankment)	89
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- Earthquake 36
- Normal Operating Condition 77

Financial Loss Assessments

SKM (2000) has assessed the financial consequences associated with the failure of Somerset Dam under three broad categories; third party damages, SEQWater direct damages and SEQWater loss of revenue. A major failure of Somerset Dam, involving failure of the spillway gates and partial failure of the abutment units was valued at \$20M, with \$18M of this classed as SEQWater direct damages.

SMEC (2004) quote a far higher cost of \$200M to repair Somerset, including environmental impacts.

These estimates depend heavily on the type of failure and extent of the damage. Failure of several abutment units at the change of slope would incur a relatively low repair cost, while major damage to the gated spillway would involve substantially higher repair costs. No detailed estimates are available but the SKM (2000) estimates appear low, particularly as they involve spillway gate failure.

Similarly, a major flood failure of Wivenhoe Dam is estimated at \$12B to \$25B by SKM (2000).

Environmental & Intangible Consequences

The SKM (2000) study included an assessment of environmental and intangible consequences. SKM assessed the incremental environmental consequences for both Somerset and Wivenhoe dams as low. The incremental intangible consequences were also assessed as low for Somerset although high for Wivenhoe. It concluded that:

"These environmental and intangible consequences were far outweighed by the significant life loss and financial consequences for this portfolio. As such they did not play a significant role in the development of the risk reduction strategy."

Risk Analysis

No Failure of Wivenhoe Dam

SMEC, 2004 notes that for zero loss of life, the ANCOLD life safety criteria do not apply.

The ANCOLD fallback criteria however, would require either PMF security for an "Extreme Category" or PMPDF security for a "High A Category." Somerset Dam does not satisfy PMF and is unlikely to satisfy PMPDF. This reflects the overall importance of the dam to SEQWater.

SMEC, 2004 also notes that the risk of failure could be reduced by around 3 orders of magnitude by:

- Installation of anchors to increase the structural adequacy at the upper gallery and change of slope;
- Construction of a concrete slab/cutoff at the toe of the dam to protect against erosion and undermining.

The above works have not been costed, SKM nominated costs between \$1M and \$2M (now dated) and SMEC "judged that costs are likely to be higher, but still in the millions of dollars range".

SMEC noted that the cost of anchors could be justified, even if consequential failure of Wivenhoe did not occur. The value of erosion protection was more difficult to justify and that ":it would need to be determined whether its cost is grossly disproportionate to the improvement gained".

Upgrading of Somerset Dam, as a stand alone structure is an ALARP issue under the ANCOLD Guidelines. As noted by SMEC, SEQWater needs to determine their acceptable level of risk in order to assess the need for risk reduction measures.

Cascade Failure of Wivenhoe Dam

The FN Chart produced by SMEC, 2004 is shown at Figure 5, and is based on the risk assessment of Somerset Dam with the assumption of a conditional probability of failure of Wivenhoe Dam of 1.0. This Report did not assess the likelihood of a failure of Somerset Dam resulting in a failure of Wivenhoe Dam. The FN Chart plots above the Limit of Tolerability and as such the risk would be deemed intolerable.

The original risk analysis for Wivenhoe Dam was developed by SKM. The Wivenhoe Alliance revised this work to incorporate the risks associated with a Somerset failure. The FN Charts for total loss of life is shown at Figure 6 and indicates that:

- The original Wivenhoe Dam plots well above the ANCOLD Limit Line;
- The Stage 1 Upgrade for Wivenhoe brings the risk below the ANCOLD Limit Line provided Somerset does not fail;
- If allowance is included for Somerset Dam failure case, the plot rises just above the Limit Line;
- The Stage 2 Upgrade brings the risk well below the Limit Line.

The total risk to Wivenhoe Dam as a stand-alone construction following the Stage 1 Upgrade works is assessed at 0.84*10⁻⁵. Introducing the risks associated with a Somerset failure increases these risks by a factor of 2.4 to 2.0*10⁻⁵.

The risk to life matrix (F-N Chart) using the incremental loss of life figures is reproduced at Figure 7. This shows the Wivenhoe risks plotting below the ANCOLD Limit Line.

Limitations of Risk Studies

The SMEC, 2004 study of Somerset Dam is considered a detail risk assessment, with the limitation that it does not consider the likelihood of a failure of Somerset Dam resulting in a failure of Wivenhoe Dam. The Report uses the SKM loss of life figures. The SKM Report was a preliminary assessment and as SMEC notes the consequence study is not developed to the same standard as the failure analysis.

The Wivenhoe Alliance study is a modification of the SKM study and as such is a Preliminary Risk Assessment. If the risk profile is a concern, a detailed risk analysis should be carried out, that includes a detailed assessment of the consequences, particular loss of life.

Hazard Category

The Dam Safety Management Plan, SEQWater (2005) at Section 6.1 states that "The Corporation's dams are classified under the ANCOLD classification guidelines as HIGH hazard because of the significant consequences of a dam failure". These are presumably the 1986 ANCOLD Guidelines.

The hazard classification was determined by GHD and the following statement included in GHD (2000).

"A hazard assessment was conducted in accordance with the DPI (DNR) Dam Safety Guidelines Procedure DS003 and the June 2000 ANCOLD Guidelines on Assessment of Consequences of Dam Failure. Both methods indicate that the dam should be classified as having a High Hazard Category."

No discussion of the hazard classification was provided at GHD (2000). It is assumed that the hazard classification allows for the possibility of a cascade failure of Wivenhoe Dam and, given the financial loss assessments noted at 0, that this would be a High A classification for flood under ANCOLD.

It is recommended that the Hazard Classification be given further consideration on the basis that:

- The PAR from a cascade failure would be in excess of 1,000, and the ANCOLD Guidelines would indicate a an Extreme Classification;
- The Hazard Classification for a sunny day failure would be lower, possibly High B or High C.

Conclusions

Somerset Dam as a stand alone structure satisfies the ANCOLD risk to life criteria. There is scope for substantially reducing the risk of failure, but the value of this work needs to be assessed in terms of the SEQWater risk management procedures.

A cascade failure of Somerset and Wivenhoe Dams is possible and stability is marginal for the 1 in 100,000 AEP event. Preliminary risk assessments indicate the cascade failure is close to the ANCOLD Limit of Tolerability.

SEQWater has completed Stage 1 of an upgrade program and Wivenhoe Dam now is now capable of handling a flood with an AEP of 1 in 100,000. Stage 2 would provide full PMF security. This would satisfy the ANCOLD Limit of Tolerability and the ALARP principle.

While Somerset Dam can also handle a 1 in 100,000 AEP flood event, upgrade work, if required at all, would reasonably attract the same degree of urgency as Stage 2 Wivenhoe works.

The various Reports however, raise a number of issues that require investigation:

- Cracking observed in the Upper Gallery walls may also exist above or below the Gallery. While such cracked concrete sections would just satisfy stability criteria for a storage level of EL109.75, stability reduces rapidly for higher storage levels and failure could occur at EL110.1. It was recommended that some exploratory drilling be carried out to determine whether such cracks do exist. A similar recommendation was made in GHD (2000);
- The WIVOPS flood operation program at one time required that the Somerset spillway gates be lowered if Wivenhoe Dam is in danger of being overtopped. This is a difficult procedure that would raise a number of operational and safety issues and require a review of the stability conclusions given above.
- Stability analyses assume that the gallery systems are not flooded by water overtopping the abutment monoliths. The dam layout should be reviewed to ensure this is the case and waterproof doors installed where necessary.
- SMEC, 2004 notes that should the spillway gates not operate as intended, the dam could become unstable and, "as part of its risk reduction strategy, SEQWater needs to consider this aspect". Risk reduction methods considered included "removal of the sector (radial) gates, or anchoring the dam to the foundations".

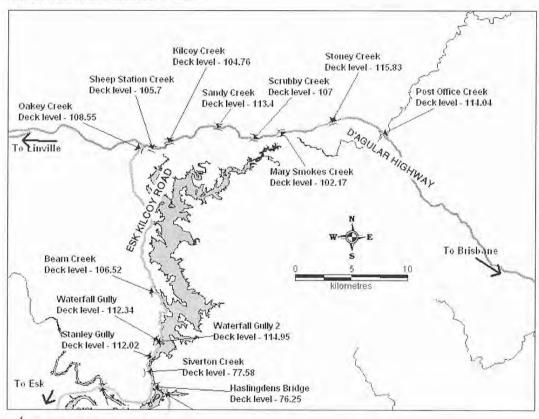
Appendix I. Cost Estimates for Raising Somerset Dam

Appendix J. Raising Somerset Dam Feasibility Investigations by SMEC

Appendix K. Inundation Maps for Wivenhoe and Somerset Dams

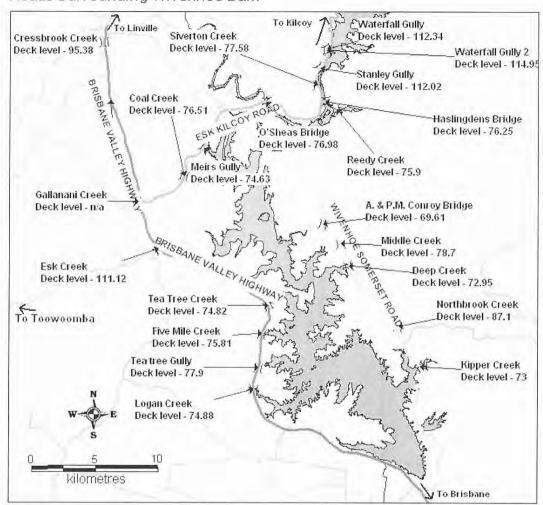
Appendix L. BRIDGE Levels Upstream and Downstream of the Dams

Roads North of Somerset Dam



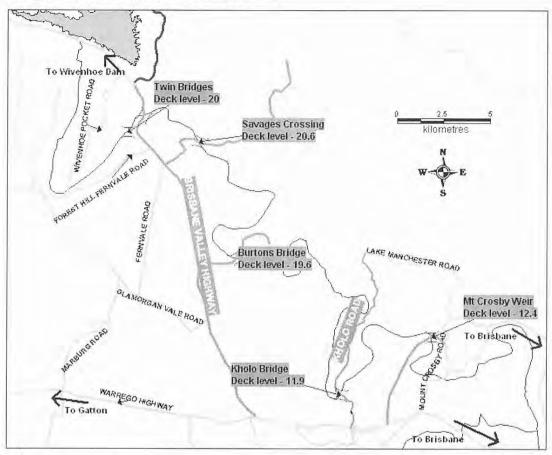


Roads Surrounding Wivenhoe Dam





Bridges Downstream of Wivenhoe Dam





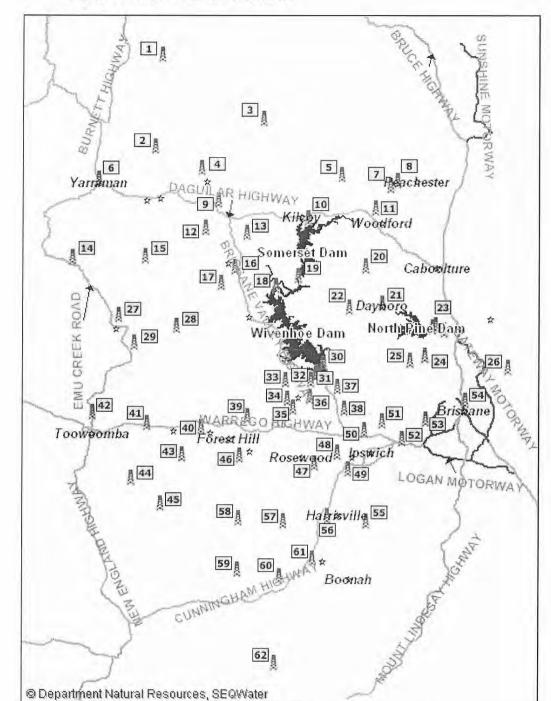
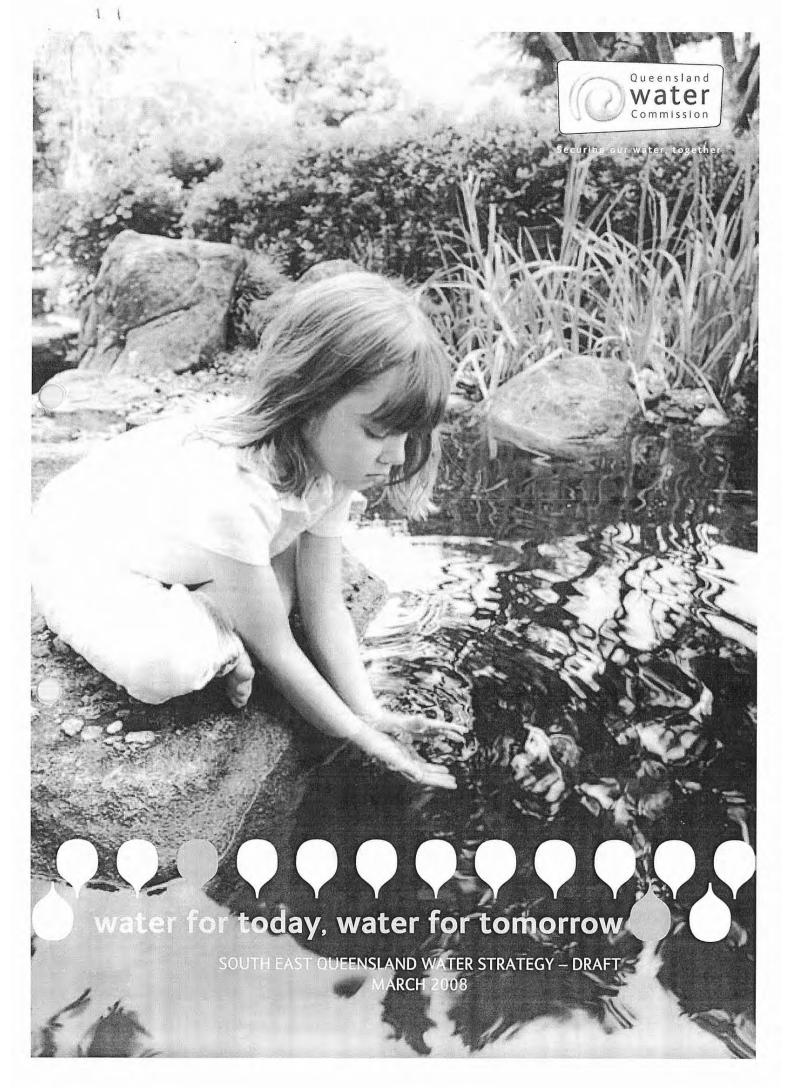
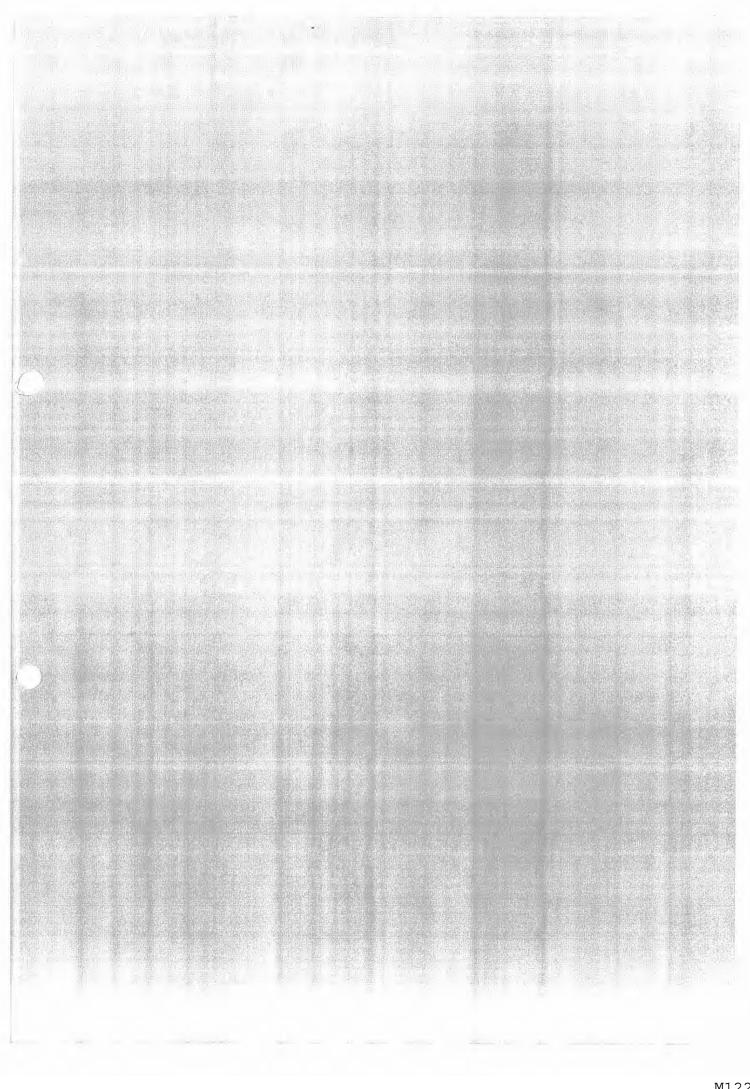


Figure 8 - Alert Station Locations

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Appendix M. Somerset Drawings





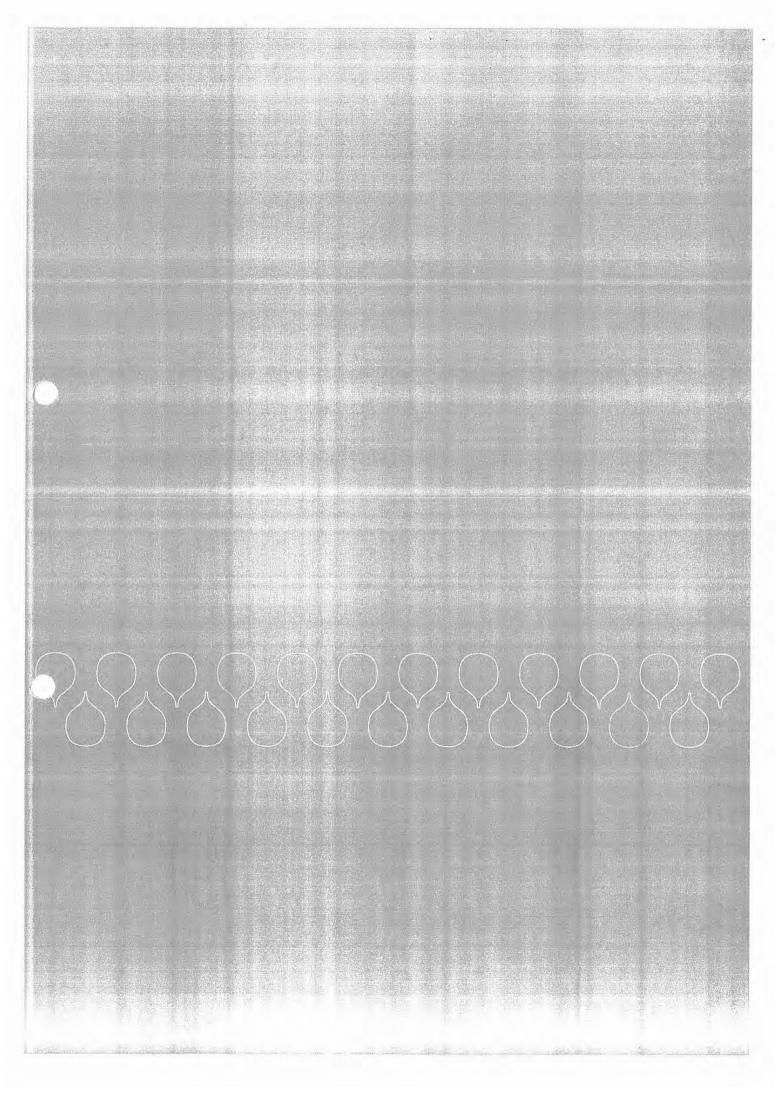


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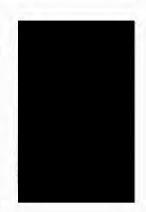


Foreword

This draft report on the South East Queensland Water Strategy outlines a new approach to integrated, sustainable water supply planning in South East Queensland.

The planning that underpins this draft report includes many technical and methodological innovations. These innovations have delivered better outcomes through the integrated assessment of demand trends, water security and sustainability objectives, infrastructure options and potential demand management measures.

Importantly. the system models which are at the heart of the planning process are robust and flexible and are capable of being continually updated to reflect relevant changes in the future, such as in relation to population growth, demand, community attitudes and climate change.



The Queensland Water Commission invites the community to consider, and comment on, future expectations in relation to long–term water supply planning. The South East Queensland community has proven itself to be amongst the most water conscious in the western world during the current drought. We now seek your feedback on the long–term planning framework, which will govern how supply and demand measures are implemented to secure our water supply for the next 50 years. In particular, it identifies potential sources of supply that will be required beyond 2028, unless brought forward as part of the response to a severe drought.

This draft report also seeks to make explicit the assumptions which will be used to provide a defined Level of Service to the community, as reflected by the frequency, duration and severity of water restrictions when we respond to future severe droughts. It is important that the Level of Service objectives used in the South East Oueensland Water Strategy reflect community expectations about water restrictions and their willingness to pay for improved security of supply to avoid the need for severe restrictions in the future.

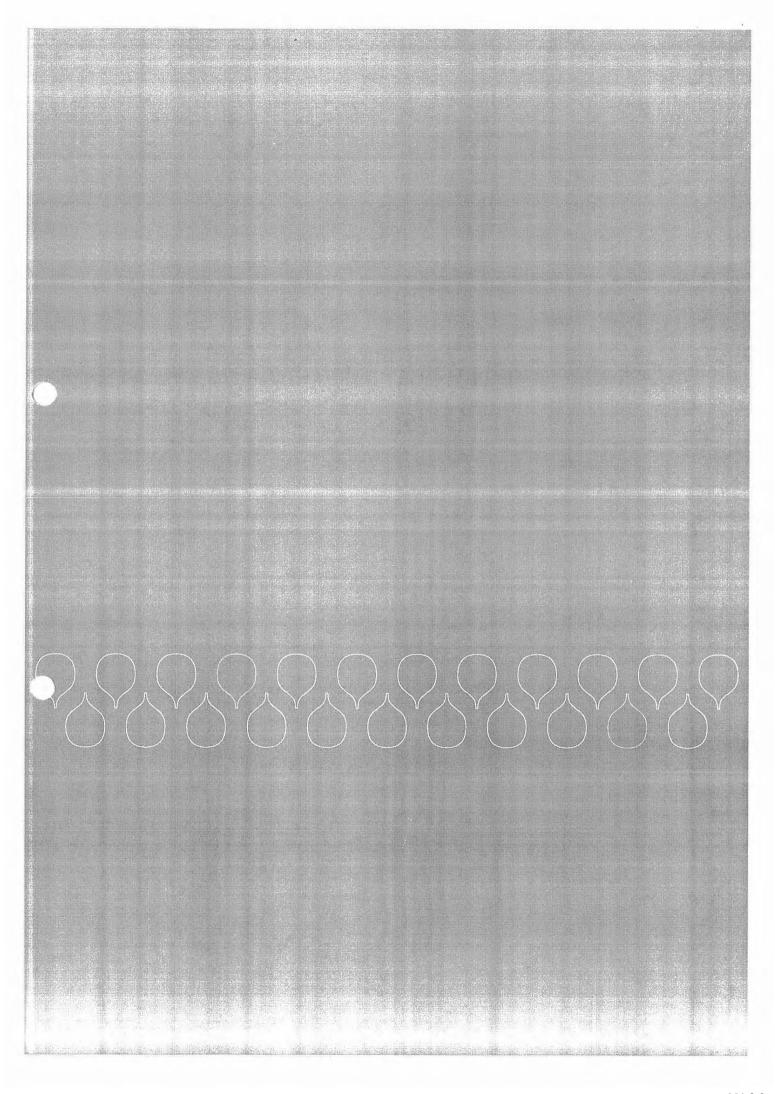
The Queensland Water Commission has suggested activities, works and initiatives that it considers should be undertaken to achieve the goals of the *South East Queensland Water Strategy*. However, the suggestions in this draft report will be reviewed following community input in the consultation phase before the final list of measures is recommended in the final report.

The final report on the South East Queensland Water Strategy will then be used to inform the Queensland Government and local governments of South East Queensland. It would be expected to form the basis of the Queensland Water Commission's formal advice under the Water Act 2000 to the Queensland Government in relation to future water security programs.

The South East Queensland Water Strategy is the beginning of a transparent water supply planning cycle and will be subject to review at regular intervals. The South East Queensland Water Strategy commenced as a partnership between the Queensland Government, Council of Mayors (SEQ) and bulk water suppliers. The Queensland Water Commission wishes to thank these organisations for their contributions, and looks forward to continuing to work with them to finalise the Strategy.

The Queensland Water Commission welcomes the community's feedback on these important issues.





Executive summary

The South East Queensland Water Strategy (the Strategy) is a plan for meeting South East Queensland's (SEQ) water supply requirements for the next 50 years. It is designed to deliver a new standard of water security in Australia's fastest growing region.

It is a plan to ensure we are 'on the front foot' in securing our future water supply – by implementing a range of demand management measures and being ready to take proactive action to invest in new infrastructure in a timely way. Importantly, it includes significant measures to ensure we are well prepared to respond to extreme drought.

The Strategy's Water Supply Guarantee is to supply sufficient water to support a comfortable, sustainable and prosperous lifestyle while meeting the needs of urban, industrial and rural growth and the environment. This vision will be achieved by ensuring that available supplies always exceed demand and water is used efficiently. As a long-term planning document, the Strategy impartially outlines all viable options for providing water to meet these needs.

The Strategy's purpose is to lay down a responsible plan for providing new water supplies to prevent the development of any gap between supply and demand in the face of certain population growth and probable climate change impacts.

One of its guiding principles is to ensure the health of catchments, aquifers and their ecosystems. With this in mind, the Strategy has been built with a total water cycle planning approach. Focussing on the entire cycle of water production and use, this approach means there will be integrated management of urban and rural water to produce the best possible environmental and public health outcomes. For example, environmental flows will be maintained and nutrient loads entering Moreton Bay will be significantly decreased.

Under this Strategy, a major feature of future water supply will be a move away from the current reliance on dams and weirs for 95% of the region's water to a more diversified position where. by 2056, desalination and Purified Recycled Water (PRW) could provide up to 30% of the supply system (refer Figures B and C).

The Queensland Water Commission (QWC) has prepared this document for consultation in

Key features of the Strategy

Target 230: A permanent water saving target for daily residential use, achieved through behavioural change, efficient fixtures and fittings, retail tariffs which reward efficient use, and some permanent, low level restrictions. As a community, SEQ will never go back to the water wasting ways of the past and will reduce per capita water consumption by around 24% compared to before the Millennium Drought.

New water supplies: The Strategy forecasts that, even without severe drought, additional sources of water will be required beyond 2028. It identifies potential sites for large climate resilient sources like desalination plants and PRW schemes and proposes that these be the subject of further investigation, including environmental and social impact assessments. The Strategy identifies the need for continued growth in the use of water from rainwater tanks for homes and businesses, as well as for giving careful consideration to other local supply sources such as rainwater harvesting and recycling.

Drought planning: The Strategy plans to minimise the impact of future droughts through sufficient investment, management of the water supply system and a pre-determined Drought Response Plan. It sets an objective that the community can expect to experience medium level water restrictions no more than once every 25 years on average.

Rural production and power stations: In the future, the Water Grid Manager will sell surplus water when it is available, including to rural producers. In addition, 42,000 ML/a has been made available in this Strategy for increased rural production. Recycled water will be supplied to the Swanbank. Tarong and Tarong North power stations.

the current environment of rapid population growth, changing climate patterns, some stressed local rivers and aquifers, and the Millennium Drought, the worst on record (refer page 49).

While recognising these challenges, the Strategy also builds on the significant developments which have occurred in response to the drought, including:

- The Queensland Government's \$9 billion program of current and committed water supply projects in SEQ;
- The exceptional demand management achievements by water users and our increased awareness of the value of this precious resource;
- The transition from a water supply system comprising eight independent water supply zones to a connected SEQ Water Grid:
- The restructure of the SEQ water supply industry over the period to 2010, with associated market reforms and improvements to asset management and economic regulation; and
- · The introduction of Australia's first PRW scheme.

A new approach to planning

The Strategy represents a new, innovative approach to water planning in SEQ.

The Millennium Drought has made it clear that there is a need to change the approach to water supply planning. It is no longer adequate to:

- Rely on our relatively short 117-year history of rainfall and stream flow records without considering the
 potential for droughts worse than those on record;
- Rely on supplies from dams and weirs without considering the possible impacts of climate change:
- Give only limited consideration to managing demand: and
- Reactively respond to droughts as they occur.

Using this new approach, the inadequacies of past approaches have been addressed by:

- Using stochastic modelling to provide better information about climate variability and the potential for droughts worse than have occurred on record:
- Developing climate models to assess potential reductions in surface water availability due to climate change:
- Undertaking a detailed review of water consumption patterns and implementing cost effective measures to reduce demand:
- Defining a yield for the Water Grid as a whole, such that it can be supplied at the specified Levels of Service objectives:
- Using the most cost effective suite of potential supplies, where they have acceptable environmental and social impacts:
- · Adopting a total water cycle management approach and operating within water resource plan limits; and
- Ensuring that planning for future droughts is a core element of the planning process.

Our Water Supply Guarantee - The Level of Service (LOS)

The Strategy's Water Supply Guarantee is to supply sufficient water to support a comfortable, prosperous and sustainable lifestyle while meeting the needs of urban, industrial and rural growth and the environment. The new

planning framework seeks to ensure that responsible, timely investment in supply and demand measures avoids the need for severe water restrictions in the future.

This aim is expressed as a series of Level of Service (LOS) objectives, which relate to the expected frequency, duration and severity of restrictions during future droughts. The choice of the LOS objectives has involved tradeoffs between financial costs, environmental impacts and the willingness of the community to accept restrictions on a periodic basis.

The QWC has proposed that the SEQ community would prefer to target permanent water conservation measures coupled with medium–level restrictions in times of drought. In normal times, this means that water should be used wisely. The average residential volume target is 230 litres per person per day, which is approximately the volume used in Level 1 water restrictions. However, unlike in 2005 this will primarily be achieved through structural measures, such as water efficient shower heads. In periods of drought, medium–level water restrictions will be introduced early enough and at such a level that they avoid the most costly impacts on community amenity and the regional economy.

The LOS objectives outlined in the document mean that future investments in the water supply system would be made with the objective of reducing the frequency of restrictions to no more than once every 25 years, on average. These restrictions would be less severe than has occurred in the current drought. Even in response to a drought as severe as the Millenium Drought, only medium-level restrictions would apply, so as to achieve a 15% reduction in total SEQ consumption. This is likely to represent a 20% reduction in residential consumption to about 185 litres per person per day. For instance, in future droughts, it is expected that restrictions would not require a ban of hand held hosing and sprinklers. Residents would not be limited to only bucket watering of gardens as they have experienced in the Millennium Drought.

Under the objectives, combined regional storage reserves should reach levels of 10% of capacity no more than once every 1.000 years, and must not be permitted to reach minimum operating levels. If this approach is adopted it will allow a return to a lifestyle of flourishing, but water wise gardens across the region and a robust horticultural industry. The specific LOS objectives adopted in the planning process are listed below.

Level of Service (LOS) objectives

- During normal operations, the LOS objectives which have been incorporated in the system planning include:
 - Sufficient Grid Water will be available to meet an average total urban demand of 375 litres per person per day (including residential, non-residential and system losses) of which 230 litres per person per day is attributed to residential demand; and
 - Permanent water conservation measures and regulatory requirements will apply to ensure that wastage is avoided without significantly impacting on community amenity.
- Sufficient investment will occur in the water supply system with the objective of ensuring that medium-level restrictions:
 - Will not occur more than once every 25 years on average;
 - Will last longer than six months no more than once every 50 years on average; and
 - Need only achieve a targeted reduction in consumption of 15% below the total consumption volume in normal operations.
- The frequency that combined regional storage reserves reach levels of 10% of capacity will be not more than once every 1,000 years; and
- Regional water storages must not be permitted to reach minimum operating volumes.

The Strategy provides for a new measure. a Drought Response Plan, which includes more than just restrictions. The Drought Response Plan is an integral part of the Strategy methodology, as it establishes an upfront plan to ensure continuity of supply regardless of climatic conditions.

The Strategy also identifies explicit drought storage reserve requirements, which provide sufficient supply during severe drought to allow new climate resilient supplies, like desalination plants, to be built. These supplies should be able to be constructed within 36 months of restrictions commencing, provided that sites are acquired and approvals obtained under the Drought Response Plan.

Our future demand for water

A key role of the Strategy is to strike the right balance in managing our future demand for water, so that future water prices are not unnecessarily high.

The Strategy aims to continue recent progress towards efficient and responsible water consumption by residents and, increasingly, business and industry. We must avoid returning to the water wasting ways of the past.

The Strategy sets out an ambitious demand management program that is forecast to reduce demand for drinking water by around 24% compared to pre-drought trends. By 2056, the forecast annual savings will be more than five times greater than the supply capacity of the desalination plant at Tugun on the Gold Coast.

The Strategy seeks to ensure that, after the Millennium Drought, average residential use does not increase above 230 litres per person per day of Grid Water. By comparison, average residential consumption prior to the Millennium Drought was approximately 300 litres per person per day. During the drought, average residential consumption has fallen below 140 litres per person per day.

Business and industry will be required to continue to move towards best practice water efficiency.

These savings can be achieved without significantly changing the lifestyle that we enjoyed prior to the Millennium Drought, including the ability to sustain healthy, water wise gardens. Long–term demand savings will generally be achieved through efficiency, rather than restrictions. To avoid wastage, permanent water conservation measures will be necessary even when the region is not affected by drought, but these restrictions will not significantly impact on our lifestyle.

A number of future demand projections were assessed based on the analysis of potential demand management measures. The major contributors to our future water savings outcomes will be:

- Permanent water conservation measures that will ensure that water is not wasted;
- Ensuring that all new buildings are water efficient, such as through the use of water from rainwater tanks or stormwater harvesting for flushing toilets and other purposes:
- Ensuring that existing buildings become more water efficient, such as by requiring water efficient showerheads to be installed as part of major renovations;
- Moving business and industry towards best practice water efficiency, through the preparation and implementation of Water Efficiency Management Plans;
- Minimising system losses, through the pressure reduction and system losses project and the design of new suburbs; and
- Ongoing targeted education programs, such as for schools and for key industries.

The proposed measures are summarised in Figure A.

Millennium Drought response

Restrictions

- Levels 1 to 6 water restrictions, including restrictions on:
 - Outdoor watering
 - Active playing surfaces
 - Cooling towers
 - Pool filling
 - Vehicle washing
 - Urinak
 - Retrofit
- Excessive water user program

Pricing and tariff design

 Water use information to residential tenants

Structural water efficiency

- · Regulations to achieve structural water efficiency:
 - Water Efficiency Management Plans (WEMPs)
 - Water saving targets for new residential buildings
 - Rainwater tanks on new industrial and commercial buildings
 - Expanded use of greywater
- Financial incentives to achieve structural water efficiency:
 - Business Water Efficiency Program
 - Home WaterWise Rebate Scheme
 - Home Garden WaterWise Rebate scheme
 - Home WaterWise Service
 - ecoBiz
 - Local government rebate schemes
- Pressure and leakage management program

Community education and behavioural change

- Target 140
- · Guidelines for business
- WaterWise
- Council programs, such as Gold Coast Watersaver

Figure A Demand management approaches

Long-term demand management program

Restrictions

- Permanent water conservation measures. such as alternate watering days
- Medium-level water restrictions in times of drought
 - Mainly from outdoor watering restrictions
 - Planning to ensure that residents are not limited to bucket watering of gardens

Pricing and tariff design

- Regionally consistent billing approach
- Water pricing structures to encourage water conservation, such as inclining block tariffs
- Wastewater pricing structures for nonresidential customers to encourage water conservation, such as volumetric charges

Structural water efficiency

- Regulations to achieve structural water efficiency:
 - Water Efficiency Management Plans (WEMPs)
 - Water saving targets for new residential buildings
 - Rainwater tanks on new industrial and commercial buildings
 - Retrofit of taps and showerheads on resale
 - Ban on sale of inefficient water devices
 - Insulation of hot water pipes in new buildings
 - Expanded use of greywater
 - Requirements regarding topping up of swimming pools
- Pressure and leakage management program
- School water efficiency
- Beyond the Millennium Drought, reduced emphasis on financial incentives to achieve structural water efficiency

Community education and behavioural change

- Water efficiency rating scheme for residential properties
- Water efficiency rating scheme for nonresidential properties
- Guidelines for business
- WaterWise
- Targeted education programs for selected industries

The Strategy is also closely related to the significant institutional reform program currently underway within SEQ, with pricing and other regulatory reforms being critical elements of long–term demand management measures. The measures outlined in the Strategy will include the development of water pricing and tariff regulatory policy to encourage conservation and reward efficient use.

Committed projects

Significant new infrastructure is being developed in SEQ to ensure that adequate water supplies can be maintained during the current Millennium Drought. This \$9 billion infrastructure program includes:

- · One of the largest PRW schemes in the world:
- One of the largest desalination facilities in Australia:
- Traveston Crossing Dam. Stage 1;
- The Logan River system, comprising the Wyaralong Dam, Bromelton Offstream Storage and Cedar Grove Weir: and
- 400 kilometres of interconnecting pipelines.

These projects will increase the diversity of supply, reducing the reliance on water from dams and weirs from 95% of the total regional supply in 2006 to about 75% in 2012. Supplies from dams and weirs will be diversified through the construction of large dams in different catchments.

This provides diversity in rainfall and inflows. For instance, Traveston Crossing Dam is located in a catchment that recieves significantly more rainfall on average than the Wivenhoe Dam catchment. This is largely attributable to the proximity of Traveston Crossing Dam's catchment to the coast.

The construction of interconnections will maximise the yield of the system as a whole. For instance, the interconnections will increase the yield of existing supplies at 2006 by about 14%. At almost 60,000 ML/a, this increase is larger than the capacity of the desalination plant under construction at Tugun. The increase will be achieved through the coordinated management of dams, minimising evaporation and the likelihood of spills, and by managing risk at a regional level, rather on an individual water storage or water supply system basis.

The water supply balance

Saving water will delay and reduce the need for additional supplies, but additional supplies will still be required.

To ensure our LOS objectives are met, the reliable yield of existing dams and weirs is estimated at 416,000 ML/a. This is 20% less than was previously assumed to be available, which reflects the cautious approach adopted in the new planning framework.

For the purposes of preliminary analysis, a climate change scenario has also been assessed which would result in a further 10% reduction in the yield of existing storages. This scenario would reduce the system yield of existing dams and weirs to about 374,000 ML/a

Climate change and our dams

Climate change may have a dramatic impact on the supply from our dams. The majority of climate modelling indicates that SEQ is likely to become hotter and drier, reducing inflows to dams and increasing demand for water.

A mid-range estimate of a 10% reduction in the yield of dams and weirs has been used for scenario analysis. This estimate is based on modelling of climate, rainfall and inflow projections for SEQ.

The impacts of climate change on water supply in SEQ will be researched through the Queensland Climate Change Centre of Excellence and the Urban Water Security Research Alliance. The Strategy will be revised as our understanding of the likely impacts of climate change on SEQ water supplies Improves.

Following the completion of current projects, additional sources of water will be required between 2028 and 2042, unless brought forward as part of the response to a severe drought. By 2056, without additional supplies, the gap between supply and demand would be between 97,000 and 308,000 ML/a, depending on population growth, savings achieved and the impacts of climate change.

The Strategy provides a planning framework to bring on supplies at appropriate times to prevent this gap from developing. To minimise the impact of severe droughts, a large proportion of this new supply should be climate resilient, such as desalination or PRW.

Figures B and C illustrate the diversity of the supply system that will exist at 2056, depending on the saving achieved, population growth and impact of climate change.

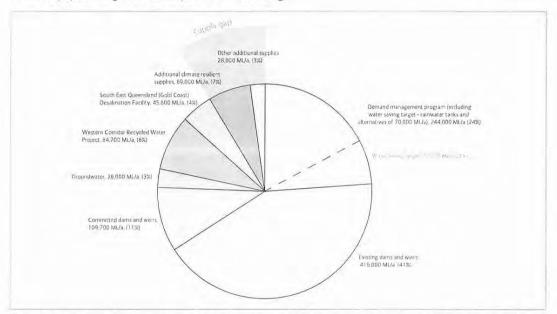


Figure B Projected future supply at 2056 (medium series population growth. no allowance for climate change)

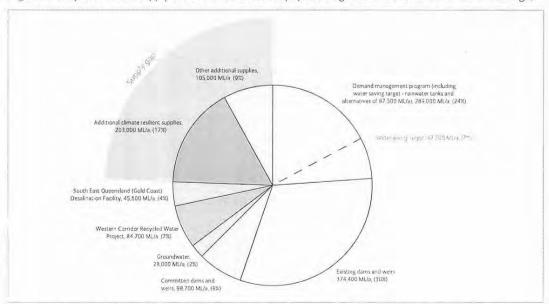


Figure C Projected future supply at 2056 (high series population growth, allowance for climate change)

Our future sources of supply

New sources of supply will not be required until after 2028, unless brought forward as part of a response to a drought as severe as the current Millennium Drought.

The Strategy outlines potential supply options to fill this supply gap, as summarised in Table A. It was informed by an impartial review of all viable options.

Table A Potential sources of supply beyond existing commitments

Type of source	Potential source
Dams and weirs	 Borumba Dam Stage 3 Traveston Crossing Dam Stage 2 Raised operating levels in Wivenhoe Dam Smaller surface water upgrades, including additional water harvesting into dams and off stream storages and raisings of Wappa Dam and the Mt Crosby Weir
PRW schemes	 Augmentation of supply from Hinze Dam Augmentation of supply from North Pine Dam Augmentation of supply at Sunshine Coast Augmentation of supply at Toowoomba
Desalination sites	 At Marcoola At Kawana At Bribie Island At the Brisbane River mouth At North Stradbroke Island At South Stradbroke Island

Desalination and PRW sites are not required immediately, but should be investigated in detail and, if viable preserved to the extent required to support the infrastructure program. Preserving the preferred sites now ensures that:

- Any future desalination facilities or PRW schemes will be located on the best possible sites, minimising the environmental, social and economic impacts;
- Corridors for connecting infrastructure can be identified and preserved;
- Town plans can be amended to ensure that any future development around the sites is complementary:
- · The sites can be taken into account in the design of the bulk networks for water and electricity: and
- Focussed planning can be undertaken for sites that may be required as part of a Drought Response Plan, including obtaining environmental approvals.

The detailed investigations, commencing in 2008, will include:

Engineering pre-feasibility studies to determine the full extent of works required at each potential site;

- Detailed bulk transport network analysis to identify how water would be distributed, including the need for major inter-connections;
- Economic assessment of the capital and operating costs:
- Environmental and social assessments; and
- Community consultation.

Detailed environmental and social assessments will be required to be prepared and assessed prior to any potential site being developed.

Desalination sites for detailed investigation

The Strategy identifies potential desalination sites for further investigation at Marcoola, Kawana, Bribie Island, Lytton, North Stradbroke Island and South Stradbroke Island.

All of the sites are government owned. One has been recently used for sand mining, one was recently a pine plantation, one is located in an existing industrial estate, one adjoins an existing wastewater treatment plant, one is an agricultural site adjoining an airport and one is unallocated State land.

The criteria used to identify the best potential desalination plant locations between Noosa and the New South Wales border included:

- Social impacts;
- Environmental impacts, including the dispersal of the waste stream; and
- Engineering feasibility.

Each site differs in terms of local constraints, including site area, distance to key growth areas, and the potential size of the desalination facility. Figure D describes the potential sites for desalination plants and PRW schemes. Any desalination facility must satisfy strict environmental requirements.

Our future infrastructure program

Desalination is likely to be a key element of the future infrastructure programs. Pending detailed investigations, the Strategy identifies that the maximum supply from potential possible dam and weir upgrades and PRW schemes will be about 220,000 ML/a, which is less than the potential supply gap at 2056. This is due to:

- Further development of dams and weirs being constrained by water resource plan outcomes and suitable
 sites for construction of dams. Most of the remaining options will be limited by the impact of climate
 variability and change. In most cases, the drought resilient yield is less than the amount that can be extracted
 from the existing dam;
- Potential PRW schemes being small compared to the Western Corridor Recycled Water Project, due to
 practical and economic considerations. By 2056, the schemes identified for more detailed investigation
 could supply about 100,000 ML/a, taking into account reduced sewer flows during drought;
- Groundwater resources in SEQ being almost fully developed and, in some cases, over-developed; and
- Importing water from outside SEQ being relatively expensive.

The preferred infrastructure program will be determined in future versions of the Strategy, informed by the outcomes of detailed investigations.

Figure D Potential sites for desalination plants and PRW schemes

The Strategy assessed two potential portfolios of supply options, including one which contained a mix of climate dependent sources and climate resilient sources and one which included only climate resilient sources. This analysis concluded a program containing a combination of climate resilient supplies, and dams and weirs was preferred, pending the outcomes of detailed investigations. This portfolio was likely to have a lower economic cost to the community.

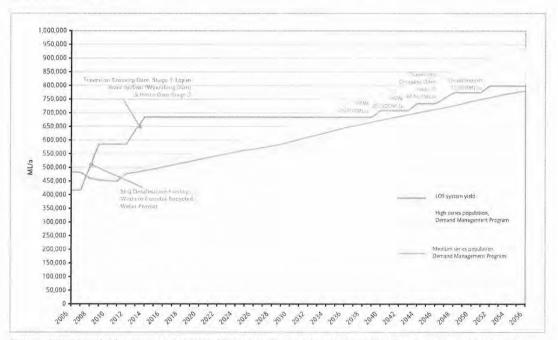


Figure E Projected infrastructure program: Climate resilient and surface supplies (medium series population growth and no allowance for climate change)

Rural water

In the future, the Water Grid Manager will sell surplus water when it is available, including to rural producers. Up to 42,000 ML/a of additional supplies will be made available for rural production, outside of severe drought. Additional supplies may be made available on a temporary basis when supply significantly exceeds demand. These supplies will be subject to conditions, including improved water efficiency and improved management of groundwater aquifers.

The QWC will investigate options to ensure that rural communities with reticulated drinking water supplies enjoy the same security of supply as the remainder of SEQ.

Implementation and review

Through the Strategy, the QWC proposes a wide range of actions to deliver on the Water Supply Guarantee. The expected outcomes of these actions are:

- Sufficient water to support a comfortable, sustainable and prosperous lifestyle while meeting the needs of urban, industrial and rural growth;
- Improved understanding and capacity to manage the risks associated with water planning, delivery, security and sustainability in SEQ:
- Improved availability and reliability of water supplies for rural production:

- The energy intensity of the Grid will be increased as more manufactured supplies are introduced, but the increase will be managed through optimised Grid operations; and
- The health of waterways in the region will be improved.

The modelling analysis which underpins the Strategy is based on a range of assumptions about climate, planning criteria, and supply and demand variables, all of which are subject to review and change. In particular, the Strategy will be revised as information on the likely impacts of climate change and population growth improves.

Consequently, it will be necessary over time to update the modelling and other analysis used in preparing this Strategy.

The QWC will coordinate the review of the Strategy at appropriate times. In general, it will be reviewed on a five yearly cycle aligned with the review of the South East Queensland Regional Plan 2005-2026. The OWC will continue to provide stakeholder organisations, individuals and interest groups with opportunities to influence water planning and management in SEQ.

Feedback on the draft Strategy

This document has been prepared to seek community input, prior to providing advice to the government, on the development of a comprehensive, long-term, region—wide water strategy.

Have your say

The QWC welcomes comment on the draft Strategy, prior to finalisation in mid 2008. Comments can be made through the QWC website at www.qwc.qld.gov.au or by writing to:

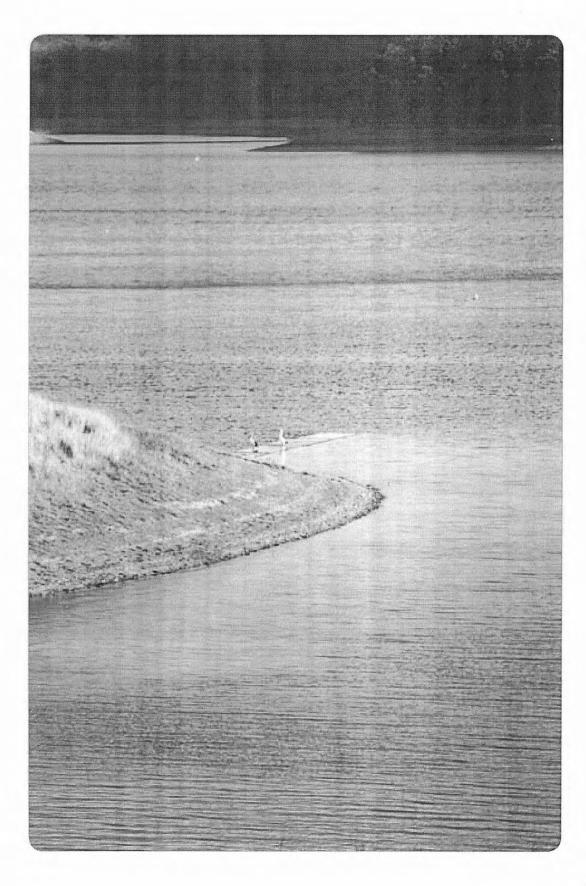
Queensland Water Commission PO Box 15087 City East 4002

For further information, contact the QWC on 1300 789 906.

The draft Strategy represents the views of the QWC, and has not been considered or endorsed by the Queensland Government or Council of Mayors (SEQ).

Informed by the comments received, the QWC will finalise the Strategy in consultation with the Queensland Government and the Council of Mayors (SEQ).







1. Setting the scene

This chapter explains the purpose of the South East Queensland Water Strategy (the Strategy), the guiding principles and the Water Supply Guarantee, which is the Queensland Water Commission's (QWC) vision for the future and the basis for water supply planning.

Key messages

- The Strategy will deliver a new standard of water security in SEQ. It will deliver the Water Supply
 Guarantee of supplying sufficient water to support a comfortable, sustainable and prosperous lifestyle
 while meeting the needs of urban, industrial and rural growth and the environment.
- The vision for the future includes a well informed, water wise community that understands the balance between water security, quality and cost and is engaged in the planning process as decisions are made. Key elements of this vision are:
 - Water efficiency will be embedded throughout the supply and demand chain:
 - Water security will be managed through diversified and interconnected water supplies;
 - The region's water resources will be managed to ensure the health of our environment, particularly our waterways and bays; and
 - The Strategy provides a comprehensive planning and implementation framework to secure water supplies for SEQ for the next 50 years.

11 Purpose of the Strategy

As described in the South East Queensland Regional Plan 2005/06 (the Regional Plan), the purpose of the Strategy is to ensure water in the region is managed on a sustainable and integrated basis to provide secure and reliable supplies of acceptable quality for all uses for the next 50 years.

SEO Local Government Areas identified in the Regional Plan, as defined in Section 2.5A.2 of the *Integrated Planning Act* include:

- Beaudesert Shire
- Boonah Shire
- Brisbane City
- Caboolture Shire
- Caloundra City
- Shire of Esk
- Gatton Shire
- Gold Coast City
- Ipswich City

- Kilcoy Shire
- Laidley Shire
- Logan City
- Maroochy Shire
- Noosa Shire
- · Pine Rivers Shire
- Redcliffe City
- Redland City
- Toowoomba City

Consideration has also been given to the Cooloola Shire that joins to the north of the SEQ region since it relies on the Mary River for part of its water supply.

As of March 15, 2008, the boundaries for Local Government Areas in Queensland changed. The Strategy has been prepared with consideration of the new local government boundaries. Importantly, the Strategy provides for continuous water security, irrespective of outcomes from local government and water supply institutional reforms currently taking place in SEQ.

1.2 Guiding principles

The principles underpinning development of the Strategy derive from the Water Act 2000 Section 346 (3):

- Water is a scarce and precious resource that is to be shared across the region:
- Water quality should be managed from its source to its end-users in a way that:
 - i. Ensures the health of catchments, aquifers and their ecosystems; and
 - ii. Delivers water of a quality desired by the end-users at the lowest overall cost;
- Water supply arrangements should maximise efficient and cost-effective service delivery and the efficient
 use of water, such as appropriate connectivity between supply sources, in accordance with Level of Service
 objectives;
- Costs of water sources should be equitably shared among users who benefit from them:
- Pricing should recognise Queensland Government commitments under inter–governmental agreements (e.g. the National Water Initiative);
- Regional water planning should consider environmental, social and economic factors, and include 'least cost
 planning' to ensure proper economic comparison of all supply and demand options;
- Water restrictions should only be used where they will help achieve the region's objectives for long-term
 demand management for water and in managing any significant threat to the sustainability and security of
 the region's water supply; and
- Flood mitigation and dam safety should be considered in the preparation of assessments of regional water supply.

These principles articulate the Queensland Government's expectations of the QWC. and how it will fulfil its functions. Consequently, investigation of future options within these parameters has guided the recommendations provided in this document, with the *Water Supply Guarantee* as the strategic outcome.



1.3 South East Queensland today

SEQ is one of the most livable regions in Australia. Located in the sub-tropics, the region experiences a pleasant year-round temperature range that supports an environment rich in biodiversity and natural resources — and a highly attractive outdoor lifestyle.

Within SEQ. the diversity of sub-regions includes mountain ranges. pastoral lands. rainforests, beaches and islands. Predominantly rural landscapes lie to the west of the urbanised coastal centres. The Lockyer Valley, a major agricultural area. lies outside Brisbane. World Heritage listed rainforests such as Lamington National Park and Main Range National Park are located along the region's southern border ranges, an area known as the Scenic Rim.

The region supports a diversified economic base including agriculture, aquaculture, manufacturing, mining, commercial and tourism enterprises. As the fastest growing metropolitan area in Australia. SEQ's economic significance to the state includes generating:

- · 62% of Queensland's Gross State Product:
- 70% of manufacturing turnover; and
- 68% of Queensland's employment.

At the same time, SEQ is one of the most diverse, species-rich regions in Australia and the world, supporting.

- Approximately 5.000 native plant species:
- 900 native animal species;
- 149 ecosystems, including eucalypt rainforest, non-eucalypt rainforest, vine thicket, and non-forest ecosystems;
- Healthy populations of dugong herds, turtles and other marine animals in Moreton Bay; and
- An internationally recognised (Ramsar Convention) site in Moreton Bay of significance to migratory wading birds.

Within SEQ, there are numerous localised catchments forming or emptying into the greater SEQ catchment (see Figure 1.1).

Historically, the SEQ community has relied on rainfall over dam catchments and the recharging of groundwater aquifers to meet our water needs – and our needs have been substantial. Prior to the current drought, SEQ residents used approximately 300 litres of water per person per day.

The combination of economic development and a highly livable environment has resulted in a massive population migration to the region over the last 20 years with approximately 66% of Queensland's population currently living in SEQ. This growth is impacting on our natural environment and waterways. Urban, rural and coastal developments are affecting water movement and recharging of groundwater aquifers within the SEQ catchment.

In addition to these concerns, SEQ is experiencing the worst drought in recorded history. The Millennium Drought, so named because it began at the turn of the millennium, will move into its eigth year at the beginning of 2008. The drought has demonstrated the implications of relying on surface water storages when our historical climate record is so short. In response to the drought, the community has demonstrated an outstanding commitment to reducing water consumption by embracing water restrictions and other voluntary water saving behaviours.

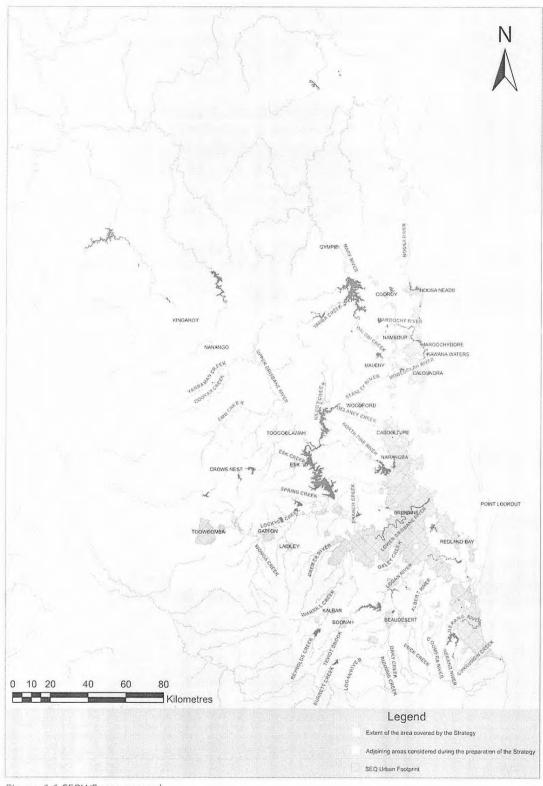


Figure 1.1 SEQWS area covered

14 The Water Supply Guarantee

The Millennium Drought has changed the way the SEQ community thinks about water. Every drop of water is precious. The Strategy reflects this changed attitude through the vision of the Water Supply Guarantee for SEQ. The Strategy was developed using a new planning methodology and a comprehensive water balance model that, as far as possible, considers climate change, climate variability, population growth and other regional factors affecting supply and demand. The Strategy aims to deliver the Water Supply Guarantee.

This section outlines the vision of life for SEQ which we are seeking to realise through the Strategy.

The Water Supply Guarantee

It is our vision that there will be sufficient water to support a comfortable, sustainable and prosperous lifestyle while meeting the needs of urban, industrial and rural growth and the environment.

Known as the Water Supply Guarantee. this water security vision will be achieved by:

- Balancing community expectations of water security, quality and cost;
- · Embedding water efficiency throughout the water supply and demand chain:
- Managing water security through diversified and integrated water supplies and drought preparedness;
 and
- Improving environmental outcomes, including healthier waterways, through integrated strategic
 planning and catchment management.

1.4.1 Balancing community expectations

SEQ is becoming an increasingly inter–connected community, where urban and rural areas both contribute to regional wealth. There are diverse employment opportunities, as well as shared infrastructure and services including education, recreational, health, energy and transport systems. Likewise, available water resources will be shared for the mutual benefit of all South East Queenslanders while concurrently meeting the needs of the environment. This will enhance existing recognition of SEQ as a progressive and well informed community, fostering sustainable regional equality and prosperity. The SEQ community will be water wise and increase indoor and outdoor water efficiency.

Our water resources will be managed sustainably. Including recycling where it can be done effectively and safely. New infrastructure will be built in time to meet anticipated growth in the community. Planning will regularly be reviewed to keep abreast of technological advances and will reflect changing demand patterns and cultural attitudes towards water conservation. Using the scientific information available and prudent planning, investments in the water supply system will be made with the objective that medium–level water restrictions will not occur more than once every 25 years on average. These medium–level restrictions would be less onerous than the Severe Level Restrictions applied in the current drought. For instance, this new planning framework will not require the residential community to water their gardens with a bucket in response to future droughts. Public health and safety will not be compromised and the highest water quality standards appropriate to the use will always be maintained.

These outcomes will be achieved with the best possible economic management to minimise the cost to the community and ensure our water supplies remain affordable. In the future, the pricing of water will reward efficient users while still reflecting the actual cost of developing and operating new water sources.

The preferred method of achieving this saving will be reflected in future restrictions regimes. The QWC will take into account the likely impact of restrictions and the existing level of efficiency for residential and non-residential customers. Once business and industry has implemented permanent water saving measures, it is likely that additional savings will be mostly derived by curtailing outdoor use by the residential sector.

1.4.2 Embedding water efficiency

During the Millennium Drought, South East Queenslanders have demonstrated their capacity to be water efficient. After the drought, the community will continue to value water and seek ways to be more efficient without compromising quality of life.

There will be enough water to maintain our gardens, wash cars, and top up swimming pools and fill paddle pools. But as a water wise community, we will water our gardens in the cool of the day, use efficient watering devices such as low flow taps and minimise pool losses by using pool blankets or topping up first with rain water tanks. Our houses will be fitted with water efficient appliances such as dual flush toilets, so we can save water without thinking about it. Water conservation will be an important design aspect when building and renovating houses and all commercial and industrial buildings.

Our commercial, industrial and government water users will have water efficiency embedded in their business plans and operate under codes of practice to ensure they reach and maintain best practice standards. Our rural water users will be able to trade water and they will have efficient irrigation equipment and on–farm water use practices.



The region's water supplies will be managed to provide efficient, sustainable and equitable water services. Water use from major water sources will be metered, monitored and managed through the operation of the Water Grid. The infrastructure that supplies our water will be well maintained so that best practice leakage and loss management can be achieved.

1.4.3 Water security through diversified and integrated water supplies

SEQ will have a water supply network that is increasingly diversified and interconnected. There will be water supplies located throughout the region that, over time, can supply all parts of SEQ with reticulated drinking water supplies through an expanding grid of inter-connecting pipe networks. We will have a range of water supplies including new dams and weirs, desalination and water recycling. This combination will make the most of the rain we receive and protect us from periods of drought. All South East Queenslanders will have access to the region's water resources. Our water supplies will be managed on an integrated basis to provide efficient. sustainable and equitable bulk water services. There will be pre-determined Drought Response Plans in place to meet our water needs during future periods of prolonged drought. Corridors and potential sites will be identified and preserved so we can build the best new water supply infrastructure in the future.



1.4.4 Improving environmental outcomes

The region's sources of supply will be managed with a view to enhancing the health of our waterway systems. Nutrient discharges into Moreton Bay will be reduced because more of SEO's water will be recycled. Enough water will be released into rivers and streams from our dams to maintain flora, fauna and river health. Informed choices will be made about the balance between water supply and energy consumption. Our community will have an improved quality of life because of the choices we make,

1.5 What the Strategy aims to do

SEQ is a large and diverse area with numerous challenges to resolve. Development of the Strategy has required collaborative investigations by state and local governments over a number of years. This included the assessment of water available from existing, committed and potential dams and weirs through Water Resource Planning processes, projections of future water demands driven by regional growth, and detailed investigation of future water supply and demand management options. The Strategy will be further refined after considering feedback received from the community when it is released for consultation.

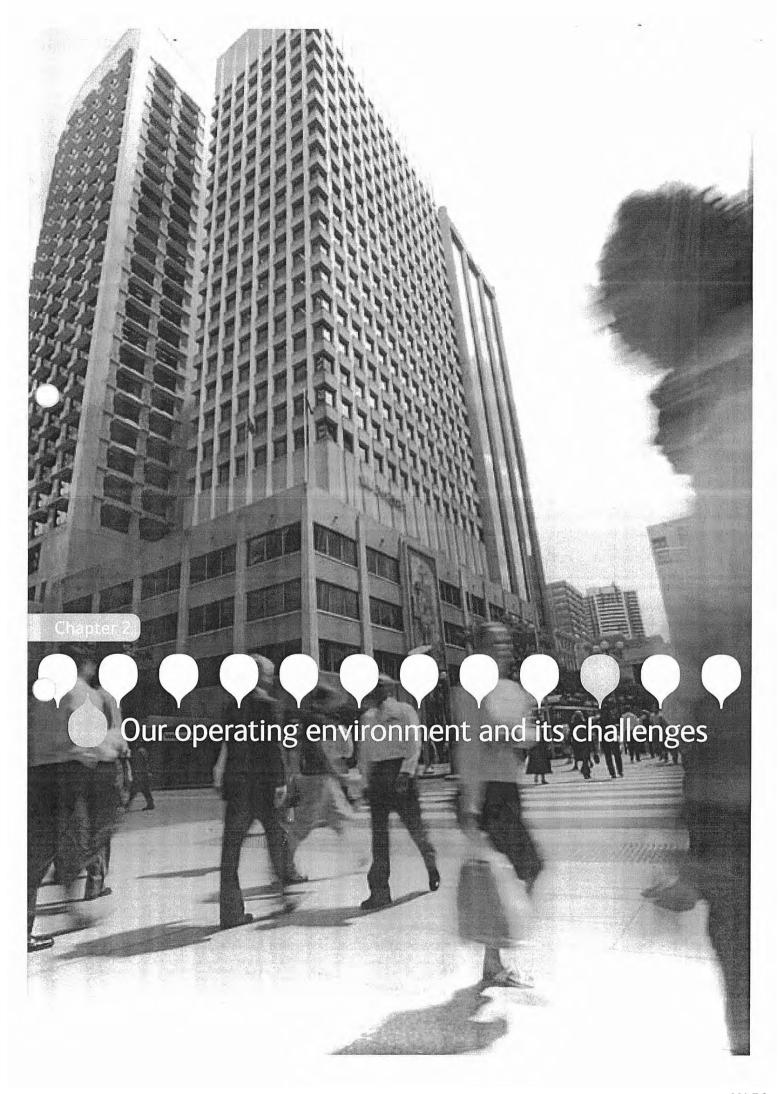
During the course of this investigation work, SEQ entered into severe drought and the Queensland Government announced a range of drought initiatives to ensure restricted water supplies can be maintained. Consequently, a number of measures to manage demand and augment supply were announced under the Water Amendment Regulation (No. 6) 2006 (Drought Regulation). The report. Water for South East Queensland: a long-term solution. explained the rationale behind the Drought Regulation using information gathered as part of the Strategy development. The measures are expected to deliver security to regional water supplies over the next 20 years or more.

The Strategy

- Establishes clear regional water planning criteria for future growth and drought that considers economic, social and environmental factors;
- Provides a basis for water security options developed for the Queensland Government to consider, as part of the OWC's function under the Water Act 2000;
- Assesses supply and demand forecasts;
- Identifies timing and scale of augmentation for regional water supplies:
- Identifies optimal infrastructure and demand management responses (i.e. maximises efficient and cost effective delivery and the efficient use of water):
- Informs the community on the Level of Service objectives proposed for the community and how these have been developed; and
- Enables the community to comment on the proposed management of the region's long-term water security.







2. Our operating environment and its challenges

This chapter describes the existing framework of plans, policies, strategies and programs that direct the development and management of growth and resources within the SEQ region. The chapter also describes the major challenges of our region that have been identified as affecting the approach by which we plan for the future.

Key messages

- The Strategy has been developed with consideration of the relevant laws, regulations, guidelines and agreements related to planning in SEQ.
- Key challenges facing SEQ include a rapidly expanding population served by surface and groundwater supplies that are vulnerable to climate impacts.
- Water supply planning must reflect the importance of healthy waterways and catchments.
- Water supplies for rural communities should be enhanced, however there are limited opportunities.
- The growth in SEQ is encroaching on potential sites of future water sources. Potential sites for future water supply projects need to be identified and preserved.

2.1 The Queensland Water Commission

In 2006, the QWC was established as the primary organisation to provide advice to the Queensland Government on achieving water security in SEQ. The QWC's role is set out in the *Water Act 2000*. Consistent with this role, the QWC became responsible for coordinating the final development of the Strategy.

2.2 Working in partnership

The QWC recognises the importance of partnerships to achieving the region's water supply objectives. The QWC has continued the partnership approach to the development of the Strategy, which commenced as a collaboration between the Queensland Government, the Council of Mayors (SEQ) and the region's existing bulk water authorities — SEQ Water and SunWater. The Strategy builds on earlier work including Water for South East Queensland, a long-term solution, prepared by the then Department of Natural Resources, Mines and Water. Input was also sought from industrial and rural water user groups, specialist working groups and the Healthy Waterways Partnership. The QWC will report on the Strategy to both the Queensland Government and Council of Mayors (SEQ) after community consultation.

Management of the Millennium Drought, particularly the formulation of water restrictions, has prompted extensive consultation with residential, industrial and environmental groups. The development of large infrastructure works can be a sensitive issue, both socially and environmentally. Stakeholders have been consulted extensively during development of specific projects in the Drought Regulation and they will continue to be consulted as further infrastructure development occurs. This input has been used to gauge the community's expectations about quality of life and water use in the future, recognising that developing individual supply and demand solutions will require a high degree of community engagement.

2.3 Our legislative and policy frameworks

Figure 2.1 shows some of the key state and regional plans that have influenced the development of the Strategy. The development of the Strategy has also been influenced by other policies and initiatives such as the National Water Initiative and the National Water Quality Management Strategy.

2.3.1 The SEQ Regional Water Security Program

The legislative and policy framework for water management in SEQ includes specification of a number of required (and enforceable) programs and plans. The Regional Water Security Program is one of these. The SEQ Regional Water Security Program is made by the Minister for Infrastructure and Planning. It specifies at high level, how regional water security is to be achieved. A Regional Water Security Program for SEQ was made on 13 November 2006, providing for the construction of significant infrastructure. The Strategy will form the basis of the QWC's advice to the Minister for Infrastructure and Planning on further regional water security options if such advice is sought.

2.3.2 The Regional Plan

The Regional Plan was developed to provide a framework for sustainable growth in the region to the year 2026. It describes management strategies, regional land use patterns and policies to address growth management issues.

The Regional Plan describes a projected population approaching four million people in 2026 living mostly in a compact, well–serviced and efficient urban form supporting diverse economic activity and employment opportunities. Rural communities and industries are recognised as making an important contribution to the region's quality of life and economy, providing diverse agriculture and grazing opportunities.



Figure 2.1 Relationship of the Strategy with other planning processes

The Regional Plan acknowledges that water is a precious and finite regional resource that requires management on a total water cycle basis. The desired outcome of the plan is that water in the region is managed on a sustainable and integrated basis to provide adequate supplies for human and environmental uses.

The Regional Plan requires that there are secure, coordinated supplies of water to meet reasonable growth and development in the region including meeting rural water needs. This must be done while minimising overall system costs and protecting and enhancing the ecological heath of our groundwater and surface water systems. It supports targeted reductions in water consumption by using water efficiently and managing consumer behaviour. Under the Regional Plan, it is proposed that the Strategy will examine alternative water sources and demand management options, developing a strategic direction for water supply in the region through to 2056.

2.3.3 Water resource planning

The Department of Natural Resources and Water is responsible for the preparation and implementation of Water Resource Plans and Resource Operations Plans, in accordance with the requirements of the *Water Act 2000*. A Water Resource Plan details what the government aims to achieve for a catchment's social, economic and environmental needs (both now and in the future) and provides a framework for the management and allocation of water in a catchment. A Resource Operations Plan explains how water resources will be managed from day to day to meet the strategic objectives and outcomes specified in Water Resource Plans. Together these documents describe how to allocate surface and ground water from natural watercourses and aquifer systems.

Water resource planning is a prerequisite to any regional water supply planning as it establishes how much of our natural water sources have been allocated, and how much and where it is available.

Water Resource Plans have been finalised for all major catchments in SEQ, namely the Mary, Moreton, Logan and Gold Coast (refer Figure 2.2). To cater for population growth, these Water Resource Plans were developed taking into consideration the Regional Plan and the SEQ Infrastructure Plan and Program. Resource Operations Plans are currently in preparation.



The Water Resource Plans:

- Provide transparent sharing of water to protect environmental and human interests;
- Provide for future water needs;
- Provide for secure water entitlements for the life of the plan;
- Ensure that new allocations will only be issued if they meet the plan's objectives:
- Allow for permanent trading of water allocations, separate from land;
- · Protect the ecosystem health of rivers, estuaries and bays; and
- Define the monitoring requirements.

The plans protect existing users and the environment by specifying long–term performance indicators, derived through hydrologic assessments.

The Resource Operations Plans establish the amount of water allocated for high priority and medium priority purposes to achieve the objectives set down in the Water Resource Plans. High priority water, with a supply reliability generally greater than 95% based on historical records, is usually allocated for urban and industrial purposes. Medium priority water with a lower supply reliability is usually allocated to rural irrigation.

Any new infrastructure that provides additional water under the Strategy must be consistent with the requirements established under the Water Resource Plans.

23.4 Healthy Waterways

Healthy Waterways is a program of the South East Queensland Healthy Waterways Partnership, a whole-of government, whole-of-community collaboration. It has a focus on leadership, commitment and voluntary cooperation to understand, plan and manage the use of SEQ's waterways and catchments. The program aims to complement, support and help implement other strategies and plans, including the Regional Plan, the Strategy and the Natural Resources Management Plan.

2.3.5 Drinking water quality

The Australian Drinking Water Guidelines (ADWG) provide a framework for good management of drinking water supplies that, if implemented, will assure safety at point of use. The ADWG have been developed after consideration of the best available scientific evidence. The guidelines are designed to provide an authoritative reference on what defines safe, good quality water, how it can be achieved and how it can be assured. The ADWG address health and aesthetic issues and include guideline values for water quality parameters. The guidelines are intended for use by the Australian community and all agencies with responsibilities associated with the supply of drinking water, including catchment and water resource managers, drinking water suppliers, water regulators and health authorities.

A 95% supply reliability means that the full water allocation can be delivered in 95% of the months that exist on the historical record analysed in producing the Water Resource Plan. A failure to meet the full water allocation in any month does not mean that no water is available in that month.

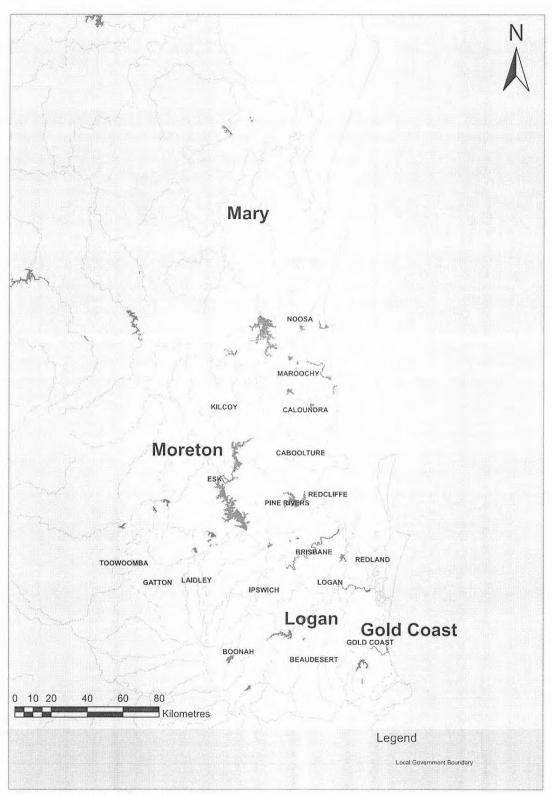
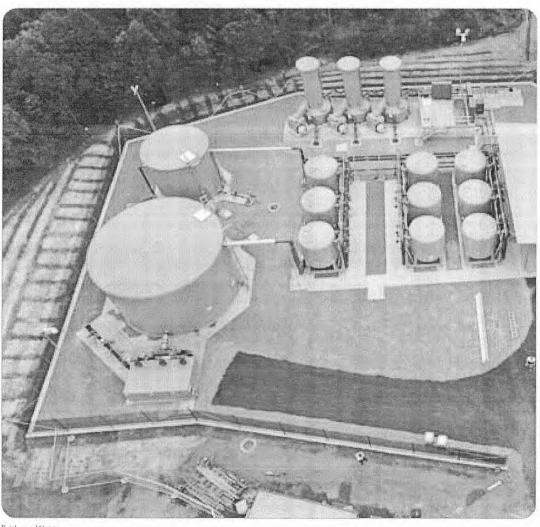


Figure 2.2 Water Resource Plan areas

2.3.6 Regulation of groundwater

The Water Act 2000 is the primary tool for management of groundwater extraction in Queensland. Regulated groundwater areas have recently been identified in the Water Resource Plans for the Mary and Moreton catchments. These mainly affect existing irrigated supplies. Bores for domestic use in SEQ have been regulated on an as-needs basis, such as the recently announced moratorium over the area of the Brisbane Aquifer Project.

Water bores may require a development permit under the *Integrated Planning Act 1997* before they can be constructed. This ensures that these works are constructed properly and do not pose a risk to public safety or to the groundwater resource. Generally, the permit is required for all purposes except for stock water and domestic use.



Brisbane Water Runcorn Water Treatment Plant Copyright 2007 Brisbane Caboolture Aquifuture Alliance Photo courtesy of Brisbane City Council

2.3.7 Regulation of recycled water

The Queensland Government is developing a recycled water regulatory framework to safeguard the public and to make sure that recycled water schemes produce water of a quality that is suitable for its intended use. The framework will apply to all new and existing schemes across Queensland and it will be in place before PRW is introduced to the region's drinking water supply.

In 2006, the Australian Guidelines for Water Recycling Phase 1 were released following endorsement by Environment Protection and Heritage Council and the Natural Resource Management Ministerial Council. The guidelines comprise a risk management framework and specific guidance on managing the health risks and the environmental risks associated with the use of recycled water. Phase 2 of the guidelines has recently been released for consultation, and specifically addresses the use of PRW for augmenting drinking water supplies.

2 3.8 National Water Initiative

The National Water Initiative (NWI) is an inter–governmental agreement between the Commonwealth of Australia and all states and territories, with the aim of improving water management across the country.

The overall objective of the NWI is to achieve a nationally compatible market, regulatory and planning-based system of managing surface and groundwater resources for rural and urban use that optimises economic, social and environmental outcomes. In particular, the NWI seeks to achieve.

- Progressive removal of barriers to trade in water to facilitate the broadening and deepening of the water market, with an open trading market to be in place;
- More confidence for those investing in the water industry due to more secure water access entitlements, better and more compatible registry arrangements, better monitoring, reporting and accounting of water use, and improved public access to information;
- A commitment to complete the return of all currently over-allocated or overused systems to environmentally sustainable levels of extraction;
- More sophisticated, transparent and comprehensive water planning that deals with key issues such as
 the interaction between surface and groundwater systems, and the provision of water to meet specific
 environmental outcomes; and
- Better and more efficient management of water in urban environments, for example through the increased use of recycled water and stormwater.

2.4 Institutional arrangements

Traditionally in Queensland, councils have been the primary providers of reticulated urban water supply. In many cases, particularly outside SEQ, they are also the main providers of bulk supply sources and delivery.

Historically, the institutional arrangements for water supply in SEQ have been parochial and fragmented, with bulk source, transport and treatment assets owned by 25 different entities, servicing 17 separate retail businesses. As highlighted by the current drought, these arrangements suffer from serious systemic weaknesses that have directly impacted on the ability of SEQ's water supply system to meet the needs of the entire regional community.

Since 2005, the Queensland Government and councils have been engaged in a process to develop improvements to the institutional and regulatory arrangements. In May 2007, the QWC delivered a report to the Queensland Government recommending a restructure of the water sector in SEQ to ensure that in the face of climate change and massive population growth, water supplies and wastewater services are sustainable and efficient.

The arrangements will facilitate the implementation of the Regional Water Security Plan and the System Operating Plan, in order to achieve water security for the SEQ region. The key features for the new arrangements at the bulk level are:

- Establishment of the Queensland Bulk Water Supply Authority which will own all dams, groundwater infrastructure and water treatment plants in SEQ;
- Establishment of the Queensland Manufactured Water Authority which will own the desalination plant at the Gold Coast and the Western Corridor Recycled Water Project;
- Establishment of the Queensland Bulk Water Transport Authority which will own all major pipelines in SEQ (including the eastern and northern pipeline interconnectors); and
- · Establishment of the SEQ Water Grid manager to:
 - Manage water sharing across the region by directing the physical operation of the Water Grid to meet the requirements of the Regional Water Security Program and the System Operating Plan; and
 - Provide a mechanism to share the costs of the Water Grid, by acting as the single buyer of bulk water services and the single seller of bulk water for urban and industrial purposes.

The key features of the new arrangements at the retail/distribution level are:

- Consolidation of retail businesses from 17 to between three and 10, with Councils to submit a consolidated proposal to the State Government on the final number; and
- Establishment of a single, distribution business owned by local government that will own all the water reticulation, service pipes, meters and sewerage reticulation in the region.

Reform at bulk level is well underway, starting with the South East Queensland Water (Restructuring) Act 2007 which commenced in November 2007. The reforms at retail and distribution level are to occur by no later than July 2010.

The management strategy for wastewater treatment plants was still under consideration at the time of printing.

2.5 Total water cycle planning

The Strategy recognises that sustainable management of the water cycle is crucial to the ecological health of the region. Water quality issues are inextricably linked to the development and management of the region's water resources.

Total water cycle management recognises the finite limit to the region's surface and ground water resources, and the inter–relationships between the human uses of water and the health of the natural environment. It involves integrated assessment of water management issues across the entire community. A component of total water cycle planning is Water Sensitive Urban Design (WSUD). WSUD seeks to integrate all aspects of the water cycle into urban planning, including water supply, sewage and stormwater management to use water more efficiently and achieve improved environmental benefits.

The Strategy has sought to optimise total water cycle outcomes by:

- Considering all potential water sources. including wastewater and stormwater;
- Seeking to use and manage all water resources sustainably and within Water Resource Plan limits;
- Integrating water use and natural water processes by maintaining environmental flows and seeking strategies that protect water quality; and
- Recognising the importance of catchment management in protecting public health and safety.

This approach to preparing the Strategy has highlighted the importance of enhanced recycling, WSUD and the requirement to focus on catchment management to protect drinking water supplies and waterways from pollution.

Total water cycle planning

Total water cycle planning incorporates all aspects of the natural and urban–rural water cycles. Key features of total water cycle planning (compared to traditional urban–rural water cycle planning) include enhanced recycling. Water Sensitive Urban Design in development, use of stormwater for water supply and a focus on catchment management to protect drinking water supplies and waterways from pollution.

 The natural water cycle – The key features of the natural water cycle are rainfall into lakes and rivers, recharge of groundwater aquifers, transport of water to the sea and evaporation to produce more rain.



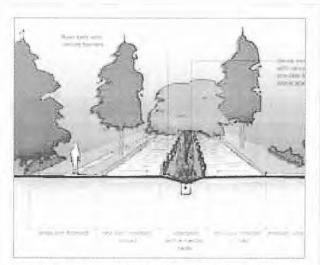
Source: Healthy Waterways Fact Sheet - The Water Cycle

- The urban-rural water cycle The water cycle created by urban and rural development. Its key
 features are the introduction of water storages, the treatment and distribution of drinking water,
 and the collection, treatment and discharge of wastewater. This cycle also includes the run off and
 discharges from agricultural and industrial activities.
- The total water cycle An integrated approach that optimises outcomes relating to:
 - Integrated management of urban and rural water:
 - Public and environmental health;
 - Allocation of water resources for human use and the environment; and
 - The natural and built environment.

Water Sensitive Urban Design

Water Sensitive Urban Design is a planning and design approach that integrates water cycle planning management into the built form of houses, allotments, streets, suburbs and master planned communities. Among other things. Water Sensitive Urban Design seeks to avoid or minimise the impacts of development by:

- Protecting and enhancing the intrinsic values of the natural water cycle by minimising disturbance to natural landforms, wetlands, watercourses and riparian zones;
- Protecting surface and groundwater quality;



Source: Water Sensitive Urban Design Technical Design Guidelines for South East Queensland, Moreton Bay Waterways & Catchments Partnership

- Reducing downstream flooding and drainage impacts on aquatic ecosystems by managing stormwater runoff and peak flows;
- Promoting more efficient use of water by providing access to local supplies of alternate water, such as recycled water or stormwater;
- Minimising wastewater generation and ensuring treatment of wastewater to a standard suitable for effluent reuse or release to receiving waters:
- · Controlling soil erosion during construction and operational phases; and
- Providing localised water supply solutions.

In recent years, some local governments in SEQ have integrated Water Sensitive Urban Design into town planning activities, often in partnership with developers. Examples of this include:

- Gold Coast Water's Pimpama Coomera WaterFutures Master Plan. which is regarded locally and internationally as an excellent example of integrated water planning;
- Brisbane City Council's Rochedale Master Plan; and
- · Pine Rivers Shire's work on the North Lakes development.

The Strategy will promote Water Sensitive Urban Design through:

- Establishing water saving targets for new residential developments;
- · Requiring the installation of rainwater tanks on new industrial and commercial buildings; and
- Increasing the use of recycled water, treated to fit-for-purpose standards.

The Regional Plan endorses the adoption of Water Sensitive Urban Design.

2.6 The challenges we face

The challenges

The challenges that must be managed to achieve the Water Supply Guarantee are.

- Meeting the needs of rapidly expanding population growth:
- Reversing the pre-drought trend of increasing water usage per capita:
- · Reducing reliance on surface and groundwater supplies that are vulnerable to climate impacts;
- Further expanding water supply in SEQ with limited opportunities for additional dams and weirs.
 beyond existing commitments:
- Planning for the impact of climate variability and climate change on SEQ's surface and groundwater supplies, including greater incidence of hotter and drier periods:
- Enhancing water supplies for rural production:
- Reducing the impact of treated effluent discharges into waterways;
- Making the most efficient use of the energy required to deliver water to SEQ consumers:
- Implementing a new administrative and institutional structure to ensure efficient management of the Water Grid:
- Establishing equitable water pricing frameworks to encourage efficient use; and
- Identifying and preserving suitable sites for future water supply projects, such as desalination plants and recycled water schemes, in a time of high regional growth.

Our rapidly growing community is facing many challenges – to our lifestyle, environment, economic productivity and livability of our region. The QWC will work in partnership with the SEQ community as we face these challenges to manage their implications for our water security.

2.6.1 Population growth and demand trends

SEQ's population growth over the last 20 years. coupled with our economic profile, suggests the region's population will continue to grow substantially between 2007 and 2056 (see Table 2.1). Given these trends, planning has occurred on the basis that future population growth in SEQ will trend between the medium and high series projections. Based on a high series projection, the population of SEQ will surpass six million people by 2056.

If SEO residents were to return to pre–drought water usage of nearly 300 litres per person per day, regional water demand would double within the next 30 years based on high series population forecasts. However, the community's response to the current drought has demonstrated that implementing simple behavioural changes, supported by basic water efficiency devices, can result in substantial water savings potentially reducing and deferring the need for additional infrastructure.

Table 2.1 Low. medium and high population projection series.

Projected Population			
	Medium	High	
2006¹	2,802,500	2.802.500	
2011	3,072,300	3.133,800	
2016	3,376,800	3,518,900	
2021	3,677,000	3.921.200	
2026	3,959,500	4,321.600	
2051 ²	5.079.700	6,233,500	
2056³	5,250,000	6,432,100	

Sourced from the Planning Information and Forecasting Unit, Department of Local Government, Planning. Sport and Recreation. October 2007.

²2051 figures taken from *Queensland Government Population Pojections to 2051: Queensland and Statistical Divisions, 2nd Edition, 2006* (Published by the Office of Statistical Research, July 2006).

³2056 – extrapolated by QWC from 2051 data and figure provided by PIFU and from *Queensland Government Population Pojections to 2051: Queensland and Statistical Divisions, 2nd Edition. 2006*

2.6.2 Climate dependent water supplies

As the Millennium Drought has demonstrated, these sources are affected by climate variability. In addition, once the currently planned projects are completed, there are few sound opportunities for significant further development of major new storages in the region. This is due to the shortage of suitable sites in areas identified as having reliable water inflows available in Water Resource Plans.

Groundwater use in SEQ is almost fully developed. apart from smaller opportunistic extractions. The use of groundwater for rural applications is also considered fully developed and in some cases over-developed.

2.6.3 Climate change and variability

Queensland experiences one of the most naturally variable climates in the world. Australian Bureau of Meteorology studies indicate that Queensland's climate is changing, becoming increasingly drier and hotter since 1910. Australian Bureau of Meteorology and CSIRO studies suggest the region is heading into a period of increased climate variability, experiencing drought more often and for longer periods of time. Figure 2.3 shows the historical record for rainfall and combined inflows for the SEQ region, demonstrating huge variability.

From the start of the Federation Drought through to the start of the 1950s, the inflow pattern was on average. substantially lower than during the second half of the century, while at the same time average rainfall was quite similar. This demonstrates the significant impacts of patterns of rainfall within a year, particularly the intensity of rainfall leading to inflow.

Climate change

Around the world, 11 of the past 12 years have been the warmest years of global surface temperature on record (recording began in 1850). The global average sea level has increased by approximately 17cm during the 20th century, with the rate of warming and sea level increases accelerating over the last century. The global climate appears to be changing. While climate will continue to be variable, the climate of the last 100 years or more may become less reliable as a guide to the climate of the future².

² IPCC 2007, p5 'Summary for Policymakers', in Climate Change Science: The Physical Science Basis. Contribution of Working Group 1 to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change.

Planning to achieve water security becomes challenging where climate change impacts are uncertain. Previous planning has relied on historical climate behaviour to guide planning for the future. There are risks in waiting for increased certainty in relation to the consequences of climate change.

The more we learn about the climate system, the more we appreciate the system's unpredictability. The challenge is to ensure that water security planning accommodates drought impacts and maintains sufficient flexibility to adapt as climate change science improves. This is particularly important in SEQ, given our current high reliance on surface water supplies.

The challenges for the SEQ community are to recognise that our regional water supply planning will continue to evolve as our understanding of climate change science improves, and to recognise and accept that cost-effective drought planning may mean behavioural changes that include never reverting to pre-drought water usage behaviours. There will be no simple solutions or decisions.

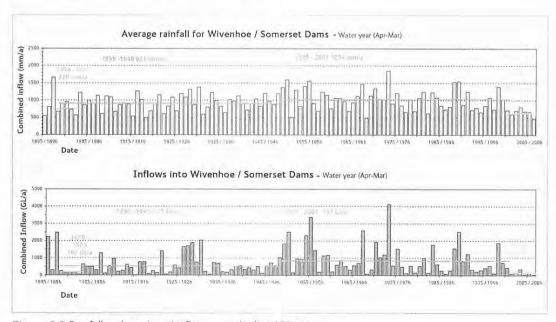


Figure 2.3 Rainfall and combined inflows over the last 100 years.

Note: Average rainfall is the mean rainfall from the Wivenhow and Somerset rain gauges.

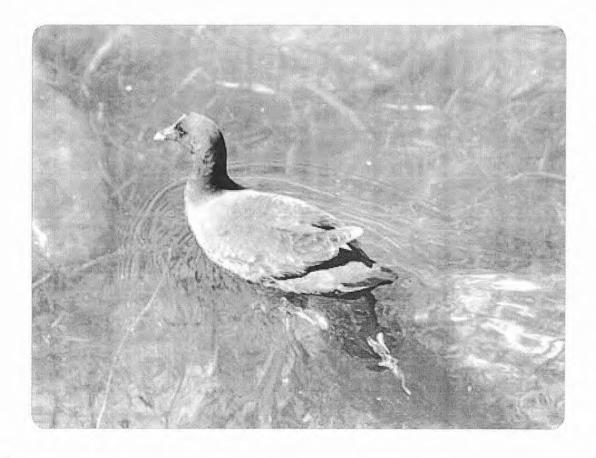
The El Niño-Southern Oscillation (ENSO)

ENSO is a global phenomenon that has a strong impact on Australian rainfall, particularly summer rainfall in Queensland. ENSO involves interplay between the ocean and atmosphere, which sets up a see–saw–like fluctuation in air pressure and sea surface temperature across the eastern and western Pacific. One extreme of this fluctuation is known as El Niño and the other extreme as La Niña. The fluctuation tends to lock into one mode (i.e. either El Niño or La Niña. or a more neutral mode) for several months — typically from spring through to the end of summer. Such ENSO events tend to break down in autumn. El Niño events tend to lead to dry summers in Queensland due to a reduced onshore flow, fewer tropical cyclones (particularly in Southern Queensland) and a less active and less extensive monsoon system. Opposite conditions tend to occur during La Niña events.

ENSO has not been the only factor contributing to the dry conditions experienced in SEQ over the last five to six years. Rainfall in the region is influenced by both tropical systems from the north and fluctuations in the high–pressure ridge to the south. Interaction of these phenomena throws significant uncertainty around rainfall projections and long–term climate behaviour of the SEQ climate system.

The SEQ climate system behaves somewhat predictably (for example, through ENSO fluctuations), but in other respects also behaves chaotically. Therefore the impact of El Niño or La Niña differs somewhat from one event to the next. However, we do know that the ENSO phenomenon has been a major contributor to drought over the last six years in Australia, with El Nino events in 2002/03, 2004/05 and 2006/07.

Modified from: The South East Queensland Drought to 2007. Queensland Climate Change Centre of Excellence. 2007.



The Federation Drought

From 2001 to 2007, SEQ has experienced the worst drought in the region's recorded history in terms of both length and rainfall deficit – one which had not broken by the end of 2007.

Until the current Millennium Drought, the Federation Drought was the worst drought in Australia's recorded history. The Federation Drought of 1895–1902, had significant impacts in Queensland. Rivers in Western Queensland dried up, including the Darling River, with devastating impacts to stock across drought afflicted areas. Sheep numbers fell from 91 million to 54 million, and cattle from 11.8 to 7 million, with some far western properties dropping from tens of thousands to only a few hundred head of cattle³.

Figure 2.4 illustrates the difference between the accumulated rainfall deficits across the catchment area to the west of Brisbane during the Millennium and Federation Droughts. Accumulated rainfall deficit is the difference between rainfall over the drought period and average rainfall.

SEQ suffered the Federation drought for five years (April 1898 to April 1903). During the 61–month period, a cumulative rainfall deficit occurred across the catchment area of 1278mm. However, Figure 5.4. in Chapter 5 illustrates that, in a water supply sense, the Federation Drought continued well beyond 1903.

In comparison, as at November 2007, the SEQ Millennium Drought had been running for 80 months, with a cumulative rainfall deficit of 1392mm.

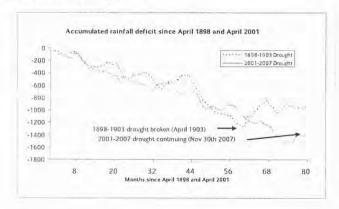


Figure 2.4 Accumulated rainfall deficit for the Federation and Millennium Droughts

Source: The South East Queensland Drought to 2007, prepared by the then Department of Natural Resources and Water, 2007.

2.6.4 Rural water supplies

The Regional Plan identifies around 80% of SEQ as Regional Landscape and Rural Production Area. A portion of this area comprises protected national and conservation parks, water storages and state forests. The majority, however, is privately—owned farmland, generally designated 'rural' in local government planning schemes.

Water for rural production relies predominantly on dams, river flows and groundwater, with recycled water playing an ever increasing role. From an irrigation planning perspective, the region is characterised by:

- 13 sub-catchments which fragment potential water delivery schemes and make movement of water from one area to another very difficult and expensive:
- Multiple sources of irrigation water coming from supplemented and unsupplemented surface water supplies
 in several different catchments, overland flow, groundwater and in some cases, recycled water;

³ Australian Bureau of Meteorology website, Australian Climate Extremes – Drought: http://www.bom.gov.au/lam/climate /levelthree/c20thc/drought1.htm

- The irrigation of 30 different commodities:
- A dominant interest in securing urban supplies, which compete with the increasing rural demand for water.
- The static or declining populations in some rural areas which make it more difficult to compete for the available water supplies; and
- A struggle by even the most efficient rural producers to meet their contractual commitments without secure
 water (as highlighted by the current drought).

These characteristics create a unique set of challenges to be overcome when developing a rural water supply strategy that aims to meet the objectives of the Regional Plan.

2.6.5 Our environment

Catchment management and waterways health

Water connects the community to the SEQ catchment. However, the movement of water through the catchment determines the region's environmental health, livability and subsequent economic wealth. Human activities can interfere with the natural water cycle, threatening the future quality of our water supply, our environment, our lifestyle and the economic productivity of our entire region. An increasing population, together with substantial industrial growth, has elevated the nutrient content in our wastewaters. Sediment content in waterways is also elevated due to the loss of riparian vegetation around creeks, streams and gullies through land clearing and grazing animals. Despite programs to reduce the concentration of pollutants entering waterways, some local ecosystems have been modified to the point where they are no longer sustainable. The challenge is to develop water solutions for SEQ that reflect the importance of healthy catchments and waterways.

Grow Is in energy consumption of water infrastructure

All SEQ water infrastructure requires electricity to some extent, with energy intensity dependent on the age, efficiency and type of infrastructure. Climate resilient water supplies such as desalination and PRW use more energy than traditional storage and treatment processes (refer Section 6.8, Chapter 6). Consideration must also be given to the location of those supplies and the accompanying pumping and delivery requirements, as water is a very heavy product to move around the region.

The challenge for water planners is to secure new supplies and increase the climate resilience of SEQ's water supply. While minimising the growth in electricity consumption per megalitre of water delivered. The challenge will also be to minimise processing and pumping energy requirements but at the same time maintain regional water security.

2.6.6 Our economy

Water Grid management

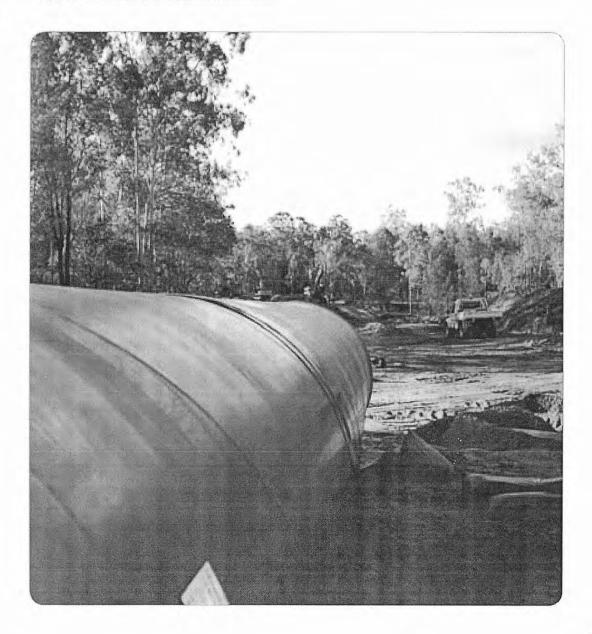
Once the SEO Water Grid is in place, there will be challenges in commissioning and optimising a large and complex water supply scheme, even though this will be simplified under new institutional arrangements. Long term there will be opportunities to maximise the system yield and these must be balanced against opportunities to reduce operating costs. The challenge will be to optimise efficiency within the Water Grid to minimise costs for the SEQ community, while still achieving regional water security objectives.

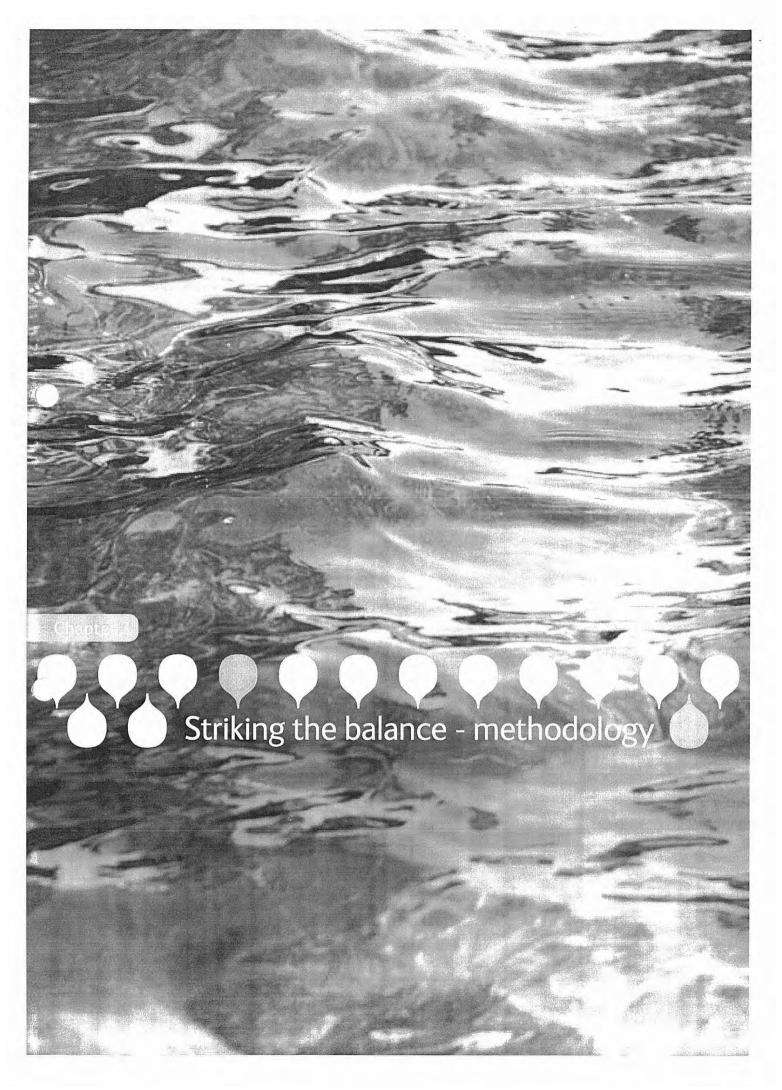
Cost of water

Building a range of infrastructure to increase SEQ water security, including manufactured water, will increase the cost of water supply to the SEQ community. At the same time, the National Water Initiative also requires state governments to ensure cost reflective pricing of water. The challenge is to ensure that the cost of new infrastructure is equitably shared across current and future generations and that pricing provides incentives to use water more efficiently.

Competition for land

As SEQ's population continues to grow, competition for land is rapidly increasing. Planning for future water infrastructure requires site investigation and preservation well ahead of future need. The challenge for planners is to ensure sufficient land is preserved for potential future water supply options including interconnections, with the least possible impact on adjacent communities.





3. Striking the balance - methodology

This chapter provides an overview of the planning framework that underpins the Strategy. It explains the new approach to water security planning in SEQ, and the Level of Service (LOS) objectives that have been adopted. It also provides an explanation of how the Water Grid will be operated to achieve the LOS objectives. Finally, the chapter provides an overview of the methodology for demand forecasting and comparing alternative demand and supply options.

Key messages

- The Strategy is based on achieving Level of Service (LOS) objectives for supplies from the Water Grid.
- LOS objectives include the duration, severity and frequency of water restrictions.
- LOS objectives should reflect the community's expectations regarding water security and willingness to pay for that security.
- The impact of climate change has been analysed assuming a 10% decrease in the yield from dams and weirs
- A Drought Response Plan must be developed to allow a preplanned response to drought, underpinned by the regional drought storage reserve.
- The Drought Response Plan requires the introduction of medium–level restrictions and, if triggered, construction of new climate resilient water supplies such as desalination plants.
- During normal operations, the LOS objectives which have been incorporated in the system planning include;
 - Sufficient Grid Water will be available to meet an average total urban demand of 375 litres per person per day (including residential, non-residential and system losses) of which 230 litres per person per day is attributed to residential demand; and
 - Permanent water conservation measures and regulatory requirements will apply to ensure that wastage is avoided without significantly impacting on community amenity.
- Sufficient investment will occur in the water supply system with the objective of ensuring that medium-level restrictions:
 - Will not occur more than once every 25 years, on average:
 - Will last longer than six months no more than once every 50 years, on average; and
 - Need only achieve a targeted reduction in consumption of 15% below the total consumption volume in normal operations.
- The frequency that combined regional storage reserves reach levels of 10% of capacity will be not more than once every 1,000 years.
- Regional water storages must not be permitted to reach minimum operating levels.

The Strategy seeks to ensure that SEQ has a safe and secure water supply. Residents of SEQ are entitled to expect to never run out of water, and in the most extreme circumstances should have enough water to maintain basic health and safety standards. The social and economic consequences of an unreliable water supply or a failure of supply are simply unacceptable.



Effective water supply planning necessitates the balancing of supply and demand into the foreseeable future while at the same time optimising social, economic and environmental outcomes. Future water needs can be met either by increasing supply or reducing demand or a combination of both.

3.1 Managing risks and competing objectives

The Millennium Drought has highlighted the need to establish new and improved ways of analysing and managing water supply risks and competing objectives in SEQ. A balance needs to be struck between the outcomes sought by various stakeholders, which are not always well aligned. Some examples include:

- Ensuring that the recommended infrastructure programs are sufficiently flexible to be able to deal with uncertainty and, in particular, climatic risk;
- Improving water use efficiency while maintaining adequate supplies to support the SEQ community's lifestyle expectations;
- Providing sufficient water without over-capitalising on excess supply capacity;
- Providing improved access to water supplies for rural production while maintaining user-pays principles; and
- Providing sufficient regional water security while minimising social, environmental and economic impacts.

Figure 3.1 illustrates the key considerations that have been taken into account in preparing the Strategy and the broad outcomes.

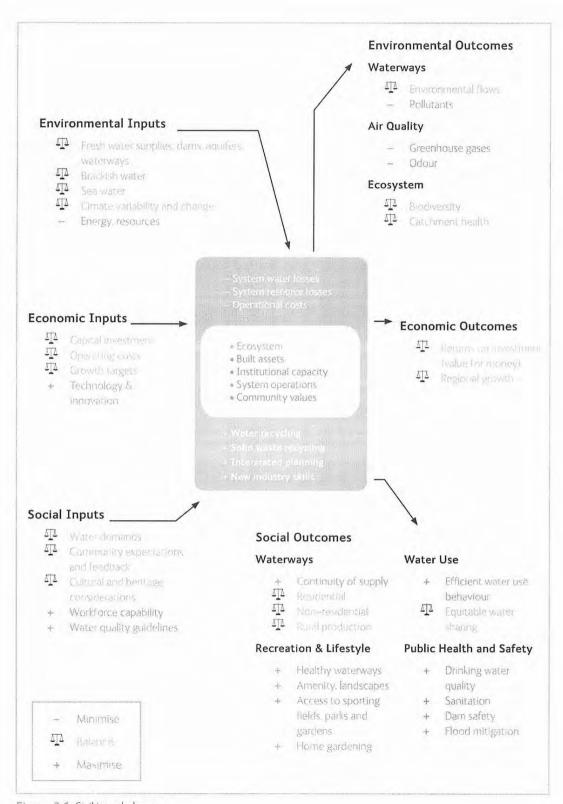


Figure 3.1 Striking a balance

3.2 The past approach to urban water planning

Up to the present day, drinking water in SEQ has been almost exclusively derived from dams and weirs. This was due to the low cost of these sources and an absence of practical alternatives. The yield of these storages was determined from historic inflow records, commonly using the Historical No Failure Yield (HNFY) approach and assuming access to the full operating volumes of the dams. Planning for growth was based on comparing this yield with forecast demand. Plans would then be made to upgrade or augment the surface water supplies.

The HNFY approach was often used to determine how much water could be withdrawn from a particular river or system each year, based on climate and stream flow records. This approach was based on using the full operating volume of dams without a contingency for droughts worse than anything on record.

Previous regional water supply planning in SEQ considered many factors, including demand management techniques and how they might be applied, the use of recycled water for irrigation, and potential interconnectivity of water supplies. However, the yield assessments indicated that existing supplies were adequate to meet the needs of the community.

The Millennium Drought, unbroken in January 2008, has made it clear that there is a need to change the approach to regional water supply planning. It is no longer adequate to:

- Rely on our relatively short 117-year history of rainfall and stream flow records without considering the
 potential for droughts worse than those on record;
- Rely extensively on SEQ surface water supplies which are subject to the vagaries of climate without considering the possible impacts of climate change;
- · Give only limited consideration to managing demand; and
- Reactively respond to droughts as they occur (past responses to severe drought have generally relied on rapid access to excess water supply capacity in other areas and the application of water restrictions).

3.3 Urban water supply planning underpinning the Strategy

While desalination and PRW projects are being constructed. SEQ will continue to rely on its surface water storages for a long time into the future. To ensure that these dams are appropriately managed, it is essential that we address the inadequacies associated with the past approaches to urban water supply planning.

The Strategy adopts a new analytical technique based on the LOS objectives approach, originally published by the Water Services Association of Australia in June 2005. This approach is reflected in the *Water Act 2000*, which requires the QWC to provide advice based on desired LOS objectives.

Using this new approach, the inadequacies of past approaches have been largely addressed by:

- Stochastically¹ generating longer time sequences of hydrologic data that have similar statistical
 characteristics to that of the historical record, to provide better information about climate variability and the
 potential for droughts worse than have occurred on record;
- Developing climate models to assess potential reductions in surface water availability due to climate change;

¹ A stochastic model is a tool for estimating probability distributions of potential outcomes by allowing for random variation in one or more inputs over time. The random variation is usually based on fluctuations observed in historical data for a selected period using standard time–series techniques. For our model, the historical record was used to generate 1.000 replicates of data with each replicate representing more than 100 years of inflow data.



- Undertaking a detailed review of water consumption patterns and implementing cost-effective measures to reduce demand;
- Ensuring that the planning for future droughts is a core element of the planning process; and
- Defining a yield for the Water Grid as a whole, such that it can be supplied at the specified LOS objectives.

The substantial differences in the planning approaches between those employed in the past and that used to develop the Strategy are highlighted in Figure 3.2. It should be noted that the planning for committed surface water projects has utilised the LOS approach, taking climate variability into account.

Figure 3.2 Old and new approaches to ensuring regional water security

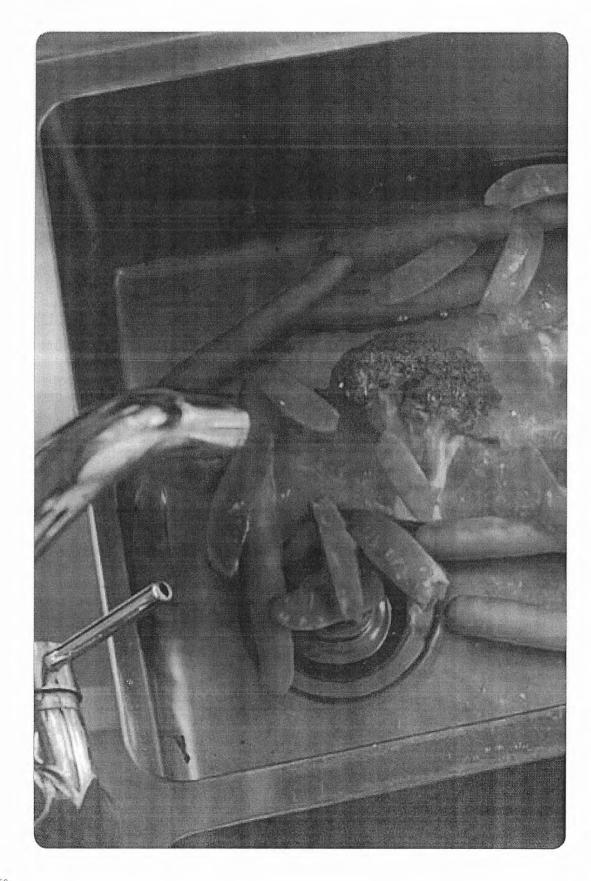
Identify regional objectives: Give consideration to legislative and policy framework (Chapter 2): and This level of direction has only been available over the last 15 years. Previously objectives were mostly local. Prepare demand projections: Most likely based on historical use trends; and Possibly some allowance for efficiency improvements. Assess potential future supply options: Assess potential supply options; and Short-list options for detailed investigation. Assess yields for all existing and potential water sources: Dam yields assessed on the basis of full working volumes above minimum storage levels and using available historical data and hydrologic models. Risk assessment based on previously recorded droughts. System yield an aggregation of yields from individual sources of supply, and Ensure compliance with performance indicators in Water Resource Plan. including environmental flows Evaluate options and construct water balance: Determine the supply/demand gap: Identify supply and demand portfolios to meet future water needs: Ensure supply exceeds demand at all times; and Preliminary least cost analysis and social, economic and environmental assessments Key outcomes: Demand measures: Supply infrastructure; and Milestones and targets. Finalising the Strategy. Refine based on stakeholder consultation Implementing the Strategy Undertake detailed investigation of supply options. Construct approved infrastructure; and Operating rules for water supply infrastructure incorporated into appropriate Resource Operation Plan and Resource Operations Licences.

Drought response:

- Usually developed separately from the Strategy:
- Restrictions usually form the central component; and
- Pre-planned response including infrastructure may or may not exist.

Identify regional objectives (Chapters 1 and 2): Define Water Supply Guarantee; and Give consideration to legislative and policy framework Define Water Grid performance and LOS objectives (Chapter 3): Define objectives in terms of capacity, restrictions, and security, and Process iterative with steps below. Profile future water demands (Chapter 4): Forecast demand based on pre-drought usage trends: Assess potential efficiency measures: Forecast demand incorporating water savings measures being implemented during the Millennium Drought; and Forecast demand incorporating other identified cost-effective measures. Identify Drought Response Plan requirements for water balance modelling (Chapters 5 and 6). Determine period over which restrictions are the main response: Identify climate resilient supply options: Assess time to construct climate resilient supplies: and Determine drought storage volume requirements considering climate resilient supplies for input into regional water balance model. Assess potential supply options (Chapter 5): Assess potential supply options (based initially on historical inflow data): Short-list options for detailed investigation: Develop supply scenarios to assess in the regional water balance model; and Preliminary least-cost analysis and social, economic and environmental assessments Assess options using a regional water balance model (Chapter 3) Determine the supply gap in normal conditions based on forecast demand and the LOS system yield of existing and committed infrastructure Determine the scale and timing for supply augmentation: Determine requirement for additional climate resilient supplies to be constructed as part of a Drought Response Plan; and Undertake sensitivity analysis. Determine LOS system yields: Assessed on the basis of working volumes above drought storage reserves, emergency storage volumes and minimum storage levels: Assessed iteratively using the regional water balance model and stochastically generated sequences of flow data longer than exist on historic record: Determined for system as a whole: Supplies from individual dams depends on where drought storage reserves are held; Assess climate change impacts on regional LOS system yields; and Ensure compliance with performance indicators in Water Resource Plan, including environmental flows. Key outcomes: Water Grid performance and LOS objectives: Demand management program, Drought Response Plan framework, and Desalination and PRW project options for detailed investigation, and ultimate incorporation into Drought Response Plan. Finalising the Strategy. Refine based on community consultation; and Focus on Water Grid performance and LOS objectives and Drought Response Plan requirements. Implementing the Strategy: Key outcomes implemented when incorporated into the Regional Water Security Plan: Undertake detailed investigation of potential projects: Formulate Drought Response Plan including exact type, location and timing of climate resilient supply augmentations. Amend the System Operating Plan as required when new sources of supply are commissioned; and Operating rules for water supply infrastructure incorporated into appropriate Resource Operation Plan and Resource Operations

Licences.



3.3.1 Level of Service objectives

LOS objectives provide a basis for establishing a secure water supply through:

- Timely implementation of supply and demand initiatives to meet future water needs as a result of population growth; and
- A pre-determined Drought Response Plan.

The LOS objectives should reflect community expectations about water restrictions and their willingness to pay for improved security of supply. This approach acknowledges that future severe droughts will occur. Water restrictions are an effective and efficient means of managing the impact of these droughts but can have a significant impact on the community. The LOS objectives make clear the assumptions made by water supply planners and will inform investment decisions by the community.

The proposed LOS objectives for SEQ are summarised below. These objectives are proposed to be targeted across all SEQ communities with reticulated drinking water. They will be reviewed regularly, as part of the review of the Strategy to determine if they are still a true reflection of the community's expectations.

Level of Service objectives

During normal operations, the LOS objectives which have been incorporated in the system planning include:

- Sufficient grid water will be available to meet an average total urban demand of 375 litres per person
 per day (including residential, non-residential and system losses) of which 230 litres per person per day
 is attributed to residential demand; and
- Permanent water conservation measures and regulatory requirements will apply to ensure that wastage
 is avoided without significantly impacting on community amenity.

Sufficient investment will occur in the water supply system with the objective of ensuring that medium-level restrictions:

- Will not occur more than once every 25 years, on average;
- Will last longer than six months no more than once every 50 years, on average; and
- Need only achieve a targeted reduction in consumption of 15% below the total consumption volume in normal operations.

The frequency that combined regional storage reserves reach levels of 10% of capacity will be not more than once every 1.000 years.

Regional water storages must not be permitted to reach minimum operating levels.

The QWC has proposed in its LOS objectives that, in order to maintain a comfortable lifestyle, the SEQ community would prefer to target permanent water conservation measures coupled with medium–level restrictions in times of drought. In normal times, this means that water should be used wisely. In periods of drought, medium–level water restrictions will be introduced early enough and at such a level that they avoid the most costly impacts on community amenity and the regional economy.

The choice of the LOS objectives has involved tradeoffs between financial costs, environmental impacts and the willingness of the community to accept restrictions on a periodic basis. Information gained from managing the Millennium Drought has been used to assist in the formulation of the LOS objectives. The experience of managing

regional water security during the Millennium Drought has provided exceptional data on practical issues and community expectations. There is evidence that many people would value a more reliable water supply service than currently exists in SEQ and support investment to improve that service. As one expression of this value, there has been widespread take-up of rainwater tanks and other alternative sources of supply.

On the basis of the proposed LOS objectives, the community can expect to experience water restrictions no more than once every 25 years on average. Such restrictions would reduce total urban demand by an average of 15%, across the entire community. The LOS objectives seek to ensure that future droughts do not require Severe Level Restrictions on the community. For instance, our planning will aim to ensure that residents do not need to bucket water again in future droughts.

The preferred method of achieving this saving will be reflected in future restrictions regimes. The QWC will take into account the likely impact of restrictions and the existing level of efficiency for residential and non-residential customers. Once business and industry has implemented permanent water saving measures, it is likely that additional savings will be mostly derived by curtailing outdoor use by the residential sector. The QWC expects that residential consumption may be curtailed by up to 20% in times of drought.

3.3.2 Drought Response Planning

The purpose of the Drought Response Plan is to ensure continuity of supply regardless of climatic conditions. The Strategy adopts a managed hydrological risk approach, taking advantage of the region's ability to develop climate resilient supplies such as desalination and PRW as a response to drought. This enables future water supply risks to be managed at the least social, economic and environmental cost in the long-term.

The Drought Response Plan contains the pre-determined response to droughts, including water restrictions, water efficiency measures and new climate resilient water supplies. Once implemented, the infrastructure component of the Drought Response Plan may become part of permanent supply arrangements and would delay the need to implement further supply sources.

If future water restrictions are introduced and the combined regional storage levels continue to decline, then the construction of projects identified in the Drought Response Plan will be triggered. The construction of new sources will be timed to ensure that there are sufficient reserves held in storage to sustain the water needs of the community during the construction period. It is likely to occur if restrictions are in place for six months with continued low inflows. Preparation for the construction phase will commence immediately upon the commencement of restrictions, and potentially earlier depending on the time of year and rate of decline of the regional storages.

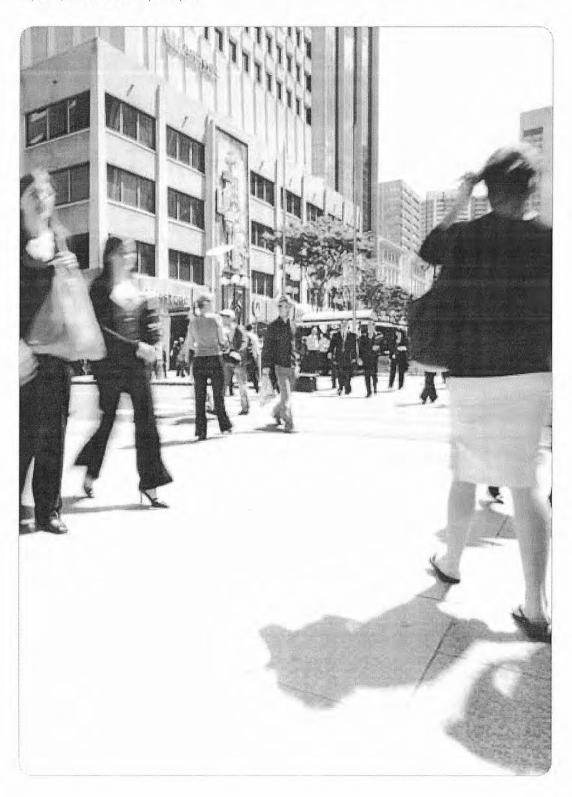
Construction is expected to occur not more than once every 50 years on average because it is expected that restrictions would, on average, only last more than six months once every 50 years.

While the Drought Response Plan projects will be completed within a nominated period of 30 months, the water restrictions will only be lifted if:

- The drought conditions ease, that is, following one or more major rainfall events resulting in significant inflows; or
- Additional pre-planned infrastructure is brought forward.

The LOS objectives and the Drought Response Plan have been formulated based on the estimated frequency that the combined regional storage volume will decline as low as 10% of combined regional full supply storage volume not more than once every 1,000 years, Drought Response Plan projects will usually be completed before combined regional storage volumes reach 10%.

Hydrologic, engineering and economic optimisations are needed to identify the best locations to hold drought storage reserves and minimise the costs of water transfer within the region. These decisions can have a significant impact upon the SEQ LOS system yield.



3.3.3 Water Grid operations

The LOS approach requires two main operating modes:

Mode 1. Normal Operations Mode

This applies to periods when there are plentiful stored regional water supplies, combined with permanent water conservation measures. This mode will apply over most periods in the long-term.

Mode 2. Drought Response Mode

- a. Preparation Phase: Applies when regional storage volumes drop down into the drought storage reserve.
 Pre-planned, medium-level restrictions and cost-effective, short-term water efficiency measures will be introduced. This phase provides time to prepare for the construction phase in the event of a worsening of the drought conditions.
- b. Construction Phase: Applies when construction of pre-planned climate resilient water supplies such as desalination plants is required to ensure that the restricted water demands for the community can be met for the duration of a long, severe drought.

Consistent with this approach, the Strategy partitions the water storage in SEQ dams both individually and as a combined total SEQ system into:

- Working storage:
- Drought storage reserve;
- · Emergency volume; and
- Minimum operating volume.

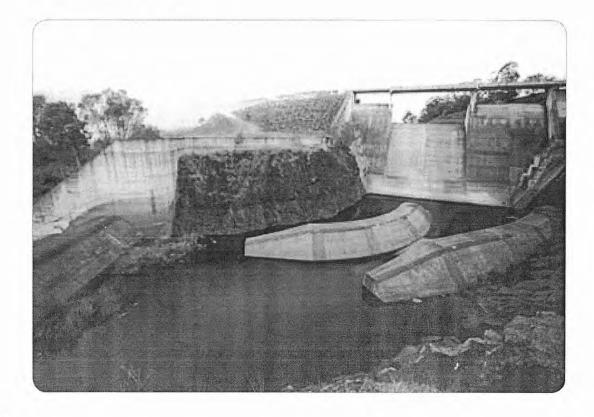


Figure 3.3 illustrates the partitioning of dams. As illustrated, the level of each partition will vary between dams depending on a range of factors including local demand and the extent of inter-connection. Resource Operations Plans for SEQ catchments may need to be amended to reflect these partitions.

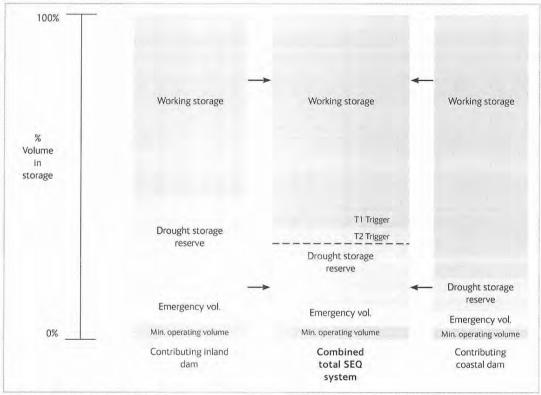


Figure 3.3 Partitioning of dams

The Normal Operations Mode applies when combined dam levels are within the working storage.

The drought storage reserve underpins the Drought Response Plan. The regional drought storage reserve is sized to provide, in conjunction with climate resilient sources, a minimum of 36 months supply of water at a restricted demand. The actual volume of the drought storage reserve will vary over time according to the mix of supplies and the demand for water. Calculation of the drought storage reserve requirement has included consideration of the restricted demand. climate resilient dam inflows, system losses including evaporation and transport losses, and the existing climate resilient supplies, such as desalination and PRW.

Within the drought storage reserve there are two trigger levels. T1 is the trigger level to enter the Drought Response Mode Preparation Phase. T2 is the trigger level to enter the Drought Response Mode Construction Phase.

In addition to the drought storage reserve, an emergency volume has been set in each dam to provide an allowance for extraordinary circumstances.

The drought storage reserve and emergency volume are additional to the minimum operating volume.

To exit the Drought Response Mode, the combined regional storage level will need to increase beyond the T1 trigger level. The exit level will need to be set sufficiently above T1 to minimise the risk of re-triggering water restrictions within an appropriate period. The actual exit level would be determined following consideration of:

- Climate forecasts;
- The existing mix of climate dependent and climate resilient supplies;
- The status of any infrastructure projects in construction:
- Short-term limitations on system capacity due to water quality; and
- Managing the risk of use rebounding above the target of 230 litres per person per day once the Drought Response Mode is exited.

Ultimately. the capacity above T1 that is selected will need to strike a balance between the cost of staying in Drought Response Mode unnecessarily, and the economic and social cost of moving out too early, and being forced to re-enter shortly after if dam levels decline back to T1.

The operation of the Water Grid is illustrated in Table 3.1.

Table 3.1 Water supply operating modes

Operating Mode	Tingger	Response to achieve LOS objectives
Normal Operation		
Applies over most periods in the long-term. Operations occur within the working storage volume supported by permanent water conservation measures to support efficient water use.	Normal operating mode.	 Permanent water conservation measures contribute to a target residential consumption of 230 litres per person per day. Ongoing demand monitoring and management. Operations strike a balance between cost and security. Development of new water supplies aligned with population growth. Climate independent and resilient supplies such as desalination are operating at full
Drought Response		capacity when required.
a) Preparation Applies when combined regional dam levels first enter the drought storage reserve.	Triggered when a pre-defined level of regional water storage is reached, the T1 trigger level. T1 is set so there is nominally 36 months of water in the entire Drought Storage Reserve.	 Medium-level restrictions and water efficiency measures will be introduced to reduce demand to a preset percentage (nominally 85%) of normal demand. Tenders may be called and evaluated in this phase in preparation for the construction phase. This phase is expected to be triggered no more than once every 25 years, on average.

Operating Mode	Trigger	Response to achieve LOS objectives
b) Construction Applies when construction of pre-planned climate independent and resilient water supplies is required to ensure that the restricted water demands for the community can be met for the duration of a long and severe drought.	 Triggered when: a pre-defined level of regional water storage is reached. the T2 trigger level. T2 is set at a level which ensures there is a minimum period (nominally 30 months) of supply available when the phase is entered: OR a decision is taken to bring forward construction of new water supplies because mediumlevel restrictions have been in place for an extended period. Review and consideration of additional construction activity is ongoing during this phase. 	 Medium-level restrictions will remain in place as per the preparation phase. Construction of pre-planned drought infrastructure commences. Construction of drought infrastructure is completed before the regional emergency volume is reached. If there is an extended drought, sufficient climate resilient or independent sources of supply will be in place following completion of construction to meet restricted demand indefinitely. This phase is expected to be triggered no more than once every 50 years, on average.
c) Exit to Normal Operations	Return to Normal Operations Mode triggered when combined regional dam levels exceed the T1 trigger level by the amount required to sustain Normal Operations for an appropriate period with only drought resilient inflows.	 Considerations include climate forecasts, the mix of climate dependent and climate resilien supplies, the status of projects in construction limits on system capacity, and management of the drought rebound. Planning commences immediately on preparation of the next supply options for growth or drought response.

3.3.4 Determining the yield of the Water Grid

The yield of the Water Grid is the average annual volume that can be supplied at the adopted LOS objectives.

Until relatively recently, estimating the system yield of a suite of integrated sources of supply has been based on an aggregation of yields of individual sources of supply, treated as unconnected. The modelling undertaken for this Strategy has taken several years to develop and incorporates assessments of the LOS yield of specific dam systems and of the Water Grid as a whole. Future water availability has been estimated following consideration of:

- The total water storage capacity in the Water Grid;
- Inflows to the Water Grid storages over the period of the historical record:
- Estimated variability in inflows based on synthetically generated datasets that have the same statistical
 inflow characteristics as the historical record:
- The possible impacts of climate change on inflows;
- · Supply from climate resilient sources;
- Environmental flow releases needed to maintain riverine, estuarine and marine ecosystem health;
- · The LOS objectives; and
- The requirements for drought storage reserves and emergency and minimum operating volumes in each dam.

The regional water balance model has been used to estimate the yield from the Water Grid with different LOS objectives. The outcomes are contained in Chapter 5.

The regional water balance model has informed the development of broad operating rules for the Water Grid. The proportional storage rule is the most important of these rules and will inform decisions about the operation of the various dams contained within the Water Grid. Under this rule, major dams will be drawn down in a proportional manner such that the level of the working storages will be depleted at the same time. Small coastal dams are likely to be more dynamic, reflecting the probability that they will fill more frequently than major dams.

The outcomes of the regional water balance model will be verified against models used to establish the operating rules contained in Resource Operations Plans for SEQ catchments. This will ensure that the results are consistent with the relevant Water Resource Plans which protect water entitlements for all water users and specify environmental flow requirements.

Operating rules for the optimised use of the region's urban water supplies will be addressed in the System Operating Plan (refer Chapters 5 and 7).

3.3.5 Planning for climate change

Modelling of SEQ dam catchments suggests climate change may dramatically impact on regional water supplies. The majority of climate-catchment modelling results for SEQ indicates the region is likely to become drier. This means less surface water is likely to be available for water catchments and dams.

Over the last three years, Regional Climate Models have been developed which increase the resolution of Global Circulation Models. These models have increased certainty in analysis for SEQ. Subsequent refinement of climate change models supports a mid-range climate change scenario of 10% reduction in surface water availability in SEQ. Impacts of this order of magnitude have also been observed in physical climate change studies performed in the Fitzroy. Burnett and Condamine regions of the State, suggesting that significant climate change impacts are likely to occur before 2030.

Scenario analysis has been undertaken assuming a 10% reduction in the LOS yield of surface storages due to climate change. While the true impacts of climate change are difficult to quantify at this time, working within this range provides sufficient flexibility to activate or delay projects as the scientific certainty around climate change impacts increases for SEQ. Importantly, while the uncertainty around potential impacts has continuously narrowed over the last six years of research, the implications of the mid–range scenario has remained constant.

As our understanding of the likely impacts of climate change on SEQ water supplies are better informed with the passage of time, the Strategy and scenarios will be revised appropriately.

3.3.6 Application of the Level of Service objectives

The LOS objectives will be the performance objectives for bulk water supplies from the Water Grid.

Achieving these objectives will be the responsibility of the Water Grid Manager. LOS objectives will form part of the product definition for bulk water supplied by the Water Grid Manager to any bulk transport node. ready for local distribution. Figure 3.4 illustrates where the LOS objectives apply under the new institutional arrangements.

LOS should not be confused with Standards of Service. Standards of Service describe the product that is delivered by water retailers to their customers. The *Water Act 2000* describes the requirements for establishing Standards of Service. The matters that may be covered in Standards of Service include water quality, delivery pressure and the reliability of supply. For example, Standards of Service may include response times for breakdowns.

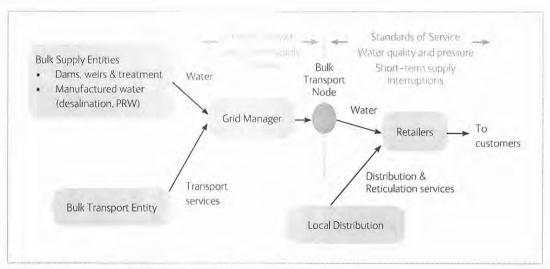


Figure 3.4 Application of LOS objectives and Standards of Service

3.4 Planning for rural production

The Strategy does not outline LOS objectives for the rural production sector. However, the Strategy does include significant initiatives to improve supply to the rural sector as discussed in Chapter 6. Rural water allocations are usually defined through the water resource planning processes. Rural water allocations are generally allocated as medium priority water with a reliability of supply less than high priority water. This approach enables larger volumes of water to be made available during periods of good rainfall. Other types of supply objectives will be contained in commercial supply agreements between the Water Grid Manager and rural water users.

Unfortunately, SEQ is expected to have extended dry periods. Irrigators can mitigate the impact of dry periods by storing water in the wetter periods and using it when it is dry. The Queensland Government has previously sought to improve outcomes for irrigators in this way by establishing water supply schemes for irrigators. Such schemes exist in the Mary, Logan. Lockyer and Warrill Valleys. These schemes have operated with varying degrees of success and irrigators have sought improved water security. Irrigators currently do not pay for the full cost of running these schemes. Chapter 6 discusses the options to improve rural supply.

3.5 Profiling future demand

A comprehensive assessment of current and forecast water demands across SEO was commissioned to assist in the development of the Strategy. The assessment is one of the most exhaustive analyses of its type ever undertaken in Australia. The best techniques currently available for predicting demands were employed to ensure that forecasts are realistic and achievable. The methodologies and modelling will continue to be refined to actively monitor demand assumptions.

Forecasting of urban water demands in SEQ has been based on:

- Medium series population growth projections derived from the Queensland Government Population Projections 2051. High series population forecasts have been used for sensitivity testing:
- Assessment of historical patterns of water use with a view to understanding the factors influencing historical and future demand;
- Assessment of the historical effectiveness of existing and potential water saving programs including analysis
 of the costs and benefits of different water conservation and source substitution options at the end-user
 level:
- Aggregation of the forecast demands in each council area to produce demand trend forecasts based on the
 continuation of existing policy in 2006 (i.e. by assuming that water use continues into the future without
 savings from any additional demand management initiatives other than those that were already in place);
 and
- Aggregation of the forecast demands in each council area based on high, medium and low savings scenarios.
 The savings scenarios differ in terms of number and scope of demand management measures.

To ensure that demand assumptions underpinning the Strategy remain current, ongoing demand monitoring and management will be undertaken using the South East Queensland Water Accounting Framework (SEQWAF).

Increasing supply or reducing demand?

Some components of the supply and demand balance could be considered as either increasing supplies or reducing demand. The Strategy defines any new water source that contributes to the Water Grid as an increase in supply. For example, PRW is considered to increase potable supply as it is added to the Water Grid. Water from rainwater tanks and other types of recycled water reduces demand on drinking water supplies from the Water Grid.

3.5.1 Assumptions used in forecasting demand

Demand forecasts were made assuming existing policies will continue, such as the Water Efficiency Labelling Scheme (WELS) and parts of the *Queensland Development Code* that mandate the installation of water efficient fixtures and fittings in new homes.

The potential reduction in demand from savings measures was estimated based on a range of complex considerations and assumptions. These included:

- Permanent water saving measures implemented during the Millennium Drought;
- The effectiveness of potential demand management measures, including participation rates and the number of water efficient devices installed:
- · Changing demographic patterns, in particular the trend towards smaller households; and
- · Ongoing compliance with rules and regulations.

Demand forecasts are outlined in Chapter 4. Growth in demand for water for rural production is addressed in Chapter 6.

3.6 Identifying and evaluating demand and supply options and portfolios

In order to identify the best strategy to deliver the Water Supply Guarantee, it was necessary to take account of key criteria including economic cost, and social and environmental impacts.

Strategic factors also need to be considered, particularly the potential long-term (greater than 50 years) strategic benefit of securing sites suitable for development of major water supply infrastructure such as dams, desalination plants and PRW schemes.

As far as practical, the demand and supply options were compared on the basis of achieving similar outcomes in terms of:

- Security of supply:
- Technical requirements including dam structural safety and operational reliability; and
- Ecological sustainability.

3.6.1 Initial screening of options

An initial screening process was undertaken prior to undertaking a more detailed economic assessment of alternative portfolios of demand and supply options. The screening process focused on hydrological performance, indicative cost, and social and environmental impacts.

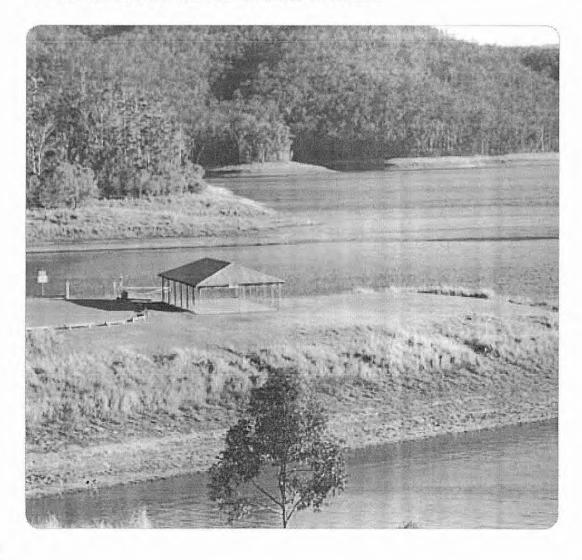
Demand and supply options shown to have high economic, social or environmental costs were removed from the list of potential options. Options with low hydrological performance were also removed. For demand management options, annualised cost analysis was used in the initial screening process, as explained in Section 4.2, Chapter 4. It was also used to assess some bulk supply options. Annualised cost is calculated by dividing the cost of an option by the amount of water that it will save each year.

Levelised cost analysis was used for some supply and demand options. Levelised cost is a more sophisticated type of analysis that takes into account the differences in savings over time. It is calculated by discounting the whole–of–life costs of an option to derive the net present cost. The net present cost is then divided by the discounted value of the future volumes supplied.

A portfolio model was used to assess the economic cost of a suite of demand and supply measures as outlined in Section 3.6.2. Chapter 3.

The economic assessment of demand management options was focused on the economic benefit of deferring supply augmentations — represented by the long—run marginal cost of supply which is an estimate of the savings associated with a small deferment of capital expenditure on new water supply infrastructure. A demand management initiative has an economic benefit if its average cost is less than the long—run marginal cost. A group of demand management measures were identified that clearly demonstrated value and were cost effective when compared against the long—run marginal cost of supply. These measures were included in all portfolios. They included behavioural change through education, and structural change through the use of water efficient fixtures and fittings.

Following this initial screening process, the focus has been on differentiating between the supply portfolios to meet forecast demand since all realistic demand side measures are included.



3.6.2 Assessing economic costs using portfolio modelling

The main purpose of portfolio analysis is to incorporate the principles of least–cost planning to compare the costs and benefits to the community of different suites of water supply and demand initiatives. Increasingly, governments are using this technique to find the most efficient supply solution.

A portfolio model was developed for SEQ to estimate the overall economic cost of combinations of supply and demand management options capable of meeting water supply needs for the period to 2056. The focus of portfolio modelling is on estimating the Net Present Value (NPV) for the whole–of–life cost (capital costs and operating costs) of alternative supply portfolios over the period. The NPV is defined as the lump–sum equivalent of all future economic costs in today's terms or at some other point in time. Future costs can be brought into a present value equivalent using an appropriate discount rate.

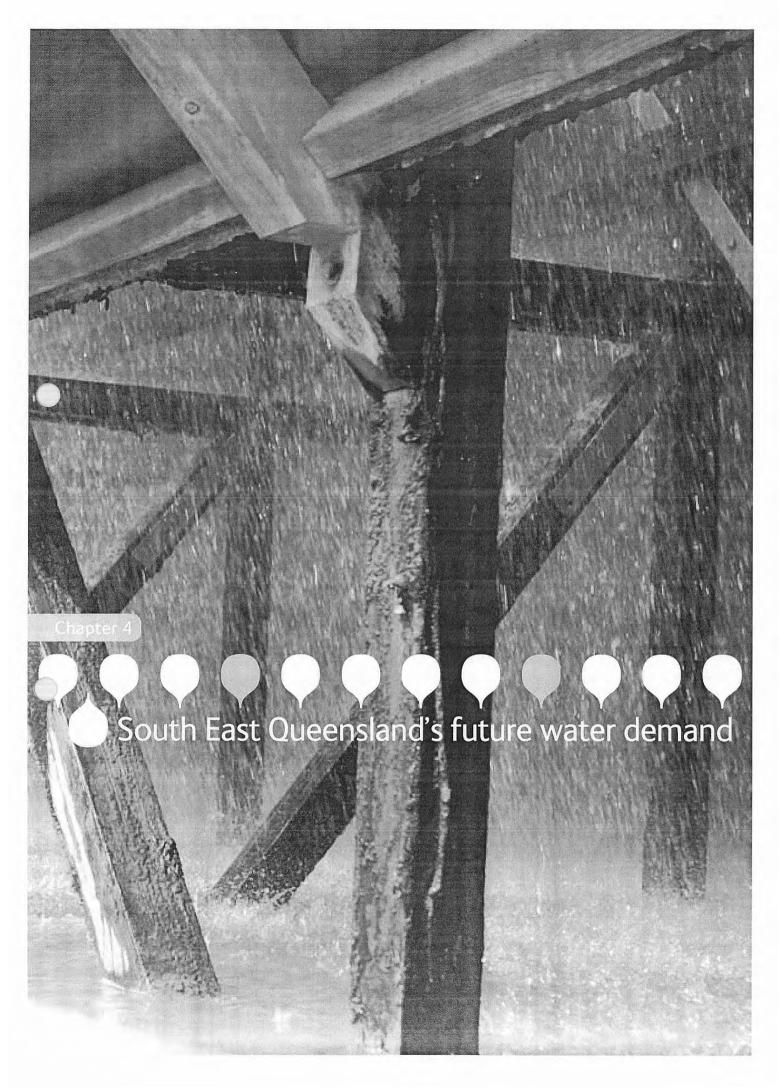
The economic benefit of a given portfolio is the cost savings relative to the 'next best alternative'. Hence the objective is to quantify, and then compare, the economic cost of supply for alternative portfolios. The option with the lowest economic cost is assumed to be the most efficient in terms of a narrow economic assessment. However, it is important to stress that the portfolio modelling fed into a much broader assessment process that took account of longer-term supply-security factors and the wide range of environmental and social assessment criteria outlined above.

Importantly, all portfolio modelling is underpinned by yields for surface water supplies estimated from hydrological modelling that are consistent with LOS targets. In addition, hydrological interactions between supply options are directly taken into account in the portfolio modelling.

In addition, sensitivity analysis was undertaken in relation to key model parameters. The sensitivity analysis applied included testing the impact on portfolio model results of:

- Climate change under this scenario it was assumed that climate change results in yield from surface water storages decreasing by 10% (bringing forward supply augmentations);
- An increase in demand under this scenario the high population/high water savings demand scenario was adopted (bringing forward supply augmentations);
- An increase in variable operating costs under this scenario the impact of increasing variable operating costs by 30% was assessed to provide insights to the possible impacts of rising energy prices attributable to the introduction of carbon trading; and
- An increase in capital costs under this scenario the impact of a 30% increase in capital development costs was assessed.

The outcomes of the portfolio analysis are discussed in Section 6.3.3. Chapter 6.



4. South East Queensland's future water demand

This chapter outlines water consumption trends as well as initiatives and projects being implemented to reduce water demand and increase efficiency of use. It also sets appropriate demand targets and forecasts water demand based on achieving these targets.

Key messages

- Efficient water use by all sectors of the community is essential to ensuring equitable and sustainable provision of water.
- A wide range of demand management programs have been accelerated in response to the Millennium Drought.
- Saving water is generally less expensive than creating additional supplies.
- The Strategy is based on an overall reduction in demand for Grid Water of around 24% compared to pre-drought trends. By 2056, this will save about 236,000 ML/a based on medium series population growth.
- After the drought, the average residential consumption target will be 230 litres per person per day of Grid Water. Prior to the drought, average residential consumption was about 300 litres per person per day.
- Non-residential users, including business and industry, will be required to continue to move towards best practice water efficiency.
- Power stations will be required to use recycled water, where available.
- Bulk transport and distribution system loss targets have been set at no more than 8% of total urban water use.
- All building development applications lodged for the construction of new homes in SEQ must meet mandatory water saving targets. Rainwater tanks are one option to achieve the water saving target.
- Rainwater tanks and stormwater harvesting are forecast to comprise about 7% of the total regional supply at 2056.
- Stormwater harvesting and sewer mining are likely to have limited large scale application.

The Millennium Drought has reinforced the need to appropriately value our water resources. Over the past decade, the region has experienced significant growth while water supplies have been under pressure from climate variability and climate change impacts.

Efficient water use by all sectors of the community is essential to ensuring equitable and sustainable provision of water in terms of cost and environmental impact.

The Strategy to achieve the post-drought demand targets is described in Section 6.1, Chapter 6.

Water demand information

Water accounting data for the Strategy has been collected at a billing level from 18 local government authorities listed in Section 1.1, Chapter 1. Demand analyses were conducted on a local and regional basis, historically and out to 2056. Demand has been forecast for the residential, commercial and industrial sectors and unaccounted for water, with and without demand modification initiatives and climate change impacts being applied.

4.1 Pre-drought water consumption

Water consumption in SEQ has reflected climatic, demographic, economic and housing characteristics. Prior to the Millennium Drought, there were very few drivers for urban and industrial users to reduce consumption. During periods of poor inflows, Wivenhoe Dam has previously contained sufficient storage reserves to maintain unrestricted supplies across most of the region. There have always been limitations on supply for rural water users, which have resulted in some inherent self–regulation of use.

Unrestricted consumption provides a basis for water security planning. In SEQ, the most recent unrestricted consumption occurred in 2005. Table 4.1 below summarises water use patterns in 2005.

Table 4.1 SEQ water consumption in 2005

Sector	Water consumption (ML/a)	Proportion of total demand	Proportion of urban demand
Urban			
Residential	277.459		65%
Non-residential	91,426		21%
System losses	59.808		14%
Total urban	428.693	69%	100%
Power generation	38,000	6%	
Rural communities	5.7031	1%	
Rural production	150,000 ²	24%	
Total	622,396	100%	

¹ Includes estimated consumption for Rosalie, Jondaryan, Crow's Nest and Cooloola

About 75% of water consumed was used for urban purposes and power generation. The remainder was used for rural purposes. Figure 4.1 illustrates water use in 2005 by sector.

² Excludes rural water use in the Mary River.

³ Excludes recycled water supplied to industry, golf courses and parks.

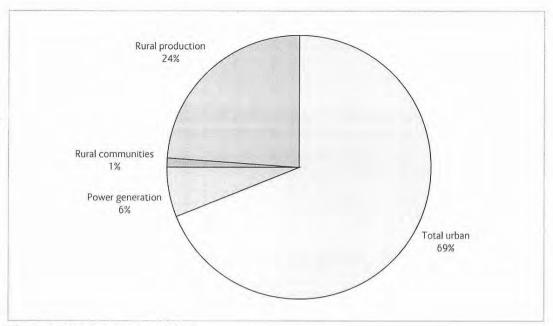


Figure 4.1 Water use by sector (2005)

This pattern differs from typical Australia-wide consumption patterns. In 2000, Australia used 83% of its water for rural applications and only 17% for urban and industrial applications.

System losses accounted for about 14% of the water used for urban purposes, including fire service, metering errors, leakage and theft (refer Section 4.4.4). Figure 4.2 illustrates urban water use by customer class.

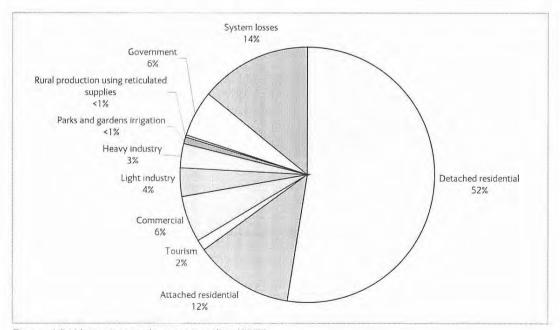


Figure 4.2 Urban water use by customer class (2005)

On average, residents with reticulated drinking water supplies consumed approximately 300 litres per person per day. As shown in Table 4.2, this rate of consumption was comparable with that in other capital cities in Australia. The variation in consumption rates can be attributed to housing density and climate, as well as access to and cost of water.

Table 4.2 Average residential water consumption in Australian cities (2005)

Average residential water consumption (litres per person per day)	
296	
275	
230	
307	
220	
289	

¹ Brisbane and Gold Coast estimates calculated as climate corrected average daily consumption prior to restrictions, using billing data for calendar year 2005.

4.2 Potential demand management options

An extensive list of potential demand management measures was identified during the early phases of developing the Strategy. A detailed and comprehensive assessment was conducted of some 100 potential measures across all customer sectors and involving a range of implementation mechanisms.

Potential demand management measures were screened using the following criteria:

- Significance of water savings from a regional perspective:
- Sustainability of water savings from a regional perspective;
- · Reductions in energy use:
- · Improved public awareness:
- · Likely public acceptance:
- Equity across customer base;
- Regulatory obstacles:
- Life cycle cost to customers: and
- Life cycle cost to water service providers.

The savings from each potential measure were estimated using existing national end-use studies and taking into account changing demographic patterns. Key factors in quantifying the water savings of potential demand management programs included:

The target sector for each measure and the number of existing and new accounts for each year to 2056:

² Sydney, Canberra, Melbourne and Adelaide estimates calculated from Water Services Association of Australia (2005) WSAA Facts 2005–06 for comparative purposes. Some data may have been affected by water restrictions.

- The proportion of overall water use related to the measure:
- The savings which might be achieved from the measure;
- The potential uptake of the measure, taking into account the natural replacement rate of fixtures and fittings;
- Interaction between different demand management measures, for example, where savings from a showerhead retrofit program could overlap with savings from the compulsory retrofit of showerheads on resale

The annualised cost of potential programs was compared to the cost of potential sources of supply. On this assessment, the measures proposed in the Strategy were generally cost effective relative to potential sources of supply.

Figure 4.3 illustrates the annualised cost of some of the potential demand management options. based on the initial planning assumptions. Some of the options have been refined since this analysis was undertaken, which may change the annualised cost as assessed earlier. Annualised cost comprises the annualised cost of capital plus the estimated annual operating and maintenance cost divided by the amount of water that it will save each year.

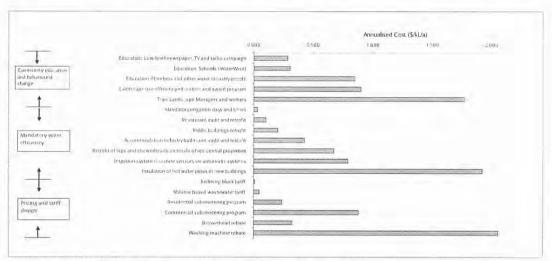


Figure 4.3 Annualised cost of potential demand management options

Annualised cost assessment was used as part of the initial screening process. More detailed economic analysis was undertaken for significant measures, including levelised cost assessment, which is discussed below, and portfolio analysis, which is explained in Section 3.6.2. Chapter 3.

Almost all of the shortlisted potential demand management measures have been implemented as part of the response to the Millennium Drought or are included in the demand management program, which is contained in Section 6.1. Chapter 6. Consequently, the Strategy focus has been on differentiating between the supply portfolios to meet forecast demand, as explained in Section 3.8.2. Chapter 3.

4.2.1 Levelised cost of major initiatives

Demand management measures also compare favourably with current supply augmentation commitments on a levelised cost comparison.

A number of levelised cost assessments were undertaken for the Strategy, as outlined above. The outcomes of these assessments are illustrated in Figure 4.4.

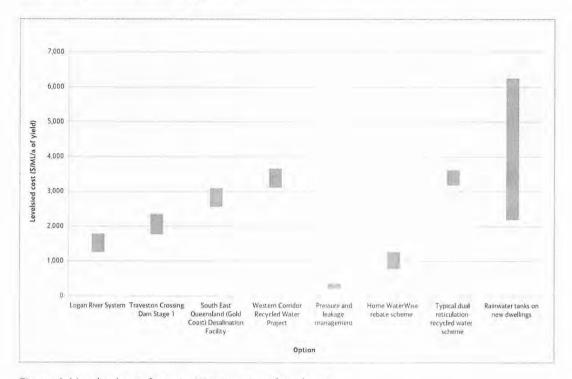


Figure 4.4 Levelised costs for major initiatives currently underway

The levelised costs of the pressure and leakage management program and Home WaterWise Rebate Scheme are less than the levelised cost of the key supply sources.

The levelised cost for the Home WaterWise Rebate Scheme reflects the benefits of bringing forward demand savings as part of a drought response. The scheme would be significantly less cost effective beyond the drought, when LOS system yield exceeds demand, and similar demand savings would have been achieved through regulation and the natural replacement of fittings and fixtures.

PRW and desalinated water are much more expensive than most demand management measures, due to their inherent energy costs. However, water from new large dams is relatively inexpensive due to the quantity they can yield.

The cost efficiency of rainwater tanks varies substantially between individual properties and locations. For new houses in SEQ, the cost of rainwater tanks is comparable to the cost of desalination and PRW. Rainwater tanks are less cost efficient in existing houses or where used solely for garden irrigation because they don't provide any Grid Water savings during the drought when outdoor watering is minimised.

4.3 Measures currently being implemented

Many of the potential demand management options were selected and accelerated as part of the response to the Millennium Drought. Following implementation of these measures, there has been an improvement in water efficiency, coupled with a substantial reduction in demand for water, particularly in the residential sector.

Around 2005, as the extent and impacts of the Millennium Drought became evident, the Government increased its efforts in terms of water efficiency improvements and demand management. This culminated in the establishment of the Queensland Water Commission (QWC) in 2006.

The QWC and its partners are working together on a number of projects to:

- Manage the development of the Water Grid:
- Reduce water wastage:
- · Identify and utilise alternative water sources: and
- Efficiently manage existing and future water resources.

A range of programs, such as the Home WaterWise Service. Water at Work and the Business Water Efficiency Program have been developed to provide water conservation advice and incentives to householders and businesses. These programs, underpinned by the water restrictions introduced by the OWC and a marketing campaign, have contributed towards a significant reduction in water consumption across the region from 752 ML/d to 645 ML/d in 2006/07. Residential usage has been under 140 litres per person per day for over six months as at the beginning of December 2007.

The community's efforts in embracing these programs has formed the cornerstone of the successful management of the drought and assisted in developing much of the demand management component of the Strategy.

Figure 4.5 represents the demand management framework that has underpinned the response to the Millennium Drought. The figure illustrates the key components of the framework and their relative importance in managing demand. These components will continue beyond the drought.

Table 4.3 provides information about the measures that are currently being implemented. Many of these measures will continue beyond the Millennium Drought, as explained in Chapter 6. Of the remainder, some will be modified, some will become permanent and some will be relaxed. For example:

- Regulations regarding permanent structural changes will
 continue to contribute to efficient water use with no
 impact on lifestyle, such as through the requirement for
 new houses to use water efficient fixtures and fittings:
- Education campaigns that have driven behavioural change, such as shorter shower times, may be modified to achieve new demand savings targets; and
- Drought watering restrictions will be reduced to lowlevels, allowing reasonable outdoor water use.



Demand Management

Millennium Drought response

Restrictions

- Levels 1 to 6 water restrictions, including restrictions on:
 - Outdoor watering
 - Active playing surfaces
 - Cooling towers
 - Pool filling
 - Vehicle washing
 - Urinal
 - Retrofit
- Excessive water user program

Pricing and tariff design

 Water use information to residential tenants

Structural water efficiency

- · Regulations to achieve structural water efficiency:
 - Water Efficiency Management Plans (WEMPs)
 - Water saving targets for new residential buildings
 - Rainwater tanks on new industrial and commercial buildings
 - Expanded use of greywater
- Financial incentives to achieve structural water efficiency:
 - Business Water Efficiency Program
 - Home WaterWise Rebate Scheme
 - Home Garden WaterWise Rebate scheme
 - Home WaterWise Service
 - ecoBiz
- Local government rebate schemes
- Pressure and leakage management program

Community education and behavioural change

- Target 140
- Guidelines for business
- WaterWise
- Council programs, such as Gold Coast Watersaver

Figure 4.5 Demand management framework at 2007

Long-term demand management program

Restrictions

- Permanent water conservation measures, such as alternate watering days
- Medium-level water restrictions in times of drought
 - Mainly from outdoor watering restrictions
 - Planning to ensure that residents are not limited to bucket watering of gardens

Pricing and tariff design

- Regionally consistent billing approach
- Water pricing structures to encourage water conservation, such as inclining block tariffs
- Wastewater pricing structures for nonresidential customers to encourage water conservation, such as volumetric charges

Structural water efficiency

- Regulations to achieve structural water efficiency:
 - Water Efficiency Management Plans (WEMPs)
 - Water saving targets for new residential buildings
 - Rainwater tanks on new industrial and commercial buildings
 - Retrofit of taps and showerheads on resale
 - Ban on sale of inefficient water devices
 - Insulation of hot water pipes in new buildings
 - Expanded use of greywater
 - Requirements regarding topping up of swimming pools
- Pressure and leakage management program
- School water efficiency
- Beyond the Millennium Drought, reduced emphasis on financial incentives to achieve structural water efficiency

Community education and behavioural change

- Water efficiency rating scheme for residential properties
- Water efficiency rating scheme for nonresidential properties
- Guidelines for business
- WaterWise
- Targeted education programs for selected industries

Table 4.3 Efficiency measures currently being implemented

Initiatives currently being implemented

Community education and behavioural change

Torget 140

Target 140 is the QWC campaign to encourage all residents of SEQ to use, on average, 140 litres of water a day.

Guidelines for business

Water efficiency guidelines have been developed by the QWC and local governments in consultation with industry groups and key stakeholders to assist businesses to increase water efficiency and comply with water restrictions. Guidelines have been developed for external building washing, vehicle washing, active playing surfaces, food service businesses, nurseries, hotels and laundries.

WaterWise (admiristered by the Queensland Government)

The WaterWise program is targeted at particular sectors of the community and seeks to establish lifetime water consumption habits. A proposed new program involves the development and implementation of a WaterWise Community Awareness Program and a WaterWise Education Program aimed at school children.

Gold Coast Wetersaver fadministered by Gold Coast City Council)

The Watersaver program includes a number of measures to inform and educate residents on the benefits of water efficiency. The program includes the Garden Watersaver Industry Training Program and the GreenPlumbers Watersaver Industry Training Programs. Many other local governments operate similar programs.

Structural water efficiency (such as fixtures and fittings)

Water Efficiency Management Plans (WEMPs)

WEMPs help businesses and other non-residential water users assess their current water use and identify additional water savings. The plans demonstrate if a water user is already at best practice in water efficiency or how a user is planning to become water efficient in the near future. All businesses using more than 10 ML/a must prepare, submit and comply with a WEMP. Under the WEMP, the business must achieve a 25% reduction in total water consumption or best practice in an agreed timeframe. WEMPs are also required for public swimming pools, nurseries, turf farms and market gardens, and premises with cooling towers. All businesses must ensure their urinals and cooling towers are efficient, and businesses using 1 ML/a or more must ensure that all internal water fittings on the premises are water efficient. WEMPs are permanent measures, Over time, WEMPs will be progressively reviewed and updated with the aim of moving all businesses to best practice outcomes and keeping them there.

Queensland Development Code Part 25 – Water savings targets

Since 1 January 2007, all building development applications lodged for the construction of new homes in SEQ must meet mandatory water saving targets. Detached houses must target savings of 70,000 litres per year, while terrace houses and townhouses must aim to achieve savings of 42,000 litres per year. Rainwater tanks are one option to achieve the water saving target. Alternative solutions to achieve the water saving target include communal rainwater tanks, stormwater harvesting and dual reticulation recycled water systems.

Initiatives currently being implemented

Rainwater tanks on new industrial and commercial buildings

From 1 January 2008, rainwater tanks will be required to be installed on targeted categories of new commercial and industrial buildings. Rainwater tanks will be required to be plumbed into toilet cisterns, washing machines and an external tap. The rainwater tanks will be required to have a minimum storage capacity of 3.000 litres, with the final capacity determined based on a combination of the number of toilet pedestals and available roof catchment area.

Topping up of swimming pools

Under water restrictions, water from the reticulated supply system is permitted to be used for topping up of swimming pools only if a rainwater tank or downpipe rainwater diverter is installed. The premise must also comply with three of four water efficiency measures, namely: use of a swimming pool cover, water efficient taps and showerheads, water efficient toilets and water efficient washing machines.

Pressure and Leakage Management Program

The State and local governments are collaborating to reduce supply pressure and distribution system leakage losses by 60 ML/d (21,900 ML/a) by 2012, with the majority achieved by 2008.

Expanded use of greywater

Allowable uses for greywater will be expanded where appropriate, through setting treatment standards and amendments to the types of buildings eligible to install greywater use facilities. Commercial and industrial building owners will be allowed to reuse greywater captured within their buildings. These provisions commence on 1 January 2008.

Home WaterWise Rebate Scheme

The Queensland Government's Home WaterWise Rebate Scheme is a package of incentives to encourage households to save water. Rebates may be claimed for the installation of rainwater tanks plumbed into internal fixtures and water efficiency devices such as showerheads, dual flush toilets, washing machines, swimming pool covers and greywater systems.

Home Garden WaterWise Rebate Scheme.

The Government's Home Garden WaterWise Rebate Scheme is an incentive designed to support making gardens more water efficient. Residential householders can obtain a one-off rebate for the purchase cost of defined garden products.

Home WaterWise Service

The Home WaterWise Service is a government subsidised service that involves licensed plumbers installing a range of water efficient devices in homes and providing advice on water saving strategies.

Business Water Efficiency Program (BWEP)

BWEP is an incentive scheme that provides financial and technical support to help businesses to save water. BWEP provides funding towards the cost of water efficiency projects, including contributions towards audit and WEMP costs.