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7 - FEB 2011

*Secure and efficient water
through partnership and innovation*

D/11/401

3 February 2011

Mr Peter Borrows
Chief Executive Officer
Seqwater
PO Box 16146
City East QLD 4002


Dear Mr Borrows

I write regarding the SEQ Water Grid Manager review of proposed capital and renewal projects for 2011-12.

As you are aware, on 20 October 2010 the Honourable Minister Stephen Robertson MP, Minister for Natural Resources, Mines and Energy and Minister for Trade requested that the SEQ Water Grid Manager provide advice to the responsible Ministers on the need for proposed new and replacement capital expenditure as part of the annual operational planning process for each of the Grid Service Providers. Specifically, he sought advice that:

- there is a clear and appropriate need for proposed expenditure by the Providers; and
- a full range of options have been considered, including alternative ways of operating the SEQ Water Grid and utilising existing infrastructure.

This advice was sought in relation to proposed expenditure of \$2 million or more, excluding previously committed and regionally significant projects.

On 17 December 2010, the Chair of the SEQ Water Grid Manager wrote to Minister Robertson outlining the agreed process and timeframe for the provision of advice from 2011-12.

The letter advised that a consultation process will occur throughout each year leading up to the annual operational planning process for each of the Grid Service Providers. This process is intended to complement the existing roles of the Queensland Water Commission and the Grid Service Providers.

For the next financial year, Queensland Treasury has advised that draft strategic and operational plans are due to be provided to the responsible Ministers by 31 March 2011. To meet this timeframe, I request that you provide information by Friday 11 February 2011 regarding any proposed projects involving expenditure of \$2 million or more. We will seek to prepare our advice on these proposals by the end of February 2011, depending upon the number of projects and information provided.

At a minimum, the following information should be provided for each project:

- need in terms of security, cost, quality and/or reliability and with risk assessments
- options considered, including operational changes and use of existing assets
- scope, timing and cost of preferred option
- previous approvals, if available.

Where a project is scheduled to occur over several years, the project cost should be the total over those years.

Depending upon the number of proposals, we may schedule a workshop involving all three Grid Service Providers to discuss the proposals. Alternatively, we may speak directly to each entity.

In the meantime, please contact Mr Daniel Spiller, Director Operations, on telephone [REDACTED] or via email at [REDACTED] if you require any further information.

Thank you in advance for your assistance.

Yours sincerely

[REDACTED]

Barry Dennien
Chief Executive Officer

C.C. Ms Karen Waldman,
Chief Executive Officer, Queensland Water Commission.



RECEIVED

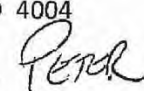
7 - FEB 2011

*Secure and efficient water
through partnership and innovation*

D/11/432

3 February 2011

Mr Peter McManamon
Chief Executive Officer
LinkWater
PO Box 1045
Spring Hill QLD 4004


Dear Mr McManamon

I write regarding the SEQ Water Grid Manager review of proposed capital and renewal projects for 2011-12.

As you are aware, on 20 October 2010 the Honourable Minister Stephen Robertson MP, Minister for Natural Resources, Mines and Energy and Minister for Trade requested that the SEQ Water Grid Manager provide advice to the responsible Ministers on the need for proposed new and replacement capital expenditure as part of the annual operational planning process for each of the Grid Service Providers. Specifically, he sought advice that:

- there is a clear and appropriate need for proposed expenditure by the Providers; and
- a full range of options have been considered, including alternative ways of operating the SEQ Water Grid and utilising existing infrastructure.

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Depending upon the number of proposals, we may schedule a workshop involving all three Grid Service Providers to discuss the proposals. Alternatively, we may speak directly to each entity.

In the meantime, please contact Mr Daniel Spiller, Director Operations, on telephone [REDACTED] or via email at [REDACTED] if you require any further information.

Thank you in advance for your assistance.

Yours sincerely /

[REDACTED]

Barry Dennien
Chief Executive Officer

C.C. Ms Karen Waldman,
Chief Executive Officer, Queensland Water Commission.

Our ref.: ME/11/0055

15 FEB 2011

Mr Barry Dennien
Chief Executive Officer
South East Queensland Water Grid Manager
PO Box 16205
City East QLD 4002

Dear Mr ~~Dennien~~

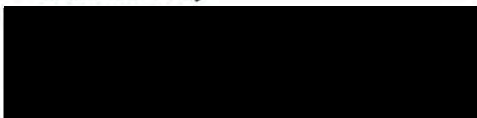
Thank you for providing me with copies of the letters dated 3 January 2011 sent to Seqwater, Linkwater and WaterSecure regarding the South East Queensland Water Grid Manager's review of proposed capital and renewal projects for 2011-12, which involve expenditure of \$2 million or more.

I understand from this letter, and other correspondence recently received by the Queensland Water Commission, you will be providing advice on any proposed projects as part of the annual strategic and operational planning process.

I welcome the invitation to work with you in reviewing any capital and renewal projects which may be proposed for 2011-12 and look forward to attending and participating in the review process.

If you require any further information, please contact me on telephone [REDACTED]

Yours sincerely



Ms Karen Waldman
Chief Executive Officer

Waldman Karen

From: Bagdon Tad
Sent: Wednesday, 16 February 2011 12:35 PM
To: 'Mary Boydell'; Waldman Karen
Subject: TRIM: FW: Optimising the Brisbane River System
Importance: High
Attachments: Inaugural Meeting Agenda - Project Reference Group.DOC
TRIM Dataset: W1
TRIM Record Number: D/11/013467
TRIM Record URI: 221691

[Agenda for the Brisbane System PRG](#)

Tad Bagdon
Acting General Manager
Regional Planning and Policy
Queensland Water Commission
L16 53 Albert Street
Brisbane QLD 4000
Phone: [REDACTED]
Mobile: [REDACTED]
www.qwc.qld.gov.au

From: [REDACTED]
Sent: Wednesday, 16 February 2011 12:02 PM
To: Bagdon Tad; Sommer Peter
Subject: FW: Optimising the Brisbane River System
Importance: High

Regards,

[REDACTED]

From: [REDACTED]
Sent: Wednesday, 9 February 2011 1:54 PM
To: Bagdon Tad
Subject: FW: Optimising the Brisbane River System
Importance: High

Hi Tad,

Here is the most recent communication sent by Ken Pearce to the members of the PRG regarding the scope of the Optimising the yield of the Brisbane River Project, which was emailed to the Seqwater representative, Rob Drury.

It is our intention to send out the draft terms of reference for the PRG prior to the PRG meeting and that the scope of the project will be discussed at the inaugural PRG meeting. The outcomes of this discussion will

8/05/2011

influence the development of the project plan.

It will be made clear that we have an inquiry in place and that the PRG scope is subject to the progress of the inquiry and the outcomes of it. The revised project plan will initially target 'no regret' work that could assist with the inquiry or would be unlikely to be impacted by the outcomes of the inquiry.

Colin Apelt has been provided with an terms of reference to define the scope of his engagement as a contractor on the PRG. He has also been provides with a superseded project plan, dated November 2010.

Regards,

Senior Policy Officer, Regional Planning and Policy

Telephone [REDACTED]

Email: [REDACTED]

www.qwc.qld.gov.au

Queensland Water Commission
53 Albert Street, Brisbane Q 4000
PO Box 15087, City East Q 4002

From: Pearce Ken

Sent: Thursday, 3 February 2011 5:15 PM

To: Tucker, Greg

[REDACTED] Hogan Bernadette;

[REDACTED] 'Colin Apelt'; Sommer Peter;

Tony Jacobs

Cc: Sommer Peter;

Subject: Optimising the Brisbane River System

Dear PRG Members,

The Brisbane River System Project is being set up to address Key Action #50 in the SEQ Water Strategy. Seqwater and the Commission are obligated by the Strategy to :

"Review the operation of the Brisbane River system to optimise the water supply yield and balance flood storage and water supply storage volume requirements."

Initially the scope of the Project was limited to consideration of the ***"maximum level to which the working storage of Wivenhoe Dam could be raised without raising the dam walls."***

Owing to recent flooding in the Brisbane River Valley, it is seen as prudent to develop the scope, with input from the Project Reference Group, for consideration of the Commission's Executive. The scope as currently proposed is as follows.

Optimise water supply and flood mitigation in the Brisbane River system using existing water supply infrastructure (Wivenhoe Dam), new infrastructure and operational arrangements. This would require the consideration of:

- ***a FSL for existing water supply infrastructure (Wivenhoe Dam) that balances supply and flood mitigation;***
- ***new infrastructure that can optimise the yield of the system and or flood mitigation; including management infrastructure;***
- ***new and existing infrastructure working in unison to optimise supply and flood mitigation;***
- ***improving or upgrading downstream infrastructure that would increase operational flexibility at upstream structures, such as raising road crossings downstream of Wivenhoe Dam; and***
- ***operational improvements.***

Consideration of the FSL of existing infrastructure could lead to a dynamic FSL approach for water supply infrastructure in the Brisbane River system. This dynamic approach could take into

8/05/2011

consideration the likelihood and degree of inflows in the water cycle year along with the supply/demand balance of the Water Grid.

The balancing of water supply and flood mitigation would need to consider parameters in the WRP and ROP. The optimum outcome may therefore involve legislative amendments.

The scope of the exercise will be discussed at the inaugural meeting of the Project Reference Group.

A draft agenda for the inaugural meeting is attached for your consideration. Please advise if you would like to make any changes.

I will be away until the 21 February 2011. Please make contact with [REDACTED] in my absence should you wish to respond; or want additional information. [REDACTED] telephone number is [REDACTED]

Regards

Ken Pearce
Project Officer
Regional Planning & Policy

Queensland Water Commission

Level 16, 53 Albert Street, Brisbane QLD 4000
PO Box 15087 City East QLD 4002

[REDACTED]

[

8/05/2011



Optimisation of the Brisbane River System

Agenda

TYPE OF MEETING	Inaugural meeting of the Project Reference Group (PRG)
TIME & DATE	9:30 am – 4:00 pm, Friday 25 February 2011
LOCATION	Wivenhoe Dam Operations Complex

Item	Time	Subject	Lead	Outcome required
1	9:30 - 9:50 am	Tea/Coffee	Seqwater	
2	9:50 – 10:00 am	Welcome by Chairman	Peter Sommer (QWC)	
3	10:00 – 11:00 am	Brisbane River System Operations - Recent drought and flood events - Constraints on operation - Issues	Rob Drury (Seqwater)	
4	11:00 – 1:00 pm	Tour of Wivenhoe Dam and downstream constraints	Rob Drury (Seqwater)	
5	1:00 – 1:45 pm	Lunch	Seqwater	
6	1:45 – 2:00 pm	Project Scope	Peter Sommer	
7	2:00 – 2:30 pm	Terms of Reference for the PRG Membership of the PRG	Peter Sommer	Agreement on TOR
8	2:30 – 3:00 pm	Commission of Inquiry into QLD's unprecedented flood disaster	Peter Sommer	
9	3:00 – 3:30 pm	Project Strategy	Ken Pearce (QWC)	Agreement on strategy
10	3:30 – 3:45 pm	Close	Peter Sommer	
11	3:45 – 4:15 pm	Afternoon Tea	Seqwater	

Trim Reference: D/11/002098

Waldman Karen

From: Best Debbie
Sent: Wednesday, 16 February 2011 4:54 PM
To: Lance McCallum; Waldman Karen
Cc: Bradley John
Subject: FW: Optimising the Brisbane River System

Attachments: Inaugural Meeting Agenda - Project Reference Group.DOC

Lance,
I have spoken to Karen that this workshop should not proceed until after the Commission of Inquiry. Karen is consulting with Mary tomorrow about the workshop and how to manage not proceeding. She will be advising us on how this will be managed.
Debbie

From: Pearce Ken
Sent: Thursday, 3 February 2011 5:15 PM
To: Tucker, Greg [REDACTED]; [REDACTED]; Hogan Bernadette; [REDACTED] 'Colin Apelt'; Sommer Peter; Tony Jacobs
Cc: Sommer Peter; [REDACTED]
Subject: Optimising the Brisbane River System

Dear PRG Members,

The Brisbane River System Project is being set up to address Key Action #50 in the SEQ Water Strategy. Seqwater and the Commission are obligated by the Strategy to :

"Review the operation of the Brisbane River system to optimise the water supply yield and balance flood storage and water supply storage volume requirements."

Initially the scope of the Project was limited to consideration of the "maximum level to which the working storage of Wivenhoe Dam could be raised without raising the dam walls."

Owing to recent flooding in the Brisbane River Valley, it is seen as prudent to develop the scope, with input from the Project Reference Group, for consideration of the Commission's Executive. The scope as currently proposed is as follows.

Optimise water supply and flood mitigation in the Brisbane River system using existing water supply infrastructure (Wivenhoe Dam), new infrastructure and operational arrangements. This would require the consideration of:

- * a FSL for existing water supply infrastructure (Wivenhoe Dam) that balances supply and flood mitigation;
- * new infrastructure that can optimise the yield of the system and or flood mitigation; including management infrastructure;
- * new and existing infrastructure working in unison to optimise supply and flood mitigation;
- * improving or upgrading downstream infrastructure that would increase operational flexibility at upstream structures, such as raising road crossings downstream of Wivenhoe Dam; and
- * operational improvements.

Consideration of the FSL of existing infrastructure could lead to a dynamic FSL

approach for water supply infrastructure in the Brisbane River system. This dynamic approach could take into consideration the likelihood and degree of inflows in the water cycle year along with the supply/demand balance of the Water Grid.

The balancing of water supply and flood mitigation would need to consider parameters in the WRP and ROP. The optimum outcome may therefore involve legislative amendments.

The scope of the exercise will be discussed at the inaugural meeting of the Project Reference Group.

A draft agenda for the inaugural meeting is attached for your consideration. Please advise if you would like to make any changes.

I will be away until the 21 February 2011. Please make contact with [REDACTED] in my absence should you wish to respond; or want additional information. [REDACTED] telephone number is [REDACTED]

Regards

Ken Pearce

Project Officer



Inaugural Meeting
Agenda - Pro...

Region 1 Planning & Policy

Queensland Water Commission

Level 16, 53 Albert Street, Brisbane QLD 4000

PO Box 15087 City East QLD 4002

[REDACTED]

[REDACTED]

[

Waldman Karen

From: Waldman Karen
Sent: Thursday, 17 February 2011 4:48 PM
To: Sommer Peter
Cc: Bagdon Tad
Subject: Optimising the Brisbane River System

Dear PRG members

On 3 February 2011, an email was sent to you from Ken Pearce, Project Officer, Regional Planning and Policy, advising that, owing to the recent flooding in the Brisbane River Valley, it is planned to seek input of the PRG into a proposed revised scope at the scheduled workshop on 25 February 2011, prior to taking it to the QWC's Executive for consideration. The email also attached a draft agenda for the meeting.

Although the intention stated by Ken was to seek input of the PRG into the proposed scope, the QWC's preferred approach is to review any change to the planned scope in relation to how it links to the relevant action for the QWC stated in the SEQ Water Strategy. The proposed scope contained in the email of 3 February 2011 alters the QWC's original endorsed action and may have unintentionally given the impression that the QWC role was extending into areas in which it has no responsibility.

Therefore the QWC would like to retract the proposed scope stated in the email of 3 February 2011 and review the direction of this project in the context of the SEQ Water Strategy, the recent establishment of the Commission of Inquiry and the annual review of the SEQ Water Strategy.

This review will aim to ensure preservation of options that are fit-for-purpose in the current operating environment.

As a result of the above, it is planned to cancel the workshop on 25 February 2011 at this stage, and review considerations at the Executive level of the QWC prior to confirming the next steps. I apologise for any inconvenience this may cause and thank you for your input to date. I will keep you informed as we clarify our progress.

Regards,

Peter Sommer

Waldman Karen

From: Waldman Karen
Sent: Thursday, 17 February 2011 5:10 PM
To: [REDACTED]
Cc: Bradley John
Subject: FW: The proposed PRG meeting on 25 February for optimising the yield of the Brisbane River system

Hi Debbie and Lance

As discussed yesterday - for your information, regards, Karen.

Chief Executive Officer | Queensland Water Commission
[REDACTED]

From: Sommer Peter
Sent: Thursday, 17 February 2011 5:01 PM
To: Tucker, Greg; [REDACTED]; [REDACTED]; Hogan Bernadette; [REDACTED]; 'Colin Apelt'; 'Tony Jacobs'
Cc: Waldman Karen; Bagdon Tad
Subject: The proposed PRG meeting on 25 February for optimising the yield of the Brisbane River system

On 3 February 2011, an email was sent to you from Ken Pearce, Project Officer, Regional Planning and Policy, advising that, owing to the recent flooding in the Brisbane River Valley, it is planned to seek input of the PRG into a proposed revised scope at the scheduled workshop on 25 February 2011, prior to taking it to the QWC's Executive for consideration. The email also attached a draft agenda for the meeting.

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I apologise for any inconvenience this may cause and thank you for your input to date. I will keep you informed as we clarify our progress.

Should you have any questions please do not hesitate to contact me.

Regards

Peter Sommer
Director, Planning Projects
Regional Planning and Policy

[REDACTED]
Email: [REDACTED]

www.qwc.qld.gov.au

Queensland Water Commission
53 Albert Street, Brisbane Q 4000
PO Box 15087, City East Q 4002

Waldman Karen

From: Waldman Karen
Sent: Friday, 21 January 2011 7:55 AM
To: [REDACTED]
Subject: Re: Correspondence from Minister Robertson

Thanks Tim

----- Original Message -----

From: Tim Watts [REDACTED]
To: Waldman Karen
Sent: Fri Jan 21 07:54:31 2011
Subject: RE: Correspondence from Minister Robertson

Karen

I have checked and the attachment was in the email.
Let me know if you have further trouble.
Tim

Tim Watts

Policy Advisor

Office of the Minister for Natural Resources, Mines and Energy and Minister for Trade

-----Original Message-----

From: Waldman Karen [REDACTED]
Sent: Thursday, 20 January 2011 7:43 PM
To: Tim Watts
Cc: [REDACTED]
Subject: Re: Correspondence from Minister Robertson

Hi Tim

I'm not sure if it is that I can't pick this up clearly on my Blackberry or not, but could you pls check we have been sent the attachment to the letter.

I will check on the PC tomorrow and see you at 1pm as usual.

Regards, Karen

----- Original Message -----

From: Tim Watts [REDACTED]
To: Mary Boydell [REDACTED] Waldman Karen
Cc: Josh Lockyer [REDACTED] Lance McCallum [REDACTED]

Sent: Thu Jan 20 19:31:20 2011
Subject: Correspondence from Minister Robertson

Mary Karen

Please find correspondence from the Minister attached.

Tim

<<Mary Boydell.pdf>> <<Karen Waldman.pdf>> Tim Watts Policy Advisor Office of the Minister for Natural Resources, Mines and Energy and Minister for Trade

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Hon Stephen Robertson MP
Member for Stretton

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Queensland
Government

Minister for Natural Resources,
Mines and Energy and
Minister for Trade

20 JAN 2011

RECEIVED
21 JANUARY 2011

Ms Mary Boydell
Commissioner
Queensland Water Commission
PO Box 15087
CITY EAST QLD 4002

CC: Ms Karen Waldman
Chief Executive Officer
Queensland Water Commission
PO Box 15087
CITY EAST QLD 4002

Dear Ms Boydell

Please find attached correspondence to Mr Phil Hennessey, Chair, SEQ Water.

I would appreciate you providing all necessary assistance to SEQ Water to ensure that the requests in the attached correspondence can be responded to as a matter of priority and with urgency.

Should you have any further enquiries, please do not hesitate to contact Lance McCallum, Principal Advisor, on telephone [REDACTED]

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
Facsimile +61 7 3225 1828
Email nrmet@ministerial.qld.gov.au



Hon Stephen Robertson MP
Member for Stretton



Queensland
Government

Minister for Natural Resources,
Mines and Energy and
Minister for Trade

20 JAN 2011

Ref CTS 00433/11

Mr Phil Hennessy
Chair
Seqwater
PO Box 16146
City East QLD 4002

CC: Mr Peter Borrows
Chief Executive Officer
Seqwater
PO Box 16146
CITY EAST QLD 4002

CC: Ms Mary Boydell
Commissioner
Queensland Water Commission
PO Box 15087
CITY EAST QLD 4002

CC: Mr Gary Humphrys
Chair
SEQ Water Grid Manager
PO Box 16205
CITY EAST QLD 4002

Dear Mr Hennessy

You will be aware that the Premier recently announced a Commission of Inquiry into Queensland Floods which will consider among other things, compliance with, and the suitability of the operational procedures relating to flood mitigation and dam safety.

The Commission is required to deliver an interim report by 1 August 2011 (on matters associated with flood preparedness to enable early recommendations to be implemented before next summer's wet season); and its final report by 17 January 2012.

However, I am also aware that Seqwater is currently managing the releases from the flood compartment of Wivenhoe and Somerset Dams in South East Queensland, in the context of the company's current Flood Mitigation Manual for those dams. There are three matters I wish to raise with you in this letter:

(1) I note that under the Flood Mitigation Manual for Wivenhoe and Somerset Dams, Seqwater is required to prepare a report on the recent flood event (see clauses 2.9 and 7.4 of the Manual). It is essential that a report (covering the requirements of both clauses 2.9 and 7.4 of the Manual) to the Department of Environment and Resource Management (DERM) is completed within the required timeframe of six weeks from the date of the incident. However in view of the fact that we remain in the middle of the wet season and further significant inflows are possible, I would urge you to complete this review, which should include consideration of the appropriate Full Supply Levels, as a matter of priority and urgency.

Any other changes you propose to the Flood Mitigation Manual, or related matters, eg improved data collection, should be clearly identified in the Review report, along with a timetable to implement them.

Level 17
61 Mary Street Brisbane Qld 4000
PO Box 15216 City East
Queensland 4002 Australia
Telephone +61 7 3225 1861
Facsimile +61 7 3225 1828
Email nrmet@ministerial.qld.gov.au

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(2) Furthermore, while this review of factors relevant to the operating release strategy and the Full Supply Levels is underway, I would request that you develop a contingency protocol which would ensure that if rainfall, that is likely to result in a flood release from Wivenhoe Dam, is forecast for the catchment then Seqwater will immediately convene a discussion with the Chief Executive Officer of DERM, his dam safety regulatory staff, and other appropriate parties.

(3) I note that the recent preliminary report by Mr Cooper identified a number of improvements that Seqwater could implement to achieve a better outcome in the application of the Draft Communication Protocol between government agencies and local governments. I request that you contact Mr Bob Reilly, General Manager, Office of the Water Regulator of the department on [REDACTED] to progress these as a matter of urgency.

I have also written to the Chair of the Water Grid Manager and the Water Commissioner requesting all necessary assistance be afforded to SEQ Water to ensure the matters raised in this letter are responded to as a matter of priority and with urgency.

Should you have any further enquiries, please do not hesitate to contact Mr John Bradley, Chief Executive of the Department, on [REDACTED]

Yours sincerely



STEPHEN ROBERTSON MP

MEETING BETWEEN QWC & OWSR – 21.01.11

Key Information

- Maximum System Take allowed = 450,000 ML/a
- Current Demand = 300,000 ML/a
- Current Additional Available = 150,000 ML/a
- Total Water Supply of Wivenhoe Dam = 1,165,000 ML (EL 67m) 100%
- Flood Capacity of Wivenhoe Dam = 1,450,000 ML (EL 77.5m) 200%
~~176m~~ 230% Overstop

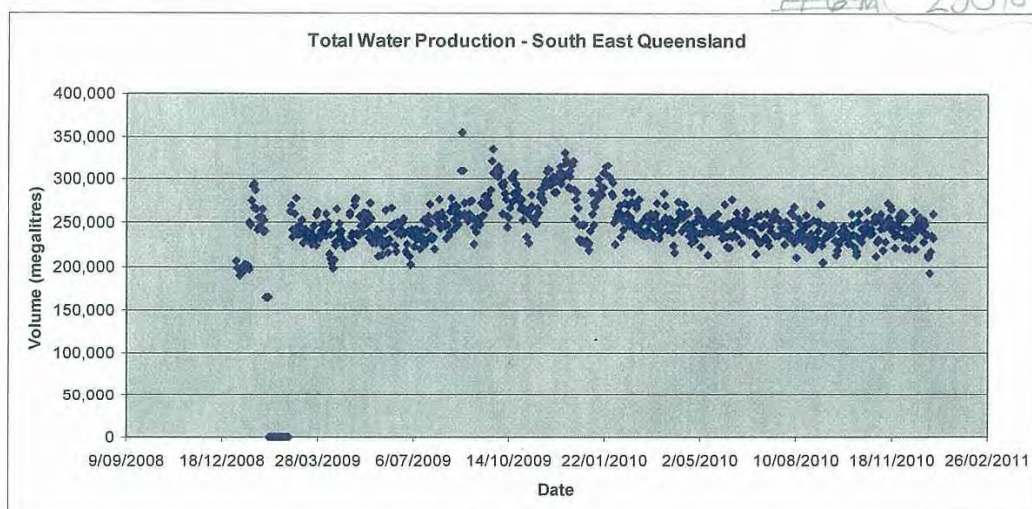
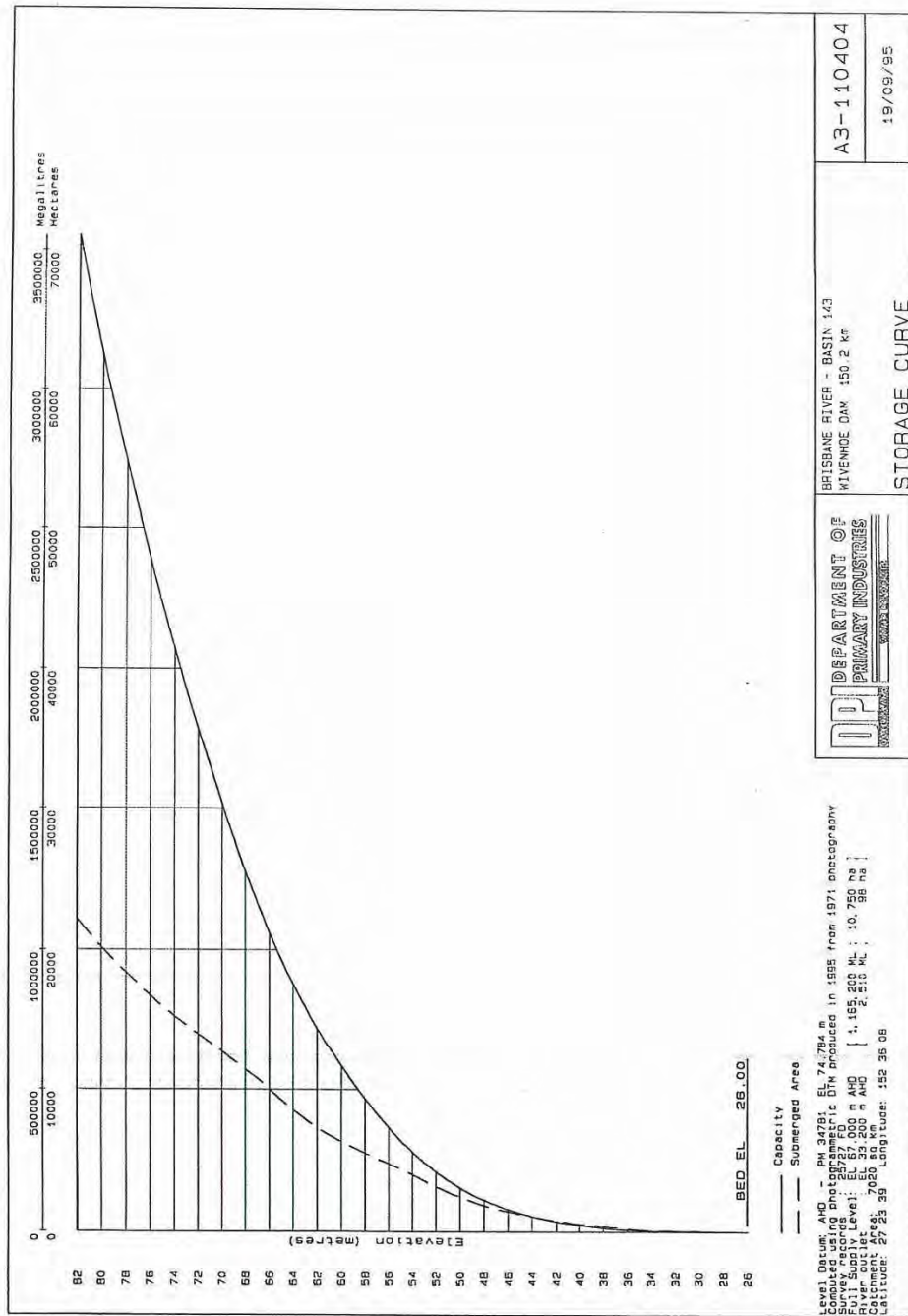


Table of Storage Reduction for Wivenhoe Dam

% Reduction (from Full Supply)	Volume of Water Released (ML)	Volume Remaining at Wivenhoe (from Full supply)	Height Reduction (m) (from Full Supply)
5	58,250	1,106,750	0.25
10	116,500	1,048,500	0.8
12.9	150,000	1,015,000	1.5
15	174,750	990,250	1.75
20	233,000	932,000	2.33
25	291,250	873,750	3.0
30	349,500	815,500	3.75



EL (M)	AREA (HA)	TOTAL VOLUME (ML)	COMM.
42.50	1134	35183	
42.00	1006	40150	
41.50	1006	35127	
41.00	1006	30104	
40.50	977	25081	
40.00	944	20058	
39.50	911	15035	
39.00	879	10012	
38.50	846	5000	
38.00	813	0	
37.50	774	35568	
37.00	744	31682	
36.50	715	27796	
36.00	686	23910	
35.50	656	19924	
35.00	627	15938	
34.50	598	11952	
34.00	568	7966	
33.50	539	3980	
33.00	510	0	
32.50	480	0	
32.00	451	0	
31.50	422	0	
31.00	392	0	
30.50	363	0	
30.00	334	0	
29.50	304	0	
29.00	275	0	
28.50	246	0	
28.00	217	0	
27.50	188	0	
27.00	159	0	
26.50	130	0	
26.00	101	0	
25.50	72	0	
25.00	43	0	
24.50	14	0	
24.00	0	0	

EL (M)	AREA (HA)	TOTAL VOLUME (ML)	COMM.
57.00	5978	413632	
56.75	5875	401506	
56.50	5772	389380	
56.25	4810	376573	
56.00	4721	364560	
55.75	4627	352547	
55.50	4537	340534	
55.25	4445	328521	
55.00	4353	316508	
54.75	4261	304495	
54.50	4169	292482	
54.25	4077	280469	
54.00	3985	268456	
53.75	3893	256443	
53.50	3801	244430	
53.25	3709	232417	
53.00	3617	220404	
52.75	3525	208391	
52.50	3433	196378	
52.25	3341	184365	
52.00	3249	172352	
51.75	3157	160339	
51.50	3065	148326	
51.25	2973	136313	
51.00	2881	124300	
50.75	2789	112287	
50.50	2697	100274	
50.25	2605	88261	
50.00	2513	76248	
49.75	2421	64235	
49.50	2329	52222	
49.25	2237	40209	
49.00	2145	28196	
48.75	2053	16183	
48.50	1961	477	
48.25	1869	0	
48.00	1777	0	
47.75	1685	0	
47.50	1593	0	
47.25	1501	0	
47.00	1409	0	
46.75	1317	0	
46.50	1225	0	
46.25	1133	0	
46.00	1041	0	
45.75	949	0	
45.50	857	0	
45.25	765	0	
45.00	673	0	
44.75	581	0	
44.50	489	0	
44.25	397	0	
44.00	305	0	
43.75	213	0	
43.50	121	0	
43.25	29	0	
43.00	0	0	

EL (M)	AREA (HA)	TOTAL VOLUME (ML)	COMM.
123.65	154267	154267	
123.00	12365	12365	
122.50	12005	12005	
122.00	11645	11645	
121.50	11285	11285	
121.00	10925	10925	
120.50	10565	10565	
120.00	10205	10205	
119.50	9845	9845	
119.00	9485	9485	
118.50	9125	9125	
118.00	8765	8765	
117.50	8405	8405	
117.00	8045	8045	
116.50	7685	7685	
116.00	7325	7325	
115.50	6965	6965	
115.00	6605	6605	
114.50	6245	6245	
114.00	5885	5885	
113.50	5525	5525	
113.00	5165	5165	
112.50	4805	4805	
112.00	4445	4445	
111.50	4085	4085	
111.00	3725	3725	
110.50	3365	3365	
110.00	3005	3005	
109.50	2645	2645	
109.00	2285	2285	
108.50	1925	1925	
108.00	1565	1565	
107.50	1205	1205	
107.00	845	845	
106.50	485	485	
106.00	125	125	
105.50	0	0	
105.00	0	0	
104.50	0	0	
104.00	0	0	
103.50	0	0	
103.00	0	0	
102.50	0	0	
102.00	0	0	
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5.00	0	0	
4.50	0	0	
4.00	0	0	
3.50	0	0	
3.00	0	0	
2.50	0	0	
2.00	0	0	
1.50	0	0	
1.00	0	0	
0.50	0	0	
0.00	0	0	

EL (M)	AREA (HA)	TOTAL VOLUME (ML)	COMM.
82.00	2918.1	3955900	
81.50	2191.6	3449906	
81.00	1816.8	3445428	
80.50	89.75	3391980	
80.00	81.25	3338361	
79.50	211.65	3338361	
79.00	203.18	3283762	
78.50	205.77	3237774	
78.00	205.77	3183774	
77.50	205.77	3129774	
77.00	205.77	3075774	
76.50	205.77	3021774	
76.00	205.77	2967774	
75.50	205.77	2913774	
75.00	205.77	2859774	
74.50	205.77	2805774	
74.00	205.77	2751774	
73.50	205.77	26	

INTERNAL MEETINGS 24.01.11 / 25.01.11
MEETINGS BETWEEN QWC & ERM – 25.01.11

Example Framework for Consideration of the Impact on SEQ Water Strategy
of Various Operating Levels for Wivenhoe Dam

Description	Base Case	Short Term Options			Intermediate (Ingenuity Option)	Long Term Option
		10% drawdown	30% drawdown	50% drawdown		
Security						
• Sufficiency	ok	ok	impacted	impacted	↑	Impacted – demand management/ manufactured water required
• Demand/Supply Balance	ok	ok	ok	ok		Impacted – new infrastructure brought forward
Levers						
• Level of Service changed					Review	
• Policy					Review	
• Assumptions					Review	
• Other						
Input						
• Allocation	ok	ok	Impacted?	Impacted?	↓	Impacted - Review required
• Yield	ok	ok	ok	ok		Impacted
• Demand	ok	ok	ok	ok		Potentially reduced
• Other						
Price						
	ok	ok	Grid operating costs / manufactured water triggered?	Grid operating costs / manufactured water triggered		Yes – new price path?

Note: above table is only an example – details are being assessed.

Figure 1: Water Balance

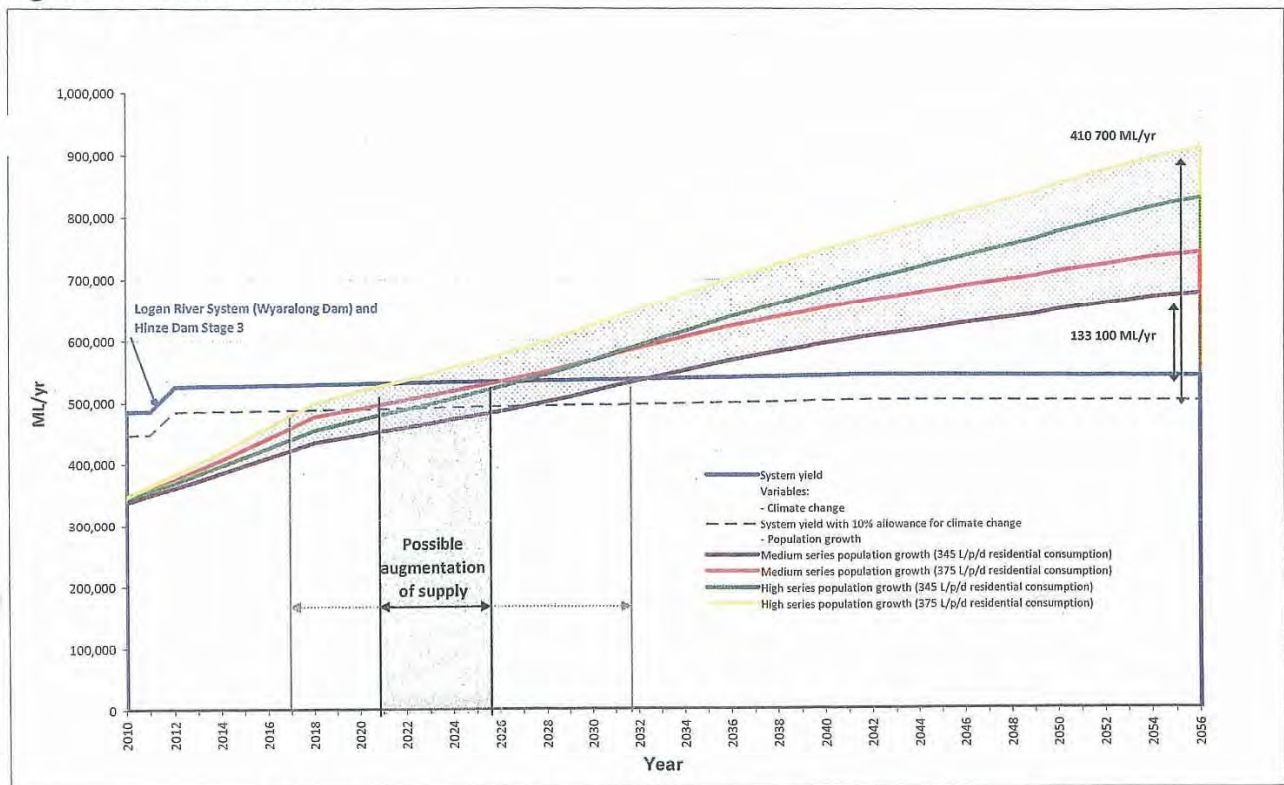
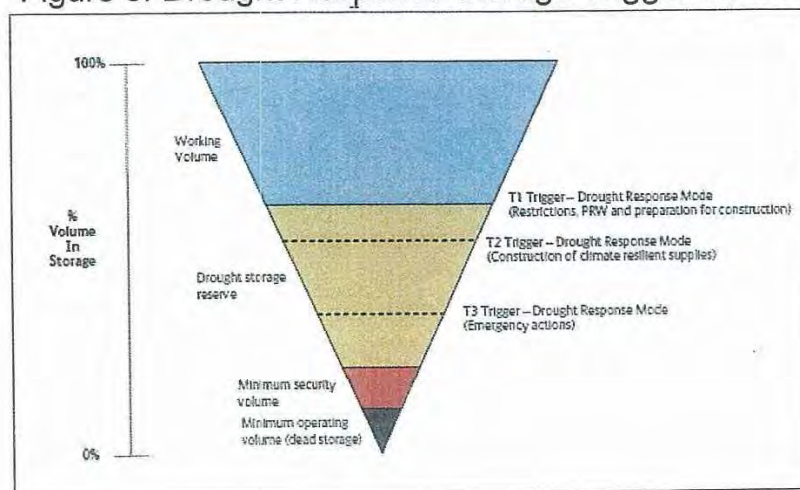


Figure 3: Drought Response Storage Trigger Points



The next bulk water source will be required for a growth or drought trigger. Fig 1 shows likely timeframes for growth scenarios. Fig 2 shows that there is 1 in a 1000 probability that a drought trigger might occur in late 2014 requiring construction to commence in 2017. Fig 3 illustrates the relationship of drought triggers to storage levels while Fig 4 illustrates that the present grid is sufficiently robust that on present population and planning based demand levels of 230 l/p/d construction of drought response infrastructure would not have been required for the Millennium drought.

Figure 2: Storage Levels - "Grid 12"

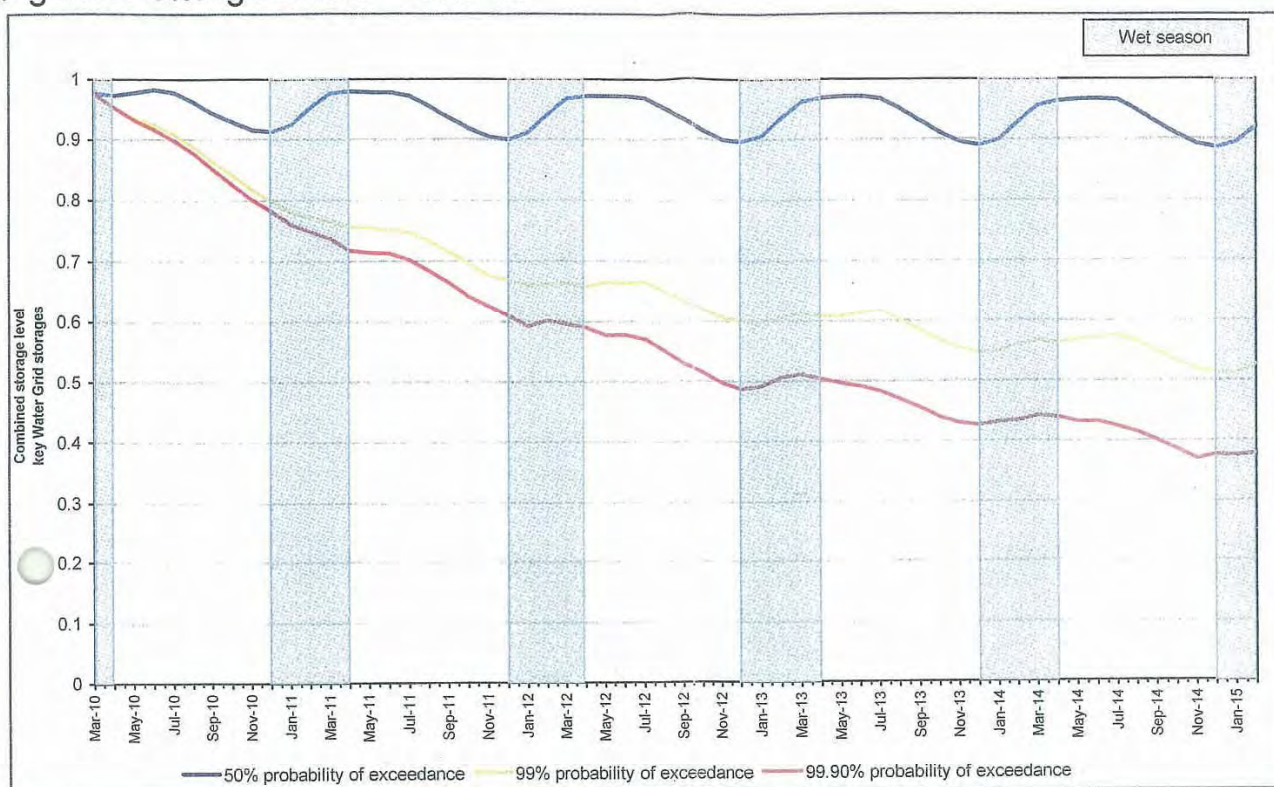


Figure 4: Storage Levels with Drought Response Triggers

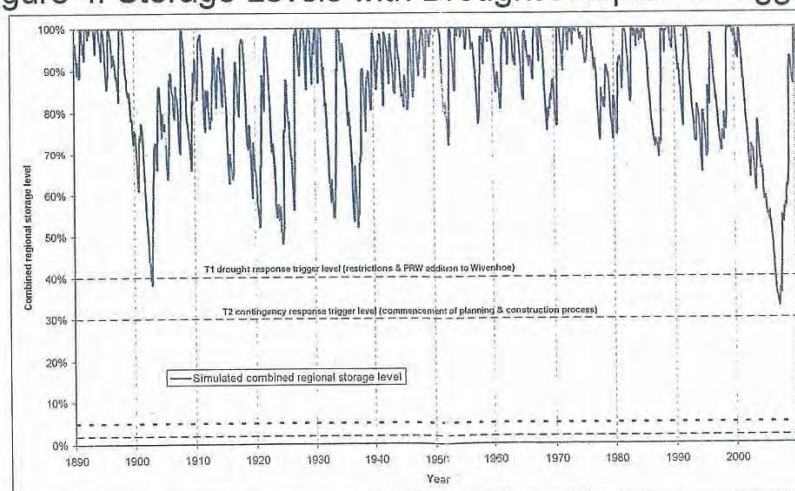


Table A: Impact of Reduced Consumption on the Timing of the Next Augmentation

Scenario	Regional average residential consumption	
	230 litres/person/day	200 litres/person/day
Earliest date with: • high population growth • provision for climate impact	2017	2022
Likely date with: • high population growth	2021	2027
Likely date with: • medium population growth • provision for climate impact	2020	2027
Latest date with: • medium population growth	2026	2032

From WGM 1.2.11

Figure 1 Estimated probability of SEQ reaching T1 and T2 (May-2011 to Apr-2021)
impact of temporary reduction of Wivenhoe FSL to end June 2011

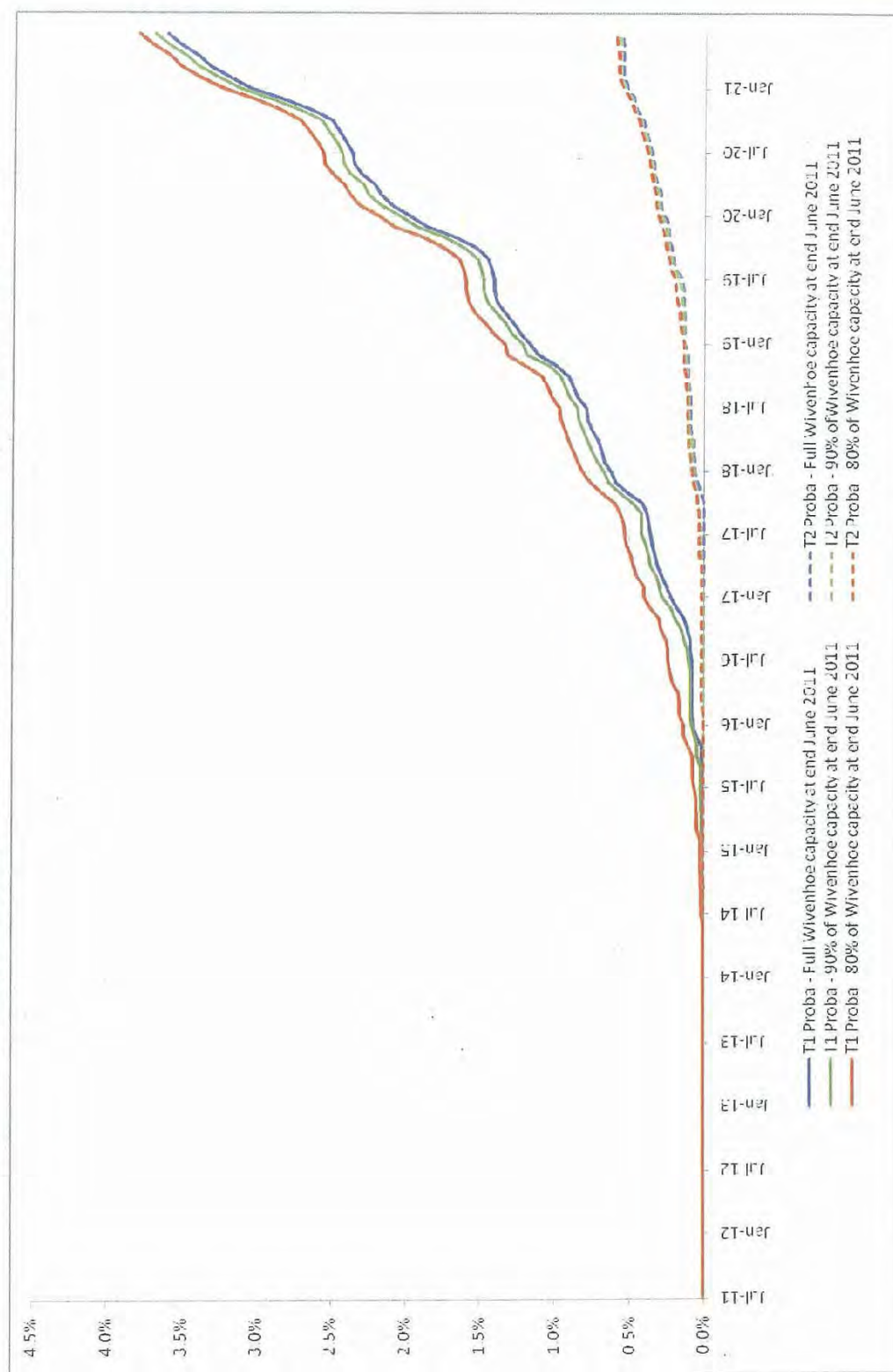
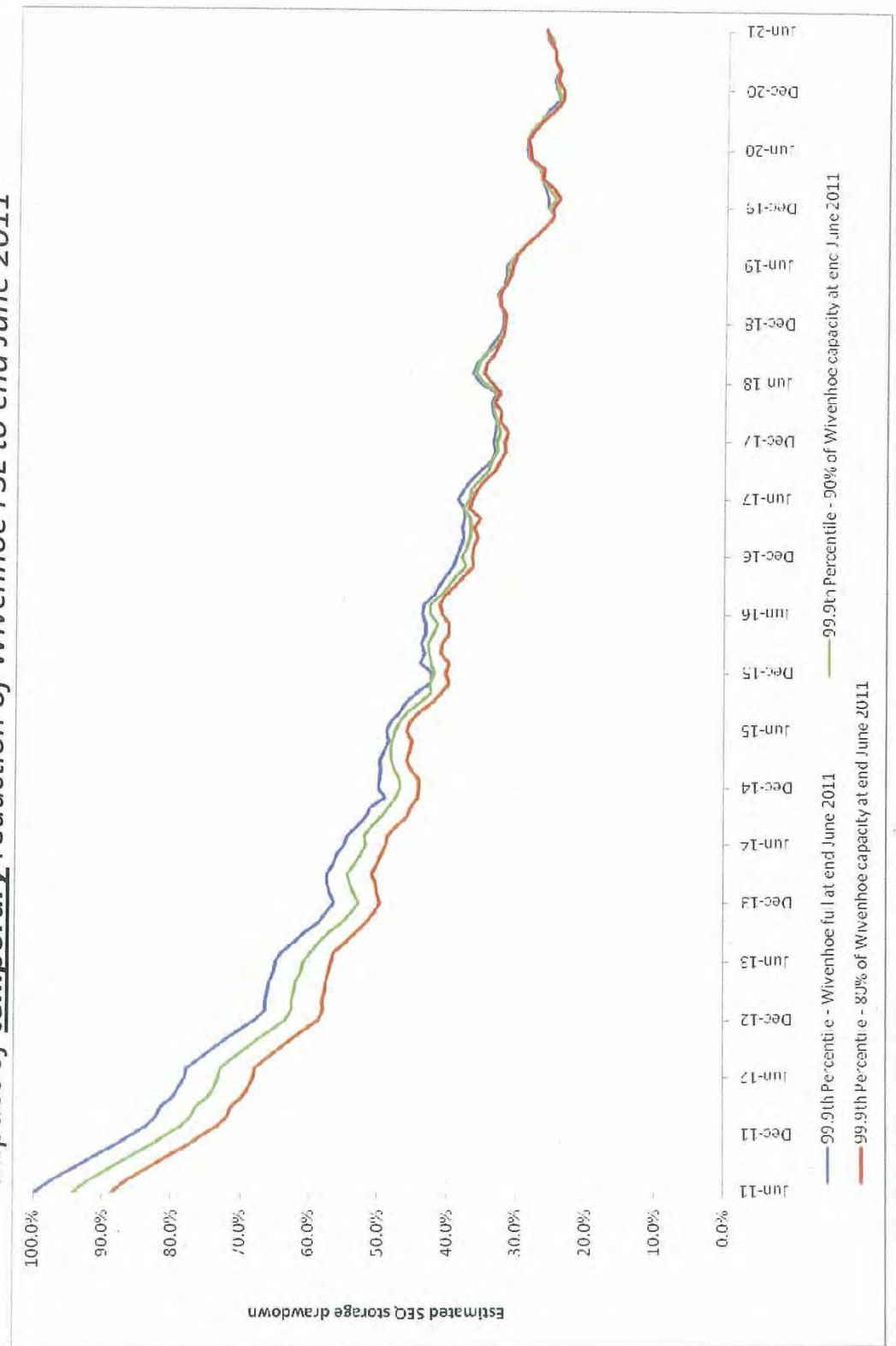


Figure 2 Estimated 10-year forecast drawdown of SEQ storages, 99.9th. Percentile
 impact of temporary reduction of Wivenhoe FSL to end June 2011



Scenarios for Operation of Wivenhoe Dam January 2011

Preliminary Modelling results

Variation in Initial Wivenhoe Dam Level

An assessment of the risk criteria for three initial levels of Wivenhoe Dam was undertaken with the following assumptions:

- Initial levels of Wivenhoe Dam were 87.1%, 70% and 50%
- **All other storages were set at 100% initially.**
- No NPI2 for the duration of the modelling
- Simulation start was February 2011, with initial dam levels January 2011
- Price path 2010 – 2015 demands
- No Tugun desalination above 60% Key Water Grid Storages, full desalination below 60%

All scenarios passed the SOP risk criteria as shown below in the Table 1.

Table 1

SOP			
Volume of water stored by all Key Water Grid Storages	Probability of reaching stored volume		
	1 year	3 years	5 years
40%	<.2%	NA	<5%
30%	NA	<.5%	<1%
Scenario - Wivenhoe 87% (Case 2)			
Volume of water stored by all Key Water Grid Storages	Probability of reaching stored volume		
	1 year	3 years	5 years
40%	<.01%	NA	0.09%
30%	NA	<.01%	<.01%
Scenario - Wivenhoe 70% (Case 4)			
Volume of water stored by all Key Water Grid Storages	Probability of reaching stored volume		
	1 year	3 years	5 years
40%	<.01%	NA	0.20%
30%	NA	<.01%	0.01%
Scenario - Wivenhoe 50% (Case 6)			
Volume of water stored by all Key Water Grid Storages	Probability of reaching stored volume		
	1 year	3 years	5 years
40%	<.01%	NA	0.48%
30%	NA	<.01%	0.01%

Emailed to J. Bradley 1.2
Handed out at mtg on
1.2.11 to
WGM, DERM, OWSR, Sqrwater
Emailed to J. Pruss 1.2.11

Below in Table 2 are some of the results comparing the probability of reaching 40% for the scenarios run so far:

Table 2

Case	% Reduction Wivenhoe (from full supply)	Volume of Water Released from Wivenhoe Dam (ML)	%reduction of Grid 12 Storages (from full supply)	Probability of reaching 60% within 5 years (desalination trigger)	Probability of reaching 40% within 5 years (PRW trigger)
1	10	116,500	5.6		
2	12.9	150,285	7.3		.09%
3	20	233,000	11.3		
4	30	349,500	16.9		.2%
5	40	466,000	22.5		
6	50	582,500	28.1		.48%

Wivenhoe Dam initially at 50%, with varied initial Baroon Pocket and Hinze dam levels

An assessment of the effect on risk criteria of lower initial Hinze and Baroon Pocket dam levels was undertaken with the following assumptions:

- Initial level of Wivenhoe Dam 50%
- Baroon Pocket and Hinze Dam initial levels at 50%
- **All other storages were set at 100% initially.**
- No NPI2 for the duration of the modelling
- Simulation start was February 2011, with initial dam levels January 2011
- Price path 2010 – 2015 demands
- No Tugun desalination above 60% Key Water Grid Storages, full desalination below 60%

Both scenarios passed the risk criteria as shown in Table 3 below.

Table 3

SOP			
Volume of water stored by all Key Water Grid Storages	Probability of reaching stored volume		
	1 year	3 years	5 years
40%	<.2%	NA	<5%
30%	NA	<.5%	<1%
50/50/50%			
Volume of water stored by all Key Water Grid Storages	Probability of reaching stored volume		
	1 year	3 years	5 years
40%	<.01%	NA	0.49%
30%	NA	0.01%	.033%

Table 4 compares the risk criteria for all scenarios.

Table 4

Wivenhoe/Baroon/Hinze levels	50/50/50	50/100/100	70/100/100	87/100/100	SOP
40% SEQ volume					
1 year	<.01%	<.01%	<.01%	<.01%	<.2%
5 year	0.49%	0.48%	0.20%	0.09%	<5%
30% SEQ volume					
3 years	0.01%	<.01%	<.01%	<.01%	<.5%
5 years	0.03%	<.01%	0.01%	<.01%	<1%

Storage behaviour curves for varying probabilities of exceedance are shown below in Figures 1 and 2.

DRAFT

Figure 1

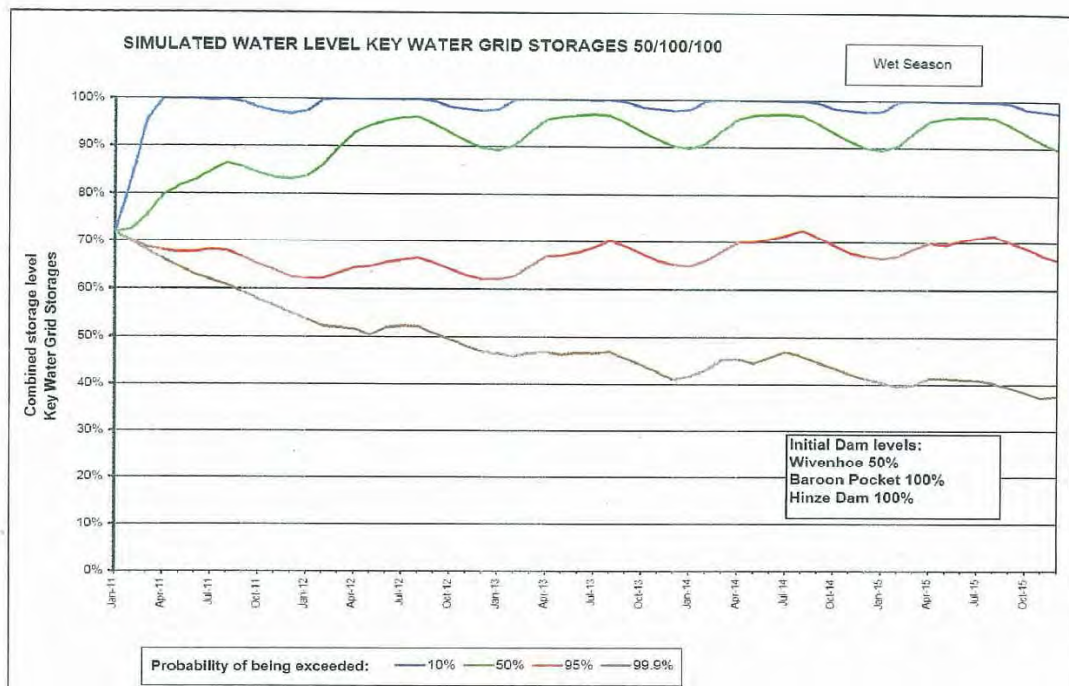
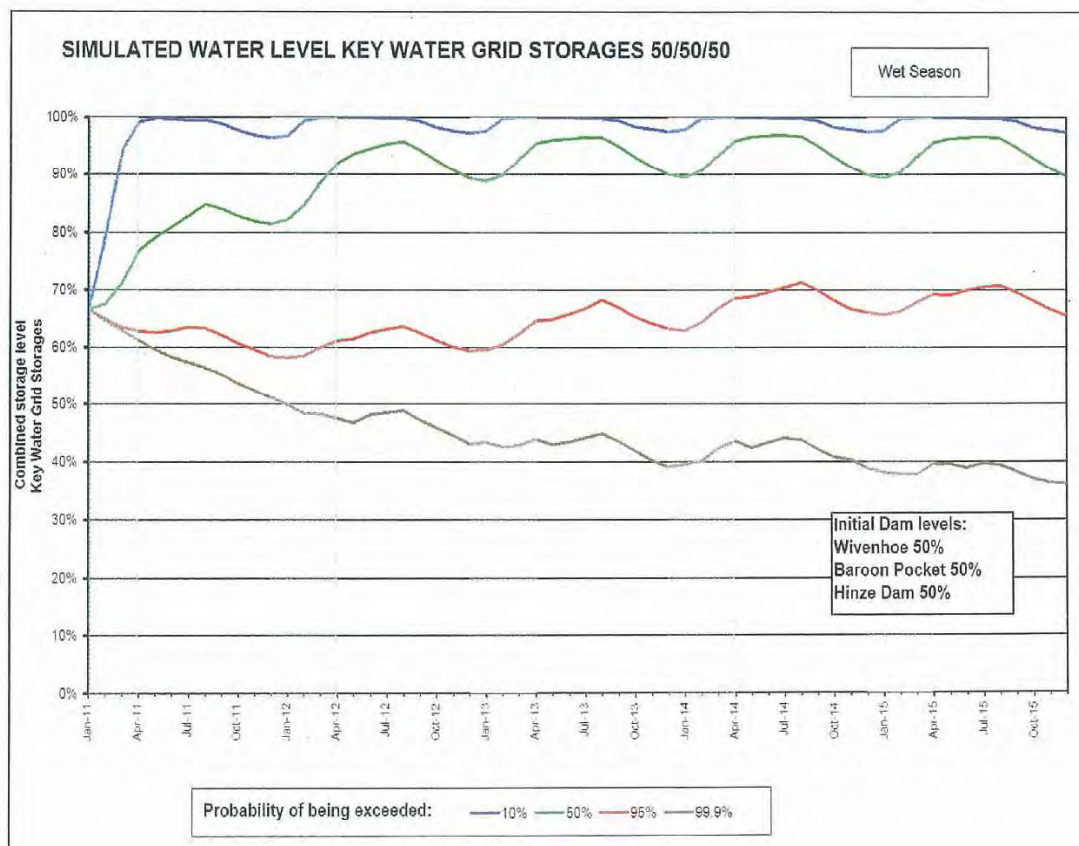


Figure 2



Waldman Karen

From: Waldman Karen
Sent: Tuesday, 1 February 2011 2:40 PM
To: Bradley John
Cc: Mary Boydell; Bagdon Tad; Wong Wai Tong
Subject: FW: Scenarios for operation of Wivenhoe Dam January 2011.DOC
Attachments: Scenarios for operation of Wivenhoe Dam January 2011.DOC

Hi John

Information paper for this afternoon's meeting as requested by Lynette.

Regards, Karen.

Chief Executive Officer | Queensland Water Commission



28/01/2011

4 February 2011



The Honourable Stephen Robertson MP
Minister for Natural Resources, Mines and Energy
and Minister for Trade
PO Box 15216
CITY EAST QLD 4002

Dear Minister,

I refer to my 27 January 2011 letter and I am pleased to be able to relay to you the following further update, which has been provided to me by Seqwater's officers.

Work is continuing on the full Seqwater report on the recent flood event at Wivenhoe Dam, as required under the Flood Mitigation Manual for Wivenhoe and Somerset Dams. That report will address the requirements of sections 2.9 and 7.4 of the Manual and will be completed within the stipulated six week timeframe.

On Tuesday, 1 February 2011, Seqwater held a further meeting involving the Director-General of the Department of Environment and Resource Management (DERM), senior Board and Chief Executive representatives from the Water Grid Manager (WGM), Queensland Water Commission (QWC) and senior officers from DERM, including the Dam Safety Regulator and representatives from the Water Supply Regulator, to discuss the progress of works tasked to Seqwater on 25 January to address the issues raised in your letter of 20 January.

In your letter of 20 January 2011, you requested that Seqwater assist DERM in the consideration of the appropriate Full Supply Levels (**FSLs**) for Wivenhoe and Somerset Dams. Given that:

- (a) Wivenhoe and Somerset Dams fulfil dual water supply and flood mitigation functions;
- (b) the dams are the primary urban water supply for South East Queensland and their current FSLs are enshrined within the Moreton Resource Operations Plan and underpin the system yields adopted for the South East Queensland Water Strategy;
- (c) Seqwater is obliged under its Flood Mitigation Manual to ensure that all opportunities to fill the dams are taken and therefore there should be no reason why the dams are not at their respective FSLs following a flood event,

it is noted that DERM is considering, from a policy perspective, whether the FSLs for the dams should be changed.

To assist DERM in formulating that policy position, Seqwater is continuing further modelling to provide an indicative assessment of the benefits or otherwise of undertaking a pre-release strategy to pre-emptively reduce the FSL of Wivenhoe Dam and the mechanisms by which any change to the FSL might best be implemented. However, given that this technical information will be of critical importance to:

- (a) DERM in the formulation of its long term water supply and flood mitigation policies; and
 - (b) the Commission of Inquiry investigating the January 2011 flood events,
- great care must be taken to ensure that the technical information is both accurate and comprehensive. Seqwater also notes that DERM will want to take into account the Inquiry's findings.

Compiling this technical information entails the following tasks:

- (a) modelling the water outflows from Wivenhoe Dam for design flood events;
- (b) calculating Brisbane River levels resulting from these various water outflow events; and
- (c) determining the extent of inundation based on those Brisbane River levels.



In respect of task (a), Seqwater has completed modelling of approximately 90 permutations in respect of 3 previous flood events (including January 2011) and 6 design flood events (ranging between a 1 in 200 and a 1 in 5000 flood event) and our modelling has been peer reviewed by independent external experts.

Task (b) requires Seqwater to work with the Bureau of Meteorology (BOM) or Brisbane City Council (BCC), both of which have developed models for determining Brisbane River levels for various flow events. Seqwater is anxious to progress this task as a matter of priority but you should be aware that –

- (i) BOM is unable to assist Seqwater at this point; and
- (ii) BCC does not wish to assist until its model has been updated to take into account the January 2011 flood event.

If BCC is unable to assist promptly, Seqwater will need to utilise other modelling alternatives.

BCC has also developed the models which will need to be utilised to complete task (c). Task (c) can only be completed accurately when Seqwater and BCC have finalised task (b). Furthermore, Seqwater will need to have independently validated the input provided by BCC.

All of these tasks should be completed by 31 March 2011.

However, DERM may be satisfied, based on advice from QWC and the WGM from a water supply security perspective, that Wivenhoe Dam's FSL could be reduced in the short term to, say, 75% of its current FSL. If that is the case, Seqwater can confirm (from its modelling undertaken in respect of task (a) to date) that, in respect of a flood event beyond Wivenhoe Dam's current flood mitigation design capability, such a reduced FSL will provide flood mitigation benefits for such an extreme rainfall event occurring in the Wivenhoe and Somerset catchments. For example, for a 1 in 500 probability flood event, the water outflows under Wivenhoe Dam's existing FSL are approximately 5,000 cubic metres of water per second (cumecs), whereas those water outflows would be approximately 3,400 cumecs in the case of a 75% FSL (assuming releases under the flood mitigation manual are triggered only at the reduced 75% FSL; by contrast, the water outflows would be approximately 3,700 cumecs if releases under the manual are triggered at the current FSL).

For your information, Wivenhoe Dam's current flood mitigation design enables it to contain a 1 in 100 probability flood event and substantially reduce the impacts of up to a 1 in 500 probability flood event.

Should a decision to reduce the FSL be made:

- (a) Seqwater will need to work urgently with the Dam Safety Regulator to finalise any necessary changes to the flood mitigation manual;
- (b) if requested, Seqwater can provide assistance to DERM following DERM's determinations regarding the Moreton Resource Operations Plan and the appropriate mechanism by which such a pre-release strategy would be implemented.

Seqwater has also developed a draft contingency protocol, should further rainfall result in the need for floodgate releases from Wivenhoe Dam in the next few weeks, and is currently finalising it with DERM.

Seqwater has sought input from the Office of the Water Supply Regulator to enable Seqwater to finalise improvements to the Technical Situation Report format identified by Mr Brian Cooper to enhance communication between government agencies and local governments during future flood events. Seqwater is currently finalising those improvements with DERM.

Seqwater remains committed to providing the State Government with timely and considered advice on the operation of the region's dams and co-operating fully with the Commission of Inquiry.

Yours sincerely,

[Redacted Signature]

Phil Hennessy
Chairman

[Redacted]

Waldman Karen

From: Aleisha Paine [REDACTED]
Sent: Wednesday, 9 February 2011 11:49 AM
To: Peter Borrows
Cc: Waldman Karen; Dennien Barry [REDACTED]
Subject: Copy of letter re: water security impacts of lowering FSL at Wivenhoe Dam
Attachments: Water security impacts of lowering FSL at Wivenhoe Dam.pdf

Good morning Peter,

Please find attached a copy of our letter regarding water security impacts of lowering Full Supply Level at Wivenhoe Dam.

A hard copy will be sent to you and CC'd to Karen today.

Kind regards,

Aleisha Paine
Board Executive Officer
SEQ Water Grid Manager

Phone: [REDACTED]

Email: [REDACTED]

Visit: Level 15, 53 Albert Street Brisbane

Post: PO Box 16205, City East QLD 4002

ABN: 14783 317 630

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TRIM ref: D/11/502

Secure and efficient water
through partnership and innovation

9 February 2010

Peter Borrows
Chief Executive Officer
Seqwater
PO Box 16146
City East QLD 4002

Dear Mr Borrows

I refer to Seqwater's Chair's letter to Minister Robertson dated 4 February 2011, regarding Seqwater's consideration of the appropriate Full Supply Levels (FSL) for Wivenhoe and Somerset dams. We acknowledge having recently received a copy of this letter from you.

I write regarding the water security impacts of lowering the FSL of Wivenhoe Dam, in light of the SEQ Water Grid Manager's obligation to manage water supplied from its water entitlements in accordance with Sections 6 and 7 (Desired Levels of Service Objectives and Risk Criteria) in the *South East Queensland System Operating Plan*. We understand that this is being considered as an interim measure for the current wet season.

I confirm previous verbal advice that, from a water security perspective, the SEQ Water Grid Manager has no objection to Wivenhoe Dam being drawn down to 75 per cent of its FSL. The water security implications of a temporary draw down are unlikely to impact our ability to comply with the *South East Queensland System Operating Plan* or our Grid Contract obligations.

If a permanent reduction of Wivenhoe Dam's FSL is later considered, this may have an impact on the *South East Queensland System Operating Plan's* desired levels of service objectives and we would suggest that you also engage with the Queensland Water Commission on this matter.

I trust that this advice is sufficient. If you have any questions, please do not hesitate to contact me by telephone on [REDACTED] or via email at [REDACTED]

Yours sincerely

[REDACTED]
Barry Denham
Chief Executive Officer

CC: Karen Waldman, Chief Executive Officer, Queensland Water Commission.

PO Box 16205, City East QLD 4002 Tel: +61 7 3247 3012 Fax: +61 7 3405 0373 www.seqwgm.qld.gov.au

ABN 14 783 317 630

Parkin Helen

From: Mary Boydell [REDACTED]
Sent: Tuesday, 29 March 2011 3:39 PM
To: Salcedo Agustin
Subject: Fwd: Copy of letter re: water security impacts of lowering FSL at Wivenhoe Dam
Attachments: Water security impacts of lowering FSL at Wivenhoe Dam.pdf, ATT630391.htm

Begin forwarded message:

From: "Waldman Karen" [REDACTED]
Date: 9 February 2011 1:13:55 PM AEST
To: "Bagdon Tad" [REDACTED] "Wong Wai Tong"
[REDACTED]
Cc: "Mary Boydell" [REDACTED]
Subject: FW: Copy of letter re: water security impacts of lowering FSL at Wivenhoe Dam

Hi all

For information - Peter Borrows advises me that this is forming the basis of a discussion with John Bradley this evening as they now have clear direction on water security.

Do we concur with its statements?

Regards, Karen.

Chief Executive Officer | Queensland Water Commission
[REDACTED]

From: Aleisha Paine [REDACTED]
Sent: Wednesday, 9 February 2011 11:49 AM
To: Peter Borrows
Cc: Waldman Karen; Dennien Barry [REDACTED]
Subject: Copy of letter re: water security impacts of lowering FSL at Wivenhoe Dam

Good morning Peter,

Please find attached a copy of our letter regarding water security impacts of lowering Full Supply Level at Wivenhoe Dam.

A hard copy will be sent to you and CC'd to Karen today.

Kind regards,

Aleisha Paine
Board Executive Officer

Waldman Karen

From: Peter Borrows [REDACTED]
Sent: Saturday, 12 February 2011 1:01 PM
To: Waldman Karen
Subject: Re: TRIM Document : D/11/001976 : Report on Impact of Operating Scenarios on Water Strategy for Wivenhoe Dam 11 Feb 2011

Sensitivity: Confidential

Thanks Karen

----- Original Message -----

From: Waldman Karen [REDACTED]
Sent: Saturday, February 12, 2011 12:55 PM
To: Peter Borrows
Cc: Mary Boydell (Bigpond)
Subject: Fw: TRIM Document : D/11/001976 : Report on Impact of Operating Scenarios on Water Strategy for Wivenhoe Dam 11 Feb 2011

Hi Peter, as discussed, please confirm if you can retrieve document, Karen

----- Original Message -----

From: Wong Wai Tong
To: Waldman Karen; Bagdon Tad; Leaver Gayle; Hoekstra Margaret; Askins Mark; Scott Richard; Claridge Justin; Auton Wendy; Allan Julie; Sweet Anita
Sent: Fri Feb 11 17:04:31 2011
Subject: TRIM Document : D/11/001976 : Report on Impact of Operating Scenarios on Water Strategy for Wivenhoe Dam 11 Feb 2011

Hi all

Karen has requested that this latest version 5, incorporating comments from today's Project Team meeting be sent to all for final review.

It is anticipated that the draft report be sent to Seqwater on Monday.

Regards
Wai-Tong Wong

-----< TRIM Record Information >-----

Record Number : D/11/001976
Title : Report on Impact of Operating Scenarios on Water Strategy for Wivenhoe Dam

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

INFORMATION MATERIAL ONLY



Impacts on SEQ Water Strategy of Various Operating Scenarios for Wivenhoe Dam

11 February 2011

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Version 5

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Document Control

Date	Author	Description	Version
3/2/2011	Wai-Tong Wong	Draft	1
3/2/2011	Julie Allan Mark Askins Richard Scott Wendy Auton Justin Claridge Gayle Leaver	Reviewed Draft - with edits	1, 2, 2A
8/2/2011	Wai-Tong Wong Mark Askins Wendy Auton	Draft edited with additional sections on modelling review by DERM, demand reduction and Waspp simulations. Incorporated comments by Karen Waldman	3
9/2/2011	<u>Wai-Tong Wong</u> Julie Allan Mark Askins Wendy Auton Justin Claridge <u>John Collins (John Collins Consultants Pty Ltd)</u>	Executive Summary added and section 4.1 edited <u>Comments from John Collins incorporated.</u>	4
<u>10/2/2011</u>	<u>Wai-Tong Wong</u> <u>Mark Askins</u> <u>Wendy Auton</u> <u>Justin Claridge</u> <u>Richard Scott</u>	<u>Incorporated strategic comments from Project Team meeting (Karen, Waldman, and Tad Bagdon)</u>	<u>5</u>

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Approval

Date	Name	Description	Version
3/2/2011	Tad Bagdon Gayle Leaver	Reviewed	2
3/2/2011	Tad Bagdon Karen Waldman	Reviewed	2A
<u>11/2/2011</u>	<u>Tad Bagdon</u> <u>Gayle Leaver</u> <u>Karen Waldman</u>	<u>Reviewed</u>	<u>5</u>

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Executive Summary

The purpose of this report is to provide information on the potential impact on the security of supply, in south east Queensland (SEQ) if a significant volume of water was released from the water supply capacity of Wivenhoe Dam as a potential flood mitigation measure.

In the main the scenarios considered would be potentially a short term measure over the 2011 wet season based on the impacts to the SEQ Water Grid as a whole. The underlying assumptions used include the demand and supply capacity as contained in the SEQ Water Strategy, with demand forecast updated to align with the Bulk Water Price Review November 2010 demand forecast.

For completeness two scenarios involving permanent reduction in the full supply volume of Wivenhoe Dam have also been considered but further investigation is required to understand the full impacts. This assessment is based on sensitivity analysis of the total grid capacity and no detailed assessment has been undertaken.

The following observations can be drawn from these assessments:

- If releases were made as a temporary measure to reduce the water level in Wivenhoe Dam by 25% of full supply capacity (a release of about 291,250 ML), the Risk Criteria of the SEQ SOP (System Operating Plan) would still be met.
- Despite the SOP Risk Criteria being met as stated above, if inflows for the next 6 years were as low as the 2001-2006 drought, full desalination may be triggered, as Grid 12 storage levels could drop to 60% in this time.
- As the volume released increases, more factors become impacted such as, the increased likelihood of triggering desalination, use of purified recycled water or introduction of restrictions and potentially increased operating costs of the Water Grid.
- Permanent reduction in the full supply volume of 25% will lower the LOS yield by about 30,000 ML/annum. This reduction in LOS yield may require the construction of new infrastructure being brought forward by about 5 years to 2021 based on current demand assumptions. Other options to mitigate the yield reduction such as demand management measures may also be possible.

These analyses are an exercise in assessing risk management rather than a forecast for the future. Therefore an understanding of the consequences involved for a particular risk profile is important.

This report does not recommend a particular scenario for adoption as other factors such as social, economic and environmental may also need to be considered. It provides some risk information on the security of supply, based on the short term (SOP risk criteria) and the long term water demand/supply balance in the SEQ Water Strategy. Operational and regulatory impacts such as increased pumping costs and water resource plan have not been assessed and advice from the responsible agency or entity would need to be also considered.

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1 Purpose

The purpose of this report is to outline the results of the assessment, from a water supply security perspective for South East Queensland (SEQ) over the short and long term, of possible scenarios for lowering of Wivenhoe Dam below the deemed full operating supply level (i.e. 100 percent dam level for water supply purposes). The effects of temporarily lowering the full supply level of Baroon Pocket and Hinze Dams were also assessed.

For the purpose of this report, short term is defined as the period over the next 5 years (as per risk criteria of SEQ System Operating Plan) where the supply security in SEQ may be impacted by any proposed temporary lowering of the Wivenhoe Dam operating level over the 2011 wet season.

Long term is defined as a period of 50 years in relation to the demand and supply (LOS Yield) balance in the SEQ Water Strategy.

This assessment does not deal with the environmental, social and economic impacts of the dam operating levels in relation to flood mitigation to downstream properties and infrastructure.

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2 Background

Major flooding occurred in the Brisbane River catchment on 13 January 2011.

This resulted in the Brisbane River peaking at 4.46m at the Port Office in Brisbane City and causing extensive damage to properties and businesses throughout the catchment. The 2011 flood was about 1m lower than the 1974 Flood event of 5.45m at the Port Office, Brisbane City. However, the social and economic impacts are much more significant given the building and business developments in the catchment over the last 37 years. Flood rebuilding is currently estimated to cost about \$5B.

The Minister for Natural Resources, Mines and Energy and the Minister for Trade has written to the Commissioner on 20 January 2011, requesting the Queensland Water Commission provide all necessary assistance to Seqwater in their review of the operation of Wivenhoe and Somerset Dams.

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3 Role of Queensland Water Commission

3.1 Background/Context

The Queensland Water Commission (the Commission) is responsible for providing advice to the Minister on matters relating to water supply and demand management for water for SEQ. A key function of the Commission is to provide advice on the desired Levels of Service (LOS) for water supplied to SEQ.

The SEQ Water Strategy defines the LOS objectives to include the expected frequency, duration and severity of restrictions during future droughts. The LOS objectives means that sufficient water from the SEQ Water Grid will be available to meet average regional urban demand of up to 200 litres per person per day for residential uses.

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The Commission also makes and administers the SEQ System Operating Plan (SOP) under the Water Act 2000 which sets out the rules for operating the SEQ Water Grid to help achieve the LOS objectives.

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While the LOS objectives specify the basis for operating the Grid over the long term, the risk criteria of the SOP provide the basis for balancing water security and operating costs over the short term.

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The SOP risk criteria are given below:

Volume of water stored by all key water grid storages	Probability of reaching <u>40% and 30%</u> volume of water stored		
	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%

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3.2 Report to Seqwater

To support Seqwater's review of the operations of Wivenhoe and Somerset Dams, the Commission has conducted a series of modelling exercises to determine the potential impacts of certain operating arrangements on the security of supply for the region.

Consideration has been given to the ability of the SEQ Water Grid to continue to achieve the desired Level of Service objectives in the short term (up to 5 years) for various scenarios of lowering the deemed full water supply level particularly at Wivenhoe Dam, and also for Hinze and Baroon Pocket Dams.

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For completeness two scenarios involving permanent reduction in the full supply volume of Wivenhoe Dam have also been considered but further investigation is

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required to understand the full impacts. This assessment is based on sensitivity analysis of the total grid capacity and no detailed assessment has been undertaken.

These analyses are an exercise in assessing water security risk rather than a forecast for the future. Therefore an understanding of the consequences involved for a particular risk profile is important.

Operational and regulatory impacts such as increase in pumping costs and water resource plan have not been assessed and advice from the responsible agency or entity would need to be also considered.

This report provides an input, amongst other considerations, for Seqwater or other agencies to assist in developing advice to Government on the operating level of Wivenhoe Dam over this 2011 forecast wet season.

4 Short Term Impacts

The potential short term impacts are assessed using hydrological modelling. These are described in sections 4.1 to 4.3.

4.1 Use the SEQ Regional Water Balance Model (Wathnet Model) to assess the SOP risk criteria

The modelling conducted for this report was carried out using the Wathnet Model¹ which assesses the likelihood of reaching particular water storage volumes. Under the current operating arrangements and policies, the volumes of interest are:

- 60% of the Grid 12 volume, when full desalination production is triggered; and
- 40% of the Grid 12 volume, when full production of purified recycled water from the Western Corridor Recycled Water Project is triggered, to augment water supplies in Wivenhoe Dam and medium level restrictions would be introduced.

The Grid 12 storages and their corresponding capacities are provided in Appendix A.

Table 1 presents the scenarios modelled. Five scenarios were considered involving a reduction in water level at Wivenhoe Dam. The fifth scenario also includes a reduction at Hinze and Baroon Pocket Dams. This allows an assessment of the sensitivity to the security of supply should there be a need to also reduce the full operating levels in the Sunshine Coast (Baroon Pocket Dam) and Gold Coast (Hinze Dam).

The key assumptions adopted for these runs were:

- Simulations start end January 2011 with initial dam level (inflows from February 2011)

¹ Wathnet Model refers to the Generalised Water Supply Headworks Simulation using Network Linear Programming Model.

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- Reduced initial levels of Wivenhoe Dam to 87%, 75%, 70% and 50% capacity (Scenarios 1-4) and all other storages were set at 100% initially.
- Reduced levels of Wivenhoe Dam, Baroon Pocket and Hinze Dams to 50% capacity and all other storages were set at 100% initially (Scenario 5)
- Northern Pipeline Interconnector Stage 2 ~~excluded~~.
- Demands used correspond to the Bulk Water Price Review November 2010²
- Medium series population growth consistent with SEQ population forecasts
- No desalination above 60% Grid 12 Storages
- Full desalination below 60% Grid 12 Storages

For example, a 25% reduction of volume of 291,250 megalitres (ML) from Wivenhoe Dam would correspond to about 3 m drawdown from the full supply level based on the storage capacity data provided in Attachment B.

The scenarios do not consider day-to-day operational matters.

Table 1: Modelled scenarios

Scenario	%reduction Wivenhoe Dam (from Full Supply)	%reduction from other dams (from Full Supply)	Volume of Water Released (ML) [#]	%reduction of key Grid 12 Storages (from Full Supply)
1	13*	none	150,000	7.2
2	25	none	291,250	14.0
3	30	none	349,500	16.9
4	50	none	582,500	28.1
5	50	50 (Baroon Pocket) 50 (Hinze Dam)	693,500	33.5

* Scenario 1 was selected as a starting point for the assessment of 150,000 ML (about 12.9%, but rounded up to 13% in the Table).

[#] This is only the total volume and the strategy for release has not been considered. Operational constraints are also not considered for the purpose of this assessment.

² Bulk Water Price Review November 2010 (QWC) contains the demand forecasts based on permanent conservation measures, in particular, residential consumption increasing from current levels to 200 litres/person/day by 2018.

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The corresponding risk criteria results as compared to the SOP requirements are shown in Table 2.

Table 2: Results of risk criteria

Period	SOP	Scenarios				
	Criteria	(Wivenhoe/Baroon Pocket/Hinze capacities)				
		1 (87/100/100)	2 (75/100/100)	3 (70/100/100)	4 (50/100/100)	5 (50/50/50)
Probability of reaching 40% Grid 12 Storage Volume						
1 year	<0.2%	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%
5 year	<5%	0.09%	0.15%	0.20%	0.31%	0.49%
Probability of reaching 30% Grid 12 Storage Volume						
3 year	<0.5%	<0.01%	<0.01%	<0.01%	<0.01%	0.01%
5 year	<1%	<0.01%	<0.01%	<0.01%	<0.01%	0.03%

From the above analysis, all scenarios 1 to 5 in Table 2 pass the SOP risk criteria. While this means that the risk associated with the short term security of supply is acceptable, the consequences of each scenario with respect to other factors would need to be examined – see Section 6.

4.2 Forecast the probability of key Grid 12 storages level over the next 5 years

To forecast the probability of the Grid 12 storages reaching a certain level, the Wathnet Model was used, based on stochastic data generation for 117 years of historical information.

Figure 1 shows the forecast storage level for the Grid 12 storages for Scenario 4 (as described in Section 4.1) with Wivenhoe drawn down to 50% and the rest of the storages at 100% at the start of the simulation in end January 2011. (Note: The plots for Scenarios 1 – 3 would show higher storage levels than those shown in Figure 1).

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<#>Implications of each scenario¶
Table 3 provides a general framework for the assessment of the consequences of each scenario based on the following criteria for the short, intermediate and long term periods:¶
<#>Security of supply - involves examining the sufficiency, LOS yield, and demand and supply balance¶
<#>Levers – these are some of the factors that could be reviewed to optimise the security of supply such as Levels of Service specification, government policies and ... [24]

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In this scenario:

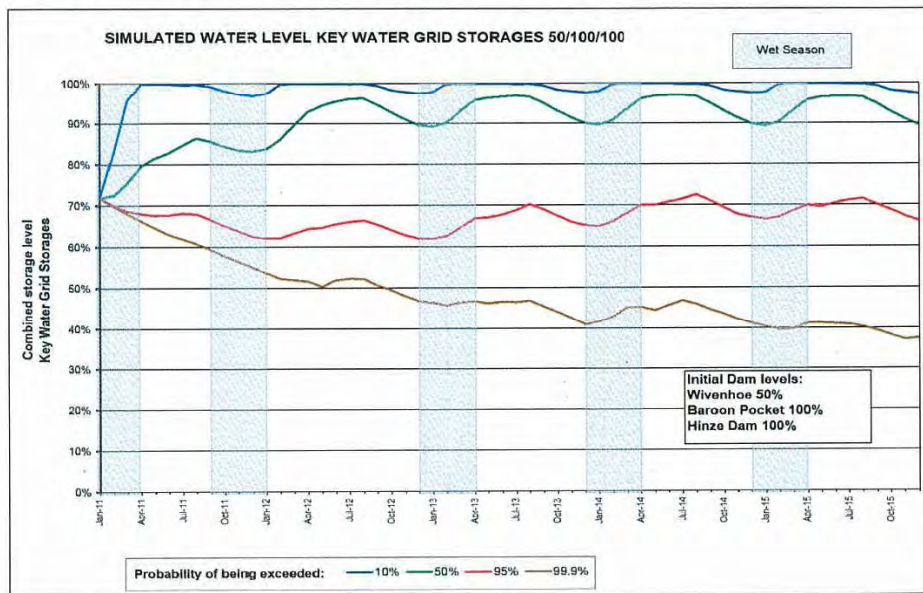
- there is a 95% probability that the combined Grid 12 dam levels remain above 60% over the next 5 years;
- there is a 99.9% probability that the Grid 12 level remains over 40% for the next 4 years; and
- there is a 50% probability that the combined Grid 12 dam levels will climb back to 90% and remain at this level for the remainder of the 5 year period.

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Figure 1: Scenario 4 with Wivenhoe Dam drawn down to 50% - forecast combined dam level Grid 12 showing probabilities of exceedance

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Scenario 5 (as described in Section 4.1) tests the sensitivity of the model findings by starting with Wivenhoe, Baroon Pocket and Hinze Dams all drawn down to 50% and the rest of the Grid 12 storages at 100% at the start of the simulation. This scenario represents the highest risk situation of all the model scenarios. The results are still within the bounds of the risk criteria set in the SOP.

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Figure 2 shows the forecast storage level of the Grid 12 with Scenario 5:

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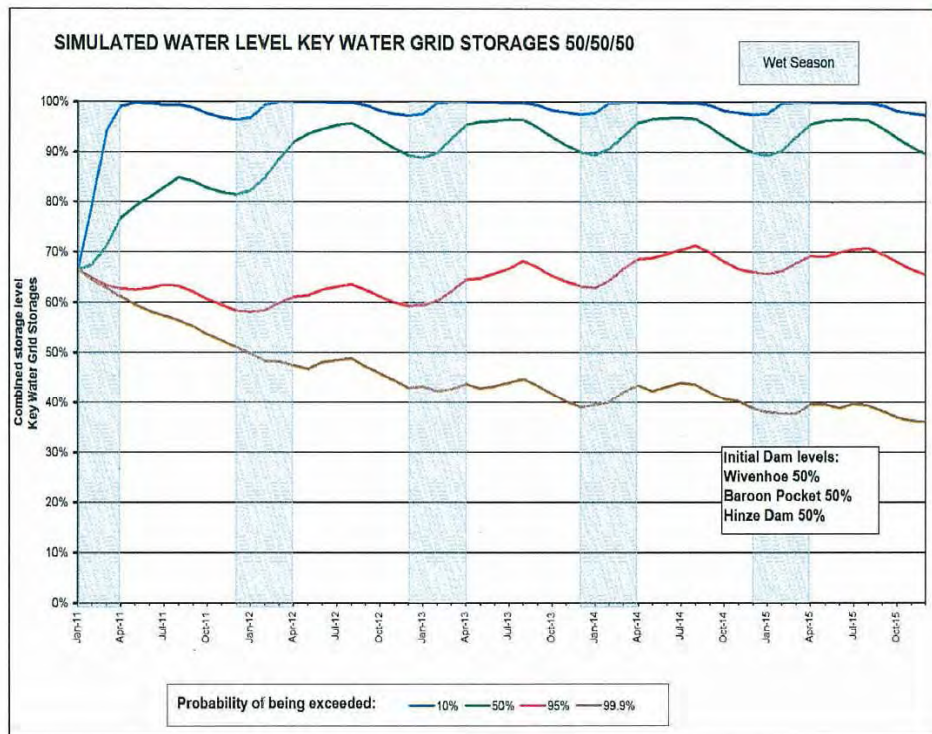
- There is about a 90% probability that the Grid 12 will stay above 60% over the next 5 years.
- There is a 95% probability that Grid 12 will stay above 40% for the next 5 years.
- There is a 50% probability that the Grid 12 level will climb back up to 90% and remain about this level for the next 5 years.

Figure 2: Scenario 5 with Wivenhoe, Baroon Pocket and Hinze Dams all drawn down to 50% - forecast combined dam level Grid 12 showing probabilities of exceedance

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4.3 Simulated storage behaviour of Grid 12 storages over the next 6 years for three inflow scenarios (using Waspp Model³)

The purpose of these simulations was to assess the potential behaviour of the Grid 12 storages over the next 6 years using three inflow scenarios (or cases) based on probability of combined inflows into the storages.

For all inflow scenarios, Wivenhoe Dam was assumed to be initially at 75% capacity.

There are various methodologies that could be used for the selection of inflow sequences. For the purpose of this work, it is considered necessary to test scenarios covering a period of relative wet, average inflow and the driest years. The annual inflows for the Grid 12 storages from 1890 to 2007 were used in the analysis. Table 5 provides the scenarios corresponding to the 30% (wet), 50% (average) and 100% (dry) exceedance probabilities⁴ based on 6 years of cumulative inflow sequence.

The worst 6 years of inflows (100% exceedance probability) was found to correspond to the most recent drought on record from 2001 to 2006 shown in Case 3 (Table 5).

Table 5: Inflow scenarios assessed

Scenarios (Case)	Exceedance Probability of Inflows	Continuous Sequence (6 years)	Total Inflow Volume Grid 12 (ML)
1	30%	Jan 1985 – Dec 1990	10,193,300
2	50%	Jan 1995 – Dec 2000	7,243,300
3	100%	Jan 2001 – Dec 2006	2,752,000

The assumptions adopted in the modelling were:

- 75% initial storage volume at Wivenhoe Dam (all other storages at 100% full)
- or Grid 12 storages at 86% capacity

³ Waspp Model refers to Water Supply Predictive Planning Model, QWC.

⁴ The exceedance probability is the percentage probability of a 6 year cumulative inflows being equalled or exceeded. For example, the exceedance probability of the Jan 2001-2006 inflows is 100% - as this volume of inflow is always exceeded (100%) based on historical record.

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- Demands based on Bulk Price Review November 2010
- Full desalination production when Grid 12 storages drop below 60% capacity, no desalination above 60%
- Northern Pipeline Interconnector Stage 2, Hinze Dam raising and Wyaralong Dam not included
- Purified recycled water introduced into Wivenhoe Dam when Grid 12 storages drop below 40% capacity.

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The results of the simulations for the 3 scenarios are shown in Figure 3 for Grid 12 storages with Wivenhoe Dam assumed to start at 75% capacity (or Grid 12 at 86% capacity). The worst case scenario from the historical record shows the lowest combined storage levels after June 2014, but staying above the 40% capacity to the end of 2016. Under this scenario of inflows, purified recycled water is not expected to be introduced into Wivenhoe Dam within the next 5 years. For scenarios 1 and 2, the storage levels generally decreased for the first 3 years before increasing thereafter.

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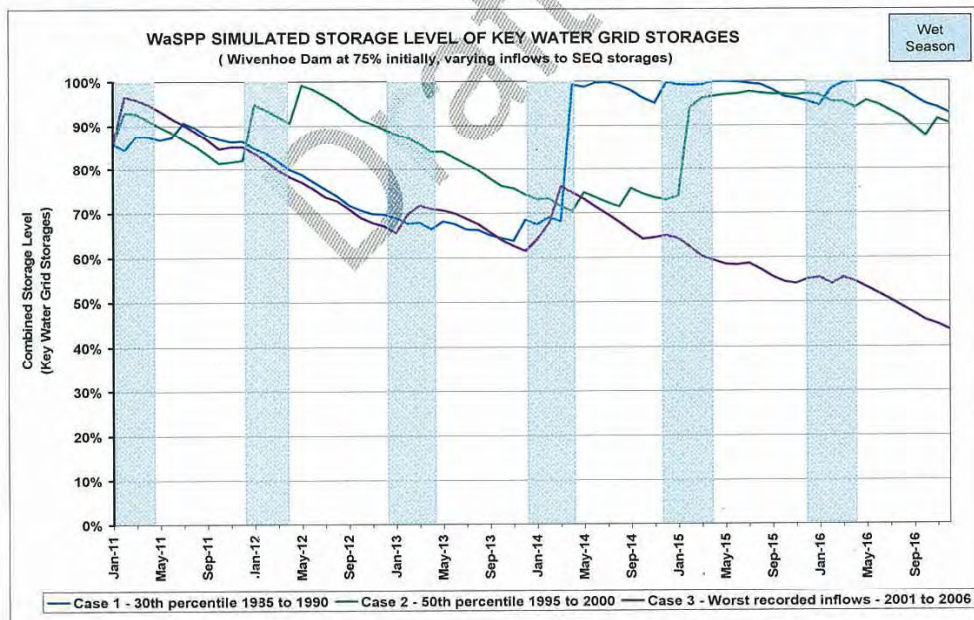
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Figure 3: Simulated Grid 12 storage levels for 3 inflow scenarios/cases



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The simulated storage level behaviour of Wivenhoe Dam for the three inflow scenarios is indicated in Figure 4. As expected the simulated level for Wivenhoe Dam reduces significantly due to the worst inflow sequence (drought). With scenarios 1 and 2, Wivenhoe Dam recovers within about 3 years.

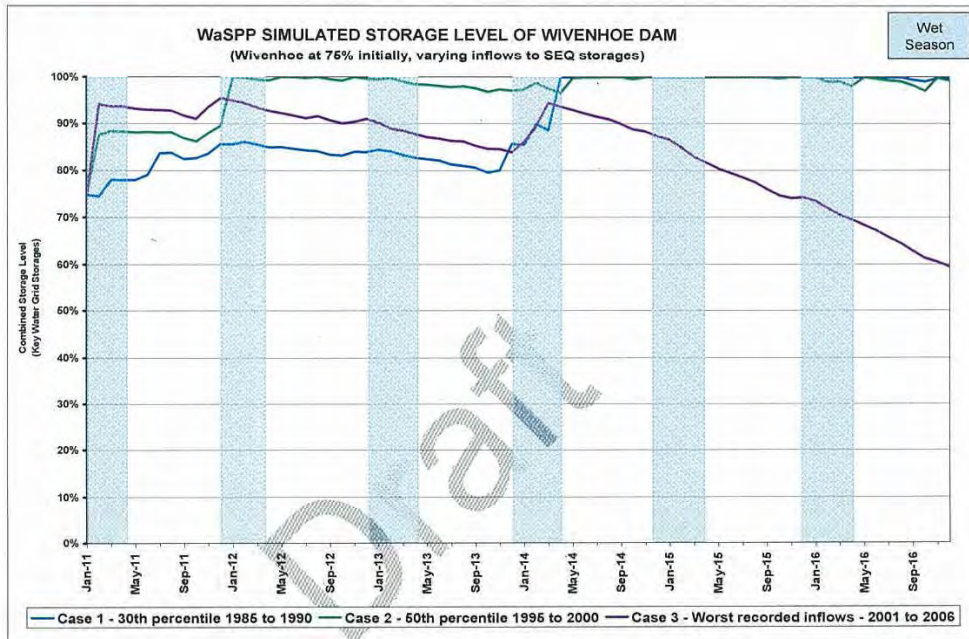
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Figure 4: Simulated Wivenhoe Dam storage levels for 3 inflow scenarios/cases



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4.4 Potential for demand reduction

One of the input factors that impacts on the water supply balance is the level of extractions from the supply storages. The level of extraction depends on the level of demand in South East Queensland (SEQ).

The supply balance and risk assessment modelling conducted for this information paper includes the level of expected demand based on residential water consumption of 200 litres/person/day (Target 200). This demand scenario is the same as that recently used for the review of the bulk water price path.

The 200 litres/person/day demand scenario is the equivalent of total water demand of 870 ML per day for SEQ or 317,550 ML per annum.

The level of total water demand in SEQ for the last three months has been approximately 670 ML/d, which when annualised gives 244,550 ML per annum. On a per person basis this is the equivalent of 150 l/p/d. However, this level of consumption is unlikely to remain this low with further rebound in water usage expected over time. The current wet climatic conditions being experienced will be suppressing water consumption.

The price path scenario forecasted demand position for 2011 is residential demand at approximately 185 l/pd, being the equivalent of 800 ML per day for SEQ or 292,000 ML per annum. If demand was to be maintained at this level, this represents a demand saving of 25,550 ML per annum.

A saving of 25,550 ML per annum would almost entirely offset the LOS yield reduction of 30,000 ML/annum if Wivenhoe Dam was operated at 25% lower than Full Supply Level (FSL) over a long period (Refer to section 5.2).

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5 Long Term Impacts - assessment of the potential impact on the LOS Yield (using Wathnet Model)

To assess the long term impact on the LOS yield if Wivenhoe Dam was permanently operated at a reduced water supply capacity, two scenarios involving a 10% and 25% reduction from full supply level were investigated.

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This assessment is carried out for completeness only and does not suggest that the dams be operated permanently with a reduced full supply level. Further investigation is necessary to understand the full impacts.

The Regional Water Security Program for SEQ establishes the desired LOS objectives which form a basis for the SEQ Water Strategy and are implemented through the System Operating Plan. These objectives provide a long term security of water supply and are defined as the:

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- desirable maximum frequency, duration and severity of water restrictions
- the average amount of water per person that must be supplied in normal times.

These objectives are used to determine the Level of Service (LOS) Yield. The LOS Yield is used, along with the projected demands, to ensure that adequate initiatives are in place to meet demand in the future.

The LOS Yield for the 2010 Infrastructure (capacity to deliver) is assessed to be 485,000 ML/a. This assumes that the desalination plant is providing 125 ML/day and Purified Recycled Water (PRW) at 142 ML/day.

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To assess the impact on the long term LOS Yield, the Wathnet Model was used.

This assessment was based on the following assumptions⁵:

- 2010 infrastructure, prior to the full operation of Wyaralong Dam and Hinze Dam Stage 3
- PRW production at 52,000 ML/a (142 ML/day) and supplies 34,950 ML/a (96 ML/day) to industry
- Desalination production at 46,000 ML/a (125 ML/day)

⁵ The Wathnet modelling scenarios were based on the model set up used in the preparation of the SEQ Water Strategy.

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5.1 Results – 10% reduction on Full Supply Volume for Wivenhoe Dam

The LOS Yield for the 2010 Infrastructure (capacity to deliver) is assessed to be 485,000 ML/a.

Preliminary modelling work suggests that the impact of a 10% reduction in the full supply volume at Wivenhoe Dam is minimal on the LOS yield as this is within the tolerance of the model. This needs further investigation.

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5.2 Results – 25% reduction on Full Supply Volume for Wivenhoe Dam

There is a significant reduction in the LOS yield of 30,000 ML/annum with a scenario* where Wivenhoe Dam was permanently operated at 25% lower than the Full Supply. The LOS yield has reduced from 485,000 ML/annum to 455,000 ML/annum.

Figure 5 shows that new infrastructure would need to be brought forward by about 5 years to about 2021 from 2026 under the medium population growth series.

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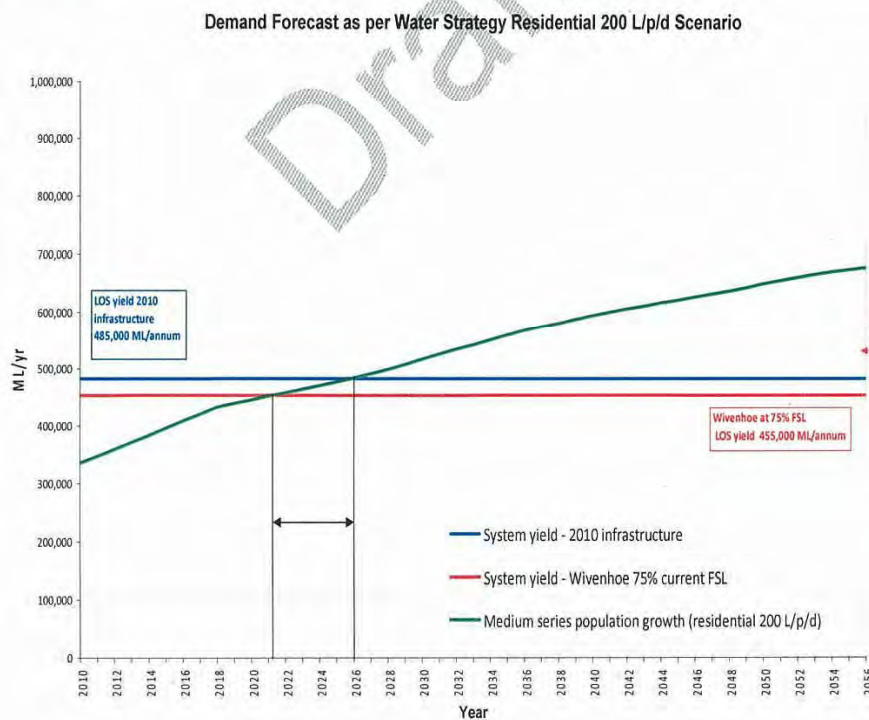
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Figure 5: LOS Yield comparison



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6 Implications of each scenario

Table 3 provides a general framework for the assessment of the consequences of each scenario based on the following criteria for the short, intermediate and long term periods:

- Security of supply - involves examining the sufficiency, LOS yield, desalination, and demand and supply balance
- Levers – these are some of the factors that could be reviewed to optimise the security of supply such as Levels of Service specification, government policies and assumptions
- Inputs – these are some of the input factors which could be impacted e.g. allocation, demand and supply
- Pricing – some of the scenarios may impact upon the current Price Path 2010-12 that has been established such as through increases in operating costs.

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The following observations are made and this is reflected in Table 3:

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Short Term Reduction in Full Supply Capacity

- If releases were made as a temporary measure to reduce the water level in Wivenhoe Dam by 25% of full supply capacity (a release of about 291,250 ML), the Risk Criteria of the SEQ SOP (System Operating Plan) would still be met.
- As the volume released increases, more factors become impacted such as the increased likelihood of triggering desalination, use of purified recycled water or introduction of restrictions and potentially increased operating costs of the Water Grid.
- The SOP Risk Criteria are satisfied for scenarios with up to 50% of water released from Wivenhoe Dam. However other factors become impacted. This assessment deals only with the volume capacity and does not consider actual availability due to operational constraints.
- Operational costs may be impacted when the storage is drawn down to 50% as the Grid operating costs will increase with the manufactured water (desalination) being triggered more frequently.

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Long Term (Permanent) Reduction in Full Supply Capacity at Wivenhoe Dam

- A reduction of 25% or more in the full supply level would have an impact on the security of supply.

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- New infrastructure would need to be brought forward about 5 years to meet the LOS objectives – for a 25% drawdown scenario.
- There could be an impact on the future price path and the increase in operational costs may affect the achievement of the current 2010-2012 Price Path - for a 25% drawdown scenario.

There could potentially be some optimal operating arrangement, indicated as Intermediate Option in Table 3. This could involve a review of the levers such as redefining the LOS objectives based on further investigations, to ensure that the short term operating options do not compromise the long term security of supply.

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Table 3: Preliminary Framework for Consideration of Impacts on SEQ Water Strategy for Various Operating Levels of Wivenhoe Dam

Description	Base Case (status quo)	Short Term Scenario (Temporary Wivenhoe Dam drawdown)			Intermediate Option	Long Term Scenario (Permanent Wivenhoe Dam drawdown)
		13%	25%	50%	Review	25%
Security of supply						
• Sufficiency	✓	✓	✓	✓	✓	✗
• LOS Yield	✓	✓	✓	✓	✓	✗
• Demand/ Supply Balance	✓	✓	✓	✓	✓	✗
• Desalination	✓	✓	If 2001-2006 inflows - may potentially trigger desalination	If 2001-2006 inflows - may potentially trigger desalination	✓	✗
Levers						
• Levels of Service						
• Policies					Review	
• Assumptions						
Input						
• Allocation/Yield	✓	✓	Allocation - determined by DERM	Allocation - determined by DERM	Review	✗ (impacted)
• Demand	✓	✓	✓	✓	✓	✗
• Supply	✓	✓	✓	✓	✗ (impacted)	✗
Pricing						
• Impact on pricing	✓	✓	✓	✓	Review	✗ new price path is potentially required

Note: ✓ Minimal impact ✗ Impacted

1. A permanent change in the full supply level of Wivenhoe Dam would require a review of available entitlements from Wivenhoe Dam under the water resource plan.

2. Needs further assessments.

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7 Peer review of modelling by Department of Environment and Resource Management

The results of this modelling work were reviewed by the Queensland Hydrology Group of the Department of Environment and Resource Management.

The review of the input and results for the Wathnet Model was carried out by Dr John Vitkovsky, Senior Hydrologist, who stated that, "modifications were made to the WathNet SEQ Grid model for the purposes of a sensitivity analysis of the SEQ LOS statistics from lowering the full storage volume of key large storages. There (are) a number of changes to the model that can only be done by someone with intimate knowledge of the lower-level files in the model—and cannot be made using the spreadsheet. However, as long as it is only the SEQ volume LOS statistics that are being reported on and given the modifications made to the spreadsheet the results should be reasonable." Further:

- "The model setups for all runs seem correct,
- The results seem entirely reasonable and satisfy the SOP Risk Criteria,
- The output statistics for both the long-term and forecast model runs seem reasonable (without re-running those scenarios) and are compliant with the LOS and SOP criteria."

For the review of the Waspp Model, Mr Craig Johansen (Principal Hydrologist) has stated that "the results of the scenarios presented for review appeared logical and appropriate based on the rules of the SEQ Water Grid and the understanding the model."

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Appendix A - Grid 12 Storages in South East Queensland

As at 27 October 2010

	<u>FULL SUPPLY VOLUME</u> (Megalitres)
<u>Southern</u>	
<u>Little Nerang</u>	<u>6,705</u>
<u>Hinze</u>	<u>161,073</u>
<u>Total Southern</u>	<u>167,778</u>
<u>Central</u>	
<u>North Pine</u>	<u>214,302</u>
<u>Somerset</u>	<u>379,849</u>
<u>Wivenhoe</u>	<u>1,165,238</u>
<u>Lake Kurwongbah</u>	<u>14,370</u>
<u>Leslie Harrison</u>	<u>24,868</u>
<u>Total Central</u>	<u>7,798,627</u>
<u>Northern</u>	
<u>Baroon Pocket</u>	<u>61,000</u>
<u>Cooloolabin</u>	<u>13,800</u>
<u>Ewan Maddock</u>	<u>16,587</u>
<u>Lake MacDonald</u>	<u>8,018</u>
<u>Wappa</u>	<u>4,694</u>
<u>Total Northern</u>	<u>104,099</u>
<u>TOTAL SEQ</u>	<u>2,070,504</u>

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Appendix B – Wivenhoe Dam Storage Capacity Data

EL (M)	AREA (HA)	VOLUME (ML)	TOTAL	COMM	EL (M)	AREA (HA)	VOLUME (ML)	TOTAL	COMM	EL (M)	AREA (HA)	VOLUME (ML)	TOTAL	COMM	EL (M)	AREA (HA)	VOLUME (ML)	TOTAL	COMM
82.00	22161	3555000			69.50	12395	1464267			57.00	5078	413539			44.50	1134	59185		
81.75	21916	3489806			69.25	12205	1423557			56.75	4995	401056			44.25	1095	56399		
81.50	21660	3445425			69.00	12046	1393246			56.50	4897	388706			44.00	1040	53727		
81.25	21415	3391580			68.75	11889	1363332			56.25	4810	376573			43.75	1009	51167		
81.00	21166	3338351			68.50	11725	1333815			56.00	4721	364660			43.50	977	48865		
80.75	20918	3285752			68.25	11561	1304714			55.75	4627	352573			43.25	944	46895		
80.50	20677	3233774			68.00	11401	1276113			55.50	4537	341519			43.00	911	43968		
80.25	20431	3182392			67.75	11240	1247314			55.25	4446	330291			42.75	879	41729		
80.00	20192	3131619			67.50	11080	1219815			55.00	4348	319307			42.50	828	39503		
79.75	19952	3081433			67.25	10916	1192221			54.75	4236	308561			42.25	801	37657		
79.50	19735	3031816			67.00	10751	1165238			54.50	4144	298094			42.00	774	35589		
79.25	19509	2982758			66.75	10572	1138589			54.25	4042	287851			41.75	744	33692		
79.00	19286	2934275			66.50	10389	1112378			54.00	3942	277871			41.50	715	31868		
78.75	19051	2885358			66.25	10197	1086544			53.75	3837	268147			41.25	686	30116		
78.50	18831	2839008			66.00	9990	1061414			53.50	3735	258683			41.00	659	28425		
78.25	18613	2792205			65.75	9787	1036687			53.25	3633	249474			40.75	625	26829		
78.00	18390	2745957			65.50	9586	1012440			53.00	3534	240523			40.50	599	25299		
77.75	18173	2700285			65.25	9382	988661			52.75	3428	231845			40.25	570	23834		
77.50	17956	2655020			65.00	9176	965376			52.50	3329	223403			40.00	544	22424		
77.25	17746	2610475			64.75	8968	942515			52.25	3212	215250			39.75	533	21055		
77.00	17536	2566237			64.50	8754	920030			52.00	3121	207334			39.50	512	19761		
76.75	17322	2522510			64.25	8542	897956			51.75	3026	199551			39.25	494	18504		
76.50	17116	2479757			64.00	8341	876132			51.50	2932	192003			39.00	475	17292		
76.25	16920	2437223			63.75	8131	854551			51.25	2837	184693			38.75	456	16128		
76.00	16724	2395172			63.50	7934	834241			51.00	2744	178019			38.50	433	15014		
75.75	16531	2353507			63.25	7747	814416			50.75	2654	171275			38.25	408	13937		
75.50	16337	2312228			63.00	7564	794257			50.50	2576	164738			38.00	388	12896		
75.25	16147	2271925			62.75	7380	775087			50.25	2501	158392			37.75	369	11880		
75.00	15964	2231791			62.50	7208	756514			50.00	2427	152331			37.50	349	10896		
74.75	15783	2192113			62.25	7042	737320			49.75	2350	146255			37.25	329	9935		
74.50	15616	2152874			62.00	6877	719011			49.50	2284	140494			37.00	308	8984		
74.25	15443	2114055			61.75	6715	701062			49.25	2179	134939			36.75	287	8046		
74.00	15269	2075678			61.50	6557	683435			49.00	2100	129594			36.50	265	7120		
73.75	15105	2037713			61.25	6395	666123			48.75	2025	124434			36.25	243	6207		
73.50	14943	2000156			61.00	6245	649112			48.50	1957	119452			36.00	221	5307		
73.25	14782	1963000			60.75	6089	632398			48.25	1889	114644			35.75	200	4418		
73.00	14620	1926255			60.50	5936	615666			48.00	1820	110006			35.50	184	3544		
72.75	14454	1889912			60.25	5787	598909			47.75	1754	105542			35.25	167	2697		
72.50	14285	1853982			60.00	5639	582627			47.50	1693	101235			35.00	150	1864		
72.25	14121	1818486			59.75	5490	566319			47.25	1639	97073			34.75	133	1055		
72.00	13962	1783388			59.50	5345	550276			47.00	1590	93038			34.50	116	718		
71.75	13800	1748690			59.25	5195	534370			46.75	1540	89123			34.25	99	510		
71.50	13642	1714393			59.00	5048	518502			46.50	1489	85338			34.00	82	327		
71.25	13484	1680488			58.75	4904	502675			46.25	1444	81670			33.75	65	167		
71.00	13323	1646983			58.50	4764	486808			46.00	1395	78116			33.50	49	47		
70.75	13167	1613971			58.25	4625	471015			45.75	1355	74673			33.25	33	12		
70.50	13005	1581156			58.00	4487	455360			45.50	1312	71340			33.00	17	1		
70.25	12851	1548833			57.75	4351	440212			45.25	1268	68138			32.75	0	0		
70.00	12693	1516908			57.50	4215	425507			45.00	1214	65053			32.50	0	0		
69.75	12529	1485375			57.25	4075	411247			44.75	1174	62068			32.25	0	0		

Level Datum: AHD + RW 34781 EL 74.784 m
 Computed using photogrammetric DTW produced in 1995 from 1971 photogrammetry
 Survey records: 2577 F3
 Full Study Level: 5.000 m AHD
 River outlet: 5.330 m AHD
 Catchment Area: 7220 sq km
 Latitude: 27 23 38 Longitude: 152 36 08



BRISBANE RIVER - BASIN 143
 WIVENHOE DAM 150.2 km

A3-110405

STORAGE DATA

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 Appendix B - Key Grid 12
 Storages in South East
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of 291,250 ML is made from

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now (about 25% reduction

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based on SEQ Grid 12 storages are acceptable. Furthermore there is a potentially to

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full desalination within 3 years if the 2001-2006 inflows should reoccur over the next 6 years

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There appears to be minimal short term supply security impacts with a release of 150,000 ML from Wivenhoe Dam (about 13% reduction of full supply capacity).

The temporarily lowering of Wivenhoe Dam beyond 150,000 ML (or 13% capacity), although passes the risk criteria of the SEQ System Operating Plan (SOP), would cause the contract volume and entitlement to be impacted.

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contract volume allowed under the SOP,

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or

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yield etc.

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If a release of 291,250 ML is made from Wivenhoe Dam now (about 25% reduction of full supply capacity), the Brisbane river system allocation of 285,545 ML are impacted, even though the SOP Risk Criteria based on SEQ Grid 12 storages are acceptable. Furthermore there is a potentially to trigger full desalination within 3 years if the 2001-2006 inflows should reoccur over the next 6 years.

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As a point of comparison, during the recent January floods in Brisbane, flood water was released from Wivenhoe Dam at a rate up to the equivalent of 645,000 ML/day.

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has a significant impact in

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implies that

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may need to be

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to meet the demand in SEQ.

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and further investigation is required to understand the full impacts

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merely

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which is potentially impacted

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considerations

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notes that the Brisbane River system (Wivenhoe, Somerset and Gold Creek dams, Lake Manchester and Mt Crosby Weir) provides an average contribution of 256,300 ML/annum to the LOS Yield.

The current daily production rate from the Brisbane River system is about X ML/day. This equates to about 100,000 ML/annum

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assuming this level of use continues to end of June 2011

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Thus, there may be potential to release

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if appropriate, without significant short term impacts,

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about 150,000 ML/a or about 13%

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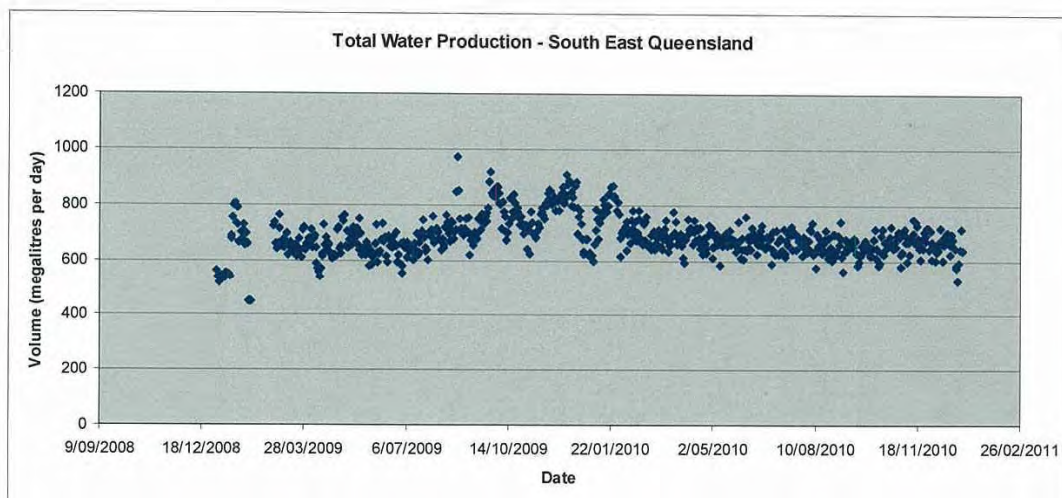
of the full supply volume (FSV) of Wivenhoe Dam based on the Storage Capacity data provided in Appendix A. These calculations and conclusion are premised on the current high volumes of water in the remaining SEQ water storages, and the assumption that this stored water could be readily accessed to meet the region's demands.

Determine the volume of release (or dam level) which can be accommodated in accordance with the SOP for the SEQ region as a whole [jva1]

Figure 1 shows the daily production rate of water for all of SEQ, since January 2009. As expected, there are some daily variations due to factors such as climatic conditions but over these two years the volume of production was about 680 megalitres per day (ML/day) or about 250,000 ML/annum.

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Figure 1: Total daily water production for South East Queensland



The SOP specifies a maximum contract volume from the whole SEQ system of 450,000 ML/a. The current SEQ demand (projected production to 30 June 2011) is about 250,000 ML/a.

There is thus potential to release about 200,000 ML/a or 17% reduction in capacity from full supply volume (FSV) of Wivenhoe Dam based on the Storage Capacity data provided in Appendix A. This is equivalent to a 2 metre reduction from the full supply level of 67m AHD at Wivenhoe Dam.

However, as the Wivenhoe dam is part of the SEQ Water Grid, the overall impact of releasing 200,000 ML is equivalent to a reduction of about 9.7% of the Grid 12 capacity.

This assessment assumes that:

- the release from Brisbane River system would mean that demand over the next few months to June 2011 would need to be by other sources of supply within the SEQ system
- any entitlement issues that may be triggered by the water resource plan or resource operations plan issues are dealt with. Such release would be from the water resource planning entitlement for the Wivenhoe-Somerset water supply system held by the Water Grid Manager and even if the dam were to refill there would be no reset of the entitlement until the start of the next water year on 1 July 2011.

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Implications of each scenario

Table 3 provides a general framework for the assessment of the consequences of each scenario based on the following criteria for the short, intermediate and long term periods:

Security of supply - involves examining the sufficiency, LOS yield, and demand and supply balance

Levers – these are some of the factors that could be reviewed to optimise the security of supply such as Levels of Service specification, government policies and assumptions

Inputs – these are some of the input factors that drive the system which could be impacted e.g. allocation, demand and supply

Pricing – some of the scenarios may impact upon the current Price Path 2010-12 that has been established.

The following observations are made and this is reflected in Table 3:

Short Term Reduction in Full Supply Capacity

There appears to be minimal impact on the security of supply with up to 50% of water released from Wivenhoe Dam. However the contract volume allowed under the SOP is impacted if the drawdown exceeds 30% at Wivenhoe Dam (for a release of 200,000 ML which may not impact on the contract volume, the equivalent drawdown is 17% at Wivenhoe Dam).

Operational costs may be impacted when the storage is drawn down to 50% as the Grid operating costs may increase with the manufactured water (desalination) being triggered more frequently.

Long Term Reduction in Full Supply Capacity at Wivenhoe Dam

A reduction of 25% or more in the full supply level would have an impact on the security of supply and the allocation.

New infrastructure would need to be brought forward about 5 years to meet the Level of Service – for a 25% drawdown scenario.

There could be an impact on the future price path and the increase in operational costs may affect the achievement of the current 2010-2012 Price Path - for a 25% drawdown scenario.

There could potentially be some optimal operating arrangement, indicated as Intermediate Option in Table 3. This involves a review of the levers such as redefining the LOS objectives, to ensure that the short term options do not compromise the long term options.

Table 3: Preliminary Framework for Consideration of the Impact on SEQ Water Strategy of Various Operating Levels for Wivenhoe Dam

Description	Base Case (status quo)	Short Term/Temporary Options (Wivenhoe Dam drawdown)			Intermediate Option	Long Term/Permanent Options (Wivenhoe Dam drawdown)
		13%	30%	50%	Review	#10%25%
Security of supply						
Sufficiency	✓	✓	✓	✓	Review	✗
LOS Yield	✓	✓	✓	✓		✓
Demand/ Supply Balance	✓	✓	✓	✓		✓
Desalination	✓	✓	✗ (triggered)	✗ (triggered)		✓
Levers						
Levels of Service					Review	
Policies						
Assumptions						
Input						
Allocation/Yield	✓	✓	✗	✗	Review	✗
Demand	✓	✓	✓	✓		✓
Supply	✓	✓	✓	✓		✗
Pricing						
Impact on pricing	✓	✓	✓	✓	Review	✓
						✗ new price path



Note: ✓ Minimal Impact × Impacted

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Table 3: Preliminary Framework for Consideration of the Impact on SEQ Water Strategy of Various Operating Levels for Wivenhoe Dam

Description	Base Case (status quo)	Short Term/Temporary Options (Wivenhoe Dam drawdown)			Intermediate Option
		13%	25%	50%	Review
Security of supply					
Sufficiency	✓	✓	✓	✓	Review
LOS Yield	✓	✓	✓	✓	
Demand/ Supply Balance	✓	✓	✓	✓	
Desalination	✓	✓	Full desalination potentially triggered if 2001- 2006 inflows occur	Full desalination potentially triggered if 2001-2006 inflows occur	
Levers					
Levels of Service					Review
Policies					
Assumptions					
Input					
Allocation ¹ /Yield	✓	✓	Allocation - determined by DERM	Allocation - determined by DERM	Review
Demand	✓	✓	✓	✓	
Supply	✓	✓	✓	✓	
Pricing					
Impact on pricing	✓	✓	✓	✓	Review

Note: ✓ Minimal Impact ✗ Impacted assessments

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¹ A permanent change in the full supply level of Wivenhoe Dam would require a review of available entitlements from Wivenhoe Dam under the water resource plan.

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**Appendix B - Key Grid 12 Storages in South East Queensland
As at 27 October 2010**

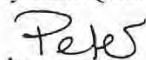
	FULL SUPPLY VOLUME (Megalitres)
Southern	
Little Nerang	6,705
Hinze	161,073
Total Southern	167,778
Central	
North Pine	214,302
Somerset	379,849
Wivenhoe	1,165,238
Lake Kurwongbah	14,370
Leslie Harrison	24,868
Total Central	7,798,627
Northern	
Baroon Pocket	61,000
Cooloolabin	13,800
Ewan Maddock	16,587
Lake MacDonald	8,018
Wappa	4,694
Total Northern	104,099

TOTAL SEQ	2,070,504
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Our ref: ME/11/0017

14 February 2011

Peter Borrows
Chief Executive Officer
Seqwater
PO Box 16146
City East QLD 4002



Dear Mr Borrows

On 20 January 2011, the Honourable Stephen Robertson MP, Minister for Natural Resources, Mines and Energy and Minister for Trade, wrote to the Queensland Water Commission (Commission) requesting the Commission provide all necessary assistance to Seqwater to ensure the Minister's requests to Mr Phil Hennessy, Chair, Seqwater, as raised in his letter of 20 January 2011, are able to be responded to as a matter of priority and with urgency.

On 25 January 2011, the Commission advised the Minister that it was liaising with Seqwater and undertaking preliminary work to support the matters raised.

Since that time the Commission has progressed its work in order to be in a position to provide advice to Seqwater and/or the Minister as and when required.

On 4 February 2011, you provided us with a copy of a letter from Seqwater's Chair to Minister Robertson regarding Seqwater's consideration of the appropriate Full Supply Levels (FSL) for Wivenhoe and Somerset Dams. This letter advised that "DERM may be satisfied, based on advice from QWC and the WGM from a water supply security perspective, that Wivenhoe Dam's FSL could be reduced in the short term to, say, 75% of its current FSL".

I note that the South East Queensland (SEQ) Water Grid Manager has provided you with a letter on 9 February 2011, confirming that "from a water security perspective, the SEQ Water Grid Manager has no objection to Wivenhoe Dam being drawn down to 75% of its FSL".

As you are aware, the Commission has now finalised a draft report as input information material for Seqwater, as requested by the Minister (attached), titled *Impacts on SEQ Water Strategy of Various Operating Scenarios for Wivenhoe Dam, 14 February 2011, Version 6*. The purpose of this report is to provide information on the potential impact on the security of supply in SEQ if a significant volume of water is released from the water supply capacity of Wivenhoe Dam as a potential flood mitigation measure. The information in this report has been shared with Seqwater officers during the course of its preparation, and a full version provided to you on 12 February 2011.

In preparing this report, the Commission has based its assumptions on the SEQ Water Strategy of July 2010, including the addition of purified recycled water into Wivenhoe at the 40% trigger level. Demand forecasts have been updated to align with the recent bulk water price review in November 2010.

The report has considered scenarios as temporary options for the 2011 wet season, and commenced consideration of scenarios contemplating any permanent reductions to FSL from a Level of Service (LOS) yield perspective.

In summary, the report concludes that:

- If releases were made as a temporary measure to reduce the water level in Wivenhoe Dam by 25% from its FSL (a release of about 291,250 ML), the Risk Criteria of the *South East Queensland System Operating Plan* would still be met.
- Despite the above being met, if inflows for the next six years were as low as the 2001-2006 drought, full desalination may be triggered, as Grid 12 storage levels could drop to 60% in this time.
- As the volume released increases, more factors become impacted such as the increased likelihood of triggering desalination and the use of purified recycled water and restrictions, and potentially increased operating costs of the grid.
- Permanent reduction of the FSL by 25% will lower the LOS yield by about 30,000 ML/annum. This reduction in LOS yield may require the construction of new infrastructure to be brought forward by about five years to 2021, based on current demand assumptions. Other options to mitigate the yield reduction such as demand management measures may also be possible.
- Given the current demand is less than that in the recent bulk water price review assumptions used in this assessment, there is more confidence in the margin of supply security available in the demand/supply balance.
- Any permanent reduction would have to be more critically investigated, with this report commencing the analysis for purposes of assisting to inform the annual update of the SEQ Water Strategy and investigations related to the Brisbane River system.

Given the announcement on 13 February 2011 to lower the FSL to 75% for the 2011 wet season, the Commission looks forward to working with you closely in relation to any consideration of a permanent reduction of Wivenhoe's FSL.

The Commission would appreciate your feedback on this draft report, prior to formally progressing it as a final report to Seqwater and the Minister. I will be in touch shortly in order to discuss timing for your feedback with the aim of finalising the report within the next week or so.

If you require any further information, please contact me on [REDACTED] or on email at [REDACTED]

Yours sincerely

[REDACTED]
Karen Waldman
Chief Executive Officer

Enc (1)

cc John Bradley, Director General, Department of Environment and Resource Management

Barry Dennien, Chief Executive Officer, SEQ Water Grid Manager

INFORMATION MATERIAL ONLY



Impacts on SEQ Water Strategy of Various Operating Scenarios for Wivenhoe Dam

14 February 2011

Version 6

Document Control

Date	Author/Reviewer	Description	Version
3/2/2011	Wai-Tong Wong	Draft	1
3/2/2011	Julie Allan, Mark Askins Richard Scott, Wendy Auton Justin Claridge, Gayle Leaver	Reviewed Draft - with edits	1, 2, 2A
8/2/2011	Wai-Tong Wong Mark Askins Wendy Auton	Draft edited with additional sections on modelling review by DERM, demand reduction and Waspp simulations. Incorporated comments by Karen Waldman	3
9/2/2011	Wai-Tong Wong Julie Allan, Mark Askins Wendy Auton, Justin Claridge John Collins (John Collins Consultants Pty Ltd)	Executive Summary added and section 4.1 edited. Comments from John Collins incorporated.	4
10/2/2011	Wai-Tong Wong Mark Askins, Wendy Auton Justin Claridge, Richard Scott	Incorporated strategic comments from Project Team meeting (Karen Waldman and Tad Bagdon)	5
11/2/2011	Wai-Tong Wong Julie Allan Mark Askins Justin Claridge	Incorporated minor edits and improved formatting	6

Approval

Date	Name	Description	Version
3/2/2011	Tad Bagdon Gayle Leaver	Reviewed	2
3/2/2011	Tad Bagdon Karen Waldman	Reviewed	2A
11/2/2011	Tad Bagdon Gayle Leaver Karen Waldman	Reviewed	5
11/2/2011	Tad Bagdon Karen Waldman	Reviewed	6

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Executive Summary

The purpose of this report is to provide information on the potential impact on the security of supply in South East Queensland (SEQ) if a significant volume of water is released from the water supply capacity of Wivenhoe Dam as a potential flood mitigation measure.

In the main the scenarios considered would be potentially a temporary measure over the 2011 wet season, based on the impacts to the SEQ Water Grid as a whole. The underlying assumptions used include the demand and supply capacity contained in the SEQ Water Strategy, with demand forecasts updated to align with the recent bulk water price review in November 2010.

For completeness two scenarios involving permanent reduction in the full supply volume of Wivenhoe Dam have also been considered, but further investigation is required to understand the full impacts. This assessment is based on sensitivity analysis of the total grid capacity and no detailed assessment has been undertaken.

The following observations can be drawn from these assessments:

- If releases were made as a temporary measure to reduce the water level in Wivenhoe Dam by 25% of full supply capacity (a release of about 291,250 ML), the (five year) Risk Criteria of the SEQ System Operating Plan (SOP) would still be met.
- Despite the SOP Risk Criteria being met, if inflows for the next 6 years were as low as the 2001-2006 drought, full desalination production may be triggered, as Grid 12 storage levels could drop to 60% in this time.
- As the volume released increases, more factors become impacted such as the increased likelihood of triggering desalination and the use of purified recycled water and restrictions and potentially increased operating costs of the grid.
- Permanent reduction in the full supply volume of 25% will lower the LOS yield by about 30,000 ML/annum. This reduction in LOS yield may require the construction of new infrastructure to be brought forward by about 5 years to 2021, based on current demand assumptions. Other options to mitigate the yield reduction such as demand management measures may also be possible.

These analyses are an exercise in assessing risk management rather than a forecast for the future. Therefore an understanding of the consequences involved for a particular risk profile is important.

This report does not recommend a particular scenario for adoption as other factors such as social, economic and environmental may also need to be considered. It provides some risk information on the security of supply based on the short term (SOP Risk Criteria) and the long term water demand/supply balance in the SEQ Water Strategy.

Operational and regulatory impacts such as increased pumping costs and the Water Resource Plan have not been assessed. Advice from the responsible agency or entity would need to also be considered.

1 Purpose

The purpose of this report is to outline the results of the assessment, from a water supply security perspective for South East Queensland (SEQ) over the short and long term, of possible scenarios for lowering of Wivenhoe Dam below the current deemed full operating supply level (i.e. 100 percent dam level for water supply purposes). The effects of temporarily lowering the full supply level of Baroon Pocket and Hinze Dams were also assessed.

For the purpose of this report, short term is defined as the period over the next 5 years (as per risk criteria of SEQ System Operating Plan) where the supply security in SEQ may be impacted by any proposed temporary lowering of the Wivenhoe Dam operating level over the 2011 wet season.

Long term is defined as a period of up to 50 years in relation to the demand and supply (LOS Yield) balance in the SEQ Water Strategy.

This assessment does not consider the environmental, social and economic impacts of the dam operating levels in relation to flood mitigation for downstream properties and infrastructure.

2 Background

Major flooding occurred in the Brisbane River catchment on 13 January 2011.

This resulted in the Brisbane River peaking at 4.46m at the Port Office in Brisbane City and causing extensive damage to properties and businesses throughout the catchment. The 2011 flood was about 1m lower than the 1974 Flood event of 5.45m at the Port Office, Brisbane City. However, indications are that the social and economic impacts are much more significant given the building and business developments in the catchment over the last 37 years. Flood rebuilding is currently estimated to cost about \$5B.

The Minister for Natural Resources, Mines and Energy and the Minister for Trade has written to the Commissioner on 20 January 2011, requesting the Queensland Water Commission provide all necessary assistance to Seqwater in their review of the operation of Wivenhoe and Somerset Dams.

3 Role of Queensland Water Commission

3.1 Background/Context

The Queensland Water Commission (the Commission) is responsible for providing advice to the Minister on matters relating to water supply and demand management for water for SEQ. A key function of the Commission is to provide advice on the desired Levels of Service (LOS) for water supplied in SEQ.

The SEQ Water Strategy defines the LOS objectives to include the expected frequency, duration and severity of restrictions during future droughts based on a total demand of 375 litres/person/day (including residential, non-residential and system losses) of which 230 litres/person/day is attributed to residential demand. The LOS objectives are provided in Appendix A.

The Commission also makes and administers the South East Queensland System Operating Plan (SOP) under the *Water Act 2000* which sets out the rules for operating the SEQ Water Grid to help achieve the LOS objectives.

While the LOS objectives specify the basis for operating the Grid over the long term, the risk criteria of the SOP provide the basis for balancing water security and operating costs over the short term (up to 5 years).

The SOP risk criteria are given below:

Volume of water stored by all key water grid storages	Probability of reaching 40% and 30% volume of water stored		
	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%

3.2 Report to Seqwater

To support Seqwater's review of the operations of Wivenhoe and Somerset Dams, the Commission has conducted a series of modelling exercises to determine the potential impacts of certain operating arrangements on the security of supply for the region.

Consideration has been given to the ability of the SEQ Water Grid to continue to achieve the desired Level of Service objectives in the short term (up to 5 years) for various scenarios of lowering the deemed full water supply level particularly at Wivenhoe Dam, and also for Hinze and Baroon Pocket Dams.

For completeness two scenarios involving permanent reduction in the full supply volume of Wivenhoe Dam have also been considered, but further investigation is required to understand the full impacts. This assessment is based on sensitivity analysis of the total grid capacity and no detailed assessment has been undertaken.

These analyses are an exercise in assessing water security risk rather than a forecast for the future. Therefore an understanding of the consequences involved for a particular risk profile is important.

Operational and regulatory impacts such as increased pumping costs and the Water Resource Plan have not been assessed. Advice from the responsible agency or entity would need to also be considered.

This report provides an input, amongst other considerations, for Seqwater or other agencies to assist in developing advice to Government on the operating level of Wivenhoe Dam over this 2011 forecast wet season.

4 Short Term Impacts

The potential short term impacts are assessed using hydrological modelling. These are described in sections 4.1 to 4.3.

4.1 Use the SEQ Regional Water Balance Model (Wathnet Model) to assess the SOP risk criteria

The modelling conducted for this report was carried out using the Wathnet Model¹ which assesses the likelihood of reaching particular water storage volumes. Under the current operating arrangements and policies, the volumes of interest are:

- 60% of the Grid 12 volume, when full desalination production is triggered; and
- 40% of the Grid 12 volume, when full production of purified recycled water from the Western Corridor Recycled Water Project is triggered, to augment water supplies in Wivenhoe Dam and medium level restrictions would be introduced.

The Grid 12 storages and their corresponding capacities are provided in Appendix B.

Table 1 presents the five scenarios modelled. Scenarios 1 to 4 involved a reduction in water level at Wivenhoe Dam to 87%, 75%, 70% and 50% supply capacity with all other storages set at 100% full supply initially. The fifth scenario also includes a reduction of 50% capacity at Hinze and Baroon Pocket Dams with all other storages set at 100% full supply initially. This allows an assessment of the sensitivity to the security of supply should there be a need to also reduce the full operating levels in the Sunshine Coast (Baroon Pocket Dam) and Gold Coast (Hinze Dam).

For example, a 25% reduction of volume of 291,250 megalitres (ML) from Wivenhoe Dam would correspond to about 3 m drawdown from the full supply level based on the storage capacity data provided in Appendix C.

The key assumptions adopted for these runs were:

- Simulations start at the end of January 2011 with initial dam level (inflows from February 2011)
- Northern Pipeline Interconnector Stage 2 excluded
- Demand forecast as agreed by Government in late 2010 (residential consumption increasing from current levels to 200 litres/person/day by 2018)
- Medium series population growth consistent with SEQ population forecasts
- No desalination above 60% Grid 12 Storages
- Full desalination below 60% Grid 12 Storages

The scenarios do not consider day-to-day operational matters.

¹ Wathnet Model refers to the Generalised Water Supply Headworks Simulation using Network Linear Programming Model.

Table 1: Modelled scenarios

Scenario	%reduction Wivenhoe Dam (from Full Supply)	%reduction from other dams (from Full Supply)	Volume of Water Released (ML) [#]	%reduction of key Grid 12 Storages (from Full Supply)
1	13*	none	150,000	7.2
2	25	none	291,250	14.0
3	30	none	349,500	16.9
4	50	none	582,500	28.1
5	50	50 (Baroon Pocket) 50 (Hinze Dam)	693,500	33.5

* Scenario 1 was selected as a starting point for the assessment of 150,000 ML (about 12.9%, but rounded up to 13% in the Table).

[#] This is only the total volume and the strategy for release has not been considered. Operational constraints are also not considered for the purpose of this assessment.

The corresponding risk criteria results as compared to the SOP requirements are shown in Table 2.

Table 2: Results of risk criteria

Period	SOP Criteria	Scenarios (Wivenhoe/Baroon Pocket/Hinze capacities)				
		1 (87/100/100)	2 (75/100/100)	3 (70/100/100)	4 (50/100/100)	5 (50/50/50)
Probability of reaching 40% Grid 12 Storage Volume						
1 year	<0.2%	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%
5 year	<5%	0.09%	0.15%	0.20%	0.31%	0.49%
Probability of reaching 30% Grid 12 Storage Volume						
3 year	<0.5%	<0.01%	<0.01%	<0.01%	<0.01%	0.01%
5 year	<1%	<0.01%	<0.01%	<0.01%	<0.01%	0.03%

From the above analysis, all scenarios 1 to 5 in Table 2 pass the SOP risk criteria. While this means that the risk associated with the short term security of supply is acceptable, the consequences of each scenario with respect to other factors would need to be examined – see Section 6.

4.2 Forecast the probability of Grid 12 storage levels over the next 5 years

To forecast the probability of the Grid 12 storages reaching a certain level, the Wathnet Model was used, based on stochastic data generation for 117 years of historical information.

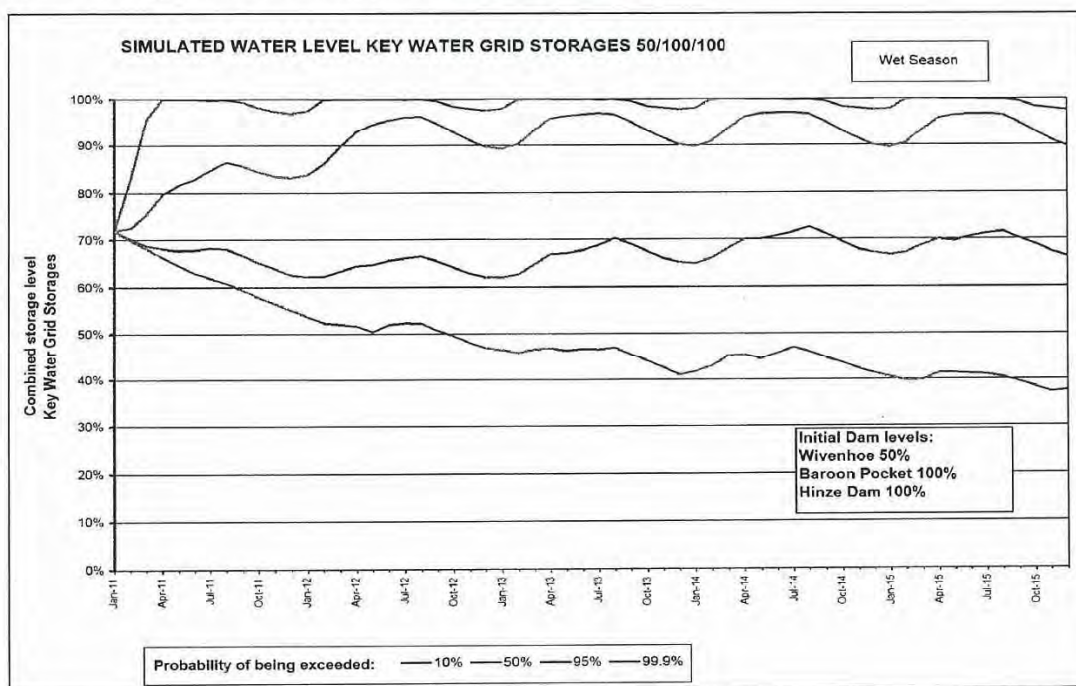
Stochastically generated data provides longer time sequences of hydrologic data that have similar statistical characteristics of that of the historical record. This data provides better information about climate variability and the potential for droughts worse than have occurred on record.

Figure 1 shows the forecast storage level for the Grid 12 storages for Scenario 4 (as described in Section 4.1) with Wivenhoe drawn down to 50% and the rest of the storages at 100% at the start of the simulation in end January 2011. (Note: The plots for Scenarios 1 – 3 would show higher storage levels than those shown in Figure 1).

In this scenario:

- there is a 95% probability that the combined Grid 12 storage level remain above 60% for the next 5 years;
- there is a 99.9% probability that the combined Grid 12 storage level remains above 40% for the next 4 years; and
- there is a 50% probability that the combined Grid 12 storage level will climb back to 90% and remain at this level for the remainder of the 5 year period.

Figure 1: Scenario 4 with Wivenhoe Dam drawn down to 50% - forecast combined Grid 12 storage level showing probabilities of exceedance

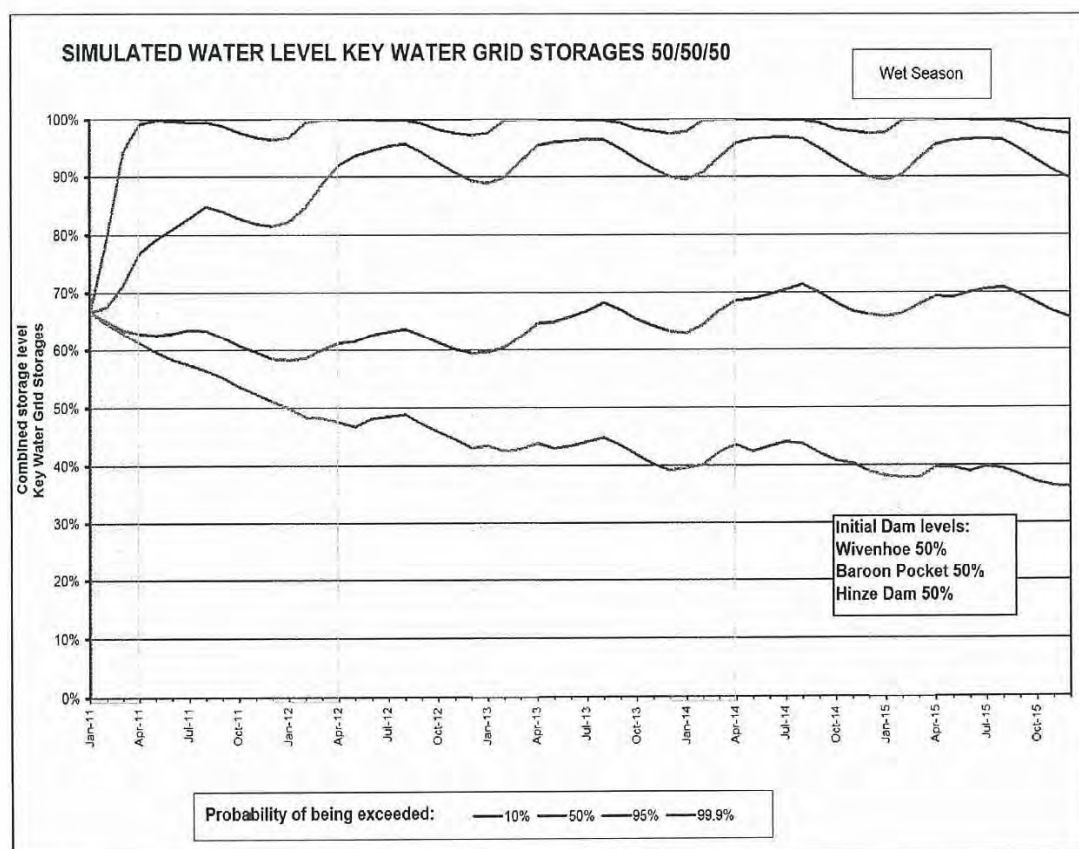


Scenario 5 (as described in Section 4.1) tests the sensitivity of the model findings by starting with Wivenhoe, Baroon Pocket and Hinze Dams all drawn down to 50% and the rest of the Grid 12 storages at 100% at the start of the simulation. This scenario represents the highest risk situation of all the modelled scenarios. The results are still within the bounds of the risk criteria set in the SOP.

In this scenario (Figure 2):

- There is almost a 95% probability that the combined Grid 12 storage level will stay above 60% for the next 5 years.
- There is at least a 95% probability (could be approaching 99.9%) that the combined Grid 12 storage level will stay above 40% for the next 5 years.
- There is a 50% probability that the combined Grid 12 storage level will climb back up to 90% and remain about this level for the next 5 years.

Figure 2: Scenario 5 with Wivenhoe, Baroon Pocket and Hinze Dams all drawn down to 50% - forecast combined Grid 12 storage level showing probabilities of exceedance



4.3 Simulated storage behaviour of Grid 12 storages over the next 6 years for three inflow scenarios (using Waspp Model)

The purpose of these simulations was to assess the potential behaviour of the Grid 12 storages over the next 6 years using three inflow scenarios based on probability of combined inflows into the storages.

For all inflow scenarios, Wivenhoe Dam was assumed to be initially at 75% capacity.

There are various methodologies that could be used for the selection of inflow sequences. For the purpose of this work, it is considered necessary to test scenarios covering a period of relative wet, of average inflow and of the driest years. The annual inflows for the Grid 12 storages from 1890 to 2007 were used in the analysis. Table 5 provides the scenarios corresponding to the 30% (wet), 50% (average) and 100% (dry) exceedance probabilities based on 6 years of cumulative inflow sequence.

The worst 6 years of inflows (100% exceedance probability) was found to correspond to the most recent drought on record from 2001 to 2006 as shown in Scenario 3 (Table 5).

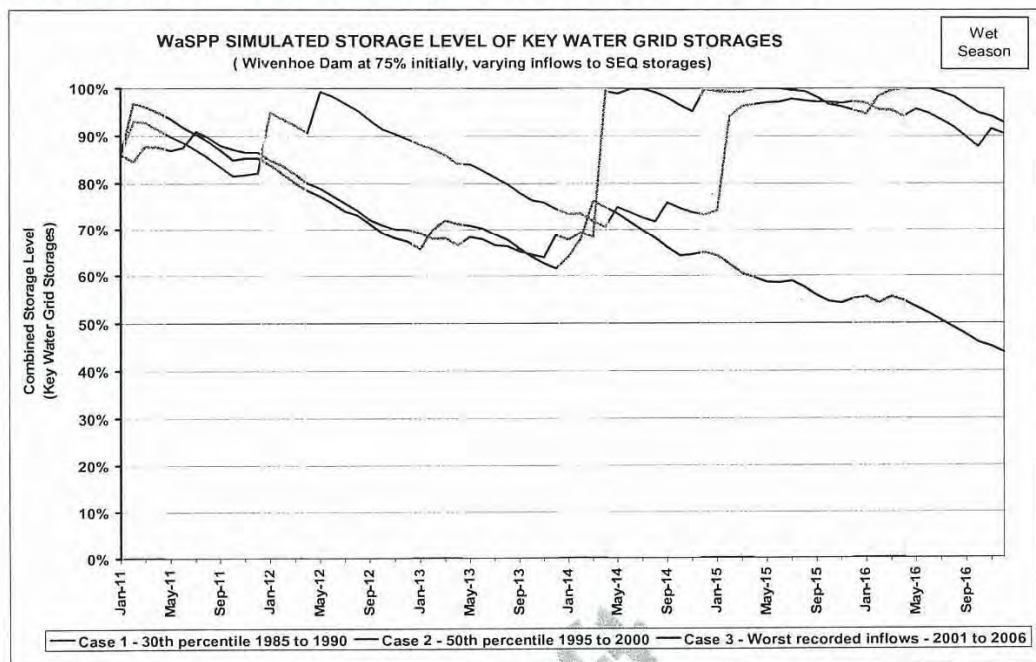
Table 5: Inflow scenarios assessed

Scenario	Exceedance Probability of Inflows	Continuous Sequence (6 years)	Total Inflow Volume Grid 12 (ML)
1	30%	Jan 1985 – Dec 1990	10,193,300
2	50%	Jan 1995 – Dec 2000	7,243,300
• 3	• 100%	• Jan 2001 – Dec 2006	• 2,752,000

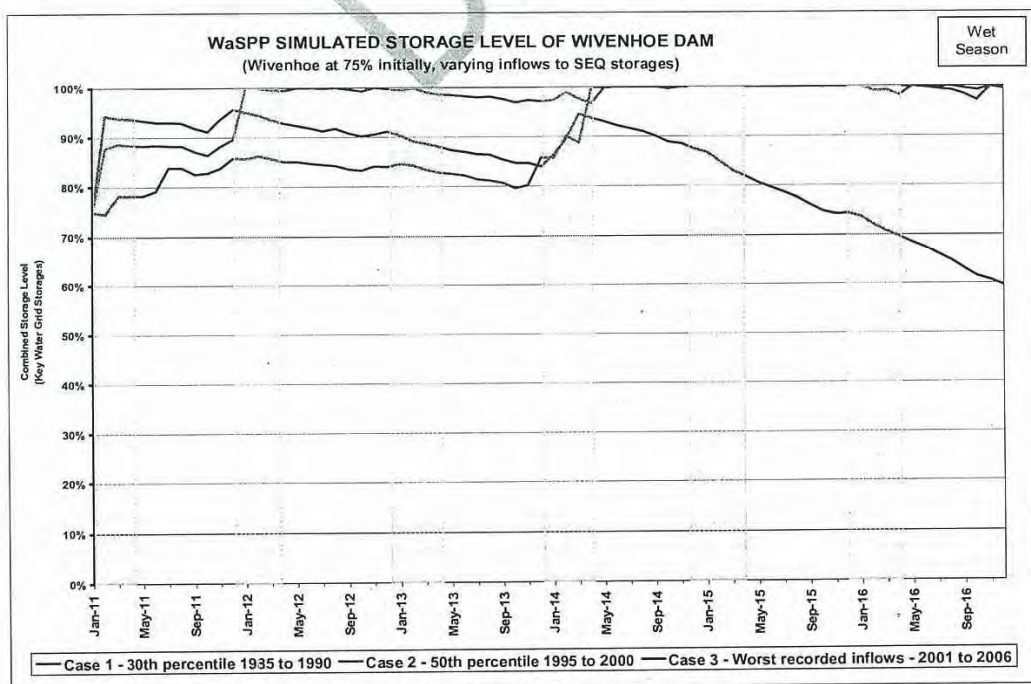
The assumptions adopted in the modelling were:

- 75% initial storage volume at Wivenhoe Dam (all other storages at 100% full) - or Grid 12 storages at 86% capacity
- Demands forecast as agreed by Government in late 2010 (residential consumption increasing from current levels to 200 litres/person/day by 2018)
- Full desalination production when Grid 12 storages drop below 60% capacity, and no desalination above 60%
- Northern Pipeline Interconnector Stage 2, Hinze Dam raising and Wyaralong Dam not included
- Purified Recycled Water introduced into Wivenhoe Dam when Grid 12 storages drop below 40% capacity.

The results of the simulations for the 3 scenarios are shown in Figure 3. The worst case scenario from the historical records shows the lowest combined storage levels after June 2014, but staying above the 40% capacity to the end of 2016. Under this scenario of inflows, Purified Recycled Water is not expected to be introduced into Wivenhoe Dam within the next 5 years. For scenarios 1 and 2, the storage levels generally decreased for the first 3 years before increasing thereafter.

Figure 3: Simulated Grid 12 storage levels for 3 inflow scenarios

The simulated storage level behaviour of Wivenhoe Dam for the three inflow scenarios is indicated in Figure 4. As expected, the simulated level for Wivenhoe Dam reduces significantly due to the worst inflow sequence. With scenarios 1 and 2, Wivenhoe Dam recovers within about 3 years.

Figure 4: Simulated Wivenhoe Dam storage levels for 3 inflow scenarios

5 Long Term Impacts - assessment of the potential impact on the LOS Yield (using Wathnet Model)

To assess the long term impacts on the LOS yield if Wivenhoe Dam was permanently operated at a reduced water supply capacity, two scenarios involving a 10% and 25% reduction from full supply level were investigated.

This assessment is carried out for completeness only and does not suggest that the dams be operated permanently with a reduced full supply level. Further investigation is necessary to understand the full impacts.

The Regional Water Security Program for SEQ establishes the desired LOS objectives which form a basis for the SEQ Water Strategy and are implemented through the SOP. These objectives provide long term security of water supply and are defined as the:

- desirable maximum frequency, duration and severity of water restrictions, and
- the average amount of water per person that must be supplied in normal times.

These objectives are used to determine the Level of Service (LOS) Yield. The LOS Yield is used, along with the projected demands, to ensure that adequate initiatives are in place to meet demand in the future.

The LOS Yield for the 2010 Infrastructure (capacity to deliver) is assessed to be 485,000 ML/a. This assumes that the desalination plant is providing 125 ML/day and Purified Recycled Water (PRW) 142 ML/day.

To assess the impact on the long term LOS Yield, the Wathnet Model was used.

This assessment was based on the following assumptions:

- 2010 infrastructure, prior to the full operation of Wyaralong Dam and Hinze Dam Stage 3
- PRW production at 52,000 ML/a (142 ML/day) and supplies 34,950 ML/a (96 ML/day) to industry
- Desalination production at 46,000 ML/a (125 ML/day)

5.1 Results – 10% reduction on Full Supply Volume for Wivenhoe Dam

The LOS Yield for the 2010 Infrastructure (capacity to deliver) is assessed to be 485,000 ML/a.

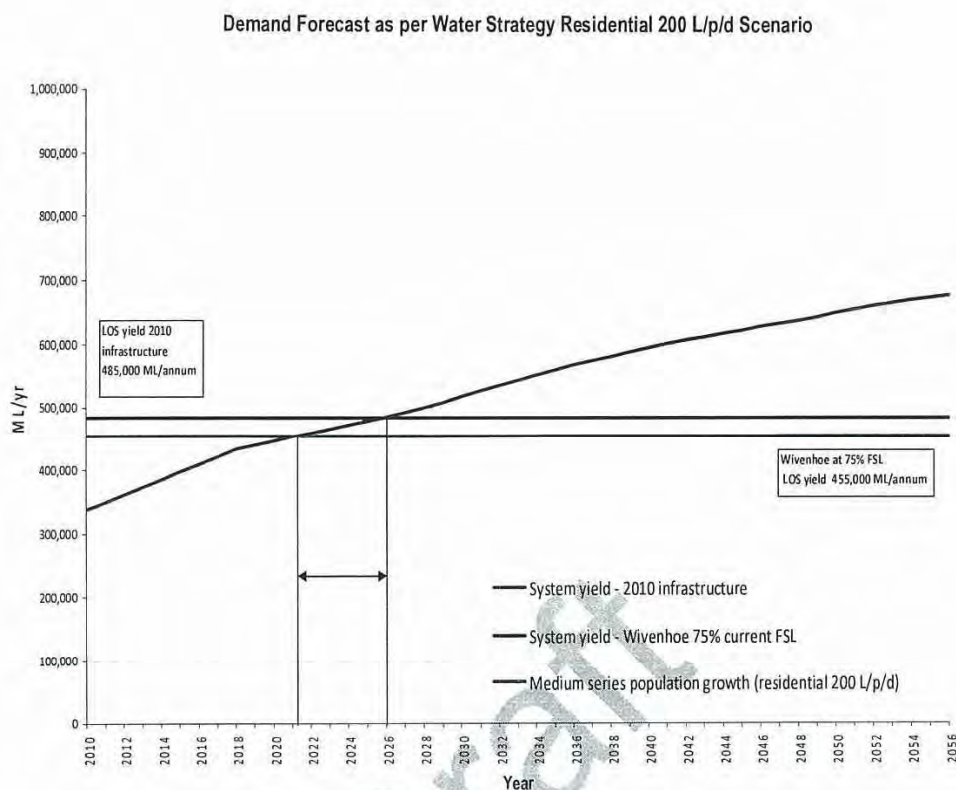
Preliminary modelling work suggests that the impact of a permanent 10% reduction in the full supply volume at Wivenhoe Dam is minimal on the LOS yield as this is within the tolerance of the model. This needs further investigation.

5.2 Results – 25% reduction on Full Supply Volume for Wivenhoe Dam

There is a significant reduction in the LOS yield of 30,000 ML/annum with a scenario where Wivenhoe Dam was permanently operated at 25% lower than the full supply level. The LOS yield has reduced from 485,000 ML/annum to 455,000 ML/annum.

Figure 5 shows that new infrastructure would need to be brought forward by about 5 years to about 2021 from 2026 under medium series population growth.

Figure 5: LOS Yield comparison



5.3 Potential for demand reduction

One of the input factors that impacts on the water supply balance is the level of extractions from the supply storages. The level of extraction depends on the level of demand in South East Queensland (SEQ).

The supply balance and risk assessment modelling conducted for this information paper includes the level of expected demand based on residential water consumption of 200 litres/person/day (l/p/d). This demand scenario is the same as the demand forecast as agreed by Government in late 2010 (residential consumption increasing from current levels to 200 l/p/d by 2018).

The 200 l/p/d demand scenario is the equivalent of total water demand of 870 ML per day for SEQ or 317,550 ML per annum.

The level of total water demand in SEQ for the last three months has been approximately 670 ML/d, which when annualised gives 244,550 ML per annum. On a per person basis this is the equivalent of 150 l/p/d. However, this level of consumption is unlikely to remain at this level.

The late 2010 demand scenario includes a residential demand at approximately 185 l/p/d for 2011, being the equivalent of 800 ML per day for SEQ or 292,000 ML per annum. If demand was to be maintained at this level, this represents a demand saving of 25,550 ML per annum.

A saving of 25,550 ML per annum (difference between 317,550 and 292,000 ML per annum) would significantly offset the LOS yield reduction of 30,000 ML/annum if Wivenhoe Dam was operated at 25% lower than Full Supply Level (FSL) over a long period (Refer to section 5.2).

6 Implications of each scenario

Table 3 provides a general framework for the assessment of the consequences of each scenario based on the following criteria for the short, intermediate and long term periods:

- Security of supply - involves examining the sufficiency, LOS Yield, desalination, and demand and supply balance
- Levers – these are some of the factors that could be reviewed to optimise the security of supply such as Levels of Service, policies and assumptions
- Inputs – these are some of the input factors which could be impacted e.g. allocation/yield, demand and supply
- Pricing – some of the scenarios may impact upon a future review of the Price Path such as through increases in operating costs.

The following observations are made and reflected in Table 3:

Short Term Reduction in Full Supply Capacity

- If releases were made as a temporary measure to reduce the water level in Wivenhoe Dam by 25% of full supply capacity (a release of about 291,250 ML), the Risk Criteria of the SEQ SOP (System Operating Plan) would still be met.
- As the volume released increases, more factors become impacted such as, the increased likelihood of triggering desalination, use of purified recycled water or introduction of restrictions and potentially increased operating costs of the grid.
- The SOP Risk Criteria are satisfied for scenarios with up to 50% of water released from Wivenhoe Dam. However other factors become impacted. This assessment deals only with the volume capacity and does not consider actual availability due to operational constraints.
- Operational costs may be impacted when the storage is drawn down to 50% as the grid operating costs will increase with the need for desalination being triggered more frequently.

Long Term (Permanent) Reduction in Full Supply Capacity at Wivenhoe Dam

- A reduction of 25% in the full supply level would have an impact on the security of supply.
- New infrastructure would need to be brought forward about 5 years to meet the LOS objectives for a 25% drawdown scenario.
- There could be an impact on the future bulk water through an increase in operational costs for a 25% drawdown scenario.

There could potentially be some optimal operating arrangement, indicated as Intermediate Option in Table 3. This could involve a review of the levers such as redefining the LOS objectives based on further investigations, to ensure that the short term operating options do not compromise the long term security of supply.

Table 3: Preliminary Framework for Consideration of Impacts on SEQ Water Strategy for Various Operating Levels of Wivenhoe Dam

Description	Base Case (status quo)	Short Term Scenario (Temporary Wivenhoe Dam drawdown)			Intermediate Option	Long Term Scenario (Permanent Wivenhoe Dam drawdown)		
		13%	25%	50%	Review	10%	25%	
Security of supply								
• Sufficiency	✓	✓	✓	✓	Review	✓	✗	
• LOS Yield	✓	✓	✓	✓		✓	✗	
• Demand/ Supply Balance	✓	✓	✓	✓		✓	✗	
• Desalination	✓	✓	If 2001-2006 inflows - may potentially trigger full desalination	If 2001-2006 inflows - may potentially trigger full desalination	Review	✓	✗	
Levers								
• Levels of Service						Review		
• Policies								
• Assumptions								
Input								
• Allocation/Yield	✓	✓	Allocation - determined by DERM	Allocation - determined by DERM	Review	✗ (impacted)	✗	
• Demand	✓	✓	✓	✓		✓	✗	
• Supply	✓	✓	✓	✓		✗ (impacted)	✗	
Pricing								
• Impact on pricing	✓	✓	✓	✓	Review	✓	✗ new price path is potentially required	

Note: ✓ Minimal Impact ✗ Impacted

¹ A permanent change in the full supply level of Wivenhoe Dam would require a review of available entitlements from Wivenhoe Dam under the Water Resource Plan.² Needs further assessment.

7 Peer review of modelling by Department of Environment and Resource Management

The results of this modelling work were reviewed by the Queensland Hydrology Group of the Department of Environment and Resource Management.

The review of the input and results for the Wathnet Model was carried out by Dr John Vitkovsky, Senior Hydrologist, who stated that: "modifications were made to the WathNet SEQ Grid model for the purposes of a sensitivity analysis of the SEQ LOS statistics from lowering the full storage volume of key large storages. There (are) a number of changes to the model that can only be done by someone with intimate knowledge of the lower-level files in the model—and cannot be made using the spreadsheet. However, as long as it is only the SEQ volume LOS statistics that are being reported on and given the modifications made to the spreadsheet the results should be reasonable." Further:

- The model setups for all runs seem correct
- The results seem entirely reasonable and satisfy the SOP Risk Criteria
- The output statistics for both the long-term and forecast model runs seem reasonable (without re-running those scenarios) and are compliant with the LOS and SOP criteria."

For the review of the Waspp Model, Mr Craig Johansen (Principal Hydrologist) has stated that "the results of the scenarios presented for review appeared logical and appropriate based on the rules of the SEQ Water Grid and the understanding (of) the model."

Appendix A – Level of Service Objectives (SEQ Water Strategy)

- During normal operating mode, sufficient water will be available from the SEQ Water Grid to meet an average regional urban demand of 375 litres per person per day (including residential, non-residential and system losses).
- Sufficient investment in the water supply system will occur so that:
 - Medium Level Restrictions will not occur more than once every 25 years, on average
 - Medium Level Restrictions will only reduce consumption by 15 per cent below the total consumption volume in normal operating mode
 - drought response infrastructure will be not be required to be built more than once every 100 years, on average
 - combined regional storage reserves do not decline to 10 per cent of capacity more than once every 1000 years, on average
 - regional water storages do not reach 5 per cent of combined storage capacity
 - Wivenhoe, Hinze and Baroon Pocket dams do not 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.

Appendix B - Grid 12 Storages in South East Queensland

As at 27 October 2010

	FULL SUPPLY VOLUME (Megalitres)
Southern	
Little Nerang	6,705
Hinze	161,073
Total Southern	167,778
Central	
North Pine	214,302
Somerset	379,849
Wivenhoe	1,165,238
Lake Kurwongbah	14,370
Leslie Harrison	24,868
Total Central	7,798,627
Northern	
Baroon Pocket	61,000
Cooloolabin	13,800
Ewan Maddock	16,587
Lake MacDonald	8,018
Wappa	4,694
Total Northern	104,099
TOTAL SEQ	2,070,504

Appendix C – Wivenhoe Dam Storage Capacity Data

EL (M)	AREA (HA)	VOLUME (ML)	EL (M)	AREA (HA)	VOLUME (ML)	EL (M)	AREA (HA)	VOLUME (ML)	EL (M)	AREA (HA)	VOLUME (ML)
TOTAL	COMM	TOTAL	COMM	TOTAL	COMM	TOTAL	COMM	TOTAL	COMM	TOTAL	COMM
62.00	22181	3555000	66.50	12326	1434287	67.00	5078	413632	44.50	1134	58185
61.75	21916	3459900	66.25	12205	1423557	66.75	4985	401056	44.25	1095	56399
61.50	21656	3445428	66.00	12046	1393246	66.50	4857	388705	44.00	1040	53727
61.25	21415	3351580	65.75	11885	1353332	66.25	4810	376573	43.75	1108	51157
61.00	21186	3338361	65.50	11723	1333815	66.00	4721	364850	43.50	977	48686
60.75	20918	3225762	65.25	11561	1314714	65.75	4627	352973	43.25	944	46285
60.50	20677	3123774	65.00	11401	1276013	65.50	4537	341519	43.00	911	43956
60.25	20431	3162392	64.75	11240	1247714	65.25	4445	330291	42.75	879	41728
60.00	20192	3151619	64.50	11080	1219815	65.00	4348	318302	42.50	825	39532
59.75	19962	3081433	64.25	10918	1196321	64.75	4256	306561	42.25	801	37527
59.50	19732	3011616	64.00	10751	1162338	64.50	4144	295084	42.00	774	35528
59.25	19505	2962768	63.75	10572	1138520	64.25	4040	287851	41.75	744	33532
59.00	19285	2934279	63.50	10395	1113738	64.00	3942	277071	41.50	715	31868
58.75	19051	2866355	63.25	10217	1088544	63.75	3827	268147	41.25	686	30116
58.50	18831	2839008	63.00	9990	1061414	63.50	3735	256683	41.00	659	28435
58.25	18613	2792205	62.75	9797	1036887	63.25	3639	245474	40.75	625	26829
58.00	18390	2745957	62.50	9598	1012440	63.00	3524	234529	40.50	595	25299
57.75	18173	2700255	62.25	9412	988581	62.75	3425	221845	40.25	575	23834
57.50	17956	2655099	62.00	9234	963718	62.50	3329	223403	40.00	544	22424
57.25	17746	2610476	61.75	9058	942515	62.25	3212	215250	39.75	533	21065
57.00	17535	2566378	61.50	8884	920090	62.00	3121	207334	39.50	512	19761
56.75	17322	2522610	61.25	8712	898036	61.75	3028	198951	39.25	494	18504
56.50	17118	2479767	61.00	8541	876532	61.50	2932	192203	39.00	475	17292
56.25	16920	2437223	60.75	8371	855361	61.25	2837	186093	38.75	456	16128
56.00	16724	2395172	60.50	8194	834591	61.00	2744	178019	38.50	435	15014
55.75	16531	2353607	60.25	8027	814418	60.75	2654	171275	38.25	396	12837
55.50	16337	2312525	60.00	7864	794557	60.50	2575	164758	38.00	338	11096
55.25	16147	2271928	59.75	7710	775057	60.25	2501	158392	37.75	305	9460
55.00	15954	2231791	59.50	7558	756214	60.00	2427	152221	37.50	279	8006
54.75	15763	2192113	59.25	7402	737320	59.75	2350	146295	37.25	207	6725
54.50	15572	2152874	59.00	7247	719011	59.50	2284	140494	37.00	154	5765
54.25	15443	2114055	58.75	7115	701062	59.25	2219	134939	36.75	166	4886
54.00	15268	2075676	58.50	6967	683435	59.00	2105	128964	36.50	153	4063
53.75	15106	2037713	58.25	6825	666123	58.75	2029	124434	36.25	132	3379
53.50	14943	2000155	58.00	6745	649112	58.50	1957	119452	36.00	104	2807
53.25	14792	1963000	57.75	6589	632358	58.25	1889	114644	35.75	95	2311
53.00	14620	1926252	57.50	6518	615965	58.00	1821	110006	35.50	84	1864
52.75	14454	1889612	57.25	6409	599909	57.75	1754	105542	35.25	90	1507
52.50	14285	1853992	57.00	6299	583927	57.50	1693	101235	35.00	55	1220
52.25	14121	1818485	56.75	6180	568318	57.25	1639	97073	34.75	44	718
52.00	13960	1783388	56.50	6065	552976	57.00	1590	93038	34.50	39	510
51.75	13800	1748690	56.25	5975	537986	56.75	1542	89123	34.25	34	327
51.50	13642	1714393	56.00	5875	523262	56.50	1495	85335	34.00	30	167
51.25	13484	1680485	55.75	5775	508516	56.25	1444	81670	33.75	19	47
51.00	13323	1646983	55.50	5674	494208	56.00	1399	78116	33.50	3	12
50.75	13167	1613871	55.25	5573	480151	55.75	1355	74673	33.25	2	1
50.50	13009	1581155	55.00	5467	466360	55.50	1312	71340	33.00	0	0
50.25	12851	1548833	54.75	5371	452812	55.25	1265	68139	32.75	0	0
50.00	12693	1515905	54.50	5273	439507	55.00	1214	65053	32.50	0	0
49.75	12529	1483372	54.25	5175	426447	44.75	1174	62069	32.25	0	0

Level Datum: AHD - PV 34781 EL 74.794 m
 Computed using photogrammetric DTM produced in 1995 from 1971 photography.
 Survey records: 25/27 FD
 Full Supply Level: EL 67.000 m AHD (1,165,200 M³, 10,750 ha)
 River Outlet: EL 33.200 m AHD (2,510 M³, 55 ha)
 Catchment Area: 7020 sq km
 Latitude: 27 22 38 Longitude: 152 36 05



BRISBANE RIVER - BASIN 143
 WIVENHOE DAM 150 ± km

A3-110405

STORAGE DATA

12/05/95

Our ref: ME/11/0317

14 February 2011

Mr John Bradley
Director General
Department of Environment and Resource Management
GPO Box 2454
Brisbane Qld 4001

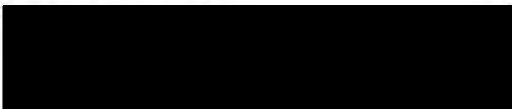

Dear Mr Bradley

Please find enclosed a copy of correspondence sent to Mr Peter Borrows, Chief Executive Officer, Seqwater concerning a request from the Honourable Stephen Robertson MP, Minister for Natural Resources, Mines and Energy and Minister for Trade, that the Queensland Water Commission provide all necessary assistance to Seqwater to ensure the Minister's requests to Mr Phil Hennessy, Chair, Seqwater, as raised in his letter of 20 January 2011, are able to be responded to as a matter of priority and with urgency.

The Commission would appreciate your feedback on this draft report, prior to formally progressing it as a final report to Seqwater and the Minister. I will be in touch shortly in order to discuss timing for your feedback with the aim of finalising the report within the next week or so.

If you require any further information, please contact me, on 

Yours sincerely



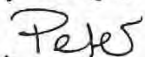
Ms Karen Waldman
Chief Executive Officer

Enc (1)

Our ref: ME/11/0017

14 February 2011

Peter Borrows
Chief Executive Officer
Seqwater
PO Box 16146
City East QLD 4002

Dear Mr ~~Borrows~~

On 20 January 2011, the Honourable Stephen Robertson MP, Minister for Natural Resources, Mines and Energy and Minister for Trade, wrote to the Queensland Water Commission (Commission) requesting the Commission provide all necessary assistance to Seqwater to ensure the Minister's requests to Mr Phil Hennessy, Chair, Seqwater, as raised in his letter of 20 January 2011, are able to be responded to as a matter of priority and with urgency.

On 25 January 2011, the Commission advised the Minister that it was liaising with Seqwater and undertaking preliminary work to support the matters raised.

Since that time the Commission has progressed its work in order to be in a position to provide advice to Seqwater and/or the Minister as and when required.

On 4 February 2011, you provided us with a copy of a letter from Seqwater's Chair to Minister Robertson regarding Seqwater's consideration of the appropriate Full Supply Levels (FSL) for Wivenhoe and Somerset Dams. This letter advised that "DERM may be satisfied, based on advice from QWC and the WGM from a water supply security perspective, that Wivenhoe Dam's FSL could be reduced in the short term to, say, 75% of its current FSL".

I note that the South East Queensland (SEQ) Water Grid Manager has provided you with a letter on 9 February 2011, confirming that "from a water security perspective, the SEQ Water Grid Manager has no objection to Wivenhoe Dam being drawn down to 75% of its FSL".

As you are aware, the Commission has now finalised a draft report as input information material for Seqwater, as requested by the Minister (attached), titled *Impacts on SEQ Water Strategy of Various Operating Scenarios for Wivenhoe Dam, 14 February 2011, Version 6*. The purpose of this report is to provide information on the potential impact on the security of supply in SEQ if a significant volume of water is released from the water supply capacity of Wivenhoe Dam as a potential flood mitigation measure. The information in this report has been shared with Seqwater officers during the course of its preparation, and a full version provided to you on 12 February 2011.

In preparing this report, the Commission has based its assumptions on the SEQ Water Strategy of July 2010, including the addition of purified recycled water into Wivenhoe at the 40% trigger level. Demand forecasts have been updated to align with the recent bulk water price review in November 2010.

The report has considered scenarios as temporary options for the 2011 wet season, and commenced consideration of scenarios contemplating any permanent reductions to FSL from a Level of Service (LOS) yield perspective.

In summary, the report concludes that:

- If releases were made as a temporary measure to reduce the water level in Wivenhoe Dam by 25% from its FSL (a release of about 291,250 ML), the Risk Criteria of the *South East Queensland System Operating Plan* would still be met.
- Despite the above being met, if inflows for the next six years were as low as the 2001-2006 drought, full desalination may be triggered, as Grid 12 storage levels could drop to 60% in this time.
- As the volume released increases, more factors become impacted such as the increased likelihood of triggering desalination and the use of purified recycled water and restrictions, and potentially increased operating costs of the grid.
- Permanent reduction of the FSL by 25% will lower the LOS yield by about 30,000 ML/annum. This reduction in LOS yield may require the construction of new infrastructure to be brought forward by about five years to 2021, based on current demand assumptions. Other options to mitigate the yield reduction such as demand management measures may also be possible.
- Given the current demand is less than that in the recent bulk water price review assumptions used in this assessment, there is more confidence in the margin of supply security available in the demand/supply balance.
- Any permanent reduction would have to be more critically investigated, with this report commencing the analysis for purposes of assisting to inform the annual update of the SEQ Water Strategy and investigations related to the Brisbane River system.

Given the announcement on 13 February 2011 to lower the FSL to 75% for the 2011 wet season, the Commission looks forward to working with you closely in relation to any consideration of a permanent reduction of Wivenhoe's FSL.

The Commission would appreciate your feedback on this draft report, prior to formally progressing it as a final report to Seqwater and the Minister. I will be in touch shortly in order to discuss timing for your feedback with the aim of finalising the report within the next week or so.

If you require any further information, please contact me on [REDACTED] or on email at [REDACTED]

Yours sincerely

[REDACTED]
Karen Waldman
Chief Executive Officer

Enc (1)

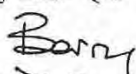
cc John Bradley, Director General, Department of Environment and Resource Management

Barry Dennien, Chief Executive Officer, SEQ Water Grid Manager

Our ref: ME/11/0017

14 February 2011

Mr Barry Dennien
Chief Executive Officer
SEQ Water Grid Manager
PO Box 16205
City East Qld 4002

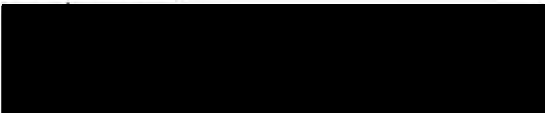

Dear ~~Mr~~ Dennien

Please find enclosed a copy of correspondence sent to Mr Peter Borrows, Chief Executive Officer, Seqwater concerning a request from the Honourable Stephen Robertson MP, Minister for Natural Resources, Mines and Energy and Minister for Trade, that the Queensland Water Commission provide all necessary assistance to Seqwater to ensure the Minister's requests to Mr Phil Hennessy, Chair, Seqwater, as raised in his letter of 20 January 2011, are able to be responded to as a matter of priority and with urgency.

The Commission would appreciate your feedback on this draft report, prior to formally progressing it as a final report to Seqwater and the Minister. I will be in touch shortly in order to discuss timing for your feedback with the aim of finalising the report within the next week or so.

If you require any further information, please contact me, on 

Yours sincerely

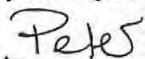

Ms Karen Waldman
Chief Executive Officer

Enc (1)

Our ref: ME/11/0317

14 February 2011

Peter Borrows
Chief Executive Officer
Seqwater
PO Box 16146
City East QLD 4002



Dear Mr ~~Borrows~~

On 20 January 2011, the Honourable Stephen Robertson MP, Minister for Natural Resources, Mines and Energy and Minister for Trade, wrote to the Queensland Water Commission (Commission) requesting the Commission provide all necessary assistance to Seqwater to ensure the Minister's requests to Mr Phil Hennessy, Chair, Seqwater, as raised in his letter of 20 January 2011, are able to be responded to as a matter of priority and with urgency.

On 25 January 2011, the Commission advised the Minister that it was liaising with Seqwater and undertaking preliminary work to support the matters raised.

Since that time the Commission has progressed its work in order to be in a position to provide advice to Seqwater and/or the Minister as and when required.

On 4 February 2011, you provided us with a copy of a letter from Seqwater's Chair to Minister Robertson regarding Seqwater's consideration of the appropriate Full Supply Levels (FSL) for Wivenhoe and Somerset Dams. This letter advised that "DERM may be satisfied, based on advice from QWC and the WGM from a water supply security perspective, that Wivenhoe Dam's FSL could be reduced in the short term to, say, 75% of its current FSL".

I note that the South East Queensland (SEQ) Water Grid Manager has provided you with a letter on 9 February 2011, confirming that "from a water security perspective, the SEQ Water Grid Manager has no objection to Wivenhoe Dam being drawn down to 75% of its FSL".

As you are aware, the Commission has now finalised a draft report as input information material for Seqwater, as requested by the Minister (attached), titled *Impacts on SEQ Water Strategy of Various Operating Scenarios for Wivenhoe Dam, 14 February 2011, Version 6*. The purpose of this report is to provide information on the potential impact on the security of supply in SEQ if a significant volume of water is released from the water supply capacity of Wivenhoe Dam as a potential flood mitigation measure. The information in this report has been shared with Seqwater officers during the course of its preparation, and a full version provided to you on 12 February 2011.

In preparing this report, the Commission has based its assumptions on the SEQ Water Strategy of July 2010, including the addition of purified recycled water into Wivenhoe at the 40% trigger level. Demand forecasts have been updated to align with the recent bulk water price review in November 2010.

The report has considered scenarios as temporary options for the 2011 wet season, and commenced consideration of scenarios contemplating any permanent reductions to FSL from a Level of Service (LOS) yield perspective.

In summary, the report concludes that:

- If releases were made as a temporary measure to reduce the water level in Wivenhoe Dam by 25% from its FSL (a release of about 291,250 ML), the Risk Criteria of the *South East Queensland System Operating Plan* would still be met.
- Despite the above being met, if inflows for the next six years were as low as the 2001-2006 drought, full desalination may be triggered, as Grid 12 storage levels could drop to 60% in this time.
- As the volume released increases, more factors become impacted such as the increased likelihood of triggering desalination and the use of purified recycled water and restrictions, and potentially increased operating costs of the grid.
- Permanent reduction of the FSL by 25% will lower the LOS yield by about 30,000 ML/annum. This reduction in LOS yield may require the construction of new infrastructure to be brought forward by about five years to 2021, based on current demand assumptions. Other options to mitigate the yield reduction such as demand management measures may also be possible.
- Given the current demand is less than that in the recent bulk water price review assumptions used in this assessment, there is more confidence in the margin of supply security available in the demand/supply balance.
- Any permanent reduction would have to be more critically investigated, with this report commencing the analysis for purposes of assisting to inform the annual update of the SEQ Water Strategy and investigations related to the Brisbane River system.

Given the announcement on 13 February 2011 to lower the FSL to 75% for the 2011 wet season, the Commission looks forward to working with you closely in relation to any consideration of a permanent reduction of Wivenhoe's FSL.

The Commission would appreciate your feedback on this draft report, prior to formally progressing it as a final report to Seqwater and the Minister. I will be in touch shortly in order to discuss timing for your feedback with the aim of finalising the report within the next week or so.

If you require any further information, please contact me on [REDACTED] or on email at [REDACTED]

Yours sincerely

[REDACTED]
Karen Waldman
Chief Executive Officer

Enc (1)

cc John Bradley, Director General, Department of Environment and Resource Management

Barry Dennien, Chief Executive Officer, SEQ Water Grid Manager

Waldman Karen

From: Waldman Karen
Sent: Thursday, 3 March 2011 5:48 PM
To: Dennien Barry [REDACTED]
Cc: spiller daniel [REDACTED]
Subject: Re: Feedback on the QWC

Thanks Barry

----- Original Message -----

From: Barry Dennien [REDACTED]
To: Waldman Karen
Cc: spiller daniel [REDACTED] Bagdon Tad
Sent: Thu Mar 03 16:31:25 2011
Subject: Feedback on the QWC

Karen

In reference to your letter of the 14th February 2011 to Seqwater with regards the security impacts of a 25% reduction in the full supply level of Wivenhoe Dam. I am providing feedback as requested.

In general the SEQ Water Grid Manager has no disagreement with the summary of findings provided by the QWC.

Regards

Barry Dennien

Chief Executive Officer

SEQ Water Grid Manager

Phone: [REDACTED] | Fax: [REDACTED] | Mobile: [REDACTED]

Email: [REDACTED]

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.

17 MAR 2011

COPY
RECEIVED
18 MAR 2011



Ref CTS 02662/11

Department of
Environment and Resource
Management

Ms Karen Waldman
Chief Executive Officer
Queensland Water Commission
PO Box 15087
CITY EAST QLD 4002

Dear Ms Waldman

Thank you for your letter dated 14 February 2011 regarding assistance provided to Seqwater by the Queensland Water Commission (QWC) at the request of the Honourable Stephen Robertson MP, Minister for Energy and Water Utilities and for the opportunity to provide feedback on the draft report enclosed with your letter.

Officers of the Department of Environment and Resource Management have been liaising with officers of the QWC on this matter. To this end, feedback has been provided by those officers to QWC on the draft report.

This feedback can be summarised in the three recommendations below:

1. To assist in providing further clarity around the assessment of the three short term scenarios and therefore further support the report's conclusions and recommendation of the 25% drawdown – it is recommended to include further critiquing, in that part of the report (page 12), of the risks associated with the 50% Wivenhoe Dam scenario.
2. To assist in how the assessment and analysis in the report makes the case consistent with its recommendations – it is recommended that you consider re-presenting the Figures 3 and 4 to show the impacts of 100%, 75% and 50% on Grid 12 combined storage and Wivenhoe storage levels, together with realigning the time period used in the modelling to commence February 2011. This may provide a more readily understandable illustration of the three scenarios.
3. It may also be beneficial to emphasise the importance and role of Wivenhoe Dam in maintaining water services to much of the Brisbane area.

I trust that this feedback is of assistance to the QWC in finalising their report.

Should you have any further enquiries, please do not hesitate to contact Ms Debbie Best, Deputy Director-General of the department on telephone [REDACTED]

Yours sincerely

[REDACTED]
John Bradley
Director-General

Level 13
400 George Street Brisbane Qld 4000
GPO Box 2454 Brisbane
Queensland 4001 Australia
Telephone + 61 7 3330 6301
Facsimile + 61 7 3330 6306
Website www.derm.qld.gov.au
ABN 46 640 294 485

22 March 2011

Ms Karen Waldman
Chief Executive Officer
Queensland Water Commission
PO Box 15087
CITY EAST QLD 4002

By Email

Dear Ms Waldman,

Draft Impacts on SEQ Water Strategy Various Operating Scenarios for Wivenhoe Dam report

I refer to your letter dated 14 February 2011 which enclosed a draft copy of the *Impacts on SEQ Water Strategy Various Operating Scenarios for Wivenhoe Dam report (Report)* (Version 6). Your letter sought Seqwater's feedback on the Report.

Seqwater is willing to provide the Commission with advice and assistance in respect of flood modelling and flood event data to the extent that an assessment of flood mitigation impacts bears upon:

- the finalisation of the draft Report;
- any consideration by the Commission for the State of a policy to permanently adjust the full supply level (**FSL**) of Wivenhoe Dam; and
- any review of the *SEQ Water Strategy 2010* and associated SEQ System Operating Plan.

Seqwater acknowledges that it has an advisory role in providing such flood mitigation advice concerning its assets as may be requested by the Commission or State.

As you may be aware, Seqwater has previously provided the Department of Environment and Resource Management (**DERM**) with simulation modelling in order to support it in its consideration of the appropriate FSL for Wivenhoe Dam. A copy of our correspondence to DERM dated 7 February 2011 is attached.

It is Seqwater's view, however, that it is beyond the scope of Seqwater's function to comment on the water supply security implications of the scenarios presented in the Report other than to provide comment and modelling on the respective flood mitigation impacts of those scenarios. Please contact Ms Alex Fisher directly on Tel. [REDACTED] in order to progress this matter.

As the operator of the Wivenhoe Dam, Seqwater is subject to the operational rules and procedures specified in the Moreton Resource Operations Plan (**ROP**) and, during flood events, the flood mitigation manual for Wivenhoe and Somerset Dams (**Manual**).

The ROP, promulgated by the State, specifies the FSL for Wivenhoe Dam.

Both the ROP and the Manual, which is approved by the State, are predicated on a policy of restricting releases below Wivenhoe Dam's FSL.

Any permanent change to the FSL of Wivenhoe Dam would require changes to the ROP and the Manual.

Extension of time for Interim Supply Security Level

As you are aware, the Minister announced on 13 February 2011 that the water storage level of Wivenhoe Dam was to be reduced to 75% of its FSL until the end of the current wet season. Following an amendment to the ROP, Seqwater sought and obtained approval from the Chief Executive of the DERM for an Interim Program to override the operational procedures contained in the ROP, in order that Seqwater be authorised to undertake releases, on specified terms:

- to reduce the water storage level in Wivenhoe Dam to an "Interim Security Supply Level" being 75% of its FSL from 20 February 2011; and
- to return the dam to the Interim Security Supply Level where inflows occur after the initial reduction, until 31 March 2011.

The relevant authorisation under the approved Interim Program is accordingly due to expire on 31 March 2011.

Seqwater is considering whether to commence discussions with the State regarding an extension to the period that Wivenhoe Dam be kept at the Interim Security Supply Level. The extension of time, if proposed, would be for the period **1 April 2011 to 30 June 2011**.

In view of the dual functionality of the Wivenhoe Dam storage, as both water supply storage and providing capacity for flood mitigation, Seqwater would only progress discussions with the State regarding a further extension of time to the current requirements under the Interim Program on receiving advice from the SEQ Water Grid Manager in relation to short term security, and the Commission in relation to long term security, that such an extension in time would not impact unfavourably on water supply security in SEQ.

Accordingly, Seqwater requests advice from the Commission whether it would object to an extension of time to the temporary draw down to 75% of FSL in Wivenhoe Dam until 30 June 2011. We request that your advice be provided by midday on Monday, 28 March 2011.

Seqwater has also sought similar advice from the SEQ Water Grid Manager.

Subject to receiving confirmation of supply security in this further advice, Seqwater would consult the Chief Executive of the Department of Environment and Resource Management to ascertain whether he would be likely to approve an extension to the present arrangements under the Interim Program for the Interim Security Supply Level at Wivenhoe Dam to be continued to 30 June 2011. Such an approach to DERM would only be made in circumstances where both the SEQ Water Grid Manager and the Commission have no objection to such a proposal from a water supply security perspective.

Yours sincerely,



Peter Borrows
Chief Executive Officer

Attach.

7 February 2011



Mr John Bradley
Director General
Department of Environment and Resource Management
Level 13
400 George Street
BRISBANE QLD 4000

Dear John,

Impact of Reducing the Full Supply Level of Wivenhoe Dam on Flood Discharges

I refer to correspondence from The Honourable Stephen Robertson MP, Minister for Natural Resources, Mines and Energy, and Minister for Trade, dated 20 January 2011. I confirm that, as requested, Seqwater has undertaken further simulation modelling to assist DERM in its consideration of the appropriate Full Supply Level (FSL) for Wivenhoe Dam. The purpose of the modelling is to provide information to assist DERM in formulating a policy position by providing an indicative assessment of a range of FSLs and pre-release strategies to pre-emptively reduce the FSL of Wivenhoe Dam.

I enclose a memorandum *Impact of Reducing the Full Supply Level of Wivenhoe Dam on Flood Discharges*, which provides a summary of Seqwater's preliminary assessment into the impact of reducing the initial storage level of Wivenhoe Dam on the downstream discharges for major flood events. A number of scenarios are presented in the memorandum for consideration by DERM in determining, from a policy perspective, whether the FSLs for Wivenhoe Dam should be changed.

The scenarios presented in the memorandum provide an approximate analysis to help inform discussion and for further consideration by DERM. The review is intended only to provide an order of magnitude assessment of impacts and the results should not be utilised beyond that purpose. More accurate estimates would require a detailed investigation and analysis of the entire river system utilising multiple flood events and a combination of hydrologic, hydraulic, and routing models.

The analysis is based upon computer modelling of simulated gate opening sequences specified in the Flood Mitigation Manual during a "loss of communications" scenario. For the reasons noted in section 2 of the enclosed memorandum, while this scenario provides a consistent means of comparing the efficacy of different mitigation options, the actual degree of flood reduction achievable is dependent on the characteristics of the specific event. The model utilised adopts flood inflows that have been derived from an analysis of past historic events, in combination with design hydrographs developed previously for design and planning purposes by the Wivenhoe Alliance (2005).

The applicable assumptions for the modelled options, presented in section 2 of the memorandum, apply equally to the scenario set out in the correspondence from Seqwater's Chairman, Phil Hennessy, to Minister Robertson, dated 4 February 2011.

Yours sincerely,

Peter Borrows
Chief Executive Officer

Encl.

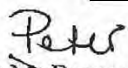


Our ref: ME/11/0179

25 MAR 2011

Mr Peter Borrows
Chief Executive Officer
Seqwater
PO Box 16146
City East QLD 4002

By email to: [REDACTED]


Dear Mr ~~Borrows~~

Thank you for your letter of 22 March 2011 including your request for advice on a proposed extension to the period that Wivenhoe Dam be kept at the Interim Security Supply Level from 1 April 2011 to 30 June 2011.

The Queensland Water Commission has no objection to this proposal as a temporary measure. Our analysis of the total grid capacity shows that the impact on water security by the extension of time is compliant with the South East Queensland System Operating Plan Risk Criteria.

It should be noted that operational and regulatory impacts such as potential increased pumping costs have not been assessed. Advice from the responsible agency or entity would need to also be considered.

If you would like to further discuss these matters or require any information, please contact Mr Tad Bagdon, Acting General Manager, Regional Planning and Policy on [REDACTED]

Yours sincerely


Ms Karen Waldman
Chief Executive Officer