

Queensland Floods Commission of Inquiry.

PO Box 1738
Brisbane QLD 4001

Submitter; **Zanows Sand and Gravel P/L.**

And

Zanows Concrete P/L

And

Related Zanow Entities.

Submission Date; 10th March, 2011.

QFI Terms of Reference.

This submission relates to the following terms of reference item.

e) Adequacy of forecasts and early warning systems particularly as they related to the flooding events in Toowoomba, and the Lockyer and Brisbane Valleys.

f) Implementation of the systems operation plans for the dams across the state and in particular the Wivenhoe and Somerset release strategy and an assessment of compliance with, and the suitability of the operational procedures relating to flood mitigation and dam safety.

Executive Summary.

The Zanow family own substantial property and business interests situated on the flood plains of the Bremer and Brisbane river valleys below Wivenhoe Dam. Early 2010, Zanow's became concerned with the near full capacities of the Wivenhoe and Somerset dam systems and knew with the next wet season, flood releases would be most probable. During 2010, Zanow lobbied SEQ Water on 3 issues.

1. A direct line of communication regarding water releases
2. Reduction of the FSL of Wivenhoe dam during high potential rainfall periods to increase the flood storage compartment.
3. Slower reduction in gate releases to reduce bank slump.

Point 1 was eventually addressed; point 3 is still an area of contention, with point 2 being ignored.

At a meeting with SEQ Water on Friday 10th December, 2010 the issue of "Reduction of the FSL of Wivenhoe dam during high potential rainfall periods to increase the flood storage compartment" was discussed. Mr Robert Drury, a SEQ Water manager at the meeting was of the opinion that reducing the full storage level to 70 to 80% would not have a marked effect on the flood storage capacity of the Wivenhoe Dam. They also advised that a change of legislation would be required to release the drinking water compartment to a volume less than 100% following a flood event. These comments were disappointing, given the detailed information and explanation given. Our calculations showed a flood event could be mitigated better with more flood storage capacity. The minutes of this meeting are available upon request.

During previous flood events before the January 2011 event, our losses have been minimal; however, interests have been severely affected by the January 2011 flood to the value of approximately \$9,000,000.00.

It is our belief that the sudden, panicked release of stored floodwater from the Wivenhoe dam late on Tuesday, 11th January, 2011 led to the flooding of our businesses and properties causing this damage. Our advice and request presented to SEQ Water on the 10th December 2010 regarding reduction of the FSL was ignored. Should the reduction to 75% FSL and occurred before the January flood, it would have drastically reduced the impact on the Zanows business. As such, we hold SEQ Water, flood operations accountable for this damage.

This submission gives detailed information supporting this claim, including SEQ Water and BoM information, dam heights and time lines relating to the event.

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INTRODUCTION.

The Zanow family operate a large Sand, Gravel and Concrete operation situated at 1630 Brisbane Valley Highway Fernvale. This business is considered a major Extractive industries, Concrete manufacture and Transport business within the quarrying industry. The site is located on the Southern Bank of the Mid Brisbane River approximately 17 kilometres downstream of the Wivenhoe Dam wall and 15 kilometres downstream of the uncontrolled Lockyer Creek intersection with the Brisbane River.

The Zanows operation was established at this site in 1996 and since then has gained all necessary approvals for all activities carried out on the site. The site had been quarried by previous operators dating back to the early 1970's.

The current activities include the following.

1. Extraction, Screening and washing of alluvial sand and gravel.
2. Crushing and sizing of alluvial gravel materials
3. Concrete Batching and delivery of ready mixed concrete
4. Transport of sand, gravel and soil materials.
5. Extraction, screening and blending of soil products.
6. Ancillary activities including workshop, refuelling and office facilities

Before the January 2011 flood, this operation employed 40 fulltime staff and many other casual and support staff with the majority working from the Fernvale quarry site. By the very nature of this industry, it is essential that the operation be located close to the raw product extracted from the Brisbane River Alluvium, thus the business infrastructure is located within the flood plain on the high bank of the Brisbane River.

Since establishing onsite, there has been a major investment of infrastructure necessary to enable the business to expand to its current capacity which in dollar terms has a gross income of around \$13,000,000.00 per annum.

The quarry sustained major damage as a result of the release of flood water from the Wivenhoe Dam during the January 2011 floods. To add to this, around 12 of our staff had to be dismissed due to no work caused by flood damage.

Apart from industrial, commercial, rural and residential properties, the Zanow family interests also include a large property on the banks of the Bremer River at North Booval in Ipswich. Considerable resources have been invested to make ready an application for material change of use from special purposes to subdivide 10 hectares into medium density house lots. Approximately 9 hectares of the 10 hectare parcel of land was inundated by this flood. The total 10 hectares was above the nominated Q100 flood level at this site of 16.35 metres. Zanows also operate another extractive industry on the Buaraba Creek at Coominya which feeds specialised sand and gravel to the main quarry operation at Fernvale. Whilst this site sustained minor damage during the January flood, it has not been able to operate as the extracted material from this site is processed at the Fernvale site, thus no extraction has taken place.

The Zanow family business interests are owned by Vivian and his brother Desmond along with Vivian's 2 sons Bradley and Darren. Whilst maintaining a keen interest in their semi-retirement, Bradley and Darren now manage the family affairs with particular control of the Zanows primary business, the sand, gravel and concrete operation at Fernvale.

It is our opinion that SEQ water did not respond to our request to lower the FSL of the dam before the flood event. Further more, it is our opinion that SEQ Water did not manage the release to minimise downstream flooding. This is evident in the fact the major Wivenhoe release on Tuesday was a major panicked release which combined with the Lockyer water peak which meant a river level higher than the 1974 event at our Fernvale site.

SEQ WATER AND ZANOWS RELATIONSHIP.

Whilst various matters have been discussed in the past with SEQ Water, the relationship has at times been strained. From March, 2010 a series of communication began involving letters, e-mail correspondence, a meeting and telephone calls. The requests made were mostly to no avail. During this time, we had no satisfaction obtaining a copy of flood release procedures and a direct line of communication with Wivenhoe dam, so information could be shared regarding water releases, allowing us to take appropriate action. This information is vital to ensure our emergency flood action plans could be implemented in a timely manner to limit damage to our business in all respects.

After researching statistics available regarding dam capacity, area of watershed within the catchment including the Lockyer and Brisbane river systems and calculating possible flood peak scenarios, it was decided to pursue this issue as a matter of urgency to gain some communication and better understanding of how flood water is released. As a result, I phoned and asked to speak with Peter Burrows on the 7th October, 2010. The receptionist and I had a heated conversation after she refused my request to talk to Peter Burrows. The receptionist kept telling me to listen to the media reports. I informed her reports were inaccurate. I outlined that local radio station River

949 were broadcasting the Fernvale bridge was "going to be cut" which was later proven not to be the case. After much meaningless discussion, the receptionist put me through to "Arnu" and I once again asked to speak to Peter Burrows to which she denied my request. I told her to tell Peter Burrows "I hold him legally responsible should he release water and flood us". They just continually told me to listen to media reports. A copy of the correspondence with SEQ Water is available upon request. On the same day in a telephone conversation with Mr Rob Drury, (Wivenhoe Dam Manager) he advised that SEQ Water would not take on the role of advice to downstream land owners. I told Rob that if "he floods us out I hold them legally responsible if I sustain damage". He would get someone to ring me back. After venting my frustration to various parties, we accepted an invitation from the mid Brisbane river irrigators to attend a meeting with SEQ Water at 9.00am, Friday 10th December, 2010.

I notice in the release procedures manual, page 16, section 6.3 states....

Release of Information to the Public. Seqwater is responsible for the issue of information regarding storage conditions and current and proposed releases from the dams to the public and the media.

During this meeting, Zanows and the MBRI discussed 3 main issues.

- 1 A direct line of communication regarding water releases
- 2 Reduction of the FSL of Wivenhoe dam during high potential rainfall periods to increase the flood storage compartment.
- 3 Slower reduction in gate releases to reduce bank slump.

Firstly the communication issue was discussed to which SEQ Water was still not taking any responsibility for informing us. They only wanted to tell council and in turn tell us. We outlined that this was a totally unacceptable situation for many reasons including the main reason of time. An 1800 number for people to ring was proposed. It was evident SEQ Water wanted to do the least work possible in terms of information sharing. We then turned our attention to hydraulic drawdown issues and the huge amount of environmental damage reducing flood water volumes had on bank slump. Mr Rob Drury informed us that the reduction in release was determined from their modelling of 5 natural events to which they reduce releases to suit. Brad Zanow then asked if SEQ Water had considered reducing the full storage level during the monsoon season to give more flood storage to help reduce the peak flooding. Brad explained his ideas in detail. He explained that people do not use as much water as they previously did, and we now have a billion dollar water grid which is sitting idle as well as Wyaralong dam which was near completion. As part of his explanation he outlined that there is a huge catchment which if it had a lot of rain, the dam would be at 200% in no time. Mr Rob Drury was of the opinion that reducing the FSL to 70 to 80% would not have a marked effect on the flood storage capacity of the Wivenhoe Dam. They also advised that a change of legislation would be required to release the drinking water compartment to a volume less than 100% following a flood event. These comments were disappointing, given we advised our calculations showed a flood event could be mitigated better with more flood storage capacity. The minutes of this meeting are attached and marked *Attachment A*.

Brad and I had run some simple mathematics after the October event. We were alarmed with the results. Given there is over 7000 square kilometres of catchment above the dam, should we get a cyclone and it dump 175mm of rain and assuming all of it runs off, even if the dam was at 100% to start with, the dams flood storage would be totally occupied. It was further alarming to us given we had no idea what triggers releases and how much would be released. Furthermore, there was 7 cyclones and heavy rain forecast along with a SOI of 20 and a strong lamina weather pattern. Having been associated with the rivers all our life, we were very worried.

Given the speed at which our business could be affected by flood releases, in most cases less than 2 hours, we got limited satisfaction from the meeting regarding communication. Soon after the meeting, there was an establishment of a data base of e-mail addresses of land owners downstream of the dam. The only way I was able to get timely and accurate information was when Mr Graham Keegan (water engineer, SEQ Water) began to send out e-mails to the Mid Brisbane River Irrigators of which we became a member. At this point I would like to acknowledge the excellent job Graham has done in informing us of the releases and volumes since this communication was established. Should we not have this information; Zanows would be many millions of dollars worse off today. Graham is a shining example of what can be achieved with cooperation. For his efforts during our darkest hours he should be awarded.

Flood History.

The business has experienced many flooding events since 1996 including larger events in 1999 and 2010. During this time, we have learnt to be very vigilant of the weather, dam operation and storage capacities, Brisbane River and its relationships with the Lockyer creek and Bremer River. Both Vivian and Desmond Zanow talk periodically about the 1974 event and its effect on these tributaries. Both brothers have been associated with these rivers all of their life. Vivian is 84 years old, and Desmond 76.

As part of our development applications at the Fernvale quarry site, 2 hydrological studies were undertaken to look at the relationship the quarry has with the riverine environment. These studies also included other parameters including potential flood events. The North Booval site has also had 2 Hydrological studies conducted to determine building allotment heights, primary flow paths and bank stability issues. The Coominya Site has also had extensive hydrological investigation as part of the Development application process and subsequent approval.

Having studied Hydraulics as part of my tertiary studies, I have taken a particularly keen interest in the Geology of the Brisbane and Bremer river environs and its relationship with Riverine environments, its Hydrological processes and in particular water management and flooding. This has extended to the operation of the Wivenhoe and Somerset Dams.

Since being given timely advice for the December, 2010 event, our flood strategy worked well and we were able to minimise damage to our Fernvale site. This was due to the advice given via e-mail from Graham Keegan.

Given our long history of association with these river environments, the Zanow family take seriously the threat of flooding and its potential effect on our business. This has come to bear given the event on the 11th January, 2011.

CRITICAL WATER LEVEL TRIGGERS.

Past flood events, Geotechnical reports, Hydrological reports, local knowledge, site constraints and economic considerations were taken into account when establishing our extractive industries business at the Fernvale site. This allowed us to establish how flooding would effect our operation in all respects in relation to Wivenhoe dam discharge combined with Lockyer creek discharge, to ascertain a total discharge in cubic metres per second past the quarry site.

A very important consideration in quarrying is economics. Quarrying is known for its high turnover, low margin economics and given the raw resource is the river alluvium; economically a business must be located close to this raw resource.

The triggers of water volume in Cubic Metres per second in the Brisbane River at the quarry, along with its direct economic effect should these volumes be exceeded are represented in the table below.

Quarry Situation	Volume Trigger	Cost to Rectify
Eastern Extraction Pit, Schmidt Pit	420 CuMecs	\$26,000.00
Western Extraction Pit, Without levy in place	750 CuMecs	\$110,000.00
Western Extraction Pit, With levy in place	1850 CuMecs	\$145,000.00
Sand and Gravel Processing Plant, Production Stopped, limited damage	1600 CuMecs	\$18,000.00
Gravel Crushing Plant, Production Stopped, Limited damage	1550 CuMecs	\$15,000.00
Sand and Gravel Processing Plant, Production Stopped, moderate damage	2000 CuMecs	\$55,000.00
Gravel Crushing Plant, Production Stopped, moderate damage	2200 CuMecs	\$68,000.00
Sand and Gravel Processing Plant, Production Stopped, Major damage	3350 CuMecs	\$450,000.00
Gravel Crushing Plant, Production Stopped, Major damage	2300 CuMecs	\$650,000.00
Sand and Gravel Processing Plant, Production Stopped, Total Inundation	8200 CuMecs	\$2,000,000.00
Gravel Crushing Plant, Production Stopped, Total Inundation	6500 CuMecs	\$800,000.00
Energex Power Infrastructure Damage, Transformers and Wires	2100 CuMecs	Not Known
Workshop Infrastructure	4000 CuMecs	\$385,000.00
Concrete Plant, Minor Inundation, Stopped Production	3900 CuMecs	\$85,000.00
Concrete Plant, moderate Inundation, Stopped Production	4500 CuMecs	\$350,000.00
Concrete Plant, Major Inundation, Stopped Production	CuMecs	\$450,000.00
Offices and Weighbridge Infrastructure	3950 CuMecs	\$300,000.00
Ancillary Processing Equipment, Screen Grizzly, Total Inundation	1800 CuMecs	\$2,500.00
Soils Operation, Partial Inundation	3650 CuMecs	\$340,000.00
Processed material Stockpiles, Various levels, Total Inundation	1850 CuMecs	\$3,000,000.00

Whilst the levels a total discharge is kept to relate to many parameters, Traditionally, a level of around 1750 Cubic metres per second seems to have been adopted by SEQ Water as a maximum total discharge past the site in a normal flooding event. When the Levy bank is in place in the Western Extraction, water does not enter this extraction, and therefore does not flood the Southern approaches of the Brisbane Valley Highway adjacent to our current workings. Should the levy bank not be in place, both the highway and the extraction would be flooded. The Highway would be flooded to a depth of approximately 350mm and the extraction would be flooded to a depth of around 20 metres. This area of the Brisbane Valley Highway floods before the Tim Fischer Bridge. It is accepted that the deck of the Geoff Fisher Bridge will become inundated at a flow rate of around 2000 Cubic metres per second.

THE JANUARY 2011 FLOOD EVENT.

On Wednesday the 5th January, Graham Keegan, (Wivenhoe Dam Engineer) had sent the MBRI (Mid Brisbane River Irrigators Association) an email stating *"BoM has released a severe weather warning for rainfall commencing tonight over SE Qld. Significant totals of 100 to 200mm may occur during the next few days. Somerset and Wivenhoe Dams are still above FSL and rising slowly due to continuing base flows from their catchments. As the catchments are still wet (low expected initial losses) it is likely that we will be releasing flood waters in the near future if BoM's forecasts are accurate. Please be prepared. We will keep you up to date with our plans as this event develops"*.

I responded to Graham thanking him for the advice and asking if he anticipated if there would be a release before the rain event?. Graham responded by saying there is a possibility as Wivenhoe is nearing its "trigger level" so early inflows could force early gate operations.

At 12.33pm Thursday 6th January, 2011 Graham sent an Update which read; *"We will commence releases via the Wivenhoe Dam gates from 1800hrs (6PM) tonight. At present our plan is to increase the flow to 250cumecs by 2200hrs (10PM) and to keep high level crossings such as Burton's Bridge open for as long as possible."*

This is dependant upon development of the current rainfall event. Note that BoM forecast is for rain up until Tuesday next week. Larger inflows will translate to larger releases.

Lockyer Creek is still flowing and rising at various monitoring stations along the creek.

We will provide further updates as necessary. Don't forget the websites and 1800 number."

This email was updated later that day at 4.39pm to read. *"The flooding situation has deteriorated since my last email."*

Lockyer Creek is rising at present and estimates indicate a peak of approx 600 to 700cumecs at O'Reilly's Weir late tomorrow. This will close all crossings except Fernvale and Mt Crosby Weir bridges. Burton's Bridge will be submerged again – possibly early Saturday morning.

The upper Brisbane River is reaching "moderate" flood levels. Somerset Dam's catchment is receiving rainfall but serious flooding is only occurring in the Kilcoy Creek zone at present. Both Wivenhoe and Somerset Dams are rising.

Contrary to the previous email and providing the weather does not change significantly, we do not expect to commence releases from Wivenhoe Dam until the Lockyer Creek peak passes O'Reilly's Weir late tomorrow. Our maximum release rate will again reach similar levels to the last release.

Expect crossings to be submerged for a couple of days again. We'll update the situation when we have further information".

At 10.56am Friday, 7th January, 2011, Graham advised; *"Lockyer Creek is beginning to peak at O'Reilly's Weir. High level crossings (except Fernvale and Mt Crosby Weir bridges) will be submerged later today.*

As we expect heavy rainfall from Sunday to Tuesday (BoM predictions) we will begin releasing flood water from Wivenhoe Dam at 3PM today. Release rate will initially reach 1200cumecs; but may be increased to 1500cumecs rapidly if conditions deteriorate in the catchments. At present we expect to hold the peak rate for a couple of days and continue releasing until the end of the week.

Somerset Dam will also be releasing into Wivenhoe Dam at this time.

We'll keep you informed of our plans. Don't forget the websites and 1800 number'.

It was obvious to me at this point in time FOC had adopted the same strategy used in all previous flood events. This strategy is to wait until the peak of the Lockyer had passed, and then release to the level the flood manual strategizes in W1 to W4. In this instance strategy W1D to W1E was initiated.

At this time the dam levels were below the trigger of 68.5 which is the next trigger to move to strategy W2.

On 10.56am, Friday 7th January, 2011 the following was received from Graham Keegan; *"Lockyer Creek is beginning to peak at O'Reilly's Weir. High level crossings (except Fernvale and Mt Crosby Weir bridges) will be submerged later today.*

As we expect heavy rainfall from Sunday to Tuesday (BoM predictions) we will begin releasing flood water from Wivenhoe Dam at 3PM today. Release rate will initially reach 1200cumecs; but may be increased to 1500cumecs rapidly if conditions deteriorate in the catchments. At present we expect to hold the peak rate for a couple of days and continue releasing until the end of the week.

Somerset Dam will also be releasing into Wivenhoe Dam at this time.

We'll keep you informed of our plans. Don't forget the websites and 1800 number".

At 7.11am, Saturday 8th January, the dam level reached 68.5 which triggered W2, the transition Strategy and W3.

I received a severe weather alert from EWN at 11.25am, Saturday, 8th January, 2011. The alert said *"QLD Severe Weather; Heavy rain & localised*

flash flooding. SE Coast & Wide Bay/Burnett at risk from later today, Sunday, Monday and into Tuesday.

At 8.26pm, Saturday 8th January, 2011, an email from /graham Keegan was received which read; *"Current releases from Wivenhoe Dam are 1250cumecs. Our aim tonight is to keep to a maximum flow of 1600cumecs in the mid-Brisbane River (including Lockyer Creek). Without changes to weather conditions, crossings are expected to be affected until Wednesday 12/01.*

The current BoM Severe Weather Warning predicts the return of rainfall tonight (radar is indicating rain bands moving onto the northern NSW coast at present). Forecast for the next 4 days is for significant rainfall across SE QLD. Possible scenarios include a reduction in release rate to accommodate potential flooding in the Bremer River; however they also include larger releases from Wivenhoe Dam if heavy rainfall strikes our catchments. Releases may then extend to the week-end or later.

We'll keep you updated as events develop. Don't forget the websites and 1800 number".

I responded from my iphone *"Let's hope not..... It would be a very devastating situation for us!*

Graham responded by saying..... *"I was trying not to alarm you, but that is what the word "however" is warning of. If we do keep peak flow rate in the river to 1800cumecs, bridges remain open – Mt Crosby Weir Bridge is submerged at 1900cumecs, while Fernvale Bridge is 2100cumecs.*

The FOC is concerned about the BoM forecasts; if we actually receive what they predict (or even exceed it) then the situation could be worse. Unfortunately we don't know until the system develops."

It is evident that FOC is watching the event unfold. During Saturday and into Sunday the inflow seemed to equal the outflow. It would have been possible to increase the releases under strategies W2 or W3 whereby the dam could have been released at a level of up to total 3500 cubic metres and 4000 cubic metres per second. The trigger for this strategy had been reached the same morning with rain predicted which eventually began to fall heavily onto the catchment very early Sunday morning. The flood compartment volume at this time was around 200,000 mega litres. Had a higher release rate been adopted at 8.00am on Saturday morning, say increased by 1500 cubic metres per second to 3000 for the period from 8.00am Saturday until midday Sunday, and edged up Sunday morning as the peak of the Lockyer passed the dam level at 1.00pm Sunday would have been around 100%, therefore an empty flood compartment. Instead, the water was edged up only to compensate for the passing of the Lockyer. This strategy would have allowed draining of the flood compartment within 7 days.

This I believe was a serious error of judgement by the FOC, given the severity of the warnings and the flood compartment being maintained not drained.

On Sunday, 9th January, 2011 there was an extreme rainfall event in the headwaters of the Brisbane River. By 9.30pm on Sunday night there was over 10,000 cubic metres per second of water entering the Wivenhoe and Somerset dams? At lunch time on this day, I received a phone call from friends in the upper Brisbane warning of a huge flood and the need for us to get our equipment high and dry. Stage 2 of our flood strategy was enacted at 7.30pm.

At 8.33pm, Sunday 9th January, 2011, Graham Keegan wrote; *"Current releases from Wivenhoe Dam are 1400cumecs. Our aim is to keep to a maximum flow of 1600cumecs in the mid-Brisbane River for the next 24 hours if possible. We may reduce the release as Lockyer Creek flooding increases. At present river crossings are expected to be closed until Saturday 15/01 if conditions don't deteriorate further.*

However, please note that we are experiencing major flooding in our catchments. Inflows are approx 5000cumecs in the upper-Brisbane river and 3000cumecs in the Stanley River system, with rainfall continuing.

The current BoM Severe Weather Warning predicts heavy rainfall until Tuesday. If these totals eventuate in the next 12 to 24 hours, higher releases from Wivenhoe Dam will be necessary. Fernvale and Mt Crosby Weir Bridges may be affected as early as Tuesday morning.

We'll keep you updated as events develop. Don't forget the websites and 1800 number".

This was alarming and more staff was called in to help with the efforts at the quarry. 5 staff was now onsite with 1 staff member dedicated to reviewing weather data.

Graham sent another e-mail at 10.27pm, Sunday 9th January, 2011. It read;

Darren,

Sorry, but this is bad news!

The FOC has provided another update at 2100hrs. Rivers are still rising and inflow rates increasing – currently 6700cumecs in upper-Brisbane and 4000cumecs in Stanley River. These rates may increase with further rainfall.

Releases from Wivenhoe Dam will increase from midday tomorrow and rise to 2600cumecs during Tuesday morning. Peak release rate will be kept below 3500cumecs, with higher flow rates in the lower Brisbane River. The aim now is to drain Wivenhoe Dam, but minimize flood impacts in urban areas.

10700 cubic metres was a huge inflow.

I contacted Graham by phone to try and ascertain what the river height would be at the quarry when the target was reached of 2600 cubic metres per

second and increase to 3600. We knew we had to immediately equalize the western extraction beside the Brisbane Valley Highway. During the past we kept flood events of less than 1800 cubic metres per second out of the extraction by construction a levy bank. This also kept water off the highway on the eastern side of Fernvale adjacent to our extraction. I let Graham know that by 4.00am the water would cut the highway at this point. Whilst the Fernvale Bridge deck has an immunity of around 2000 cubic metres per second, the eastern approach goes under at around 1750 cubic metres per second. The past events over 1750 cubic metres per second did not close the highway as we kept the water off the road with our levy bank. Graham was kind enough to have a look at previous events to try and ascertain a height at the quarry. Graham wrote, at 1.11am Monday 10th January, 2011;

"Darren,

I have looked through the DERM website. Their discharge – height data indicates the following historical flows at Savage's crossing:

Year	Height (m)	Flow rate (cumecs)
1974	23.79	7393
1968	16.12	3363
1971	14.68	2779
1996	12.58	2019
1999	11.40	1639
1992	10.00	1239
1982	9.08	1006.

It looks like the river will reach around the 16.25m mark for a flow of 3500cumecs.

I thanked Graham for this data which helped us prioritize our evacuation. At this time I went to the western extraction. Water had already begun to breach the levy, and by 7.30am the extraction was full. At 6.20am Monday 10th January, 2011 Graham sent the following e-mail;

"Darren,

Good luck with everything.

I have just been to the Fernvale Bridge. You were correct about the area at Wivenhoe Pocket Road intersection. Water is deeper there than Shine's Gully – bridge deck is still well clear."

I was glad Graham could see for himself that our levy bank did help keep water off the highway in previous events. In December, whilst being deployed for another purpose onsite, I instructed our Surveyor to survey the area to gain a better understanding of how the water would affect the highway.

Earlier, at 3.25am Monday 10th January, 2011 Graham Wrote;

"We have experienced a rapid increase in river levels and inflow rates in the upper-Brisbane River. As an example the peak flow at Gregor's Creek station (near Toogoolawah) is similar

to the 1974 peak flow at Savage's crossing (combination of Brisbane River, Lockyer Creek and Somerset Dam releases at that time). The Stanley River is also experiencing major flooding. Flow rates in both rivers may increase if predicted rainfall occurs.

Flood water and releases began to affect Fernvale Bridge before mid-night. Mt Crosby Weir Bridge was closed at the same time.

Increases in Wivenhoe Dam release rates began at 0200hrs this morning. Initial target is 2600cumecs, and potential peak rate is 3500cumecs. The release is now expected to continue until at least Sunday 16/01.

By later that morning our stage 2 evacuation had been completed. At this point we watched as the dam increased by around 5% capacity per hour. Stage 3 of our evacuation began at 4.00pm and lasted until 10.30pm. It was early afternoon we got word of the major flash flooding in Toowoomba and the Lockyer valley. We knew this water would have to come past at around this time tomorrow afternoon and with capacity quickly running out in the dam, a true picture was emerging of what was about to happen if more rain fell into the dams catchment.

At 2.42am on Tuesday 11th January, 2011 Graham wrote; "Current release rate is 2730cumecs. River heights at various gauging stations are: Lowood 15.89m, Savage's Crossing 15.77m, Burton's Bridge 12.16m and Mt Crosby Weir 15.68m.

FOC and BoM are still investigating the Lockyer Creek flash flood. If necessary (or possible) the release rate will be modified to moderate effects in the mid-Brisbane River zone. At present the peak appears to have passed Glenore Grove around mid-night but no significant rise has occurred at lower Lockyer gauging stations.

The overall strategy of maintaining the lower Brisbane River at a peak flow of 4000cumecs has not changed".

I arrived to work early. 5.00am it started and it finished at lunch time that day. 400mm of rain at Fernvale and up into the catchment. At this point, (6.30am) I lost all communication other than my iphone. Whilst most of our critical infrastructure, Workshop, Offices, Concrete plant, major power installations etc has immunity from flooding to a level of around 3800 cubic metres per second, we knew it was going to exceed that level. We got everything we could out with only 5 men. By lunch time the site was inundated and access cut off.

I received this email from Graham Keegan at 6.53am Tuesday 11th January, 2011. "The release remains at approx 2750cumecs. Current river levels are: Lowood 16.13m (rising), Savage's Crossing 16.19m (rising), Burton's Bridge 12.94m (rising) and Mt Crosby 16.23 (rising). O'Reilly's Weir was levelling off but is beginning to rise again. The creek is still rising at Lyon's Bridge.

FOC is attempting to maintain flows in the lower Brisbane River at 4000cumecs. However changes to conditions in the catchments will affect this. The upper-Brisbane River has experienced another major flood. We have reduced the flow from Somerset Dam to reduce

inflows into Wivenhoe Dam from that source. While FOC were examining the possibility of reducing the Wivenhoe Dam release to accommodate the Lockyer Creek increase, this is no longer an option. The river will rise along with Lockyer Creek; however we will attempt to maintain the Wivenhoe Dam release until the Lockyer Creek peak passes.

If the weather situation deteriorates further we may need to increase releases from the Dam and the new target flow in the lower Brisbane River will rise to 5000cumecs (including all streams). We are entering conditions where Dam Safety overrides other concerns – although minimisation of urban flooding remains very important”.

Please stay up-to-date with the BoM website, our website and the 1800 number”.

I knew we could only save as much as we could give the personnel constraints.

Whilst moving equipment to higher ground, I received the following email;
9.50am, Tuesday 11th January, 2011.

“The flood situation has moved into a critical phase as the lake is approaching our next trigger level. We began to increase releases at 8AM and will reach approx 3500cumecs by lunchtime today. Local run-off is exacerbating the situation and O'Reilly's Weir is rising also. Somerset Dam release has ceased.

At present communications with the FOC are difficult but it appears that river levels will raise significantly – no projections available yet. Current levels are: Lowood 17.05m (rising), Savage's Crossing 18.33m (rising), Burton's Bridge 14.82m (rising) and Mt Crosby Weir 16.76m (rising).

The FOC is constantly reviewing the situation and our operations. We will update ASAP, but in the meantime please check your options for re-location. Also listen to emergency services broadcasts for up-to-date situation reports. A severe weather alert is current for SE Qld and further falls of heavy rainfall appear likely.

At 10.00am on this morning there was still 1.65 metres of freeboard in the dam. Somerset had been closed off to hold back the Stanley. It is obvious strategy 4 was enacted. As it was raining heavily and the prediction was for it to continue, the release was increased progressively from 8.00am to a peak around 2.00am the next morning. When the next day came, the outflow was reduced and the dam levels increased.

FOC made a panic release which combined with the peak from the Lockyer. There was still some freeboard in the dam. Why did they not allow the fuse plug to go? This would have only added another 1800 cubic metres per second to the outflow, which could have been mitigated by closing a gate. The 4 strategy allows for the initiation of the plugs. If the flood compartment above 75.5 is not to be used, why include it in calculations and give the wrong impression that the dam has this flood compartment available.

This was the fundamental error FOC made during this event. They did not use the entire flood storage compartment. Wivenhoe peaked at just below 75 metres, over half a metre left until initiation of the fuse plugs.

The dam was built and rehashed to protect the structural integrity of the dam wall by the installation of the 3 fuse plugs. Had initiation of 1 or more fuse plugs were allowed, more of the flood compartment could have been utilized. Gate release could have been adjusted to compensate for this release.

At 5.05am, Wednesday 12th January 2011 the following email was received.

"The lake level in Wivenhoe Dam is receding very slowly and clearance to the fuse-plug trigger is increasing. We are reducing the release rate slowly – current rate is approx 4300cumecs; peak was approx 7500cumecs.

Peak river levels and current levels are:

	Peak	Current
Lowood	25.09m @ 2346hrs 11/01	24.37m (falling)
Savage's Crossing	24.13M @ 0132hrs 12/01	23.99m (falling)
Burton's Bridge		18.4m (rising)
Mt Crosby Weir	24.91m @ 0327hrs 12/01	24.84m (rising).

Levels in Lockyer Creek are also dropping – the reduction at Wivenhoe Dam will also permit Lockyer Creek to drain quicker.

We'll keep you updated on our operations".

The following email was received at 2.48pm, Thursday 13th January, 2011.

"We have begun to increase the release rate from Wivenhoe Dam. Target flow is a total of 3500cumecs at Moggill (downstream of the Bremer river junction with the Brisbane River). The increase commenced at 1300hrs (1PM) today and will rise to approx 2800cumecs by 6PM tonight. Inflows from Lockyer Creek, Bremer River and other minor streams continue.

As the Lockyer Creek peak has already passed Savage's Crossing, river rises will occur.

Current river levels are: Lowood 14.65m (falling), Savage's Crossing 14.59m (falling), Burton's Bridge (unreliable data) and Mt Crosby Weir 19.16m (falling).

Release will continue for approx 7days. Projections are unavailable for opening crossings".

CONCLUSION AND RECOMMENDATIONS

The strategy adopted to release water from the dam during the January 2011 floods was incorrect in the interpretation of the strategy W4, W4A and W4B and led excessive flooding downstream of Wivenhoe Dam. This is summarised by the following statements.

1. SEQ Water ignored our call to reduce the FSL of the dam to allow a greater flood storage compartment given the extreme wet season south east Queensland has been and was predicted to experience. As a result of the January floods, a reduction of the FSL to 75% has been adopted which is approximately equivalent to the controlled flood storage compartment lost when the fuse plug system was installed.

2. The flood water from the event on the Friday was not drained quickly enough on Saturday and Sunday in readiness for a fresh event. This could have been done within the bounds of strategy W2. Should this have been adopted, the flood compartment would have had 160,000 mega litres of additional storage for the Sunday and Tuesday events.
3. FOC panic released more water than necessary to avoid fuse plug initiation. While W4B was reached with the expectation the dam would initiate the fuse plugs, no consideration was given to the impact the water would have on downstream reaches even though the manual says **"In addition to dam safety issues, the impact of rapidly increasing discharge from the Wivenhoe Dam on downstream reaches should be considered when determining the rate of gate openings"**. The total volume of flood compartment, which still had around 15% to go at the height of the peak, was not used. It is not correct to say the dam was too full and dam safety was compromised as there are fuse plugs in place as protection from the possibility of the dam failing. Fuse plug initiation could have occurred to use more of the flood mitigation capacity further than the 15% still left in the dam without compromising its structural integrity. Only 1080,000 mega litres of flood storage was used, therefore 120,000 mega litres was freeboard.

It is these reasons we hold SEQ Water flood operations directly responsible for the damage incurred to our business.

Our recommendations are concluded from our practical knowledge of the Brisbane, Stanley and Bremer river flood runoff characteristics over a period of time from pre- 1974 event until now. The following changes should be made to maximise the flood mitigation potential of the Wivenhoe and Somerset Dams.

1. At least double the Flood Compartment of Wivenhoe Dam to increase storage capacity to allow operation to reduce peak flood flows downstream.
2. Redesign Wivenhoe Dam wall to withstand overtopping and increase freeboard height.
3. Replace Somerset Dam as it is nearing its effective life keeping in mind potential for increased flood mitigation potential in this catchment by reducing the drinking water compartment
4. Vary the FSL of the drinking compartment of both systems during known "wet weather periods" to further increase the available flood storage compartment
5. Implementation of a direct warning system to be maintained and managed by the dam operators using at least 3 modes of communication or warning. This is in accordance with current manual at 6.3, page 17.
6. Increased emphasis placed on actual rainfall events, catchment saturation percentage, forecast stream flows and rainfall forecasting to ascertain impact on dam levels as it is happening. This would give

potential to release before Lockyer and Bremer river inflows to the lower Brisbane River.

7. Establishment of more Telemetry stations upstream in the catchments to give earlier stream inflow data including upgrading current stations to ensure information is accurate and station is reliable in extreme flood events.
8. Amalgamate departments and implement systems for greater ease in information sharing in particular coordinating a warning system.

Should you wish any clarification regarding this submission, we can be contacted through our representative below.



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FLOOD DAMAGE PHOTOS.



Fernvale Quarry Offices. The peak flood height was over the power powerlines in the foreground.





The nucleus of the processing plants still under water. The peak flood height was over the power powerlines above the transformer.



Dragline, screening plant and office located above the nominated 1 in 100 flood line inundated 4 metres higher than the water level shown here



Substantial damage to fixed sand plant and concrete plant.





