Transcript of Proceedings

Issued subject to correction upon revision.

THE HONOURABLE JUSTICE C HOLMES, Commissioner

MR JAMES O'SULLIVAN AC, Deputy Commissioner
MR PHILLIP CUMMINS, Deputy Commissioner

MR P CALLAGHAN SC, Counsel Assisting
MS E WILSON, Counsel Assisting

IN THE MATTER OF THE COMMISSIONS OF INQUIRY ACT 1950

COMMISSIONS OF INQUIRY ORDER (No. 1) 2011

QUEENSLAND FLOODS COMMISSION OF INQUIRY

BRISBANE

..DATE 15/04/2011

..DAY 6

THE COMMISSION RESUMED AT 10.00 A.M.

TERRENCE ALWYN MALONE, CONTINUING:

COMMISSIONER: Yes, Mr Callaghan?

MR CALLAGHAN: Mr Malone, your Honour statement was tendered yesterday. Do you have it with you?-- I have a copy, yes.

I want to take you first of all to the attachment TM2, which is document referable to rainfall forecasting for the Wivenhoe Dam catchment. You exhibited that to your statement and have referred to it. I don't need to traverse what's been said there. What I'm interested in is - that document's dated July 2006 - how you understand the situation to have moved on in the almost five years since?-- I understand it hasn't moved on considerably since, the level of that science.

All right. Thank you. Can I take you, then, to paragraph 21 of your statement and ask some questions which may be of a highly technical nature, I'm not sure. What is of interest is the concept of the run-off fraction, that is to say the amount of rain that actually makes it into the dam after it's fallen. That's something, I take it, that is obviously the basis for the without forecast prediction model for the lake level?-- No, that's - what I'm referring to there is the percentage of gross rain which actually occurs which is converted to run-off.

All right. Run-off?-- Volume to - inflow into the dams.

That's right, and does that not inform the model which tells us what the predicted lake level will be?-- This is an approximation to that model, to the other algorithm we use in the model.

I just missed the last sentence?-- This is an approximation of the algorithm we actually use in the model.

I see. Can I ask about the algorithm that's actually used in the model then? It's something that does the same thing?-- Similar things in a different way.

Okay. And what is of interest is the manner in which the saturation of the catchment is reflected in that algorithm; in other words, that fraction of how much rain that - after it's fallen, how much of that actually makes it into the dam must be affected by the saturation of the catchment, must it not?-- It is.

Okay. So, what is the figure or is there some figure attributed to the degree to which the catchment is saturated?-- Not explicitly, it's reflected in two measures. One is the fraction of run-off, which is the - what I have

used here, but in our modelling we use another algorithm which refers to the continuing loss rate.

Right?-- And in this event, the continuing loss rate used, was lower than what we would normally expect, reflecting the degree of saturation within the catchment.

I predicted this was going to get technical. The amount of run-off into the dam after a nominal amount of rainfall in, say, the middle of the drought would be different from the amount of run-off on the 10th of January this year?-- Correct.

How is that updated, if you like? Is that a process - how is that fraction revised to reflect the saturation of the catchment?-- Well, what we're doing continuously during the modelling process is comparing our model results with what's been recorded and adjusting that parameters to match what's been recorded. So, as the catchment becomes more and more saturated, one of those loss parameters is actually decreasing, we're getting more - a higher percentage of run-off as the catchment becomes more saturated.

All right. And in part this becomes of interest because at one stage there was or the suggestion is, conclusion is, that there was a large rainfall event over the dam itself. You are familiar with what I'm talking about? How do we be confident that it was that that contributed to the rise in the lake level, rather than an increase in the run-off factor due to the what must have been extraordinary saturation?-- When we talked about the run-off factors, we're talking about those run-off factors which are from the land area-----

Yes?-- -----not on water surface area.

Quite?-- On the water surface, we get 100 per cent run-off.

Yes, of course?-- Now, I think you find in the report it's quite clear that there's a diagram which shows the water level at the upstream station at Gregors Creek, and if I can draw your attention to that?

Can you just tell us the page number?-- Yes. I will just have to find that one. Appendix 4Q.

Thank you. I have that?-- That will be on page 11.

Page 11 of appendix Q?-- Yep.

Yes?-- And I will also draw your attention to figure 9.1.2 on page 4 of the main report.

All right. Well, we might get someone to look at this later, but you say that the answer to my questions can be gleaned from - by reference to those?-- To those two figures. You will notice that in the first instance, Gregors Creek is higher in the first peak than the second peak.

Right?-- Whereas in the dam, the inflow to the dam, the peak is higher in the second peak than the first peak, and that gives us a good indication of the heavy rainfall that occurred - probably did occur between those two stations.

All right. Thank you. Can I take you to paragraph 33 and/or that part of your statement in which we are discussing the move to W4, and I appreciate that when we are talking about something like certainty, it's a relative concept, someone might look at the favourite in tomorrow's Doncaster, someone might think it's certainty, some might think it's a false favourite, it will vary according to an individual assessment, but I'm interested to explore what you regard as the necessary level of certainty to transition to W4? Can you express it in terms of the model runs that you did? Do you need a certain number of those before you move to W4 or-----?-- Before-----

-----how would you-----?-- Yes, I would require one of two things, I would require either - I was quite sure that a single model run gave me a level much greater than 74, therefore I would be reasonably confident that we would get to at least 74, or I would require several model runs which would confirm that we will get to about 74.

Right. In fact, even using the without forecast model for the predicted lake level, there were, I think, four which showed it either at 74, the first one was right on 74, and then three after that, which predicted the lake level at above 74 before W4 was declared. Is that the sort of data you would ordinarily require?-- Correct, yes.

And can I just explore that a little further, because I think I understand what you say in your statement about the need for extreme caution when making releases because of the consequences they might have downstream. The transition to W4 doesn't actually mandate specific releases, does it?-- It's uncontrolled releases.

It's absolute discretion. The other aspect of W4 is that it requires dam safety to be the primary consideration; you agree?-- Yes, yes.

Yes. And I'm just wondering why you need such a degree of certainty before you elevate that to your primary consideration?-- Up until that stage, we're trying - our optimal requirement is to minimise downstream flooding and maximise flood mitigation.

Yes?-- When we get to '74, it becomes - the risk is greater for security of the dam than it is for flood mitigation. Our design studies show that once we get to 74, if we get an extreme event, then we have to start to release very early on in the event, or - you know, when we get to 74 to make sure we don't get to those critical levels.

In effect - I am paraphrasing, correct me if I'm wrong, you equate the need to make higher releases to the same thing?-- Yes.

To the primary consideration being dam safety?-- Yes.

All right. I will take you to paragraph 48 and you may have already addressed this in the first question I asked you, but you remain of the view that was expressed in TM2, that forecasts are simply not sufficiently accurate as to provide a basis for the release of flood waters?-- I remain of that view.

Nothing you have seen or heard since then has caused you to query that?-- No.

Okay. I will take you to paragraph 69, which concludes that part of your statement in which you addressed the exchange that was had with the Brisbane City Council. You are familiar with the exchange that I'm talking about?-- Yes.

And, look, can you take it that in these questions you are not being challenged about the proposition that in the scheme of things this may not have been a huge issue?-- In the scheme of things, yes.

You have reached the conclusion that really it didn't make that much difference to anything that happened thereafter?-- No, I have reached that conclusion.

I am not challenging you on that, but what I'm confirming is that there was a degree of uncertainty as to what the relevant level of release was that would have damaging flows in Brisbane?-- In my mind-----

At the time?-- Well, no, not at the time, because I was operating under the manual.

Right?-- But subsequent, yes, I have come to doubt whether that's appropriate.

It must have at least caused you - this exchange must have at least caused you to question the manual and, as I say, no great consequence as a result, but for about six hours you did attempt to operate with information which was different from that contained in the manual?-- We were operating under the premise of minimising the downstream urban damage.

Look, all I'm getting at, and I am not challenging you if you did that?-- Yes.

That was what you were attempting to do, but I just put this: it's a bit hard to make a decision about minimising downstream damage if you don't have or if you are being challenged about the accuracy of the information that you are trying to achieve that with?-- That's true, and I think it comes back to what I have said later in my statement about clarity of terms.

Just so?-- Mmm.

All right. Can I take you to paragraph 77, paragraphs 77 to

79? Those entries in the Flood Event Log which you have extracted helpfully in your statement, we can confirm that you did make the entry at 7.20 - sorry, I withdraw that. We confirm that you are engineer 2?-- Correct.

And that the entry for 7.20 purports to relate to something that you said?-- Yes.

That's so? The content of that entry does seem to reflect the content of the preceding perhaps three entries, similar sorts of concepts being canvassed in each of them; do you agree with that?-- Yes.

But you don't recall saying any of the things recorded in those entries?-- Not specifically, no.

In fact, as paragraph 79 reads, you suggested to the extent that they suggest there was a need for releases to be increased, those entries are incorrect?-- Yes.

I'd suggest to you it might be accepted that one entry in the Flood Event Log could well be the result of a mistaken premise or a mistake made by the person who actually recorded the entry, but you accept that there are four entries there that record similar concepts?-- Yes.

All right. Beyond that, you have got nothing to add to what you have already said in your statement, 78 and 79.

Thank you. Yes, can I take you back to paragraph 28, please? This is something which you touched upon also, I believe, in your interview with Commission staff. Could I just ask you while you're here to just elaborate on the concern you express in paragraph 28?-- This is based upon my experience with the Bureau of Meteorology. Within the Flood Warning Centre, the duty engineers have the authority to talk directly to media to agencies, other agencies, and that seems to have worked well in communication - communicating technical information to other technical people in a very short space of time in potentially a rapidly changing situation, and I am of a similar opinion we can do similar things in the Flood Operations Centre.

That brings me to the topic of the manual. Do you have a copy of the manual available to you?-- Yes.

Perhaps can I ask you just in a general sense at the outset whether as a result of the experiences of the wet season just gone you have some suggestion for the manner in which the manual might be improved?-- I have made suggestions in my statement that - to that end, yes.

And nothing beyond that which appears there?-- In terms of styled differently so all the technical information is in one section and all the objectives in another, and also, as I said, the clarity of terms. I mean, terms like "likely to reach", "expected to reach", they are very subjective and need some further definition.

You have also suggested, I think, perhaps in paragraph 30, that the technical operational data should be separated from the objectives; is that right?-- Yes.

And can you just elaborate on that?-- I find in the manual at the moment there is a bit - a mixture of tables and other technical information which probably could all be put in appendices and more readily available-----

Yes?-- -----or findable to the duty engineers.

Now, please, I'm not trying to be critical here, but did you have involvement in the preparation of this manual?-- I did.

You had the opportunity to make input?-- I did.

Mr Tibaldi was the principle author; is that correct?-- There was.

There was a series of meetings between the engineers themselves?-- And the Dam Safety Regulator.

Anyone else?-- At times we were talking about the manual in other meetings.

Yes. So, there was a pooling of knowledge, if you like, as to what the content should be?-- Yes.

But as to the actual writing structure, format, that was not something that-----?-- John was the primary author, John Tibaldi was the primary author.

All right?-- But I supported him in his writings.

Yes. And can I take you specifically to 8.4 of the manual on page 22? This is possibly a part of the manual which has been drawn to your attention in recent times, and you are aware that this passage is the subject of some focus that the strategy chosen at any point in time - you can read that to yourself, I don't need to read that. Would you agree that that passage seems to suggest at least that forecast rainfall should be used in predicting the level of the lake for the purpose of choosing the appropriate strategy?-- My understanding is that we would base the current strategy on recorded rainfall-----

Yes?-- -----and future strategies and where we might get to on the forecast rainfall.

Well, would you agree that to the extent that - if that does suggest something different, you would say the manual should be amended to reflect the actual practice?-- Yes, make it quite clear.

All right. Just finally, I just want to show you a couple of e-mails. There is an e-mail on the 10th of January at 11.17 p.m.. You can read that there. It's ostensibly from

you to duty, that being the duty engineers?-- Yep.

The engineer on duty. It simply reads, "Gents, ran out of battery. All this effort and risk to reduce the peak at PO by about 500. What is the incremental impact above 4,000???" Can you just explain that one to us?-- I recall at the time that there was - this was just after the big storms in the top end of the Lockyer and there was some thought given to how we could possibly minimise the peak at the Port Office by - because we were very unsure about what was coming out of the Lockyer.

Yes?-- There was a high degree of uncertainty, so it was an effort to say, you know, if we can only reduce the peak out of the dam by 500, then it's not going to have a huge impact at the Port Office.

And so "the effort and risk" was what precisely?-- Well, if we were trying to store - keep more water in the dam-----

Yes?-- -----at the time to counteract what was coming - well, we didn't know what was coming down the Lockyer-----

I follow?-- -----then - yeah, there was a balance that we had to-----

It was the risk of holding back water-----?-- Yeah.

-----in Wivenhoe?-- Yep.

Okay. Thank you I tender that document.

COMMISSIONER: Exhibit 47.

ADMITTED AND MARKED "EXHIBIT 47"

MR CALLAGHAN: And I will show you one last e-mail. Relevantly, this is Friday, January 14, 05.56 - 5.56 a.m. ostensibly. This is directed to Mr Barton Maher and it reads, "Barton, do you have the equations for the fuse plugs? We need equations to include in our gate operation model ASAP. Approximately equations will suffice at this stage." Can you just tell us about this e-mail?-- What we wanted to do was update our operational spreadsheet to include the fuse plugs. At that stage they were only considered objectively - subjectively and what I wanted to do was make sure we include the equations of fuse plugs into the operational spreadsheet.

And precisely what does that mean, the operational spreadsheet being the document which did what?-- The way we operated the gates and determined the gate openings.

All right. So, there's some relevant equations - relevant information relating to the fuse plugs which have not yet been

included in that model; is that right?-- Not objectively or explicitly, no.

No. So, it was being left to the expertise of the - you and your fellow engineers to-----?-- Cater for it.

And I won't say intuitively, obviously you are doing it scientifically, but without the precise equation which would have been necessary?-- Which would have assisted us, yes.

Which would have assisted. Right. What does that tell us about the preparation for this event, that there information relevant to the fuse plugs which hadn't been incorporated into the gate operation model as at that time? It doesn't seem like best practice?-- The information was contained in the manual and it was readily at hand. That's how we would have taken it into account at the time.

Perhaps you just better explain exactly what that means. These are equations relevant to the fuse plugs. What precisely did they do?-- Ratings, relationship between height and flow should the fuse plugs be initiated.

Right?-- So, we had the tables, which we could have used, but it's just more convenient to have the equations.

Because they're entered into the computer models?-- Well, we could have also entered the values of the tables into the computer models manually.

Okay. But that is probably something you wouldn't want to be doing on the run in the middle of a fast breaking event like this?-- Yes.

You'd agree with that?-- Yes.

Okay. Thank you. If I haven't tendered that, I tender that one.

COMMISSIONER: That's Exhibit 48.

ADMITTED AND MARKED "EXHIBIT 48"

COMMISSIONER: Yes, Mr Rangiah?

MR RANGIAH: Mr Malone, I represent some residents of the Fernvale area. Can I start by taking you to paragraph 22 of your first statement? Do you see that it indicates that you worked in the Flood Operations Centre from 7 a.m. to 7 p.m. on Friday, the 7th of January?-- Yes.

And then the next entry is - shows that you worked from 7 a.m. to 7 p.m. on Sunday, the 9th of January. Now, did you in between also work from 7 a.m. to 7 p.m. on Saturday the, 8th of January?-- No.

In paragraph 62 of your statement you say that Strategy W3 was invoked at 8 a.m. on Saturday, the 8th of January and then you say, "This occurred during my shift."?-- Yep.

Do you see that?-- Yes.

And does that suggest that you did work a shift?-- No, that 62 is actually incorrect, and it did not occur during my shift because I was not on duty.

All right. Do you know during whose shift Strategy W3 was invoked?-- I would have to look that up.

Do you know where you got the information from that strategy W3 was invoked at 8 a.m. on Saturday the 8th of January?-- As I said, I would have to look that up

Where would you look that up?-- In the flood report.

Could you do that, please? And just as something that might assist, can I suggest that there is no record in the flood log of strategy W3 being invoked, as far as I can see it? And can I also suggest to you that there is no situation report that refers to strategy W3 being invoked?-- What's the question, sorry?

Well, I am just giving you that information because it might assist you in terms of what you look for?-- No, engineer 1, Mr Ayre, was on duty on the Saturday.

COMMISSIONER: Who gets to know about it when a strategy is invoked? Do the flood engineers just tell each other, or is it communicated - and presumably you tell the gate operators - but who is it communicated to and how?-- I think - well, there is no requirement for - in any documentation or notification to advise anyone that we're moving from one strategy to another. It is just a procedural - set of procedures we use in the Flood Operations Centre.

But it does matter because the objectives change?-- That's true.

So how do you communicate it and to whom? I am not asking what you are required to do, but just what do you do?-- We're only talking about it within the Flood Operations Centre but it is also reflected in the situation reports.

All right, thank you.

MR RANGIAH: So there should be a situation report that indicates that the strategy changed from W1 to W3 at 8 a.m. on Saturday the 8th, is that correct?-- I would have to have a look to see what the situation report at the time indicates.

Perhaps you can turn to - you will find them in the report-----?-- Yes.

-----at appendix E. And perhaps you could turn to page 13? You will see that that's a situation report, number 8, prepared at 6.32 a.m. Do you have that?-- Yes.

And then the next situation report is number 9 at 2.22 p.m. Do you see that?-- Yes.

And so if strategy W3 had been engaged at 8 a.m., you would expect to find the reference to it in situation report number 9, wouldn't you?-- As I said, not necessarily. It is -it has never been firmly stated that we put those sorts of indications in situation reports.

COMMISSIONER: It would certainly make it easier for people to

review what you did later, wouldn't it, if it were clear exactly what happened when?-- Yeah, and that's an issue for clarity within the document - the flood manual itself.

MR RANGIAH: Okay. See, it is important, isn't it, to know which strategy is actually being engaged at any point in time?-- Yes.

And, I think as the Commissioner suggested, it is important because the primary considerations change according to the strategy?-- Yes.

And the rates of release you adopt will depend upon the primary target of the strategy that you are operating under?-- Yes.

Now - so it is the case then that you weren't on duty when situation report number 9 was prepared; that's correct, isn't it?-- That's correct.

And you weren't on duty when situation report number 10 was prepared. That's correct, isn't it?-- That's correct.

And so the next time you were - or you were on duty when situation report number 11 was prepared?-- Yes.

And, in fact, it was you who prepared that situation report? You will have to actually-----?-- Sorry.

-----give me an answer so it can be recorded?-- I wasn't aware there was a question.

Okay. I should have - can you assume when I say something that it is intended to be a question mark at the end of it? Do you agree that in the situation report under the heading "rainfall" it was - you indicated that "a severe weather warning remains current for heavy rainfall in the dam catchment areas"?-- Yes.

And you indicated on the next page that it was intended to "maintain flows of around 1,600 CUMECS in the mid-Brisbane River for the next 24 hours"? Do you see that?-- That's what it says, yes.

Now, at this stage you were operating within the W3 strategy?-- Yes.

Did you know that?-- Yes.

How did you know that?-- It would have been discussed at the handover that morning. Or - yeah.

You can't remember now?-- It is obvious. I mean, some things you don't need to have written down to know.

Now, if you were operating within the W3 strategy, then there was the capacity to increase the rates of release so that the flow past Moggill was up to 4,000 CUMECS?-- Yes.

Now, could I take you to situation report number 12? And this was prepared at 9.04 p.m. on Sunday the 9th of January, is that correct?-- That's correct.

And you wrote that report?-- I did.

In that report you wrote that very heavy rainfall had been recorded?-- Yes.

And that a severe weather warning remained current for heavy rainfall?-- Yes.

And at that stage it was expected that the dam would reach at least 73 metres during Tuesday morning? That is under Wivenhoe Dam, I should say?-- Yes.

And that was on a no forecast rainfall model?-- I would have to check exactly but I would assume so.

And you make that assumption because you have indicated in your statement that you don't operate on a predicted rainfall model?-- That's correct.

When deciding strategy?-- Current strategy.

And by strategy, what you are referring to is the rate of releases?-- Yes.

And at that stage the current release rate was 1,400?-- That's what-----

You agree with that?-- Yes, that's what the situation report says.

And it was intended to increase the rate of release to at least 2,600 CUMECS on the Tuesday morning. Now, was the delay in attempting to increase the rates of release until Tuesday morning related to a desire to keep the downstream crossings open for as long as possible?

COMMISSIONER: I am not quite sure that's right, Mr Rangiah, because the increases start from noon Monday. It is not as if they have been deferred till Tuesday morning, it is just that's where it will get to by Tuesday morning.

MR RANGIAH: Yes. Well, perhaps I can put it slightly differently. The increase to 2,600 was to take place progressively until it reached 2,600 on the Tuesday morning?-- That was the expectation at the time.

And - but that figure of 2,600 or that release rate could have been reached earlier than Tuesday morning, couldn't it?-- Yes, but we would have increased downstream flooding.

And it was that desire to delay downstream flooding that resulted in you not increasing the rate more rapidly to 2,600 at that stage, is that correct?-- No, I don't see that - how

you can draw that conclusion.

Now, you were on duty, you say in paragraph 22, from 7 a.m. on Monday the 10th of January?-- Are you going back to my statement?

Yes, paragraph 22 indicates that. Do you agree with that?-- Yes.

And when you came on duty, you presumably looked at the situation report that had been released most recently?-- Yes.

And that was situation report number 14 which had been prepared by Mr Ruffini. Do you agree with that?-- That he prepared it, yes.

And that situation report indicated that the dam would reach at least 73.3 metres during Tuesday? That is the Wivenhoe Dam?-- Yes.

And that was on a no predicted rainfall model, wasn't it?-- Correct.

Now, you may need to look at the records to confirm this but can I suggest to you that at 1 a.m. there had been a model run on a with predicted rainfall basis showing an expected dam level at Wivenhoe of 74.7 metres? Perhaps while you are looking at the records I will suggest some other figures to you. Do you agree with that?-- Yes.

At 4 a.m. there was a model run on the same basis that showed a predicted dam level of 74.8 metres?-- Yes.

And at 5 a.m., 74.5 metres?-- Yes.

So by the time you came on duty, there was a consistent pattern of predicted dam level of over 74 metres using the predicted rainfall model. You agree with that?-- Yes, I agree with that.

And then it is suggested that that pattern continued so that at 9 a.m. there was a predicted level of 74.5 metres?-- You are assuming that it is going to get there. Now, it is not going to get there necessarily. We've got two uncertainties there. What we're saying there is that if we get the predicted rainfall, we may get to 74.5 and if we get to 74 some time in that forecast period, then we will have to implement W4. That's purely and simply what those model runs are for.

Do you agree, though, that on that model the predicted level of Wivenhoe was 74.5 metres at 9 a.m.?-- That's what the model run says.

And the manual itself depends upon predicted lake level, doesn't it?-- It could be interpreted that way, yes. It is unclear.

The manual doesn't refer to actual lake level?-- It does.

I am sorry, in terms of - I phrased that badly, I am sorry. It is my fault. But in terms of the W3 and W4 strategy, what those strategies refer to are storage level predicted to be at certain values or between certain values?-- I will also draw your attention to another statement in the manual under W4, which is the one I put a lot of store in and I believe my fellow operators do, too, and that says in the W4, "This strategy normally comes into effect when the water level in Wivenhoe Dam reaches 74." And that's the one under which we put most of our operational store.

So if that statement is correct, does that mean that you ignore the predicted water level using an actual rainfall model?-- Sorry, an actual rainfall model?

Yes. By actual rainfall model I mean a model taking into account rain that has already fallen and where run-off may be occurring into the dam?-- For the current strategy we use rainfall up to the current date, current time, the recorded rainfall.

So if you use actual rainfall that has already fallen, some of the water will have entered the dam and other water may still be running off into the dam?-- That's - that's the case.

Now, this statement that you rely on says that the strategy normally comes into effect when the water level in Wivenhoe Dam reaches 74?-- Yes.

So does that suggest that you wait until the water level itself reaches 74, not taking into account the predicted run-off from rainfall that has actually fallen?-- No, no, that's not the case at all. We take into account the rainfall that's on the ground and the volume of run-off, and we make an estimate of how high the dam is going to get.

COMMISSIONER: Well, that's predicted, not actual?-- That's true, yes, but that's recorded rainfall. It is not the predicted rainfall.

This really is a bit of a mess, isn't it?-- It is a very difficult concept, yeah.

Well, it is not the concepts; there are about three different ways in which it is expressed in the manual which could mean you take into account forecast rainfall-----?-- It will vary.

-----which could mean you just take into account the run-off, which could mean you just look at the water in the dam?-- Yeah.

MR RANGIAH: Now, you have made it quite clear in your evidence so far that your position is that you don't take into account a with forecast rainfall model when making decisions as to the rates of release?-- Current rates of release and then the short term rates of release.

Okay. When you decide strategies and rates of release, you are only deciding on short term releases, aren't you?-- Yes.

And strategies change as things evolve?-- Correct.

Now, on that Monday morning, if you had acted upon the predicted rainfall model, then I suggest that you had two options: (1) would be to engage the W4 strategy and the other is to increase the rates of release so that the flow would be up to 4,000 past Moggill?-- That's not the way I would operate. I would take into account that if the rainfall - if we got that forecast rainfall and if the dam got to EL 74, then we would implement strategy W4 at the appropriate time. So it was giving me - that gives me an indication of when I might have to implement W4, not at the current time.

And what you did do was you kept the release rates to about 2,000 from about 8 a.m. to 4 p.m. on that day?-- Yes.

Now, yesterday counsel for Seqwater suggested to a witness that when you engage the W4 strategy, the outflow should equal the inflow?-- That's correct.

The manual doesn't say that, though, does it?-- That's just an understanding of hydrology. To maintain current water level, steady water level, you must let out whatever is coming in.

Well-----?-- Otherwise the water level goes up or down.

Well, the manual doesn't say that it is necessary to stabilise the water level at 74?-- Yes, it does. "Opening of the gates is to occur generally in accordance with the requirement of 8.6 until the storage level of Wivenhoe Dam begins to fall."

So you are reading from the bottom of page 29?-- Yes, or halfway down.

And it says gate openings are generally to occur at minimum intervals and sequences as specified in section 8.6 until storage levels of Wivenhoe Dam begin to fall but it doesn't require outflows to - I am sorry, but it doesn't require that that be done?-- I read it does. "Opening the gates is to occur until the storage level of Wivenhoe begins to fall."

Well, it says, "Gate openings are generally to occur", doesn't it?-- No, "generally to occur in accordance with 8.6", and 8.6 gives us the opening intervals, not whether or not the open gates - it gives us the timing of the openings, not whether we open them or not.

What I am suggesting is there is a discretion remaining under the W4 strategy as to whether you maintain the lake level or have to reduce it?-- Maintain, reduce are very similar.

And strategy W4, I suggest, is intended to be engaged before the lake level actually reaches 74?-- Disagree.

In other words - we may have gone over this already - but in other words when you look at the conditions, you ignore the word "predicted", where it says, "Wivenhoe storage level predicted to exceed 74 metres"?-- I take into account when we think we might get to the point in time at which we have to implement strategy W4. So what that gives me is that if I'd run a model now and I know that it says that I'm - we might get to EL 74 at 6 o'clock tonight, then that gives me the point in time at which I would have to implement that strategy.

COMMISSIONER: That will be 6 o'clock tonight?-- Yes.

Thank you.

MR RANGIAH: All right. Did you assist in the preparation of the report?-- I did.

And you agreed with it?-- Substantially, yes. There was nothing I have strong objection to.

And I will just take you briefly to page 1 of that report - and you have read this before?-- I have.

If you look under the heading "background", the second paragraph and the second sentence says, "The objective followed and strategy chosen at any point in time depends on actual water levels in the dams as well as flood modelling predictions based on the best observed rainfall and then forecast rainfall, stream flow information available at the time." You would say that that's incorrect insofar as it refers to forecast rainfall, would you?-- May or may not. It will also depend upon what's happening. That forecast rainfall may be impacting on the areas downstream of the dam, so we would have to take that into consideration. It is not just the dam that we're operating for, it is the mitigating downstream areas, too. So the forecast rainfall may be important to those downstream areas.

So you say you do take into account forecast rainfall in making decisions as to the level of releases?-- Depending on the circumstance. It depends on the circumstances. If the forecast rainfall is for areas downstream, by releasing earlier you might make things worse. So it is a balancing act.

In your statement paragraph 33, you refer to the suggestion that strategy W4 should have been triggered earlier, and then you say, "This suggestion is incorrect because it assumes releases of floodwaters are made from Wivenhoe Dam on the basis of model results which include forecast rainfall. Duty engineers do not operate on this basis."?-- In making releases from Wivenhoe explicitly, yes, that's correct. We have to be sure that what we're going to do is not going to worsen the situation.

So is this statement correct or incorrect? I mean, do you

make decisions about releases from Wivenhoe Dam on the basis that does include forecast rainfall or don't you?-- It would depend on the situation.

So this statement here, "Duty engineers do not operate on this basis", is that incorrect?-- In some circumstances that would be incorrect.

Similarly, in paragraph 44, the last sentence where you refer to the blue line, the red line and you say, "Duty engineers make decisions to release floodwaters based on the red line, not the blue line", that's not correct either?-- We base it on what we have confidence in what's going to happen, not what we think is going to happen necessarily.

Now, one of the issues that I just don't understand is this: that the report emphasises that the Bureau of Meteorology rainfall forecasts significantly underestimated the actual rainfall. You would agree with that?-- At times, and in other times it overestimated.

But you say that - you maintain that generally the Bureau of Meteorology forecasts are not used when making decisions about the appropriate release rates?-- Well, they are considered but not used explicitly. I mean, you don't make releases in the short term based upon forecast rainfall for the next 24 to 48 hours, no.

So if that's the case, then logically the Bureau of Meteorology's underestimated rainfall forecasts would have had no impact on the short term decisions made about release rates?-- That's basically correct. In the six to 12 hours, yes.

Now, in your second statement you talk about having conducted modelling as to the effect of earlier releases at larger rates, is that right?-- Yes.

And you accept, don't you, that using a hydrodynamic model is likely to produce more accurate results?-- I have stated that, yes.

Has that been done?-- We have engaged consultants to undertake that study for us.

Thank you. I have nothing further.

COMMISSIONER: Thank you. Mr Dunning?

MR DUNNING: Yes, thank you.

MR DUNNING: Mr Malone, we agree, I think, that regardless of whatever strategy you are in - sorry, leaving aside W4 for the moment, your aim is to keep the release rates as low as possible?-- We're trying to minimise the impact to downstream areas.

Yes, all right. Because the higher the rate, the greater the impact - the impact downstream?-- Yes.

It's also right, isn't it, that once you are in that range of 3,500, 4,000 CUMECS releases, you are talking of substantial releases?-- Very much so.

That had and will continue to cause considerable inconvenience and damage?-- Yes.

And they have been the product of a significant rain effect?-- Yes.

Thank you. Now, I want to turn to talk about this issue of the reference in W3 to the upper limit of nondamaging flows. I don't want to rehearse all of those things that was gone through about it, but can I just put a couple of propositions to you to get your response. You will agree with me, won't you, that from the Brisbane City Council's point of view their interest in this topic lie upon ascertaining at what level damaging - at what level of flow or release flow property damage or damage from floods will start to occur in Brisbane; agree?-- Agree.

The dam operator, though, has a somewhat different but related consideration, and that is once it's at around this range, at around that three and a half thousand CUMECS range release, it's considering not only the impacts in Brisbane, but impacts elsewhere down and upstream of Wivenhoe, and it realises that the integrity of the dam is now on the horizon. Do you agree with that?-- I'd agree.

Thank you. And, consequently, it will be from the dam operator's point of view desirable if it can avoid into going into W4; do you agree with that?-- I would like to think so, yes.

All right. I will take you to some aspects of W4 in a moment, but before I do, it follows from that that from a dam operator's point of view you will tolerate, for example, some flooding in Brisbane if that will allow you to stay within W3?-- Yes.

And that's why logically at least you see the release rates of 4,000 CUMECS as the upper level for W3 remaining sound, even though we must recognise they involve some flooding in Brisbane?-- Yes.

Thank you. Perhaps before I go to W4, can I then just ask you one or two final questions on this topic? We obviously have all had an opportunity to read both of your statements. The issue of the reference in the manual and W3 to three and a half thousand CUMECS as being the upper limit of nondamaging floods in Brisbane - sorry, 4,000?-- 4,000.

The manual saying 4,000 being the upper limit of nondamaging floods in Brisbane, your only criticism of what appears there is that it nominates 4,000 as that figure rather than 3,500, or, alternatively, should say that 4,000 is the lower end of damaging floods in Brisbane?-- Yes, it's back to clarity of definition.

Yes. But subject to that clarity of definition of what the consequences of the flow will be, you don't have any criticism of the flow rate nominated itself?-- No.

Thank you. Now, can I then just deal with this: to the extent that there was that lack of clarity during this rain event, you will agree with me it had no operational consequences?-- It had no - none whatsoever. The difference was only 11,000 megalitres.

And one of the reasons at least that it had no operational consequences was there was in place robust and effective communication between all agencies and relevantly in this case the Brisbane City Council and the Flood Operations Centre?-- Indeed.

And it was the availability and use of those robust means of communication that ensured it had no operational consequences?-- Correct.

And it is, as it ought to be, a feature of any system such as this that it contains procedures, redundancies some will call them, to allow or dealing with issues of confusion that might arise in any unfolding operation?-- Yes.

So, in effect, to the extent it raised any confusion, it was accommodated by a safeguard already built in to the system?-- Yes.

You'd agree? Thank you. Can I take you, please, to this topic of W4, and can I ask you, please, to turn that up for me? It appears on page 29 of the manual. Now, you have been asked a number of questions, the general thrust of which, I think it's fair to say, is that there's a desirability in an earlier movement to Strategy W4 than occurred here and it seems that you and your colleagues would be disposed to in the future. I want to draw your attention to a couple of matters and I want you to tell me whether you agree or disagree with these propositions. One is there's this topic of the conditions and, in particular, the Wivenhoe storage level is predicted to exceed 74 AHD. Now, in terms of how you operate under the manual, is your operation of it informed by the fact that in condition 4 you have a rider to that, which appears in that passage you, in fact, took our learned friend Mr Rangiah to, that sentence, "This strategy normally comes into effect when the water in the dam actually reaches it", whereas there is no such rider in relation to Strategies 1, 2 or 3?-- That's correct.

Okay. Thank you. And in so much as it has been suggested that a movement to W4 is not as - doesn't have the sort of dramatic consequences that you and your colleagues have suggested because there's an element of discretion in there, I want to take you to some matters and I want you to tell me whether you agree or disagree. If you go to page 29 and the second of the paragraphs under the - the paragraph starts, "Under Strategy, W4." Do you see that?-- Yes.

Just read that to yourself for the moment, please. All right. Now, you, I take it, have operated on the basis that in executing the Strategy W4 you are bound to increase the rate of releases as it is now a question of dam safety, not downstream flood mitigation?-- I agree.

And in executing that strategy, what's required is the opening of the gates to occur generally in accordance with 8.6, and we see that again repeated in the second paragraph under the heading, "Strategy W4A." Do you see that?-- Yes.

If we then we go to 8.6, is it the way that you have executed your functions in the Flood Operations Centre under 8.6 that what it obliges you to do is if outflows are less than 4,000 CUMECS, you are to try and avoid rapid opening of the radial gates by complying with the opening sequence that is set out in 8.6?-- I agree.

All right. But that if we go over to page 32, where dam outflow exceeds 4,000 CUMECS, have you operated on the basis that once you get to 4,000, those issues of the gate opening sequence don't really matter any more, because the damage is well and truly underway?-- I understand that to be the case.

All right. Thank you. Or not understand it, but that's how you have-----?-- Operated.

Thank you. Now, we will only ever in reality be talking of a movement to W4 when we are at least around 4,000 CUMECS, won't we?-- Yes.

So, on a practical level, in circumstances where, on any view of those that have been canvassed with you this morning, we are talking of a movement to W4, we will be talking of circumstances where if, in effect, you declare W4 and you follow the procedures, what you would then move to do is open those gates as quickly and practically as you could without regard to damage downstream until such time as not only you saw the dam levels stabilise, but, in fact, fall?-- That's what the strategy requires.

All right. So, it would literally oblige you, to use a colloquialism, to open the flood gates as far as you could until you saw the levels fall?-- Yes.

That's the dramatic consequence of the suggestion of a relaxation of Strategy W4, isn't it?-- Indeed.

Thank you. And that's why at least, as you operated it, you have understood - you have worked on the basis that it contains that rider that you actually be at 74 before such a drastic step is taken?-- Indeed, yes.

Thank you. Can I then, finally, please, Mr Malone, take you to this topic of the decision to hold releases at Wivenhoe at about 2,000 CUMECS rather than 2,600 CUMECS? You are aware of the issue no doubt?-- Yes.

And it arises on a practical level because your colleagues had issued Wivenhoe Direction 9 which would have achieved once fully executed 2,600, and you and your colleagues issued Wivenhoe Direction 10 which was to reduce it to 2,000?-- Yes.

Thank you. And the sequence of events occurs in this way, doesn't it: you knew from - perhaps we could see this usefully summarised in the event log. Do you have a copy of the log in front of you? Exhibit 21, thanks. And the page we're interested, we're interested in Monday, the 10th of January. The 6.30 entry is the first I am interested in?-- What page is that, sorry?

Mine doesn't have numbered pages?-- So, what date was it again?

Monday, 10 January 2011, 6.30. Page 86?-- Yep.

All right. Now, we see there Wivenhoe Directive 9. That was the directive that your colleagues on the nightshift had issued; correct?-- Yes.

All right. Then we see at 8.30 Wivenhoe Directive 10, that yourself and Mr Tibaldi were involved in?-- Sorry, are we looking at the log or the directives?

No, if you go to 8.30 in the log you will see it summarised there?-- Okay. There's no-----

COMMISSIONER: Are you talking about log or event summary?-- The event log doesn't contain indications of when the directives were issued.

MR DUNNING: I have been dealing off the unredacted log. Is it not in evidence?

COMMISSIONER: I don't think that's the problem. I just think the Flood Event Log might be something different. Is that right, Mr Malone? It doesn't have the directives?-- No, it doesn't have the directives in it.

What does?-- They're in the first - appendix L.

MR DUNNING: Commissioner-----

COMMISSIONER: I thought you said 6.30 a.m. on Monday, Mr Dunning.

MR DUNNING: Yes. Commissioner, I understand it's Exhibit 23 and it is what I refer to as the unredacted log but I want to make sure that it is as it's being described to me, and that is, as I understand, the actual document that was produced.

COMMISSIONER: What's the appendix number? Do you have that?

MR DUNNING: I don't have an appendix number, your Honour. L, I am told, appendix L.

MR CALLAGHAN: It's not in the report, Madam Commissioner. That was the issue. The document was redacted for the purposes of the report, as I understand it.

COMMISSIONER: Right.

MR CALLAGHAN: The unredacted log is evidence as a separate-----

COMMISSIONER: Okay. Mr Malone's going to need to look on the screen then.

MR CALLAGHAN: Yes, he will.

COMMISSIONER: Thanks. So, if you look at the screen, we will get it up on that and this will give a version.

MR DUNNING: I have got a spare copy. My solicitor has got some notes on it. Unless anybody objects, I was proposing I might just pass that up. I don't know what it's like from the witness box, but at least for me it's-----

COMMISSIONER: All right. Do that. I don't think it's too bad on the screen, Mr Dunning, looking at it there.

MR DUNNING: Commissioner, it is more from back here.

COMMISSIONER: Look, the witness can have both and work out for himself which is easier.

MR DUNNING: Sorry, I now appreciate the witness has got a screen right in front of him.

COMMISSIONER: Yes.

MR DUNNING: Right?-- Sorry, where were we up to then?

We're up to the 10th of January, 6.30 a.m.?-- Right.

Can you see the 6.30 entry for the issuance of Wivenhoe Directive 9?-- Yes.

That's the one that was issued by your colleagues who had been on the night shift. All right. Then chronologically is what seems to happen is by 6.30 yourself and Mr Tibaldi resolved to issue Wivenhoe Directive 10. Do you see that? It should only be three entries down?-- Yes, yes, sorry, I do.

And that seems at least to have been informed by the fact that you are now alive to the rate of which damaging floods would be effected in Brisbane?-- Yes.

All right. And after some modelling, you resolve that the last two gate openings could be avoided and still effectively execute Strategy W3?-- Yes.

Which at that stage still had you obviously trying to avoid

downstream flooding as far as possible?-- That's the intention.

Thank you. And then if we go to 9.38, there's the conference call with Mr Morris from the Brisbane City Council?-- Yes.

In fact, what the log demonstrates is that the chronology of events is you'd, in fact, resolved to issue Wivenhoe Directive 10 before you'd spoken to Mr Morris?-- Correct.

But in that discussion, amongst other things, the rate of release and its consequences in Brisbane was discussed?-- It was.

And can I suggest to you that the discussion was throughout a professional one?-- Entirely.

And it was the sort of exchange of information intelligence that you would expect between agencies in an event like this to produce the best overall result?-- Indeed.

But that ultimately the decision that was made in relation to gate releases that day had been made prior to this discussion with Brisbane City Council?-- It had.

And in the exercise of your independent and professional judgment as to how best to prosecute W3 at that moment in time?-- Given the information available.

And as events unfolded during the day and had changed you acted accordingly?-- Yes.

Yes, thanks for your attention, Mr Malone. Thanks, Commissioner.

COMMISSIONER: Would it be convenient that you finish?

MR DUNNING: I have, thank you, yes.

COMMISSIONER: Convenient time for the morning break?

MR CALLAGHAN: Yes.

COMMISSIONER: We will come back at 20 to.

THE COMMISSION ADJOURNED AT 11.19 A.M.

THE COMMISSION RESUMED AT 11.39 A.M.

TERRENCE ALWYN MALONE CONTINUING:

COMMISSIONER: Mr Flanagan?

MR FLANAGAN: Thank you, your Honour.

Mr Malone, from January 1986 to September 2006 you were employed by the Bureau of Meteorology in the Flood Warning Centre, is that correct?-- Since '86 did you say?

Yes?-- Yes, in various States, yes.

Yes. And in that role or in that position you fulfilled certain roles including the Operational Flood Forecasting roles for river basins in New South Wales?-- Correct.

So it was a logical step, was it not, that you, as engineer 2 on the 11th of January 2011, were the engineer who had the contact with the Bureau of Meteorology?-- I think we all had contact, but, yes, seeing as I had worked there, yes.

I will take you to the log which is Exhibit 21 which probably demonstrates that most of the contact with the bureau was through yourself. Exhibit 21 and if you turn to page 89?-- Yes. Sorry, is that in the report or-----

This is the flood event log, appendix M?-- Yep.

And the first entry I want to take you to is 7.20 a.m., one of the first things you do is that you apprise the CEO of Seqwater, Mr Borrows, of the latest situation of Wivenhoe Dam and the lower Brisbane. What did you inform him?-- That it was in all likelihood we would be getting to W4.

Yes. And as a result of going to the W4 stage, you yourself knew there would be substantial releases and increases in those releases to ensure dam safety under that strategy?-- Correct.

And as a result of that did you yourself realise that the Bureau of Meteorology had to be informed of this consequence?-- There is no formal notification but I did.

As a matter of common sense-----?-- Certainly.

-----you informed them?-- I did.

And you rang them or had contact with them at 7.35 a.m. on

11 January 2011, is that correct?-- Yes.

Now, you say here that in the course of this conversation "the full appraisal of Seqwater strategy both Seqwater and BOM models results were discussed in detail and generally agreed with each other "?-- Yes.

That entry was made by you?-- No, the entry was made by flood officer 4.

I see, of course. In relation to that conversation, do you have a recollection of what was said with the bureau at this stage?-- I have not a direct recollection but the impression was that we would have been agreeing on the magnitude of the inflows.

Sorry, that you wouldn't?-- We were agreeing or concurring on the magnitude of the inflows of the dams.

Right, I see. Now, who from the bureau did you have direct contact with in the course of the 11th of January 2011?-- I don't recall specifically. A number of officers.

A number of officers. Did that include Mr Baddiley?-- Probably.

Right. Thank you. Just so that we can understand, there were something like 13 directives issued between, I think, the hours of 8 a.m. and 9.36 p.m. on the 11th, and in relation to some of those directives it resulted in an increase in the CUMECS being released from the Wivenhoe Dam, is that correct?-- That's correct.

Now, for each of those increases, because of the particular directive, did you inform at each occasion the bureau of those increases?-- Not on every occasion, I don't think.

And when you did inform the bureau of increases in releases, how was that done; by telephone, email or what?-- In two methods. First of all there would have been telephone calls and then there were emails of the actual and projected releases details.

Now, when we say projected releases, they are the releases that have been projected according to the modelling done by yourself and the other engineers?-- Correct.

And those models or that modelling is quite different to the exercise that you were requested to request of BOM to model releases in the order of 9,000 CUMECS and 10,000 CUMECS?-- Correct.

Can I just clarify this: in terms of the modelling that you were requesting the bureau to do for the purposes of predicting flood peaks in the Bremer River and, indeed, in the Brisbane River, were they based on the actual releases and proposed releases according to your modelling?-- That's - yes, that's correct.

Right. I will make this clearer: there was no part of the bureau's modelling for predicting flood peaks that incorporated the 9,000 or 10,000 hypothetical CUMECS releases?-- No, no, that was a worse case scenario.

Right. So in terms of, if you like, increases in predictions by the bureau - we appreciate there is all sorts of things that one models in - and you would know this better than anyone - but in the particular instance of this flood event one had to model in the peak of the Lockyer Creek?-- Yes.

The peak of the Bremer River?-- Yes.

The backflow effect of the Brisbane River on the Bremer River?-- Indeed.

And, indeed, the local run-off?-- Indeed.

And one other thing that had to be factored in, of course, was the releases from the Wivenhoe Dam?-- Yes.

Now, when a peak was increased for the Bremer River in the course of seven and a half hours from, say, 16 metres to 22 metres, or indeed from 12.7 metres to 22 metres, you knew, given the size of the proposed releases from the Wivenhoe Dam, that those releases, along with other factors, would have a direct impact on the prediction of the flood peaks?-- At - at all locations along the Brisbane River.

Exactly. And you appreciated that?-- Yes.

May I take you back to the entry, therefore, then 7.35 a.m.? In informing the bureau of the fact that you were contemplating the W4 stage and that increased releases would be made in the course of the day to ensure dam safety, as part of your modelling did you take into account the effects of the increased releases on the Bremer River and Ipswich?-- No, it is not a part of our duties.

If it is not part of your duties, is it simply part of your duties to inform as accurately as possible, given that these are proposed releases, the bureau of those proposed releases so that they can model that into their own modelling?-- Correct.

Thank you. May I turn to a completely different topic? And you might be able to clear this up for me easier than anyone else. In calculating the flood capacity of the Wivenhoe Dam as opposed to the water supply component, should one use 79.1 ADH or 74 ADH in calculating the various percentages?-- For?

For determining what is the percentage of water supply for the Wivenhoe Dam and what is the percentage of the flood capacity of the Wivenhoe Dam?-- The percentage for water supply is EL 67.

Yes?-- So that's 100 per cent.

Yes?-- Above that is the flood storage component-----

Yes?-- -----and that varies. It goes up to EL 80, if necessary.

Yes. But for all practical purposes, under this particular manual that you operate under, once one reaches the W4 stage, that is at 74, you are obliged to commence releases to ensure it remains at that level?-- To control the level, yes.

Yes. That is, the operation of the manual means for all practical purposes the flood mitigation capacity of the Wivenhoe Dam is not measured as between 67 ADH and 79.1 or 80 ADH, but for all practical purposes it is actually measured between 67 ADH and 74 ADH, isn't it?-- No, I disagree with that.

Can you tell me why?-- Yes, there is still flood storage up to EL 80. It is just - the dam still mitigates floods even after the gates are fully opened and the fuse plugs have been initiated.

And does that mean that if the dam was to get to 79.1 or 80 - is it possible for the dam to get to 79 or 80?-- Indeed it is.

If it gets to that stage, though, is the dam's integrity at risk?-- Indeed it is.

That's why the W4 strategy permits actions to be taken by engineers such as yourself back to the 74 mark?-- Yes.

Historically, because I notice that you have got vast experience as an engineer in relation to dams-----?-- Sorry, in relation to floods.

In relation to floods, and in all different jurisdictions of Australia, historically do you know whether the Wivenhoe Dam ever had a different percentage in terms of flood mitigation as opposed to water supply than it has today?-- No.

So has it always been something in the order of 45, 55 per cent - 55 per cent in favour of flood mitigation capacity?-- I can't categorically state that for a fact, no.

COMMISSIONER: Is that a no you didn't know the answer?-- I don't know the answer.

All right, thank you.

MR FLANAGAN: May I finally take you to your second statement, which is Exhibit 33? And this is a statement, Mr Malone, whereby you sought to answer two particular criticisms?-- Mmm.

And there were two criticisms, or two, if you like, theories put up that you have sought to refute, if you like, in the

second statement, is that correct?-- Yes.

And so when we read the evidence that you give in your second statement, we should read it in the context of you refuting two particular or specific propositions?-- Yes.

Now, may I take you to paragraph 3 of that statement? It is the case, is it not, that the modelling you've done in relation to scenario 1, if you like, is based on 100 per cent FSL?-- It assumes that, yes. We start off on 67.

Thank you. In relation to the second part of the modelling, which is dealing with a reduction prior to the 2011 flood event of 75 per cent, that modelling is based on this, is it not: that prior to the 2011 flood event, that is, say, when the Minister requested some information about a possible reduction in the dam level - and say that you had actually reduced it by 25 per cent - that is not the dam level but the - what would you have actually reduced? The 67 ADH?-- No, the level in the dam from 67 to about 64.

To 64. And that would have constituted a 25 per cent reduction-----?-- 25 per cent reduction.

-----in the ordinary ADH of the dam. Now, if you had done that prior to the flood event, this modelling that you've done here assumes this: that the flood event comes along, you permit the dam to reach again 67 ADH?-- Correct.

And then you start making releases?-- At 67.25.

At 67.25 you start making releases at that stage. Now, do you recall that you assisted Mr Maher in putting five options to the government?-- No.

Oh you didn't assist him?-- I didn't assist Mr Maher.

Actually - all right. He says in his statement that he talked to you about it at least?-- We talked about it but I wasn't involved in doing the numerical modelling.

I appreciate that. But are you aware, at least, of the five options put to the government?-- Vaguely aware. I haven't actually seen the papers.

Have you looked at the modelling of those five options?-- No.

In relation to one of those options, option 5, what has been suggested is that you have the initial reduction in the dam of 75 per cent, so we go down to 64 ADH, and that the manual is adjusted or amended and to the ROP - Moreton ROP is amended, so that the dam is operated not pursuant to the present manual but is operated in such a way that the releases - measured releases are made for the purposes of maintaining the dam at 64 ADH. You appreciate that's option 5?-- I appreciate the difference, yeah.

That option 5 is actually quite different, is it not, to the

modelling you have put in in responding to the second criticism?-- I would expect so.

Thank you. Now, it is the case, is it not, that you are not in a position to dispute that adopting option 5 would have reduced the flow from the Wivenhoe Dam during this flood event to the extent of 40 per cent?-- I am not aware explicitly of that.

Are you aware of the percentages by which, even adopting your own modelling, that is a 75 per cent reduction - sorry, a 25 per cent reduction but applying the manual so that the flood event occurs before you can release, if you like, that even with that sort of scenario, the flow from the Wivenhoe Dam for the 2011 flood event would have been reduced in the order of six to 24 per cent?-- Six to 24?

Six per cent to 24 per cent?-- Very precise numbers but if that's what studies shows.

Just taking it from there, quite fairly in your second statement you say that the studies that are required to actually identify the true impact on the Bremer River and Ipswich requires at least some sort of hydrodynamic studies, does it not?-- It does.

Can I take it then that there is no part of your second statement by which you seek to minimise the effects of the releases made from the Wivenhoe Dam on 11 January on the City of Ipswich and the Bremer River?-- Sorry?

I take it that from your statement you do not seek to minimise the effects that releases from the Wivenhoe Dam on 11 January had on the Bremer River and the City of Ipswich?-- That was not a part of this study.

No, thank you. Thank you, your Honour.

COMMISSIONER: Thank you. Now, Mr MacSporran?

MR MacSPORRAN: I have nothing, thank you, your Honour.

COMMISSIONER: Mr Malone works for Seqwater, doesn't he?

MR O'DONNELL: Yes, he does, your Honour.

COMMISSIONER: Are you happy to go next then, Mr MacSporran?

MR MacSPORRAN: I have nothing, thank you, your Honour.

COMMISSIONER: Oh, you don't have any questions anyway. Mr Ambrose?

MR AMBROSE: I have no questions.

COMMISSIONER: All right. Mr Telford?

MR TELFORD: No questions, Commissioner.

COMMISSIONER: Ms McLeod?

MS McLEOD: No questions, your Honour.

COMMISSIONER: Mr O'Donnell?

MR O'DONNELL: Nothing from the Assistant Commissioner?

COMMISSIONER: Oh, sorry, I will check that. Mr Cummins?

MR CUMMINS: Maybe just a point of clarification. Mr Malone, I did ask this of a previous witness, but the lines shown on your curves of the water level within Wivenhoe, we have talked a lot about the inflow and the assumptions behind the inflows to that, but it is correct, isn't it, that they do presume a gate-opening sequence and they presume outflows?-- In my second statement are you referring to?

No, no, the ones that are shown - the modelling runs that you did during the flood?-- They presume?

Outflows?-- Yes.

So outflows are not - they are deduced - you determine outflows on the basis of consideration of the inflows but those models themselves are done post making - I will call it a decision, but post making an estimate of what you are going to do in the future?-- Yes, they are based upon modelled headwater level and the ratings for the gates.

So if you were to, say, adopt a different operating strategy than you had in mind when you did those models, you would get a different outcome?-- Yes.

And potentially if that strategy resulted in higher outflows, it would actually show lower levels in Wivenhoe?-- Yes.

Thank you, Mr Malone.

COMMISSIONER: Can I just clarify, too, the outflows that you factor into your modelling, I think I understood yesterday they were calculated on the current strategy so you would look at what the rate was at Moggill and the rate of release from Wivenhoe to achieve the limit?-- The balance, yes.

Yes. So it is really the maximum outflow you could do under the current strategy, is that right?-- Yes, but taking into account what was coming down the Lockyer and the local inflows also.

Yes?-- So getting that balance right.

And the point of factoring that into your model is, well, if we keep on under this strategy, what will the lake level be?-- Yeah.

Thanks. Thanks, Mr O'Donnell.

Transcript of Proceedings

Issued subject to correction upon revision.

The Law Courts, George Street, Brisbane, Q. 4000 Telephone: (07) 3247 4360 Email: srb.transcripts@justice.qld.gov.au

MR O'DONNELL: You also factor in the time the water will take to get from Wivenhoe to Moggill?-- We do.

Or from Lowood Creek to Moggill?-- From Lowood to Moggill, yes, which varies according to the magnitude of the event.

The question the Commissioner raised this morning was whether you communicated to other agencies which strategy you were operating under at any particular point in time. I think you said the answer was no, but you did communicate the Situation Reports?-- Yes.

And they would routine tell other agencies what was the then level in Lake Wivenhoe?-- The level, the releases, et cetera.

The current rate of release, what increases in releases have been decided upon?-- Yes.

And the impact downstream?-- Yes.

Can we look at the range of distribution of the Situation Reports for a moment? Could the witness see, please, Mr Morris's witness statement at appendix 5, page - there are some numbers on the bottom right-hand corner. The concluding numbers are 472. Yes, that's it. Thank you. So, that should be the Situation Report at 5 p.m. on Sunday, the 9th and it sets out there a range of e-mail addresses?-- Yes.

Now, were the Situation Reports during the flood routinely sent to those e-mail addresses?-- Yes.

Without going through them in detail, they obviously cover a number of people within Seqwater, Sunwater, the Brisbane City Council, the Ipswich City Council, who else, Somerset-----?-- Somerset Regional Council.

Yes?-- And Bureau of Meteorology and also the Director of Dam Safety.

Mr Allen?-- Yes.

All right. Did the range of address expand or contract during the flood event?-- They have at times, when people said, "I would like to get the information.", we will add them in to the list.

All right. And so they would routinely receive this Situation Reports. How long after the reports - how long after the time we see on the reports?-- Oh, how long - as soon as the Situation Report is finalised it's transmitted.

Right. Thank you. If we want to see the addressees on each Flood Report, we can look through the other Situation Reports annexed to Mr Morris's statement, each of which has a range of addressees; that's right, isn't it?-- I'm sorry, yes, yes.

Thank you. Given the information that would be communicated to those other government authorities, is there any practical benefit that you can see by also telling them under what strategy the flood engineers were operating at any given moment?-- I don't see any practical strategies. All of those agencies would have copies of the manual, so they could determine it very quickly.

And if they know what the current release rate is and what decisions have been made about increasing the release rate, for their purposes, are you aware of any additional benefit to them in telling them whether you are under W3 or W2 or-----?-- I can't see much benefit, no.

All right. Thank you. Can I ask you some questions about the manual, please? Do you have a copy of the manual there?-- I do.

I'm looking at page 29 about W4, but my questions are more broad than that. There was a remark the Commissioner made this morning when talking about the manual, something to the effect that it's a bit of a mess?-- Yes.

You were involved in the writing of revision 7 of the manual?-- I was doing some study, yes.

Is it fair to say those who were involved in the writing of revision 7 were engineers?-- Mostly engineers or all engineers.

Is it fair to say when you were involved in writing it, your expectation was it could come to be applied by engineers?-- True.

Without any disparaging of the wonderful profession of engineers, is it fair to say it was written by engineers for engineers to follow?-- True.

During the flood event, this January flood event, was there at any stage where you were uncertain as to what the manual was telling you to do or uncertain as to what it meant?-- No, I think we were single minded in our understanding of what our requirements were.

Well, can we take W4 for a moment? As to the point in time when it ought to be invoked, what was your understanding of what the manual told you as to what that point in time was?-- For me, the - on my understanding was when we reached EL 74.

When the water level-----?-- Reached EL 74, we were invoking W4, and depending on the rate of rise also.

Now, that reflects what my learned friend Mr Dunning referred to as the rider in the statement, "This strategy normally comes into effect when the water level reaches 74."?-- Yes, if you are sure it was going to get to 74, you might introduce it a little earlier, but you have to have that surety.

How would you describe the rate of confidence that you would need to have of the water getting to 74 to invoke it before the water reached that level?-- It would very much depend upon what our modelling was indicating. If we were in, for example, not a rare event, such as this one, but an extreme event which we could see based upon all the information we had at hand that we were looking at a probable maximum flood, then we may well invoke it earlier.

The following sentence about the Senior Flood Engineer exercising his powers under 2.8, that didn't arise during the January flood, did it?-- No.

So, do you read those two sentences as qualifying the dot point condition at the top of the page about the level predicted to exceed 74?-- Yes.

The other thing I wanted to raise with you is what this page tells you to do once W4 is invoked. My learned friend, Mr Rangiah, asked you some questions about that. Your answers focussed on the sentence in the middle of the paragraph commencing, "Opening of the gates is to occur", and you particularly focus on the words, "Until the storage level of Wivenhoe Dam begins to fall". As a matter of physics, for the level of the lake at Wivenhoe to begin to fall, what must be the relationship between the outflow compared to the inflow?-- For the level to fall, the outflow has to be greater than the inflow.

Did you understand that would have been the basis on which you would have to structure the releases from Wivenhoe if W4 was invoked?-- Yes.

You can close up the manual, thank you. You will need two things, you will need the Flood Report and also your witness statement. If you look in the Flood Report at appendix 2E - no, appendix C, it should be the QPF reports?-- Okay.

Now, I am going to page 176 because it's in the middle of the flood event. So, have you got page 176?-- I have.

It should be the QPF you received on Monday, the 10th, at 10 a.m.?-- Yes.

Right. Do we see that at this time you were normally receiving QPFs twice a day, one at about 10 a.m., once at about 4 p.m.?-- Yes.

We can see that from the following pages, can't we?-- Yes.

And each would give you a 24 hour prediction. You make some comments about the extent to which you, as a flood engineer, could rely upon these in your witness statement. I am particularly referring to paragraphs 49 and 50?-- Yes.

Would you mind just explaining for us what you're referring to there as the limitations involved in the QPF forecasts?--

What's important in flood modelling is understanding or having a good input into the model of the spacial and temporal distribution of rainfall, and what I mean by that is we have to understand how the rainfall is distributed in the catchment and how it just - how it is distributed with time. Rainfall intensity is a particularly important feature in generating run-off and producing flood-producing run-off, and I say there that if we get 50 millimetres in 24 hours, we will get quite a different volume of run-off and pattern of run-off than if we get 50 millimetres in, say, three hours. So, the QPF which gives us a catchment average over a 24 hour period is not truly indicative of what will occur, it's a best estimate of an average, and so - when you are inputting it into models, it really is not an accurate assessment of what will occur.

You don't know whether it will occur in the first hour or over the last of the 24 hours?-- That's right, we have - gives you no indication of the spacial or temporal pattern that is associated with that QPF.

How does that affect the reliability of the modelling you do with the forecast?-- Very unreliable. I would be reluctant to make decisions based upon a forecast rainfall prediction.

Can I ask also, I notice just from page 176, the prediction there is on the Tuesday between 50 and 100 mils of rain. When you do your with forecast modelling, do you chose 50 or 100 or something in between?-- Something in between, but then you might also do a sensitivity analysis of what happens if we do get the 100.

Have a look at 177. This is on the afternoon of Monday, the 10th at about 4 p.m.. The forecast there is between 25 and 50 millimetres, but isolated falls to 100 mil. How would you factor that into the model?-- You would have to make some subjective judgments. Probably in that case you may do it - an average of 50 millimetres and then - yeah, maybe scale it up a bit, 75 millimetres, see what impact that has. That's an excellent example as to why you would not make releases on the forecast rainfall, because on that basis it was very much underestimated.

All right. What about page 178? This is on Tuesday, the 10th. It tells you "falls in excess of 100 mil". How would you use that?-- You just have to go for 100 mils, but I expect we would have been in communication with the Bureau to talk to the flood - people in the Flood Warning Centre as to what their expectation was also.

I will come back to some of those discussions shortly. You can close that up, thank you. You have been asked some questions about whether - some questions focussing on the with forecast modelling, particularly on Monday, the 10th. My learned friend Mr Rangiah asked you some questions. If we go to the time when you began your shift on Monday, the 10th, about 7 a.m., he put to you that there had been a series of models run from the Sunday night to the Monday morning showing the blue line, the with forecast model line for Lake Wivenhoe

as being above 74, and what he was intimating was whether you should have moved to a W4 strategy earlier, 24 hours earlier than you did. I want to get your opinion on this, but can we look at the actual circumstances operating when you began the shift at 7 a.m.?-- Yes.

So, should we look first at what was the lake level and the rate of inflow and outflow? Where should we look first?-- Probably 8 a.m.

Yes. So, it's 8 a.m. on the 10th?-- Yes.

What's the lake level at that time?-- 71.36.

And the rate of inflow?-- Inflow at that stage would have been just reaching its first peak, and then there was just over 10,000 cubic meters per second.

And the rate of outflow?-- The outflow at that stage was 1944 cubic meters per second.

And to see the other conditions applying at the time, where should we look, the Situation Report or-----?-- The Situation Report, yes.

Should we look at that?-- Yes.

There is one that issued at 6.30 in the morning, which I think you will find is at appendix E, page 25?-- Yes.

What are the relevant features-----?-- Sorry.

-----that would bear upon this decision we see from that Situation Report?-- At that Situation Report we were anticipating that the inflow into Gregors Creek into the dam was bigger than January '74 and February 1999. We were also suggesting that the dam level was 70.77 and the estimated peak was still rising, and the Situation Report was 8,800 cubic meters per second, and we were expecting the dam to reach at least 73. - 73.3 metres AHD during Tuesday morning, and we're saying that, "The objective for dam operations at this stage is to minimise the impact of urban flooding in areas downstream of the dam and at this stage releases will be kept below 3,500 cubic meters per second.", and we were expecting the combined flows at the lower Brisbane River to be less than 4,000 if possible.

All right. The Situation Report, also on the first page, under the heading, "Rainfall.", paragraph 3, mentioned, "Rainfall expected to occur in the downstream catchments as the system tracks south."?-- Yes.

What's that referring to?-- Well, at that stage, our QPF or our last QPF had indicated what the depth of rainfall was likely to occur and the weather system that was causing that rainfall was going to be moving south of the dam.

Downstream of the dam?-- In downstream areas.

Did that influence your thinking as to what release rate was appropriate?-- Indeed. It would mean that if we ramped up the release floods at that stage, we would be exacerbating downstream flooding.

If that rain fell-----?-- If that rain fell.

-----downstream?-- Yes.

Well, there was, though, the factor that you have got a pattern of with forecast modelling showing the blue line above 74. It's been like that all night. Should that have caused you in those circumstances to have moved to a W4 strategy-----?-- No.

-----when you began your shift?-- No, no.

Why not?-- Because at that stage, we would only have implemented W4 when we had reached EL 74, but at this stage we are still trying to ensure that we did no further damage than what was occurring. If we had have ramped up to W4 at that stage, we could well have made the situation a lot worse.

You had about another three metres?-- Plenty of storage left before we had to make that decision.

You wouldn't make a decision which might exacerbate downstream flooding while you had that three metres remaining?-- While you had that flood mitigation storage available.

Had you made a decision to move to W4 at that stage, what sort of releases would have been involved?-- At that particular point in time, at 8 o'clock on the 10th, the inflow was 10,000. To stabilise the water level at that current level of 71.36, we would have had to start making releases of the order of 10,000 cubic meters per second. That would have been disastrous.

That would have been a higher rate of release than occurred during the flood event?-- Indeed.

Thank you. Was it a situation when you began that shift where you could put your hand on your heart and say, "Well, the dam is at a safety risk right now."?-- Not at that stage, not on the Monday morning, no.

Can we track through the rest of that day? You're there from 7 a.m. to 7 p.m.?-- Yes.

If we look at the events that occurred that day, there's a consistent pattern in the modelling with forecast, the with forecast modelling, where the blue line stays above 74. I think Mr Rangiah read out some figures. It gets up close to 75 at some stages?-- Mmm.

What else happened that day? What can you tell us about the level of the lake and the rate of inflows and outflows?--

During that particular day, yes, the - I'm referring here to figure 9.1.2, which is on page 4 of the Flood Report - it quite clearly shows that at that stage we had or were just about seeing the main peak, the first peak, and we could see - expect that if we had no further rain, we would be seeing the dam stabilise at under 74 metres. That was the expectation.

You refer to that first peak of inflow?-- First peak of inflow, yeah, and-----

On the basis if you don't have the second peak, then you could get through the flood event without having to go to W4?-- Indeed, yes.

In the hope of avoiding flooding in Brisbane?-- Yes.

Yes?-- So, up until the end of the day, that seemed to be the case. The rain had eased off. The QPFs at that stage were not indicating the substantial rainfall that we did receive the next day, so at that - by later that day, we were relatively - relatively comfortable with the situation, that we had a good handle on this particular event.

Was there also a factor that if you look at the hour by hour list of the rate of inflow to the dam, that the rate of inflow diminishes?-- After that point in time.

From about 3 p.m. onwards?-- Yes. So that's also indicating that the rainfall had eased off.

Just for the Commission's benefit, does it decrease from about 3 p.m. at the 8,000 CUMECS to about the 4,000-ish figure by the time you are finishing your shift?-- Yes, a substantial reduction in inflows.

What effect did that have on your thinking?-- Again, it was - by the end of my shift, I was thinking that, yes, we have this event under control, we were able to store that volume of water within Wivenhoe Dam and release it at a rate which would minimise the impact of downstream flooding.

So, up to the time when you finished your shift at 7 p.m., what was your degree of confidence as to whether you would or would not - whether the water would or wouldn't not reach a level 74?-- I was - would have been reasonably happy that we would not have reached 74 by the end of my shift on Monday evening, even based upon what the QPF said.

What about that reference to the rainfall system heading downstream of the dam? Can we see what was written about that in the Situation Reports? I think it's mentioned in the one at 12.16, about lunchtime, on the Monday?-- It does say that the rain has continued, the severe weather warning remains current, the QPF indicated that the forecast was for 50 to 100 millimetres for the next 24 hours from 10 a.m. that day, heavy rainfall continues, the situation could deteriorate rapidly, but we will monitor the situation and - not expecting it to significantly worsen.

And also under the heading, "Impacts Downstream of Wivenhoe Dam.", if you look in the second paragraph I think it mentions the rainfall situation downstream of the dam?-- Yes, "If the predicted rainfall eventuates in the downstream tributary catchments, the resultant combined flows in the lower Brisbane may exceed the threshold of damaging discharge in the urban areas within the next 24 to 48 hours." So, at that stage if we had have started to ramp up our discharges, there was potential we could have exacerbated the flooding downstream.

If you had moved to W4 during that day of the 10th up until the time you finished, your shift finished, what sort of rates of release would you have been making?-- Again, based upon the model or the inflow at the time, that would have been of the order of - starting at 10 a.m. - 8 a.m. in the morning, we would have started releasing at 10,000 and then decreased slowly during the day as the water level stabilised. So, by the end of the shift, I would imagine that we would have been releasing 4,000.

All right. Thank you. By the end of the shift, what was the rate at which you were releasing water? Do we see it is set out in the Flood Report at page 158?-- By 7 p.m. on the 10th, we were releasing 2,277.

Thank you. Let's go then to the morning of the 11th, Tuesday morning. You arrive for work just before 7, I think?-- Yes.

6.45 you say in your statement. Can you tell us what was the situation when you arrived at work?-- The situation was that we had the handover as normal, we discuss the situation with both Rob and John.

Mr Ayre and Mr Ruffini?-- Yes.

He talks to both you and Mr Tibaldi?-- So, it was a combined handover. At that stage, we felt that we were reasonably comfortable with the situation, the dam was managing the inflows, there was some expectation of rainfall throughout the day, but nothing that we didn't think that was going to exacerbate the - or cause that rapid rises. I liked to understand the situation by modelling myself, to - even though - so - even though the handover team had given us advice, I still like to undertake my own modelling and just reassure myself that what they have told me is correct. So, we started to doing some modelling runs at 7 a.m. and then started to realise that the situation was developing very seriously and we'd have to potentially get to W4.

I want to take this step-by-step?-- Okay.

Because it is very important. Could we look at the model runs? Do you have a copy of those? Exhibit 22. Should we look here at model run 36?-- Yes.

And it shows that the red line over 74?-- Sorry, I am looking at the table.

All right. You have got a summary of the results, have you?-- Yes.

You can look at the model if you want to?-- I am quite comfortable with the table, if that's all right.

It shows the red line for the predicted lake level, taking into account rain that's already fallen as being over 74?-- Yes.

So about 74-----?-- Point 3.

All right. And there had been an earlier model run that Ayre and Ruffini had performed, or two earlier model runs showing the red line either at 74 and just nudging over?-- Yes.

And you were aware of that?-- I was aware of that, yeah.

Right. What was your reaction to this?-- Indeed, that's why I undertook the later model run, to ascertain whether that was still consistent with those earlier two runs.

What's the lake level at this time at 7 a.m. on the Tuesday morning?-- 73.6.

So you have got about 400 millimetres to go?-- To go, yeah.

Is the rate of inflow to the dam increasing or decreasing?-- At that stage we started to get big increases into the dam.

Can you give us some idea of the size of the increases?-- At 7 a.m. the inflow was 6,800; at 8 a.m. it had jumped to 8,060; at 9 a.m. it had jumped to 9,165; and by 10 a.m. it had jumped to 10,376.

All right. How did that compare to the previous hours, the hours before you started-----?-- The hours before we started, the inflows had been - in the early hours around the - indeed, they had been dropping. Up until 2 a.m. the inflow had dropped. From 1 a.m. it was 4,200, or 4,175. At 2 a.m. it was 3,594. It started to climb then slowly for the next few hours until that mammoth increase between 7 and 8 a.m.

So did you and Mr Tibaldi discuss your model run at 7 a.m.?-- Indeed we did. And we decided that the situation was potentially getting very serious. We looked at the rainfall, recorded rainfall, we were looking at the radar to indicate that the rainfall was likely to continue. And that's when we

got on to the bureau to discuss what the outlook was for the rainfall in the next few hours.

And who talked to the bureau?-- I talked to the bureau.

Do you recall who you spoke to?-- Not exactly, no. I would have called the duty officer in the Flood Warning Centre.

Do you now have a recollection of the discussion?-- No, not really. It would have been of the order of - the impression I would have is, yeah, what sort of rainfall can we expect for the next six to 12 hours. That would have been my questioning of the person I spoke to.

And do you recall the substance of the response you got?-- Well, we're going to get heavy rainfall in the next - yes, it is going to continue. It is - often in these sorts of situations it is very difficult to put numbers on it. The meteorologists, in my experience, will give you a trend analysis. They will say it is likely to continue for the next few hours based on the current rates that have been recorded in the last few hours, or they might give you an indication that it is going to cease in six hours.

Can I press you a bit further about the discussion with the bureau? Can we have a look at the flood log for the moment? Appendix M. I am looking at page 88?-- Yes.

If you look at page 88, 7 a.m. is the reference to your modelling?-- Yes.

The top of 89. There are three discussions with the bureau, if you look at 7.22, 7.35 and 7.56. Just read those to yourself, please?-- Uh-huh.

You're engineer 2?-- Yes.

Do they assist you to refresh your memory as to the matters discussed with the bureau?-- As I said, routinely we would be talking about forecast rainfall. I don't explicitly recall those discussions.

All right. Then what did you do following those discussions?-- We were then undertaking our modelling and at that stage - and noting the heavy rainfall in the area around the bottom end of the catchment. We were continuing to do model runs and updating the rainfall inputs. At that stage we found that there was a departure from what we were modelling with the recorded water levels and so we then had to make some engineering judgments about what we were going to do.

And did you discuss this with Mr Tibaldi?-- Indeed. We were in close consultation with - all the time during this particular morning.

And what did you and he decide to do?-- Well, at that stage we - given that the rainfall was continuing and the rate of rise in the dam was going up at a fairly rapid rate, and we

didn't have an appreciation or an understanding of when the rain would cease, we then started to follow the manual in regards to making the releases - to ramp up the releases from where we were. By the time we got to EL 74 that's when we had to dramatically increase the releases.

Well, the flood event summary says you reached a decision to move to W4 at 8 a.m.?-- The flood event summary, yes. That would have been our understanding, yeah.

You will see that at page 23 of the flood report?-- Yep.

That's on the right-hand column, the first dot point?-- Yes.

And you did another model run at 8 a.m.?-- Yes.

Model run 37, I think, which again showed the red line over 74?-- Yes.

But at that stage at 8 a.m. what was the lake level at Wivenhoe?-- At 8 a.m. on the 11th?

Yes?-- 73.7.

So you are about 300 millimetres short of 74. So what caused you to go to W4 before the lake level actually reached 74?-- Oh, it was quite obvious that we were going to get - by that stage there was a high degree of certainty that we were going to get to 74, EL 74. Given two things: the heavy rainfall continuing and the rate of rise not slowing down and, indeed, accelerating.

Did the advice from the bureau contribute to that decision?-- I don't recall explicitly whether it did or not, except that heavy rainfall was expected to continue throughout the day.

Is that the advice you received from the bureau?-- Yes. It probably was. I can't be guaranteed.

Do you think that contributed to your decision to move to W4 before the level got to 74?-- Well, it was certainly a part of that process. That was one of three or four inputs into it. We had the forecast of heavy rainfall continuing, we'd seen the rainfall on the ground, we were looking at the rates of rise and that - those three factors would have led us to the conclusion that we would indeed get to 74.

Can you estimate what was your degree of confidence at that time that you would reach - the lake would reach 74?-- Given we were only 300 millimetres off, a very high degree of confidence.

Right, thank you. You can close that up. There was a question the Commissioner asked this morning I just wanted to run through with you in light of the evidence you have just given. You gave some evidence before the morning break that if you did a modelling without taking into account forecast and it showed that the level of the lake would get to 74 at 6

p.m., I think the Commissioner asked you, well, at what stage would you move to W4, and you said at 6 p.m. In what actually occurred on the 11th, you moved to W4 a little before 6 p.m.?-- Yes. Yes. It would depend upon how confident I was in that particular prediction. Given the fact it was only - it was already at 73.7, it was just - we were highly confident it was going to reach 74.

You must have appreciated at that time the consequences of moving to W4?-- I did. I did.

And what were they, as you saw them?-- I saw that we would be potentially causing people damage to their houses.

Would you have avoided that if you could have?-- If we could have, yes, certainly.

So, for example, when you rang the bureau around 7.20, if the bureau said the rain is about to stop, might that have affected your decision?-- Oh, indeed, yeah. We would have attempted to maintain the releases much lower but then on the other hand we would have had to get - use the discretion under - the senior flood operations engineer has to get an exemption for that.

That would involve Mr Ayre getting approval from Mr Allen-----?-- Correct.

-----to depart from the manual-----?-- Yes.

-----exercising the powers under 2.8?-- Yes.

Thank you. Just a couple of final things. Can we put aside the January flood event and look solely to the future in terms of what should - what's the best position for the manual for the future? One thing that's under consideration by the Commission is should the manual in the future require the flood engineer to make decisions about releasing water based upon the with forecast model? Can I get your view as to what would best serve the public's needs based upon your 30 something years in hydrology and dam operations?-- The aim is always to do the least amount of damage as possible. So it is very difficult to set out - given - given the scenarios which can occur under weather situations, the variation, it is very difficult to set out a prescribed set of rules which will cover every situation. I find it is a very difficult area and I am not quite sure what the answer is. It certainly requires a lot more study and a lot more investigation than a 10 second answer on the stand.

What sort of study or investigation? Can you give us some idea?-- We would have to look at all the historical events and model those and see if we can come up with a strategy which would mitigate floods in all situations and historically; we would have to consider future scenarios, what the possibilities are for rainfall situations in various parts of the catchment, and how would various strategies either mitigator worsen situations. It is - and that's an exhaustive

study.

So you couldn't comment either way on whether you think the current practice is the best one or whether some different practice would be better?-- All I know is that floods will only get bigger and the droughts will only get longer and that balance between the two is a decision that we have to make as a community.

That's so, but I am really focussing on you make decisions about releasing water based upon the red line or the blue line, it is more that in terms of what in your opinion is the best practice?-- To base your decisions upon what you have the most certainty in rather than the uncertainty, and that's to base it upon the recorded rainfall, the predicted levels based on that recorded rainfall rather than to make decisions on something which may or may not occur. I would be much more comfortable in making releases because I had to, not because I possibly could have to make releases.

There is a preventative measure against the prospect of future rainfall?-- Yes. If the rainfall doesn't occur, then we would be sitting here talking about why did you release when you didn't have to. So that's the dilemma we face.

Is it your opinion the public would be better served by a continuation of the present - what you have described as the present practice?-- Yes.

All right, thank you. Another option that's been raised for the Commission to consider is whether there should be another strategy in between W3 and W4. For the sake of argument we will call it 3A. And under 3A the flood engineer would have greater flexibility to release higher volumes than 4,000 CUMECS before the water level gets to 74. In other words, a much greater discretion. Can you comment whether you think that would be desirable or not?-- I would like to do the studies to see whether that's a viable option. But I - I think within the manual we need to have fairly prescriptive rules, in some respects, or objectives, because when we do operate these dams, it is under very stressful situations and you don't want people having to use subjective judgments to make those decisions.

So you think it is better to have clear lines in the manual rather than-----?-- Indeed.

-----a more general discretion which might give flexibility but have other consequences?-- Has other implications, yes.

Thank you. Does the pressure that's upon the flood engineer during a flood event have a bearing upon this?-- A bearing upon?

The desirability of clearly defined rules versus broad discretion?-- Clearly defined rules obviously makes it a less stressful situation when you know what you have to do.

Thank you. One last thing: do you have your second witness statement there, Exhibit 33? I am looking at paragraph 3J on page 4. This is dealing with your modelling where there were higher releases earlier from Wivenhoe during the flood event?-- Yep.

And you modelled - we see in figure 1 that if there had been higher releases of 3,000 CUMECS from the Sunday, the peak releases from Wivenhoe would have been substantially less?-- Correct.

Four and a half thousand CUMECS versus seven and a half thousand CUMECS, or thereabouts?-- Uh-huh.

But then you model what would have been the resulting heights in the Brisbane River both at Moggill and at the Port Office, and it is only a minimal difference?-- Yes.

You say in paragraph 3J that part of the explanation for that - part of the explanation for why the reduction in peak flows would not have produced a huge difference in river heights, you say the behaviour in terms of flooding is driven as much by flood volumes as flood peaks. You say in the case of an earlier release strategy, flood volumes do not change?-- That is correct. Over the duration of the event. For example, we have the same volume - we have a given volume at the outlet.

Could you explain for me why the flood volumes matter so much or as much as the rate of the releases?-- It has to do with the quite complex and dynamic behaviour of the river and the interaction with the floodplain. Between Wivenhoe Dam and the mouth of the Brisbane River there are a series of floodplains, what we call temporary floodplain storages. For example, at the junction of the Brisbane and the Lockyer, floodwater is temporarily stored there, it inundates a large percentage of the floodplain but then downstream of that particular location there is a bit of a constriction. So that the rate at which floodwater is released from that particular floodplain storage is governed in large by the constriction. Now, there are a whole series of those floodplain - temporary floodplain storages and constrictions all down through the river. So those floodplain storages fill and then - not then spill, but there is a control or a different mechanism. The behaviour of those floodplain storages varies from event to event. For example, in the 1974 event much of those floodplain storages would have been filled from local run-off, and by the time the main flood came down,then there was not a lot of attenuation of the flood effects. In this particular event the rainfall was less intense on the local areas so there was more of the floodplain storage could be filled and as a result we ended up with significant attenuation. So it is a very complex issue and that's why we have to use these hydrodynamic models to accurately calculate the impact.

Thank you, Commissioner.

COMMISSIONER: Thank you. Mr Schmidt?

MR SCHMIDT: Thank you, Commissioner. Mr Malone, while that floodplain story that you just told is fresh in everybody's mind, can you just explain to the Commission what those floodplains are?-- They are areas of relatively flat ground in and around the river channel.

Would those floodplains be the areas that would contain the majority of the farms along the mid-Brisbane River?-- I don't know.

I would suggest that they probably are. So if that's the case, that this strategy is used to mitigate the flood at Moggill, does that mean that the area just below the dam as you are talking about, the floodplain storages, will be used every time-----?-- Depends on the-----

-----as an option?-- We don't use it, it is just a naturally occurring phenomena. In this particular case we had a combination of three sets of circumstances. We had the releases from the dam, a very large flood - and we have yet to determine how big that flood that came out of the Lockyer Creek - and also the extremely heavy rainfall that occurred in and around Lowood on the morning of those concurrent floods.

So will that modelling for the Lockyer be done?-- I hope so, yes. Yes, certainly.

Thank you. Mr Malone, you worked with Mr Tibaldi on the rewriting of the flood manual?-- I did.

Have you read the submissions of the Mid-Brisbane River Irrigators, Ms Jocelyn Bailey or Mr Darren Zanow?-- I have perused them. I haven't read them in detail.

Okay. But would you accept that there is a great deal of local knowledge about the character of the Brisbane River between Wivenhoe and Mt Crosby?-- Amongst a lot of people in the community, I would imagine, yes.

As stated in the MBRI submission, government brochure DS 5.1, the flood mitigation manual for the dam, allows for discussions between the action officer and other stakeholders. It is in our report, if you wish to see it?-- I haven't read your report.

COMMISSIONER: What's the document that it actually refers to, Mr Schmidt?

MR SCHMIDT: It is the MBRI - the actual document is the government brochure DS 5.1?-- I am not familiar with government brochure DS 5.1.

We will get a copy, if you like, Commissioner.

COMMISSIONER: That will probably the best source, if you have

got a copy of the brochure, or you can tell us what it says.

MR SCHMIDT: Well, it basically says that the action officer - sorry, "Discussions between the action officer and other stakeholders". So you can actually bring other stakeholders into the discussions about the flood manual review.

COMMISSIONER: Who is the action officer?

MR SCHMIDT: I would imagine the person conducting the review.

COMMISSIONER: We would need to know that.

MR SCHMIDT: It refers to it in the government manual, DS 5.1.

COMMISSIONER: Well, are you aware of any capacity to consult stakeholders when you are working on a revision?-- No.

There seems to be a difference of opinion. It would help to have that brochure, if you can get hold of it, Mr Schmidt. It doesn't have to be now, but you might want to tender it later.

MR SCHMIDT: No worries. It should come up on the screen.

COMMISSIONER: I am not sure. If we've got it it can. Where is it to be found?

MR CALLAGHAN: It has just been sent to your associate, Madam Commissioner.

COMMISSIONER: I see. It is obviously something you might want to take up with Mr Allen, Mr Schmidt, because I see it is endorsed by him.

MR SCHMIDT: Okay, that's fine. I can do that.

COMMISSIONER: I am not suggesting you can't talk to this witness about it.

MR SCHMIDT: I just wondered if he thought it might be a good idea in the future to actually include other stakeholders, such as the Mid-Brisbane River Irrigators Group in the discussions - in further discussions on future changes to the manual?-- Yes.

Thank you.

COMMISSIONER: Can you get a hardcopy of that brochure? I imagine the Commission has got one somewhere.

MR CALLAGHAN: Yes, we do.

COMMISSIONER: If he can get it after lunch and make it an exhibit. Thanks.

MR SCHMIDT: If you can turn to appendix A from the flood report from Seqwater. Page 2, Exhibit 22. I think we're all fairly familiar with it by now?-- Yes.

Okay. Can you tell me - I can see here that the model run 37 - at model run 37 the current lake level was 73.7, is that correct?-- Yes.

And then at model run 39 the current lake level was 74.39, is that correct?-- That's correct.

Can you tell me the exact time when - or near enough to the exact time when the dam actually reached EL 74?-- I have got here readings at 10 a.m. 73.95 and at 1 p.m. 74.39. So some time between-----

So some time around lunch on Tuesday?-- I would imagine it would be closer to 11 a.m.

11 a.m., thank you. Can you tell me what the inflow rate was at that point in time?-- Sorry, I should have referred to the table in this document rather than that. Yes, this document on page 158 of the flood report says at 11 a.m. the dam level was 74.1 and at that stage the inflow was about nine and a half thousand cubic metres a second.

Nine and a half thousand cubic metres a second?-- Yes.

So at nine and a half thousand cubic metres a second W4 was enacted?-- Yes.

So, if what you said before about had you released it earlier when the inflows were 10,000 cubic meters per second, you would have had to release a 10,000 cubic meters per second flow to balance that out?-- Yes?

Is that correct? Well, then, why was there never a 9,000 cubic meters flow released to balance that dam out? It only got to 7.6?-- No, this calculation is - it's a calculated level and if you look at the graph on page - the earliest part of the document, you will see that it's fairly sawtoothed to and that's just a numerical calculation. What actually happens is it's a much smoother curve than that, you can't categorically state that the inflow at that particular point was exactly 9,600.

So-----?-- It's an approximation.

-----you can't categorically state the inflow at the other point was exactly 10,000?-- Not - well, not exactly 10,000, but it was certainly close to that.

Doesn't seem to be much difference there to me, sorry?-- 10,000-----

Going back to the modelling, just for further - for future reference maybe, I note that all the blue line forecasts actually cross through the 74 EL mark approximately midday on Tuesday, anywhere from early a.m. to late Tuesday night. None of them actually vary from Tuesday. However, the first red line that actually crosses the 74 mark does it on Wednesday morning. So, I am just wondering to the accuracy of each. I mean, I would consider that being the blue line crossing through 74 on Tuesday and it actually peaked at 11, I think you said, on Tuesday-----?-- No.

That would probably make it a little bit more accurate?-- Sorry, it didn't actually peak at 11 a.m. on Tuesday.

Sorry, not peaked, but crossed the 74 line?-- Yeah.

At 11. So, the modelling is actually showing that was going to happen for - I think it's 12 model runs in a row that the with forecast modelling showed that that was going to happen on Tuesday?-- Yes.

And, in fact, it did?-- Yes, and that's good modelling then.

Very good, very good, but it wasn't taken into account?-- Of course it was. We were expecting to move to Strategy W4 about that time and we did.

Okay. I just thought that maybe because you knew at model 22, which was done on Monday, that there may be some notification of the possibility of going to W4 could have been put out to people who are only two hours from the dam? We don't have the luxury of having a two day period to get the water from Wivenhoe to Moggill, which they have, we have two hours from Wivenhoe to Fernvale, and we just didn't have any warning.

Maybe in the future that forecast rainfall could be used to warn areas close to the dam. Would that be possible?-- Everything's possible and, indeed, I would hope that as a result of this event we improved our communication systems and advices.

Okay. Thank you. No further questions.

COMMISSIONER: Mr Callaghan? Will you be long, because if you're not-----

MR CALLAGHAN: I have nothing further for Mr Malone at this time, thank you.

MR O'DONNELL: Commissioner, can I raise something?

COMMISSIONER: Yes.

MR O'DONNELL: We are told the batting order this afternoon is Zanow, then Tibaldi.

COMMISSIONER: Yes. Could I make a request that Mr Tibaldi be called first? He's been under some stress with being called to give evidence. He's very keen to give his evidence and to be finished if possible before this week and not have it hanging over him until May. He's been waiting for some days to give his evidence.

MR CALLAGHAN: He might have been waiting for some day but we have had a witness who's been waiting here all morning. I am conscious of the need to finish Mr Tibaldi. I would like to finish him today too, but we have a witness who will be relatively brief. He's someone who was actually directly affected by the floods and we intend to call that witness. We anticipate the evidence will not be brief. If Mr Tibaldi wants to finish this afternoon, I suspect it's likely in the hands of counsel.

COMMISSIONER: Could we start again at 2.10? Would that suit everybody-----

MR O'DONNELL: Yes, thank you, your Honour.

COMMISSIONER: -----to try and improve the prospects? Anybody got a difficulty with that? That's what we will do then. Adjourn till 2.10, please. And you are excused?-- Thank you.

WITNESS EXCUSED

THE COMMISSION ADJOURNED AT 1.05 P.M. TILL 2.10 P.M.

THE COMMISSION RESUMED AT 2.11 P.M.

COMMISSIONER: Yes, Ms Wilson?

MS WILSON: Thank you, Madam Commissioner. Before we call the next witness, there was a document of DS5.1 the Flood Mitigation Manual for the dam that was referred to in Mr Schmidt's cross-examination.

COMMISSIONER: Yes.

MS WILSON: We have a copy, a hard copy of that document. I tender that document.

COMMISSIONER: That will be Exhibit 49.

ADMITTED AND MARKED "EXHIBIT 49"

MS WILSON: And I understand also this document is available on the DERM website.

COMMISSIONER: Thank you.

MS WILSON: Thank you, Madam Commissioner.

COMMISSIONER: Yes.

MS WILSON: I call Darren Zanow.

DARREN WILLIAM ZANOW, SWORN AND EXAMINED:

COMMISSIONER: Thank you, Ms Wilson?

MS WILSON: Is your full Darren William Zanow?-- Yes, that's correct.

Are you the chief executive officer for Zanow Sand and Gravel Pty Ltd and Zanow's Concrete Pty Ltd?-- I am, yes.

And these businesses are owned by you, your brother, and your father?-- Yes, that's correct.

And this is a business that is a sand, gravel and concrete operation?-- That is correct, yes.

And it's situated at 1630 Brisbane Valley Highway, Fernvale?-- Yes, correct.

Okay. And you made a statement for these proceedings?-- I have.

And you signed the statement on the 8th of April 2011?-- I did.

And since signing your statement, exhibit marks have been added to your statement?-- Yes, they have.

And you have initialled those exhibit markings?-- I have, yes.

And there are three exhibits attached to your statement?-- That's correct.

One is the minutes with the meeting with Seqwater on the 10th of December 2010?-- Correct.

The second is a series of photographs?-- That's correct.

And the third is a submission that you sent to the Commission?-- That is correct.

Madam Commissioner, I tender the statement and the photographs.

COMMISSIONER: Exhibit 50.

ADMITTED AND MARKED "EXHIBIT 50"

MS WILSON: Now, your business is located on the southern bank of the mid Brisbane River?-- Yes, that's correct.

And that is approximately 17 kilometres downstream of the Wivenhoe Dam?-- Correct.

And 15 kilometres downstream of the Lockyer Creek intersection with the Brisbane River?-- That's correct.

Now, your operation was established there in 1996?-- Around that time, yes.

Okay. And your business has two other properties?-- That's correct.

One of them is in North Booval on the banks of the Bremer River?-- Yes.

And the other is at Buaraba Creek at Coominya?-- Correct.

Now, at paragraph 5, if I can get some clarification, you say that, "The business has experienced many flooding events since 1996, including larger events in 1999 and 2010." Are you

saying that the 1999 and the 2010 floods were larger than the floods that you experienced in January 2011?-- No.

Okay. Which was the largest flood that you have experienced out of the three that we have referred to?-- By far the 2011 event. Just from - the '96 event was a significant event, in my mind, a large event.

Now, you have completed an extensive statement which has been tendered so I am not going to take you completely through your statement, but if I can raise just a couple of matters. One of the matters is the communication with Seqwater. Now, you say in your statement at paragraph 13, "On the 10th of December 2010 you accepted an envision that from the Mid River Irrigators to attend a meeting with Seqwater?-- Yes, that's correct.

Okay. Now, is it the case that up to this time you were having difficulties communicating with Seqwater?-- Yes, I was.

Could you tell us about those, please?-- After experiencing flood events, we thought it necessary to establish a line of communication with Seqwater so that we could be - we could be updated on their flood strategies and their water releases. I sent a letter to the CEO and I did get a reply some time later, the exact reply I can't remember, but after numerous telephone conversations with - in particular trying to talk to the CEO about this, I didn't get any response other than to, "Listen to media reports", and I made it clear that media reports were usually glorified or usually incorrect and their level of detail was not sufficient for me to enact my flood management plan on site.

When he told you to listen to media reports, was that in relation to the operation of the dam and the release of water, or was that in relation to weather events?-- Both.

Now, is it because of the lack of communication with Seqwater that you became a member of the Mid Brisbane River Irrigators?-- Around the time of early - late November, early December my brother and I purchased a property across the road, across the highway, from the quarry and that - as part of that purchase a water allocation became available of which we took the water allocation, and I thought it would be sensible to become a member, as well as I knew other people that were members of the organisation as well, and they had the same problem that I had receiving information from Seqwater.

And at paragraph 13 in your statement you say that on the 10th of December 2010 you accepted an invitation from the Mid Brisbane River Irrigators to attend a meeting with Seqwater?-- That's correct.

Now, after that meeting, was there any change in the communications that you received from Seqwater?-- There was. I joined the database, along with the nominated people on the

Brisbane River Irrigators' committee, and other people, I might add, and were part of e-mails that were regularly sent, and those e-mails kept us updated on Wivenhoe releases.

Okay. And you talk in your statement about a Mr Graham Keegan, a senior water engineer of Seqwater, sending out the e-mails?-- Yes, that's correct.

And that this was an excellent way of informing you of the releases and the volumes?-- He was very good, yes.

And why was that important for you?-- Only - well, when they adjust the gates at the dam, there's probably only - depending on the size of the flood event, there's only between one and two hours lag time before the water is affecting quarry operations, so having this line of communication is absolutely vital in ensuring that I can protect my business from flooding events from Wivenhoe.

And this line of communication did assist in the protection of your business assets?-- It saved us a lot of money, yes, once we that had line of communication, of course.

Now, the inundation of your properties, you say, began on the afternoon of the 9th, but hit critical stage between - on the Tuesday, the 11th between 10 a.m. and midnight?-- Yes, that's correct.

Okay. And had you at that point in time had an opportunity to be able to move some of your assets and infrastructure on your Fernvale property?-- We did, yes. A lot of the mobile infrastructure we actually moved three times in the space of three days.

Why was that?-- Well, because earlier we - earlier on we believed that the flood event wasn't going to reach the magnitude that it did, so we - our flood plan said - well, we believed that the flood would get to a certain level. On the Saturday night actually Graham Keegan assisted us in seeing what level that would get to, so we made preparations to get - to move equipment to higher ground so that we had some immunity, and then, of course, on the Tuesday morning when it continuously rained and we were informed we'd needed to move them again, so we moved them to slightly higher ground and then, once again, later on that day or later on that morning, we moved them again, and actually later on that night.

The damage that was caused to your properties is set out in paragraph 54 of your statement and you say that it amounts to an approximate total of $9 million. Was that in relation to the Fernvale property or all three properties?-- All three properties.

What about in relation to the Fernvale property, can you give an estimate?-- In relation to the Fernvale property, around about three and a half million dollars, yes.

Now, Mr Zanow, attached to your statement was some

photographs. There's many photographs and we can just have a look at a few. You will see them on the screen. Now, can you tell us what - this is a photograph of a truck on its side?-- Yeah, this is a photograph of a dog trailer actually and the velocity of the water has obviously tipped it over. In the background, you can see a stockpile of processed material there and that there was the high watermark.

Sorry, when you say "that there", which mark are you referring to?-- This is the - see there's a vivid line across there, that's actually the high watermark when the water peaked on - late on Tuesday night, early on Wednesday morning. In the background, there's the Fernvale - some Fernvale - some houses of Fernvale.

So, there's a line just a short way down from the peak of that pile of sand behind?-- Correct.

And that's where the water got to?-- That's right, that was the peak.

And now how far away is that pile from the Brisbane River?-- That pile would be approximately 350 to 400 metres from the river.

And when was this photograph taken?-- This photograph was taken on Thursday, around lunchtime.

And that's the Thursday of the week of the flooding?-- Correct.

If we can have a look at the next photograph? Mr Zanow, was this your office?-- Yes.

Okay?-- We have - on the quarry site we have six offices of which five were totally destroyed. Underneath there is the only office that survived the inundation, and at this point that's - the offices are around between 200 and 250 metres from the river on the high bank, and the - most of our offices, yeah, were actually washed away and haven't been found yet.

Okay. Well, perhaps if we can look at the next photograph? This is not one of your offices, is it, that's another-----?-- That was the batch office for the concrete plant.

How far would the batch office be away from the Brisbane River? We can see the river in the background?-- Around about 300 metres away from the river on the high bank.

Now, if we could have a look at the next photograph? Now, when was this photograph taken, Mr Zanow?-- Also on the Thursday.

Okay. And where was this photograph taken? Whereabouts on your property was this?-- This is also at the quarry, around about 300 metres - 350 metres away from the river, not far from the first photograph.

And did that water eventually recede?-- It did, yes.

When was that? When did the water eventually recede?-- It - the water in that part of the quarry receded over a number of days, probably four or five days, I suppose.

And the next photo is the photo of another office on your property?-- Yeah, that's another angle of the first one, so that was the only office that survived.

And, finally, the final photo is a photograph of - appears to be a water tank?-- Yes.

Is that your water tank?-- Yes, it is, yes.

What is it resting upon?-- The water tank is resting on part of our fixed plant and equipment, our fixed sand processing equipment, and this conveyer here on the left-hand side was turned over, knocked over by the velocity of water. I might add the velocity of water was extreme. I have never, ever seen water come down the river so fast ever in my life and I have seen a few flooding events, and this is obviously - these photos show the velocity of the water was absolutely incredible.

Thank you. If I can take you to your submission where you made some recommendations and if I can take you to DW2 at page 18 - DW3 - and if I can take you down to number 5? One of your recommendations is, "Implementation of a direct warning system to be maintained and managed by the dam operators using at least three modes of communication or warning." Can you give us examples of what you are referring to when you are referring to at least three modes of communication or warning?-- The three proposed modes would be something like an e-mail, a text message, perhaps a siren warning system. During the height of the flood we had no electricity, we had no mobile phone coverage. Also in Fernvale there was no water supply, potable water supply, so there needs to be a multitude of warning systems and I think that even some sort of siren in the town would be useful.

Thank you, Madam Commissioner. That is the evidence.

COMMISSIONER: Thank you. Mr Rangiah, are you happy to go next?

MR RANGIAH: I don't have any questions.

COMMISSIONER: All right. Thank you. Mr O'Donnell?

MR O'DONNELL: My learned friend, Mr Pomerenke, has some questions, your Honour.

COMMISSIONER: Thank you. Mr Pomerenke?

MR POMERENKE: Thank you, Commissioner. Could Mr Zanow be shown Mr Keegan's statement, please? Mr Zanow, I just want to ask you some questions about your communications with Graham Keegan. Could you go to the first exhibit to Mr Keegan's statement, which is GK1, and there should be some page numbers in the bottom right-hand side corner.

COMMISSIONER: Could you speak up, Mr Pomerenke? You are a very quiet team.

MR POMERENKE: Sorry, Commissioner. There should be page numbers in the bottom right-hand corner?-- Yep.

Page 1. Do you see that's an e-mail sent on Wednesday, 5 January 2001 at 12.26 p.m.? Do you have that?-- Yes, yes, I do.

And you're one of the recipients of that e-mail?-- Yes.

And if we just look to the content of the e-mail, if you go to the second substantive paragraph of the e-mail and if you just read that to yourself?-- Yes.

You can see that this is an e-mail that's being sent to you before the release of any flood waters from the dam?-- Yes.

And it's telling you that they - it is likely that they will be releasing flood waters in the near future?-- Yes, that's right.

And then in the next paragraph Mr Keegan is asking you to please be prepared?-- Yes, that's correct.

Could you go, then, to page 60, please? Do you have that?-- Yes, I have.

Sorry, Mr Zanow, we are just waiting for it to come up on this screen. So, what we see at page 60 is the conclusion of an e-mail exchange between you and Mr Keegan, and if we go over the page to page 61, we see the beginning of that exchange?-- Yes.

And do you see the e-mail sent at 8.26 p.m. from Mr Keegan and in the first paragraph he tells you what the current releases-----?-- Yes.

-----from Wivenhoe are? In the second sentence of the first paragraph he tells you what the aim is in terms of releases?-- Yes.

And then in the next paragraph, reference is made to the Bureau of Meteorology warnings and he tells you about some possible scenarios based on those Bureau forecasts?-- That's right, and that's on Saturday, yes. Probably, just to clarify, we have an immunity at the quarry of around 1750 cubic meters per second, so on Wednesday that's quite fine, we wouldn't evacuate or wouldn't do a heck of a lot at

the quarry.

Yes?-- Because, okay, we're expecting rain, we know we're expecting rain, we would ensure that our levee bank on the western extraction is in place-----

Yes?-- -----which it was, and wait for further advice.

Yes?-- So, on the Saturday, that's when we became - because of these e-mails, that's when we became concerned as to what might happen.

Yes. Just in that paragraph that goes from page 61 over to page 62, you can see that one of the scenarios he's talking about, based on the forecasts, is that, "There might need to be larger releases from Wivenhoe Dam if heavy rainfall strikes our catchments." So that was useful information for you to have going into-----?-- Oh, definitely useful. Probably what we also were talking about further was the fact that our levee bank that we construct also allows more water to be released by Wivenhoe Dam to probably up to 200, even potentially 300 cubic meters per second-----

Yes?-- -----because it keeps the water off the southern approach to the highway bridge.

Yes?-- Therefore, it gives you guys or gives Seqwater the ability to make larger releases without closing the Fernvale or the Brisbane Valley Highway.

Yes, I understand. Would you mind turning to page 70 for me, please? Do you see that's an e-mail from Mr Keegan to you on the Sunday night at 10.27 p.m.?-- Yes.

And it commences, "Sorry, but this is bad news.", but nevertheless it was news that you needed to hear. If you go, then, to page 74, and if you scroll halfway down the page, we should see an e-mail from Mr Keegan to you at 1.11 a.m. on the Monday morning, a couple of hours later, and I think you refer to this in your evidence-in-chief. You said that he knocked up some heights for you?-- Yes.

Is that the e-mail you were referring to?-- That's correct.

It is? And then by 6.09 a.m. the following morning you say you were frantically working. That's working on your evacuation strategies?-- That's correct.

And I won't bother taking you to any more e-mails, but really these are the sorts of communications that you were referring to in paragraph 18 of your statement when you said that, "Graham was a shining example of what can be achieved with cooperation and that he should be awarded for his efforts."?-- Definitely, definitely.

Thank you, Mr Zanow?-- Thank you.

COMMISSIONER: Ms McLeod?

MS McLEOD: No questions.

COMMISSIONER: Thank you. Mr Dunning?

MR DUNNING: No questions, thank you.

COMMISSIONER: Mr Flanagan?

MR FLANAGAN: Just one question, Mr Zanow. In relation to your North Booval site at the Bremer River, to your knowledge did that site flood in 1974?-- Yes, it did.

And how would you describe the - from your own knowledge of the flooding in 1974, I think that's through your older relatives, but your own knowledge of the 1974 flood compared to the flood event in 2011?-- It's common knowledge through Ipswich, of which I have been a resident of the Ipswich all my life and my father and other relations, in particular Sydney Street, Brassall, there was a lot of houses washed away. On our side at North Booval that has been in the family since before the '74 flood-----

Yes?-- -----there was very little, if any, flow in the river down there. I was chasing cattle out of the flood water on Wednesday morning at around about 7 o'clock, and there was very little flow coming down the river and it was very obvious that the flooding certainly from let's say Wulkuraka, maybe Leichhardt in Ipswich, down to the mouth of the Brisbane River and the Bremer River was definitely back up from the release from Wivenhoe Dam. That was a definite.

Thank you.

COMMISSIONER: Mr MacSporran?

MR MacSPORRAN: I have nothing, thank you, your Honour.

COMMISSIONER: Mr Ambrose?

MR AMBROSE: Nothing.

COMMISSIONER: Mr Telford?

MR TELFORD: Nothing, thank you, Commission.

COMMISSIONER: Mr Schmidt?

MR SCHMIDT: Thank you, Commissioner. Mr Zanow, what reliance, if any, did you place on the BOM website in the lead-up to the flood?-- A huge amount of reliance.

So, you were actively searching information from BOM?-- Yes. Look, all of the time in the lead-up, especially on the Saturday and the Sunday, in particular, until the - we lost power at the quarry site, we were looking at the BOM website continuously. So, that was a very - a vital tool for us to be able to assess what rainfall was occurring. The other assessment we made was we had information that was given to us freely via telephone on Sunday, in particular, of the huge rain event that had fallen in the catchment, Wivenhoe, and friends had rung us and said, "You better get all your gear out because there's going to be a big flood." So, on Sunday we began those preparations, even before Seqwater said we should - you know, there's going to be larger flow. We knew that there was going to be a larger flow in the river.

Okay. After the event, did you actually check to see how accurate the BOM forecasts and BOM website was?-- Well, I thought it was very accurate, in particular the radar is obviously, you know, updated every 10 minutes, I think you get a frame, so that was certainly very, very useful.

Conservatively what would you think you would have saved in lost equipment with this information?-- With that information, difficult to ascertain, but certainly in the seven figures.

Okay. In paragraph 44 of your statement, you say that you lost all communication and after that you only had your iPhone. That was at 6.30 a.m. on Tuesday morning, was that correct?-- That's correct.

So, is that how you received the last of the e-mails from Mr Keegan?-- That is correct.

So, if you didn't have that iPhone you wouldn't have been able to receive those e-mails?-- No, no. The e-mails didn't come through very quickly, because the mobile phone service in Fernvale was very - was very, very patchy.

I take you back to the meeting on the 10th of December where we attended with Seqwater. Can you recall whether that was the - the e-mail was actually their first option of notification to us?-- Yes, I think it was.

Okay. Thank you?-- I think - sorry, I think there was also - there was talk of the 1300 number.

1800?-- 1800 number, and potentially some sort of text message system, but there was a lot of talk as to - and a method of communication, but initially there was going to be no communication whatsoever until the participants in the meeting were quite vocal and forceful to say, "We need some sort of communication.", of which I was one of them, so that we could be fully informed of what was happening.

Okay. So if anybody in Fernvale hadn't had an iPhone and wasn't on the list, they probably wouldn't have got any information at all, would they?-- No, no. Unless it came through some sort of emergency service, of which there were very few and far between in Fernvale.

So that's after the power went, of course?-- That's right.

Had you not had that iPhone you wouldn't have got the email that said "but in the meantime, please check your options for relocation"?-- No, I wouldn't have, no.

Okay. Do you know firsthand what happened to the people in the immediate locality in Fernvale that didn't have that message?-- Well, I do know, and I was there on the Tuesday afternoon and Tuesday evening, in particular the flood peak was at night in Fernvale, the flood peak was higher than the '74 flood for a shorter period of time, obviously, than the '74 flood. People were being woken up laying in water in their homes. The quarry - and probably some people here would have seen in the media that after the flood event the quarry, which was our quarry, levee bank burst which was incorrect. There was a lot of misinformation in Fernvale. There was a lot of people that had suffered a lot of loss in Fernvale. And I believe if they had have been notified earlier or notification could have got to them, I think those people, in particular in Tidmarsh Court, Schmidt Road, a lot of those low lying areas could have evacuated and actually got some of their belongings out. We have an employee who got out with his house keys and that's all he had.

Just to clarify a point, you have nothing to do with the quarry that was mentioned yesterday that was in the Upper Brisbane river?-- No, our quarry is below the dam wall. We have nothing to do with the quarry upstream. Ours is an off stream alluvial sand and gravel deposit, so it is not an on-stream deposit.

Thank you.

MS WILSON: No other questions, Madam Commissioner. May Mr Zanow be excused?

COMMISSIONER: Mr Zanow, you are excused, thank you.

WITNESS EXCUSED

MS WILSON: The next witness is Mr Tibaldi, Madam Commissioner.

JOHN VICTOR TIBALDI, SWORN AND EXAMINED:

COMMISSIONER: Thank you. Take a seat.

MR CALLAGHAN: Could you tell the Commission your full name and occupation, please?-- John Victor Tibaldi, a Principal Engineer, Dam Safety with Seqwater.

Mr Tibaldi, you've made a total, I think, of four statements for the purposes of this Commission, is that correct?-- Yes, that's correct.

They are dated respectively 25 March 2011, 1 April, 11 April and 14 April, is that correct?-- That sounds correct, yes.

All right. I tender those four statements, Madam Commissioner.

COMMISSIONER: They will be 51, 52, 53 and 54 respectively, according to date.

ADMITTED AND MARKED "EXHIBIT 51"

ADMITTED AND MARKED "EXHIBIT 52"

ADMITTED AND MARKED "EXHIBIT 53"

ADMITTED AND MARKED "EXHIBIT 54"

MR CALLAGHAN: Thank you. Mr Tibaldi, you also took part in an interview with Commission staff on the 29th of March, is that so?-- Yes, that's correct.

I tender a copy of the transcript of that interview.

COMMISSIONER: Exhibit 55.

ADMITTED AND MARKED "EXHIBIT 55"

MR CALLAGHAN: Turning back to your statement of 25 March, and subject to the corrections which you have made to that statement in subsequent statements, you affirm and stand by

the contents of that statement?-- Yeas, I do.

Can I take you then in that statements to paragraph 67 and 68?-- Is this my first statement?

Yes, of that first one, please. I think you can take it that we're all familiar by now with the subject matter to which you refer in those paragraphs, that is to say a communications between the Brisbane City Council and the Flood Operations Centre. What I wanted to ask you is this: you say at the time you made that statement you still did not know what the true threshold is, is that right?-- Yes, that's correct. In my third statement I have clarified my understanding of what the definition of that threshold is.

Yes?-- And my understanding of that definition is the level at which floodwater goes over the habitable floors of houses in urban areas.

That's right?-- In terms of that definition, that's correct, I am still - there is still some uncertainty about - in my mind, anyway, as to what that level is.

In that context - and please accept it is not being contended in the big scheme of things that this misunderstanding had any great effect upon the events of January this year - but it is the case, isn't it, that the manual as drafted requires that when you are in a W3 situation, a primary consideration is the concept of urban inundation?-- That's correct, yes.

And that's what you have to have in mind as a flood operations engineer when you are in W3?-- That's the primary consideration but lower level objectives are also considered.

That's right. It is a balancing exercise, isn't it?-- Could be described that way.

All right. However you describe it, it is a bit hard to give effect to it, I would suggest to you, if you don't know the precise manner in which it can be achieved?-- I would certainly agree that there needs to be a lot of clarity about what different flows at Moggill - you know, what they mean in terms of flooding in Brisbane. There is some uncertainties there to do with tides and storm surge which can also affect flooding in Brisbane-----

Mmm?-- -----but it would be, I think, just naturally advantageous that if you knew with certainty what flows at Moggill are doing in Brisbane, that would be helpful.

All I am getting to - ask you to agree with is that such uncertainties make it hard to achieve the objectives?-- I think that follows, yes, I agree.

They are the types of uncertainties which could be resolved in - or at least exposed during training exercises?-- That's - I would agree with that.

If you had a training operation which involved all the relevant agencies, that's the type of thing-----?-- Yes.

-----which could be resolved?-- Yes.

And have you ever been engaged in a training exercise which involved the consideration of the operation of the dam at this level?-- I believe that when I was in my role between '96 and 2005 when I was responsible for the operations of the dam, there were training exercises that I would have been involved in at that time as an operator of the dam but not as a flood control engineer.

Thank you. Can I take you to paragraph 17 of that statement? Sorry, paragraph 17 of the statement of the 11th of April, I mean?-- Will it come up on the screen or-----

I hope so.

COMMISSIONER: It should come up on the screen. You can always look up the hardcopy as well, if you want?-- Is that the first statement or the-----

MR CALLAGHAN: That's the third one, I think. The one of 11 April?-- Yes, I have that.

Can I take you to paragraph 17? You acknowledge there that adopting an early release strategy on the night of Sunday 9 January 2011 may have reduced the peak of the flow?-- Yes, I do.

I just wonder whether you are just acknowledging that as a theoretical possibility, or whether you base that on any modelling you have done, or how you have worked that out?-- I certainly haven't done any modelling on that. I have also put a couple of qualifiers there that you may note.

I do. I was really just interested in whether you had done any modelling on it?-- No, I haven't.

I am not trying to overlook those qualifications, which are, as you say, self-evident in your statement. If you turn then to the concept of the manual, and in, I think, your second statement you specifically address something about the history of the manual. You refer in paragraph 8 of that statement to meetings and various other communications which were involved in the process of drafting revision 7 to the manual. Do you agree with that?-- Yes.

At this stage, Madam Commissioner, I would like to tender a large number of documents in the possession of the Commission. We've done a separate index which itemises 10 separate bundles, whether it can go in as one exhibit with the index on top.

COMMISSIONER: How about we make each separate bundle an exhibit. So if you want to read to me what they are, those ones?

MR CALLAGHAN: Well-----

COMMISSIONER: Is there a logic to the bundles?

MR CALLAGHAN: Well, yes, by date. The first one relates to a meeting of 14 August 2009.

COMMISSIONER: The documents in relation to that will be exhibit 56.

ADMITTED AND MARKED "EXHIBIT 56

MR CALLAGHAN: 28 August 2009.

COMMISSIONER: 57.

ADMITTED AND MARKED "EXHIBIT 57"

MR CALLAGHAN: 14 September 2009.

COMMISSIONER: 58.

ADMITTED AND MARKED "EXHIBIT 58"

MR CALLAGHAN: 7 October 2009.

COMMISSIONER: 59.

ADMITTED AND MARKED "EXHIBIT 59"

MR CALLAGHAN: 15 October 2009.

COMMISSIONER: 60.

ADMITTED AND MARKED "EXHIBIT 60"

MR CALLAGHAN: 23 October 2009.

COMMISSIONER: 61.

ADMITTED AND MARKED "EXHIBIT 61"

MR CALLAGHAN: 6 November 2009.

COMMISSIONER: 62.

ADMITTED AND MARKED "EXHIBIT 62"

MR CALLAGHAN: Then the next document is an email of 26 November 2009.

COMMISSIONER: 63.

ADMITTED AND MARKED "EXHIBIT 63"

MR CALLAGHAN: The next an email of 1 December 2009.

COMMISSIONER: 64.

ADMITTED AND MARKED "EXHIBIT 64"

MR CALLAGHAN: Finally, the notes on November 2009, revision as at 1 December 2009.

COMMISSIONER: 65.

ADMITTED AND MARKED "EXHIBIT 65"

MR CALLAGHAN: Would it be helpful to tender the index as a separate exhibit?

COMMISSIONER: I think it probably would. I don't know about a separate exhibit. You might just hand it to my associate for her assistance.

MR CALLAGHAN: All right.

Mr Tibaldi, those documents go to the revision of the manual - and I will just come back to one aspect of that in a moment, but first of all I just wanted to address some general propositions about where the manual might go from here. You would agree, of course, that after an event like the one we've just had, the whole manual should be reviewed on the basis of all known information?-- It must be reviewed. That's a requirement of the manual.

Yes. You have already, I think, suggested or adopted suggestions that there need to be some minor corrections, such as the standardisation of some language?-- I believe in my either first or second statement I noted to one ambiguity in the manual that I was aware of and also I think a table in appendix J there are some arithmetical errors.

There is also the concern about the need for the concept such as prediction to be standardised; at some places it is worded as "predicted", at some places it is worded as "likely", and so on, that sort of thing is something I think you have commented on?-- Not that I can recall in my statement.

Or adopted in the Seqwater report?-- Not that I can recall in my statement but I will stand corrected if you point something out.

Okay. What about the proposition that the dam has to be lowered back to full supply level in seven days? It has been suggested that that's something that can conflict with the competing objectives at the lower strategies?-- Well, if you are going to override that requirement, there is a risk associated with that in terms of another flood event impacting on the dam within that period.

All right?-- So-----

Is that a risk which could be addressed by at least a qualification that regard be had to weather forecasts in that regard, or that it could be something which could be suspended if there was positive indication of fine weather for a predicted period?-- Well, I believe that that type of requirement is there now. You know, I mean, it comes down to what you are referring to in terms of draining down. Are you referring to-----

I can tell you, if you are asking, I am referring to the requirement that the dam be lowered to full supply level after a flood event within seven days?-- What are you saying by after a flood event? Is that the peak of the event or-----

Well, is that something that the manual makes clear?-- I believe it does. It talks about when the peak of the event passes through the dam. I think that's the wording.

Is that when you perceive the requirement to kick in that it be lowered to full supply level within a set period of time?--

Well - yes, I do, and it is talking about being substantially lowered, I guess, within that period of time. I mean, I think if you look at the drain down this time, it may have taken slightly longer than seven days, so there is not always an absolute strict requirement. I guess if you look at this time, because, you know, there was - the weather forecasts were favourable. I don't know if we were quite on 67 by the seventh day. I could be wrong here.

That's what I am getting at. Is that something where the manual perhaps needs to give a bit more precision as to what is actually required and how it is to be done?-- Well, if people see that as a priority, as something that requires clarification in their minds, yes, could do.

Do you have a copy of the manual there?-- Yes, I do.

It has been suggested that you were the principal author of this revision of the manual, is that correct?-- I certainly am responsible for all the drafting based on input.

Yes?-- From people more experienced in these matters than myself.

Sure. I think we're familiar with the process of consultation and input from many others, but the actual drafting was done by you, is that right?-- That's correct. Are you familiar with why the manual revision was undertaken and the objectives and process behind that?

Yes?-- All right.

I would like to take you to page 22, and specifically to the paragraph more or less in the middle of the page, the paragraph beginning, "The strategy chosen at any point in time"?-- Yes, I can see that.

All right. Is that a paragraph that's been drawn to your attention in recent times in preparation for this Commission's hearing?-- I am aware of that paragraph. Not specifically in relation to this hearing, though.

Nobody has drawn your attention to it specifically in recent times?-- Do you mean in the last two days or-----

Well, any time in the last week, I suppose, or two weeks?-- Not particularly.

All right. Well, are you aware that there has been some attention paid, for example, to the phrase "using the best forecast rainfall" on the second line of that paragraph?-- I am aware there has been some discussion about forecasting and the value of forecasting. I think that's addressed in my first statement.

Let me ask you this: do you have a memory of the manner in which this paragraph was drafted?-- I believe I do.

All right. What was your thinking in drafting the paragraph in that fashion? Did you intend it to be expressed that it was a requirement that predictions as to lake level be made using best forecast rainfall?

MR O'DONNELL: There are two questions in that. Perhaps my learned friend could put them one at a time so Mr Tibaldi can deal with them.

COMMISSIONER: Mr Callaghan?

MR CALLAGHAN: Well, we will take it slowly. You accept that the paragraph as written-----

MR O'DONNELL: Well, that wasn't either of the questions.

MR CALLAGHAN: No, it wasn't. I am taking it slowly.

MR O'DONNELL: The first question was-----

MR CALLAGHAN: I was taking it slowly for those who didn't follow.

MR O'DONNELL: -----what was your thinking in drafting 8.4 as you did.

COMMISSIONER: But, Mr O'Donnell, if Mr Callaghan wants to ask a different question, he is not obliged to ask the original ones. But I think you should just listen to what he asks and see if it is objectionable.

MR CALLAGHAN: Mr Tibaldi, does the paragraph relate to the manner in which the level of Wivenhoe Dam is predicted during a flood event?-- I think I need to explain to you the intent of that paragraph and-----

Look, if it is going to save time-----?-- I think it will.

-----if you want to approach it that way, then please do?-- Perhaps I could run through 8.4 by way of example, or something like that, it will only take a few minutes, and just explain 8.4. Would you like me to do that?

I would like for you to explain to us the intent of the paragraph, yes?-- I think I just need to give a bit of background here because I think just jumping in and focussing in on a few words is really not, you know, giving all that information. The intent of the review was about, I guess - one of the things we looked at was getting more explanation into the manual from what existed previously, and particularly some sections of the manual, say, for example, the previous W3 which previously consisted of a couple of sentences in the previous Somerset operational description, which consisted of a page. Having, I guess - in the flood team we had two very experienced people who had been involved for 20 years in the manual and history of the manual and had a lot of knowledge in their head, and you had two relatively inexperienced people in Mr Malone and myself who were required to use the manual for

an operational sense. I guess our view was there just wasn't enough operational detail in the manual. I mean, two sentences for me for W3, which is what's in version 6, and a page for Somerset, there just wasn't enough. So the intent of the review was, really, not to change the objectives of the manual or the intent of any strategy but try to get the knowledge that was in the two experienced engineers' heads and also the Dam Safety Regulator, who has also been involved for almost 20 years in the manual on to paper so that we could take advantage of that in a flood event. And I think also from a succession planning point of view we thought it was important to try and get that knowledge on paper. So that was the intent. So I guess with 8.4, what we're trying to do, or what we tried to do there is describe the process of what people do and what they have always done in terms of making operational decisions. Now, you will notice there is two parts to 8.4. You will notice there is the paragraph you have referred to which talks about getting all your information together before you make a decision, and a key part of that information is the forecast rainfall, okay? So you want to get - essentially what that paragraph you are referring to is saying in the three dot points below is, right, at the start of the decision making process let's get our information together and let's produce some graphs that would be similar to what is seen in appendix A of the flood report. Okay? So appendix A of the flood report has an actual rainfall line, a forecast rainfall line and a stream flow rainfall line. The stream flow is obviously the historical stuff. So the first thing you do in your decision-making process is get that together and what we're saying in that paragraph, the intent of it, is all those things - if you want to make the best decision possible, you need to use all those things. Then it comes down to the weight at which you will assign to the forecasts, and I think that's really the key question. The manual allows you to assign zero weight to a forecast if you wish. The weight you assign to a forecast will depend on the reliability of that forecast as provided by BOM. If the BOM say it is a very reliable forecast - and there are three circumstances that were discussed in the preparation of the manual where it was considered that you could get a forecast from BOM which would be considered reliable, or certainly more reliable than normal, in which case in those cases you may assign more weight to a forecast than otherwise you normally would because generally - and I refer to Peter Baddiley's statement, senior hydrologist with 30 years' experience at the bureau, who said in his statement that's been supplied to the Commission there is great uncertainties with the quantitative forecasts and they are not suitable for operational decision-making. But certainly there is some circumstances and there was three that was discussed in the formation of the manual where you may put more weight on a forecast and you may consider that in decision-making. So what I am saying is, yes, the intent of that paragraph is to consider forecasts, but if we read on through here we will see that the manual actually gives you the ability to apply a weight to those forecasts and the general forecasts we get from BOM we're applying zero weight in terms of our operational decision-making. As I said, what I tried to do was describe

the process that has always been used. That was my best attempt at it. I accept that if it is difficult to, you know, understand or it might require some additional information but that's what I did at the time. It was agreed by the other engineers that it made sense and it was certainly approved by the regulator. I don't approve the manual, it is approved by DERM. So just in terms of using forecasts, if you go to the flowchart, which is where you, I guess, apply the weight in terms of whether you wish - you know, what consideration you wish to give to a forecast, the flowchart - and if you just look at the note prior to the-----

Sorry, are you on page 23 now?-- The flowchart is on page 23 and the sentence prior to the flowchart says: "A flowchart showing how best to select the appropriate strategy", so previously we have got all our information together, now we're coming to the stage where we're going to select the appropriate strategy - "a flowchart showing how to best select the appropriate strategy to use at any point in time is shown below." So once you've got all your information together, now you have got to select your strategy, now you go to the flowchart. You will notice in the flowchart that forecast is not mentioned at all, but the engineer that has to choose the strategy has to make an engineering judgment or a judgment about what is likely. He is asked essentially two questions about what is likely. The first question is about the likely level in Wivenhoe Dam. Again, he has got to make a judgment on what is likely. He can assign whatever weight his judgment feels worthy in terms of the forecasts. Now, as I said, generally given the great uncertainties in the QPF as provided by BOM, no weight is provided to those forecasts. However, as I said, there are three circumstances under which you may provide - assign some weight to those forecasts. Now, they - none of the three - I will explain what the three circumstances are. None of them were encountered in the January 2011 event and the flood operations I have undertaken, I have never encountered one of these circumstances. However, the manual must account for all possibilities. So it was thought prudent to allow provision in the manual that if you encounter these circumstances the provision was there.

And those three are?-- The three circumstances are - and this is my recollection of what was discussed in terms of the meetings - one was there is certain, I guess, weather events that - rainfall events that can be predicted with more certainty than others, and the example - I am not a meteorologist, so you would have to get a meteorologist to discuss this matter with - an example, as I understand it, might be a large, stable, slow moving rain depression which a meteorologist might be able to make a judgment that he can give you - he or she could give you a forecast with a deal of certainty as to a quantitative amount of rain that would come from that system over a catchment area. So if we got that advice from the bureau that says, Well, yes, we're giving you a QPF but it is not an ordinary QPF", because this system is something that's well known and something that can be predicted in advance, we would certainly give more weight to

that forecast than we normally would, because, as I said, the regular forecasts have a great deal of uncertainty, the quantitative forecasts, and I assume you have heard about that. The second circumstance might be there was some consideration and we had been briefed or had talked to the bureau at that stage about advances in forecasting and an expectation that at some point in the future, in the short future there could be considerably more certainty attached to the forecasts that they will provide, and we felt that the manual needed to account for that. That was our thoughts.

And the third circumstance was to do with mobilisation of the flood centre, where it was thought that in terms of preparation sometimes it might be better to mobilise on the basis of a forecast. So, you might give more weight to a forecast during a mobilisation period of an event, so that, you know, you're in there, in the centre, you're ready, you can take whatever action is necessary and you can track the event. So, they were the three circumstances that I recall were discussed in terms of taking forecasts into account. Otherwise, as I said, generally the weight provided and the discussion at that time was that certainly you are aware of the forecasts, you might be aware of the movement of the systems, but in terms of your strategy selection, you're applying very little weight, often zero weight, in my case always zero weight, to the QPF because of the uncertainties.

And specifically on that last point, if we look at the flowchart, we go straight down from start, and if we're going in a straight line down towards W4 the question to be asked, "Is Wivenhoe likely to exceed EL 74.0?", that would be an always a zero weight situation of the kind you describe; is that right?-- No. I said there was three circumstances under which you might give weight to a forecast and certainly the first two of those circumstances where you had a - which wasn't encountered in January 2011-----

All right, I'm sorry?-- We had a certain meteorological system that the Bureau were advising you, "Look, we have got a very high expectation and there's a very high probability that this will - almost a certainty that that will produce a certain amount of rain, well, then, we would certainly take account of that in making a decision to proceed to W4. I certainly would anyway.

All right. That wasn't the case this January?-- No, there was no systems of that nature, there was no - I think if you read section 6 of the report where we have examined the forecasting data, you know, there was a lot of - I mean, it just wasn't right generally and that tends to be the norm and, again, I refer you to Peter Baddiley's statement who - I think he's quoted the first paragraph of section 6 of the report in terms of totally agreeing with Seqwater, that it's also the Bureau's position and the Bureau have given that advice-----

I have let you talk quite a lot and I am not concerned so much about the event itself as the manual and how it might be improved at the moment?-- Okay.

And from what you are telling me, the references to forecasting in the manual you wanted to leave open or the collective thinking of those who were involved was to leave open the opportunity to take those - take forecasts into account in those three situations?-- That was certainly my understanding of the discussions, that's what I wrote and that was what was approved by everyone collective.

And the third of those situations really has nothing to do with the operation of the dam itself, it is just when you

might actually mobilise the Flood Operations Centre; is that right?-- Correct.

The second of those, I suppose, is something that could happen any time in the five years between revisions of manuals?-- Well, that was the thinking. I mean, it's not a quick process because gazettal is involved and there's some legal processes there, so, I mean, it's not a quick process to amend the manual, so the thought was to leave that provision in the manual that you would take into account forecast.

What you wanted the manual to do was to leave open room for flood engineers' discretion to have regard to advances in meteorological technology or developments?-- Well, the experts in forecasting are the Bureau, they're certainly not myself. I can't speak for the other flood engineers. I'm very reliant on advice from the Bureau in terms of forecasts and I certainly have heed to their advice, particularly if they were to tell me that certain forecasts they were providing, a quantitative forecast, they were providing a great deal of certainty.

But you wanted that to be reflected in the manual somehow, the possibility that forecasting technology could improve and that you should be able to take it into account if it did?-- Correct.

And you think that's something that should be reflected in a manual of that kind?-- I believe so.

Yes?-- If it's not reflected and that situation arises, you are in a very difficult position.

And the first situation that you describe is one where there is a very obvious weather event such as - I think you say a large rain depression which just can't go ignored?-- I am told that situation could arise, but that's something you would have to discuss with the Bureau.

Certainly?-- But certainly when I - we wrote that section, I can recall there was some discussion about that.

Okay. That's something, looking forward, to something which could in conjunction with the Bureau be reflected in a form of words which might be included in the manual to clear up doubt about the sorts of things to which you might have regard?-- Yeah, look, I think any - any suggestion of the way in which we could clarify the use of forecasts so that it's clear in everyone's mind would be beneficial, no doubt about it, and obviously there is some confusion about it, without question, not amongst the flood engineers, I believe but, amongst others.

That's clear enough, I think, as far as you're all concerned, you are all of one mind as to what it meant. It is when the rest of us start looking at it that the problems start; do you agree with that?-- Yes, I do.

Well, tell me, of course a major review's got to happen. Are you aware of anything that's happened already?-- I've written a paper to our CEO in terms of what I would consider the process for such a review.

May I ask when you did that?-- Several weeks ago.

Okay?-- Perhaps longer.

And you have suggested the process for the review?-- Well, I have suggested a process. I think - I guess - you know, it's something that - I believe why it hasn't proceeded was there was consideration and it was a matter that would be considered by the Commission and it was probably inappropriate to proceed.

Well, the manner in which the manual is expressed might certainly be something on which the Commission will express an opinion, but the content is always going to depend upon the input of people like yourself, isn't it?-- I don't think it's just the flood engineers, I think there's - certainly the community have a role, local governments have a role, the Bureau have a role. I think there's a lot of stakeholders and I think that this flood has certainly highlighted that, that - you know, and certainly the community - I think everyone's got a role in really having input into the manual. I mean, the dam is not big enough to satisfy everybody in terms of both flood - just the flood mitigation but also water supply, and I think the way in which the manual is written affects everyone in South East Queensland, the whole community, and as such I think everyone needs to have a bit of a voice or opportunity for a voice.

There is no argument about that, but can I ask you, just assume for the moment that this Commission did not exist, how would the situation be approached? What would be happening as regards the manual at this moment?-- Well, as I said, the manual requires - I could refer you to the section.

I know it has to be-----?-- Okay.

-----reviewed. We understand that. That's what I am asking?-- There's a section that requires the review. I guess a process would be developed by I guess the major stakeholders in the review, and they would certainly be DERM, the three relevant councils and Seqwater, and possibly other players like the Water Grid Manager and the Water Commissioner, and once that process was agreed upon, it would be followed.

Is that any different from what happened last time?-- The revision 6 and 7?

Yes?-- Well, I haven't yet - the background for revision 7 I did ask you about - it's a completely different process. Do you wish me to explain that to you?

No, it's all right. I come back to my question as to what's

actually happening now though. You have suggested something to your CEO; is that right?-- I believe I've put forward a suggestion, yes.

All right. And we'd like to know are the sorts of things that you are suggesting things which might be effected before the next wet season?-- Well, I think the review's going to be a challenge. I mean, just the process, deciding on what that is, I think, will be a challenge. Certainly if you are looking at major changes to the manual, you are looking at a lot of engineering investigations to give you some assurance that the changes you are going to make won't make things worse.

My question is are those engineering investigations underway now?-- There's some work underway in terms of the hydraulic models of the river, which will be helpful in the review of the manual, but, I guess, the issue is that the main people that would be involved in the investigation are obviously busy, people such the four flood engineers, the Dam Safety Regulator, et cetera, so, yeah, it's bit difficult to start.

I will let you get underway as soon as you can. Thank you.

COMMISSIONER: Mr Rangiah?

MR RANGIAH: I might just flag that because there's significant overlap in the evidence of Mr Tibaldi with some of the other witnesses who have given evidence, I propose to proceed in a reasonably summary way in the interests of not wasting time.

COMMISSIONER: Yes. That would be appreciated. We understand what your issues are. It's not as if they have not been fully absorbed.

MR RANGIAH: Yes. Thank you. Could I ask you to turn to paragraph 46 of your first statement, please?-- Yes.

Do you see that in the third sentence you said, "However, operational decisions about dam releases are not made upon the basis of these with forecast results."?-- Yes.

And by "operational decisions", were you referring to decisions about the rates of release?-- Well, decisions about rates of release are based on strategies and the selection of the strategies I thought I explained just before. I can go through that again if you wish.

No, I just want you to answer the question, that's all?-- Sorry, I don't quite follow the question.

You have referred in that sentence that I have taken you to to the expression "operational decisions". You see that?-- Yes, yes, I do.

By that expression "operational decisions", are you referring to the rates of release of water?-- That would be one operational decision, yes.

Decisions about the rates of release?-- That is one operational decision, yes.

All right. So, in other words, decisions about rates of release of water are not made on the basis of with forecast results?-- Well, as I explained, if the forecasts are considered unreliable, no, we don't use the forecast results. However, if - and that's the standard situation, and I guess that statement refers to the situation of the January 2011 flood, but, as I explained before, if I got a forecast where the Bureau were telling me that they're providing this forecast with a higher level of certainty, particularly a quantitative forecast, well, that would be completely - if I said I wouldn't apply that, that would be conflicting with what I said previously.

In summary, is it the case that you give no weight to forecasts in making decisions about rates of release, except in the three exceptional circumstances that you earlier discussed? You can answer it yes or no?-- I think that's a fair statement, yes.

Now, were you the principal author of the report on the operation of Somerset and Wivenhoe Dam?-- It was a joint effort by the four of us. I did the initial drafting for a number of sections.

Could you take up that report, please?-- Beg your pardon?

Could you pick up the report?-- Yes.

If you can turn to page 1?-- Yes.

And there's a heading, "Executive Summary."?-- Yes, I can see that.

Did you write that executive summary?-- As I said, that was a joint effort amongst the four of us. I would have done the initial drafting, but everyone would have had some input into the final.

Then you see there's a heading, "Background."?-- Yes, I can see that heading.

And then the second paragraph says, "As it is not possible to provide a specific procedure for dam operation during every possible flood event, the manual takes the approach of inviting objectives and strategies to guide operational decision making during a flood event." Did you write that?-- I could have. I probably - I'm not sure if that was in the original draft, but I that's a quote - I think that whole paragraph is - more or less we were trying to give some background so we have taken some words almost directly out of

the manual there.

Now, this was a document that was not intended simply for the benefit of other flood engineers, was it?-- No, the - I think if you look at previous reports that have been done after floods, they are a different format to this. In this one, we tried to give - I guess we had an awareness that it would be read fairly widely and that the public would have an interest, the community would have an interest in reading the report.

And, in fact-----?-- We took that into account in drafting our report.

In fact, it's been published-----?-- Yes.

-----on the internet?-- Yes. I wasn't aware that was going to happen when I was writing it, but I am aware that that has occurred, yes.

Now, the next sentence says, "The objective followed and the strategy chosen at any point in time depends on the actual water levels in the dams as well as flood modelling predictions base on best observed rainfall, forecast rainfall and stream flow information available at that time." Did you write that or draft it?-- That's a direct quote out of 8.4, that sentence appears in 8.4 of the Manual of Operations.

Not quite, but was this your interpretation of paragraph 8.4 of the manual?-- Oh, look, I don't know if I wrote that sentence but essentially it's similar to the manual. I am not sure what your point is.

To a member of the public reading this-----?-- Yes.

-----wouldn't this indicate that when choosing a strategy you take into account forecast rainfall?-- I can't speculate on what people might look at that - I mean, I guess I'm not a writer but as an engineer I have had to write the report. If I have written that sentence - you know, I have tried my best to give background. If people don't understand it, well, I can't do - you know, what would you have me do? I mean, I can't speculate on what people might or mightn't think about that. You would have to ask - you would have to do a survey.

I will move on. Can you turn over the page to - it is page numbered (iii)? Do you see there's a subheading, "Operations During the January 2011 Flood Event.", and then there are the numbers one to four, and then the next sentence says, "Rainfall forecasts in the early stages of the event did not support flood releases being made from Wivenhoe Dam greater than those that occurred."?-- Yes.

Now, does that suggest that rainfall forecasts were taken into account in deciding the flood releases that were made?-- It certainly wasn't my intention to - I did write that sentence and that certainly wasn't my intention when I wrote that sentence. What I was trying to point out there was that I think at about the time that - around that time there was

certainly a lot of questioning about, you know, why forecasts weren't used and why weren't the forecasts followed, and I wasn't trying to point out that whether we do or do not use forecasts in the manual, what I was trying to refer to there was the discussion that was had in section 6 of the report where we have actually analysed the forecasts and really - you know, just, I suppose, to satisfy people's curiosity more than anything else as to what the forecasts were and just refute the fact that the forecasts really did give a very good indication of the rainfall that actually occurred, because the forecasts did not, and we have clearly gone through that in sections - primarily section 6.2. So, that sentence is a reflection of 6.2, not about what we did or didn't take into account-----

So, is it the case-----?-- -----in makings decisions.

Is it the case that in making decisions about the rates of release of water, you disregarded any rainfall predictions?-- Well, I thought I explained this before and I can explain it again. The weight you put on a forecast as required by the manual is to do with the certainty of that forecast, and the forecasts that were provided to us in January 2011 were provided with a low level of certainty. So, we gave no weight to those forecasts and I think the fact they were with a low level of certainty, there's a reason for that, because if you look at how the forecasts compared to actual rainfall, they don't compare very well, and that's discussed in section 6.2 of the report.

Is the short answer that you agree with my proposition that you gave no weight to the rainfall forecasts when deciding release rates?-- I gave no weight to them, yes, that's correct.

COMMISSIONER: Not a lot or none; which is it?-- Beg your pardon?

Not a lot or none?-- Well, I guess what the manual tried to do, and, I suppose, that - the view is that you always have an awareness of the forecasts. I think you would - I think you would be not making the best decision you could if you had no awareness of the forecasts and what the manual is encouraging you to do is have a look at the forecasts and see where they're taking you. Certainly we had an understanding of where the forecasts were saying the system might head and I think that's a bit of a clue. I mean, the facts were the quantitative forecasts, which were the best forecasts, were so badly wrong that they weren't usable, and the forecast runs that are contained in the report aren't strictly quantitative forecasts, aren't strictly the QPFs, and that's explained in appendix A. You may have seen that.

You might be getting off the track a bit?-- They were highly scaled up QPF forecasts. So, they weren't even the best forecasts anyway, we were using scaled up forecasts, otherwise you were - just were getting results that were so low in your - they just weren't usable.

MR RANGIAH: All right?-- I can explain that if you wish.

No. I think the point you have been making, though, is that you - or you have accepted that you didn't give any weight to the rainfall forecasts in making decisions about release rates?-- Because they had such a low level of certainty, correct. I said that.

Now, you were on duty from 7 a.m. on Monday, the 10th of January; is that right?-- Monday - yes, I was.

And I suggest to you that there were a number of runs that had been done in the early hours of that morning that showed predicted peak levels in Wivenhoe of over 74 metres using a with forecast model?-- Yes, but just bearing in mind that forecast was a scaled up QPF forecast, wasn't a QPF forecast.

Can you just answer it yes or no?-- I am aware of those forecasts, yes.

All right. And can I take it from the answers you have already given that you didn't take those predicted levels into account when making release decisions?-- Well, I wasn't on that night. I mean, the decisions associated with those runs would have been made the night before I came on, like you use the most up-to-date model runs to make your decisions-----

All right?-- -----not ones that were undertaken in the past.

When you came on at 7 o'clock, there were further model runs which also showed levels of over 74 were predicted on a with rainfall basis, for instance, at 9 o'clock and 12 o'clock?-- Look, I haven't got those runs in front of me. I can get them in front of me, but if you were telling me they're over 74, I believe you.

But, in any event, you didn't take those into account when making release decisions?-- No. I have said several times now that we did not take the forecast runs into account because of their low levels of certainty.

Thank you. I have nothing further.

COMMISSIONER: Thank you, Mr Rangiah. Mr Dunning?

MR DUNNING: Thank you. Commissioner, like Mr Rangiah, where I have consistently got the same answer from other witnesses in the same area I wasn't going to revisit the matter.

Mr Tibaldi, just a couple of very brief questions. The first topic I want to deal with was this issue that you will be aware is regarding the reference to 4,000 CUMECS being the upper limit of nondamaging flows in Brisbane. Are you familiar with the issue I am referring to in W3?-- I am aware of that, yes.

All right. Are we right in understanding the totality of all of your statements on this topic really to be that you took that to be a reference to the rate at which there would be an inundation above habitable floors in Brisbane?-- That's correct.

As opposed to flood damage in Brisbane more generally?-- That's right.

Thank you. And you will agree with me that you had no - this issue to the extent it was an issue for you had no operational impact?-- It had a slight impact but it had no impact on the final release rates or final flood levels or anything like that.

Would you agree with me it was immaterial in the scheme of the event?-- Yes, I have made that statement in my third statement, I believe.

Thank you. Can I move, then, please, to the decision that was made by you and your colleague, Mr Malone, regarding maintaining flow rates at 2,000 CUMECS. In this regard, Commissioner, may Mr Tibaldi please see Exhibit 23? Can I ask you, please, to go Monday, the 10 January for me, and in particular the 6.30 a.m. entry? Sorry, has Mr Tibaldi got a copy of Exhibit 23?

COMMISSIONER: I am not sure, but it will come up on the screen in front of you, Mr Tibaldi?-- If it comes up I will certainly read it instead of-----

MR DUNNING: What will come upon on the screen for you in a moment is the log for 10 January 2011 at 6.30 a.m.?-- It's not there yet. I will find it.

COMMISSIONER: It's there now, Mr Tibaldi?-- Sorry, what time was that?

MR DUNNING: 6.30 a.m.?-- Okay.

See the reference there to Wivenhoe Directive 9?-- What's the reference?

The reference at 6.30 a.m. to issue Wivenhoe Directive Number 9?-- Oh, I see. Yes, I see Wivenhoe Directive Number 9, yes.

That was the directive that had been issued by the nightshift, whom you and Mr Malone were taking over from at 7 o'clock?-- Yes, that would be correct.

All right. Thank you. And you had and Mr Malone at 8.30 issue Wivenhoe Directive 10. You will see the reference at 8.30?-- Yes, I do, that's - that would be correct.

That was a product of some additional modelling that you and Mr Malone did and taking into account, amongst other things,

the fact that it was now appreciated that a flow rate of 3,500 was the limit of nondamaging flows to Brisbane?-- Yeah. From my view, as I had some concerns about the 3,500 based on the information that I received from Mr Ruffini at handover and before we exceeded that threshold, I wanted to just clarify with the council and have a discussion with the council about exactly what it meant.

If you could just attend to my question? What we see there is at 8.30 you and Mr Malone issue Wivenhoe Directive 10. See that?-- Yes.

And the effect of it was to reduce the flows that had been anticipated by Wivenhoe Directive 9; agree?-- Correct.

Can you then go, please, to the 9.38 a.m. entry. You will see the telephone call to which you were referring a moment ago?-- The 9.38, yes.

So your discussions with Brisbane City Council are in fact about an hour after or a bit over an hour after you had decided to keep the flow rates at around 2,000 CUMECS, agreed?-- Yes, but we did try to ring the council at 8.30 and we were - at that stage we were taking on the hour openings. So it was paused at 9 - you know, we could have got back into stride again at 10 if we wished to, if we thought that was prudent.

Focussing this time, though, on my question, you issued Wivenhoe Directive 10 about an hour and 10 minutes before you actually spoke to the Brisbane City Council on the topic?-- That's correct.

Thank you. And insomuch as paragraph 67 of your first statement suggests to the contrary, you would accept that it is in error?-- It could be - do you mind if I have a quick look?

Not at all?-- Why do you think that's in error?

Because to the extent that it suggests that the decision that was made was one because you couldn't ignore the advice that you received at 9.38, in fact you'd made the decision at about 8.30. It might have influenced you through the balance of the day, but you had already made the decision to issue Wivenhoe Directive 10?-- Yes, but you will notice that the second part of Directive 9 had - the next operation was at 10 a.m., so we could have resumed Directive 9. I mean, from the point of view of giving the guys at the dam a bit of advanced notice, you know, that was the purpose of Directive 10.

Thank you for answering my questions. No further questions, thank you, Commissioner. Before I sit down, may I ask one thing? Would you prefer to be addressed as Madam Commissioner or Commissioner?

COMMISSIONER: I really don't have any strong view. Whatever springs to the lips would be just fine.

MR FLANAGAN: Commissioner, I have no questions.

MR MacSPORRAN: I have no questions.

COMMISSIONER: Thank you. Mr Ambrose?

MR AMBROSE: No questions.

COMMISSIONER: Mr Telford?

MR TELFORD: No, thank you.

COMMISSIONER: Ms McLeod?

MS McLEOD: Our position is that we have covered our issues with Mr Ayre sufficiently.

COMMISSIONER: Thank you for that. Mr O'Sullivan, no questions?

MR O'SULLIVAN: No questions.

COMMISSIONER: Mr Cummins?

MR CUMMINS: No, Commissioner.

COMMISSIONER: Thank you. Yes, Mr O'Donnell.

MR O'DONNELL: Modelling - let's talk about modelling. Have you got Exhibit 22, the set of model runs?-- I think so, yes. This is all the model runs?

Yes?-- Yeah.

I am looking at volume 2. I have just picked 25 as an example. If we look first at the red line, so the modelling based upon the rain that's already fallen and ignores the forecast rain?-- Do you wish me to look at 25, the graphs?

Yes, just as an example. I am looking at page 133, the modelled Wivenhoe Dam inflows?-- Okay.

Now, you say in your witness statement, your first witness statement at paragraph 45, there is a margin for error even in the red line?-- Yes, that's definitely correct.

You put it as a plus or minus five to 10 per cent?-- Of that order. It is difficult to estimate exactly but I will stand by that.

Does that mean it could be up to 10 per cent above or 10 per cent below?-- Plus or minus 10 per cent is either 10 per cent higher or 10 per cent lower, within that band.

What sort of factors can affect the reliability of the red line?-- Oh, a large number of factors. What the model's doing is looking at how rain falls on the ground and how it flows through various terrain towards streams and the time that takes and the quantity of rain. Now, one of the primary factors is your rain gauge coverage. You can have intense rain falling between rain gauges which may give you an incorrect picture of what's happening across the catchment. You can have the opposite of that as well, so that certainly produces uncertainties in all hydrological models, not just these ones we're dealing with at Wivenhoe.

Does that margin for error affect decisions about releasing water or changing strategies?-- It is a consideration - I

have certainly said in my statement that if you take the step to go to W4, which is a step that is going to certainly involve flooding of urban dwellings, you would want to be certain that you are going to exceed EL 74 before you take that step. Very certain.

If the lake level is not at 74 and you are relying on modelling of its predicted level based upon rain that's fallen, given the margin for uncertainty, how would you reach the necessary degree of confidence?-- I guess you would be looking for a result that is clearly over 74 based on rainfall on the ground. You would also be looking, I guess, for an indication - you know, as we did on that Tuesday, an indication from the bureau that there is - the rain is not going to stop suddenly, there is plenty of rain still to be had, and that you have just got no other option other than - you know, you have got great certainty that you are going to exceed 74. You would not do it lightly.

I think you also say in paragraph 45 of your first statement that you would be reluctant to move to a W4 situation on just one model run showing the red line over 74?-- Certainly if that model run was just over EL 74 and you were still well below 74, that wouldn't be enough for me if I was making that decision alone.

All right, thank you. Then let's look at the model with the rainfall forecast, the blue line. Can we look at that for a moment? I am interested in how the modelling marries in with the QPF documents. Would you mind turning them up? They are in the flood report appendix C. I have gone to ones on the 9th of - page 174, 9th of January, the Sunday evening?-- Yes. I would like to talk about QPFs, if I may?

Well, I am asking you how they factor into the model?-- How they factor in? Okay, I will explain. I will just have to give a bit of background. I will explain as quickly as I can.

COMMISSIONER: We have heard a fair bit about them already. You will allow for that? We do understand what they are?-- I just want to make the point that the manual requires the use of best forecast, which is the QPFs. We certainly - in the model runs that are displayed in appendix A, we haven't strictly used the QPFs, we have used something much, much bigger than the QPFs. So that when people say to us, well, this is what the forecast said, why didn't you act on that, they just need to be aware those forecasts aren't the QPFs in those model ones; they are something much, much bigger. I am happy not to discuss that provided it is clearly understood.

MR O'DONNELL: No, I think maybe you had better discuss that?-- Okay. I will just refer you to the explanation of appendix A, which is at the beginning of appendix A in the flood report. It is in appendix 1. There is a paragraph there which is the fourth paragraph down starting at the second sentence.

So you are looking at appendix A, page 1?-- Appendix A, page

1. This is the introduction to appendix A. The second sentence of the fourth paragraph down, which is the second last paragraph from the bottom: "The forecast rainfall model results supply a full 24 hour catchment average rainfall forecast from the BOM QPFs to the model run. This is regardless of the model run time in relation to the time of issue of the forecast and is regardless of the rainfall since the forecast was issued. In effect, this provides a worst case 24 hour scenario." What that means - I had written quite a bit about that in section 6 of the report but we took it out. We were worried about it being perceived as another criticism of the forecasts. What that means is that if you get a 24 hour - the QPFs are typically issued at 10 o'clock and 4 p.m. - 10 a.m. and 4 p.m. If you get a QPF issued at 4 p.m., it is saying you are going to get a certain amount of rain, say 50 millimetres of rain, in the 24 hour period. So what it is saying strictly is that once you have got the 50 millimetres, don't expect any more because you are only going to get 50. And that 50 millimetres could occur uniformly through the 24 hours or it could occur very quickly. It depends on the weather systems and such. Now, often in the event we would come to do a model run and it might be, say, six or seven hours, or a period of time after the QPF was issued and we would have already got the amount of rain that the QPF had forecasted. So, strictly speaking, if we were to use those runs we should just use actuals, because the forecaster told us we were going to get 50 millimetres, or whatever, within the 24 hour period and we'd already got it. So if you are going by the forecast you shouldn't be expecting too much more. But, clearly, that wasn't appropriate. Clearly, it wasn't appropriate because it was still raining. So what we actually did - so the QPFs are the best forecast. That's what the best forecaster was telling us. What we did was then add the full volume of the QPF in again, which effectively in some cases doubled or more. I think in one case it may have tripled the QPF and you are taking that into account, essentially, in those forecasts. So then it comes down to how much reliability is in that forecast? I mean, you are just arbitrarily doubling up or maybe tripling the QPF. You know, again, just the uncertainties there. There is not a lot of science in that but that's the best we could do. So I think why that's relevant is it does talk about - in the manual it uses the word "the best forecast" and the best forecast is the QPF. Those forecast runs you have seen in appendix A, they are not the QPF. They are not the QPF. So that needs to be understood. They are something much greater than the QPF. They are scaled up.

From what you say some would be based on the QPF but as the - as the extent of the 12 hour gap between QPFs proceeds, it could be based more and more on something additional to the QPF?-- The ones that would be based on exactly the QPF are the model runs that are done at the time the QPF is issued. All other model runs would generally include - I think every other model run would include more rainfall than what's in the QPF, than what's in the best forecast.

With your real time receipt of information of rain that's

falling, when you are doing a model run you have got the real time information as to what rain has been recorded?-- That's correct. What's recorded in the rain gauges, which may not necessarily reflect the full catchment conditions but it is the best we have.

So even if that equalled or exceeded the QPF 12 hour forecast, you might add something additional in?-- Our practice was to - our practice in all of those model runs is to add the full QPF in again. The full QPF.

Why was that? Why would you just say, well, we have already received the forecast, so we will just stop there?-- Well, I mean, to do that, I think, was unrealistic. I mean, obviously the forecast was just way wrong so you had to add something in.

Why was the forecast obviously way wrong?-- Well, it was forecasting 50 millimetres in 24 hours, for example, and you might have had - six hours may have passed and you might have had 100 millimetres. So that forecast has to be wrong.

Was it affected then by whether it is still raining in the catchment or not?-- Well, we can see rain in real time, so we were aware that rain was still falling, so it would have been - you know, our judgment was it was just wrong to assume no more rain. You can't - again, it is this whole principle of how much emphasis you put on the forecasts. I mean, you can't - particularly with the uncertainty - and we just can't blindly accept them, and here is an example and we didn't blindly accept it because obviously they were wrong.

All right, thanks. Did that affect, then, the weight you give to the with forecast blue line modelling and your decisions about releasing water?-- That's right. As I said, we gave no weight during the event because there was no basis on which we could provide - you know, we could give them weight.

One other thing you said in answer to Counsel Assisting the Commission, that during the flood event forecasting was just not right, and you added "that tends to be the norm", and then he stopped you. I am interested in the statement "that tends to be the norm". Could you tell us about your own experience of forecasting?-- Well, I am not being critical of the bureau, and I will refer to statements I have previously made on this, most notably my first statement, but the bureau say themselves very clearly that quantitative forecasting, it is just the moment - the way the science is, they cannot give us any sort of forecast with any sort of certainty. If you are talking about quantitative forecasts. That's what they tell us. Again, I refer to Peter Baddiley's statement where he says - I have certainly had the discussion with him on many occasions. He says that that's our shared understanding and he has told us that on many occasions. And I fully agree. I am not an expert in those matters. I take the advice of experts.

No, I was asking about your experience?-- Well, my experience

is they're - well, they are up and down. I mean, certainly they are an indication that rain may fall but I have seen quantitative forecasts for, you know, relatively large amounts of rain and none has fallen. I have certainly experienced that, without question.

One issue the Commission is looking at is looking to the future. Put aside the January event for a moment and just think about the future. Whether the Commission should recommend that the manual make it mandatory for flood control engineers to make decisions based upon with forecast predictions and modelling. Can we have your views please? What would be in the public interest?-- You would certainly have to define exactly what you meant by with forecast. As I said, we have scaled up the QPFs there considerably. It would be a high risk strategy, in my opinion, and you would certainly run a risk of, you know, causing a lot of urban damage when it was unnecessary. It would be very risky. My knowledge of forecasts, it is not something I would endorse, but I guess the scope of the current review, everything is on the table and that bears some discussion, for sure. Certainly the views of the bureau, I would be very interested in what they thought of that. That would be a departure from their current view, I believe.

Assuming the views are as per Mr Baddiley has expressed them to you, do you think they would be in the public interest for the Commission to make that recommendation for the future, or not?-- I - as I said, I don't think it would be a suitable strategy. That would be my view. So it wouldn't be in the public interest.

All right, thank you. Can I move to something else? Do you have the manual there?-- Yes.

Would you mind looking at page 29?-- Yes.

One issue that's arisen for the Commission is whether there is uncertainty as to the triggering for moving to W4. One thing that's been said is that the first dot point on the page when the level is predicted to exceed 74 allows you to make a decision to move to W4 when the level is below 74 but there is a prediction it will get to 74. Another view is, if you count down below that box, the paragraph commencing, "This strategy normally comes into effect as contemplating you only move to 74 when the water level actually crosses that line or in the 2.8 situation when the senior flood engineer exercises his discretion to depart from the manual." When you were conducting the flood event in January '11 did you have a view as to what was the event which would dictate a move to the W4 strategy?-- In my view the movement to W4 is when you have what I would consider to be 100 per cent certainty that the lake is going to exceed EL 74. The statement where it says "normally comes into effect" I believe is to give quite a lot of encouragement to whoever is making the decision to really show that, you know, you certainly have a very - you are expecting - you are certainly going to reach EL 74. That's my view. And on the morning of the Tuesday I was certain in my

mind that we would exceed EL 74 and that's why we made the decision to transition to W4.

I am coming to that decision shortly. The other thing that's come up here is if you move to W4, what does the manual tell you should then be the release rates? Did you have an understanding about this in January?-- Well, yes, the release rates - you essentially increase release rates until the water level stops rising.

All right. Well, how would you determine what would be the release rate?-- Well, those release rates will be dictated by your inflow rates, so essentially it will rise - it will stop rising at some point when you've balanced against your inflow rates.

Does that mean the outflow has to exceed the inflow?-- Exceed or match inflow. That will stop rising, yes.

Thank you. You can close that. One other thing: it has been said that generally this manual has a number of ambiguities or uncertainties. You were a party to writing the manual. When you were using the manual, have you yourself - or during the January flood event, did you yourself find any point at which you found the interpretation ambiguous or uncertain?-- There is two points. I have noted both of them in my statement. The flowchart on page 23, in my view there is an error in that flowchart because - and it is also not consistent with a statement I think that's at the bottom strategy W1 on page 26. There is certain times where you just can't apply the intent of strategy W2. W2 really assumes that the bulk of the water is emanating from Lockyer/Bremer. So if that isn't happening, you just can't apply the intent of strategy W2. It is just not possible. In those circumstances, I believe, you know, it is consistent with the statement on the bottom of page 26 which says, "If the level reaches EL 68.5 in Wivenhoe Dam, switch to strategy W2 or W3 as appropriate." I believe that statement to be correct and that isn't strictly consistent with the flowchart on page 23. So that's an ambiguity that I agree needs attention.

You are referring there to the box in the middle of page 23?-- That's right.

Where the maximum flood has to be less than and less than?-- That's right. It is saying under those circumstances you transition to - you transition to strategy W2 but, as I have said, there are circumstances that you just can't do that because the intent of strategy 2 can't be applied. So there should be a little maybe decision box in there to say can you apply the intent of strategy W2? If so, yes, you will go that way. If not, go to strategy W3.

What's the other respect in which you found the manual uncertain or ambiguous?-- Well, I didn't - there was no uncertainties for me. But I pointed out I think there is an arithmetical error in a table on appendix J.

Leaving that aside, is there other any other respect in actually using the manual in the January '11 flood event you found the manual uncertain or you were unclear as to what the manual required of you?-- I was comfortable using the manual.

You can close that up. Can I take you back to some of the decisions you made on the Monday the 10th and Tuesday the 11th? And I will move through these as quickly as I can. You commenced your shift on Monday the 10th at about 7 a.m.?-- Yes.

A matter that has been raised is that over the previous Sunday night and Monday morning there were a number of model runs where the with forecast model run show the blue line for the level at Wivenhoe as being consistently over 74. So it is said, well, there is a pattern, a pattern showing that if the rainfall falls as predicted, the level will exceed 74. The question is should you, when you commence your shift on Monday morning, the 10th, have moved immediately to a W4 strategy? Before you answer that, I wouldn't mind if you would tell us what was the factors which were relevant to whether you stayed in W3 or moved to W4, lake level, rates of inflow, rates of outflow, and whether in your view that consistent pattern of the blue line warranted a move to W4 earlier?-- Well, firstly, I will say the only reason the blue line was above 74 is because we were scaling up the forecast. But that aside, I accept the pattern was there.

By scaling up the forecast you mean what you discussed before-----?-- Correct.

-----where you take the QPF and on the assumption that rain had fallen, you add to it-----?-- Yes.

-----for the forecasting exercise?-- Yes, correct. But that aside, if we look at, I guess, model run done on Monday the 10th, 9 a.m. - I am not sure - hang on, I have got the full list of model runs here. Looks like the first model run that day on the 10th would have been run 26. So the Wivenhoe level at that time was 72.9.

What time are you addressing?-- Sorry, 9 a.m. on Monday the 10th.

Yes?-- So you were asking me about the decisions I made after-----

Yep?-- -----coming in on shift?

Yes?-- That's the first model run after I came in on shift. So we would have looked at certainly the level in Wivenhoe. We're seeing it at 72.9, so we've still got a fair amount to go before we get to EL 74. We've certainly seeing with that model run we're predicting a level in Wivenhoe of - sorry, I was looking at the wrong column. The actual level in Wivenhoe was 71.56. That's the current level and we were predicting a maximum level of 72.9. So even on the predicted level of 72.9, and also that model run had a flow at Lowood - a flow at

Moggill of only 3,400 - 3,420, so we had a bit up our sleeve at Moggill as well and we were really getting nowhere near EL 74. So on that basis - you asked me whether I would be transitioning to W4? There is just no justification at that time. You have still got - you are well below - I mean, even your predicted level is still well below 74. You have got no certainty - nothing to suggest, really, you are going to get to 74.

Well, you have got that consistent pattern of with forecast modelling where the blue line is over 74. That's what's being said. Should that have caused you to think we will get to 74?-- As I said, we're scaling up those forecasts. I mean, they were the best forecast information we had. If we'd applied that, I don't think we would have got to 74 because we would have applied just the QPF without scaling it up. And also the uncertainty - I don't think you would have got there anyway. But also the uncertainty in the forecast, there is just no - that wouldn't have influenced me to transition to W4 at that point.

Let's progress during the day. You worked that day until 7 p.m.?-- That's correct.

Can we look at what happened during that day? Again, there was a steady pattern of the with forecast modelling all through the day with the blue line over 74. So the question is should you have moved to W4 at some stage before the end of the shift?-- Well, again, I don't believe so. There is just - it is a similar sort of thing. I think if we look maybe at something late in the day there-----

Yep?-- -----so at - a good one might be to look at, say - I think a good one to look at is probably the 5 p.m. 5 p.m.'s probably one that's well worth looking at.

If you look at 5 p.m., again, the predicted level is still under 74. I think by that stage, we were starting to think about it, we were getting up there, even on our predicted level, and certainly we had a fair rise in the dam that day. We'd increased the flow at Moggill - they were up around the 4,000, so we were on the limit, so at that stage, you know, we were certainly starting to have some thoughts about it. If you look - why I pointed you to that one is if you look at the forecast run at that time, which would have - so it would have had the QPF - full QPF in it, because the QPF would have been issued at 4, I doubt if the - I think you can see the discrepancy too between the predicted level at 4, it dropped from - with forecast, it dropped from 75.7 to 74.6, and then at 8 o'clock was down to 74.3. So, actually there was - there's a pattern there of the predicted level on forecast going down, going down quite substantially actually and from 75.7 to 74.1 over a period. So, yeah, look there's just nothing there - I mean, we would have been thinking about it for sure. We would have certainly had some considerations to it, but, again, just the justification's not there. I mean, you go to 74, you are certainly going to flood houses, you know, and that has a great effect on people, and it is just not something we do unless we absolutely have to.

Can I point out also if you look at the Flood Report, page 158, the rate of inflow into the dam?-- So, that's in the afternoon. Well, yeah, the inflow is certainly decreasing and I guess probably if you look at the rainfall that's actually on the ground then, it's possibly on the way down as well. I mean, you can check that in the section 7, but, yeah, I agree with you. I mean, that's a factor as well. Looking at inflows, they're certainly on the decrease. I say we were hoping certainly at that time that we could squeeze by. Around that time also we started to become aware of what was happening in the Lockyer, there was massive flows potentially doing to be coming down the Lockyer because of the flash flooding that occurred late that afternoon, and - you know, we just had no real understanding of that at that time, the volumes and the flow rates associated with that, we were aware it was happening, but we didn't know what it was going to mean, we had no control over those flows, so to ramp up releases at that time potentially on the back of those flows, just would have been absolutely disastrous.

You mean the combination if you'd increased the releases at Wivenhoe together with flash flooding from the Lockyer?-- That's correct, that's what I'm-----

Could have been had affects where-----?-- That would have affected - you know, all the way down to Brisbane, and we just did not have an understanding at that time as to what those volumes or flow rates would be from the Lockyer, and given that we just had no justification really whatever, it appeared we could contain the flood within the dam. That was certainly our hope. You know, there's just - I didn't think it made sense to - well, I had no consideration at all actually to transition W4 at that point in time.

All right. You mentioned the flash flood in the Lockyer in the Flood Event Summary. Can I take you to that, please, page 21 of the Flood Report?-- Twenty-one of the Flood Report?

Yes, the left-hand column, last dot point, you say there you received information from the Bureau of Meteorology at 5.32 of the flash flood in the Lockyer but you had no volume or flow details?-- Yes, that's correct.

Could I direct your attention to the right-hand column, last dot point, "Strategy continued to be not releasing flows that could cause high level urban inundation until it was certain it could not be avoided. Model results continue to indicate this was possible." Does that reflect your thinking at the time?-- That's an exact reflection of my thinking at that time.

Did you discuss this with Mr Malone when you finished your shift at 7 p.m. on the 10th?-- We would have been discussing that concept through the day and that would have been discussed at handover.

You start your next shift on Tuesday, the 11th-----?-- Yes.

-----at about 7 a.m.. What was the position when you arrived at work?-- My recollection was that we had handover, we arrived early, maybe half an hour early, had a handover.

That's from Mr Ayre and Mr Ruffini?-- Mr Ayre and Mr Ruffini were on. Look, we were on the borderline of transitioning. There was optimism with Mr Ayre and Mr Ruffini that we could sort of hang on to contain the flood. They'd discussed the previous night, you know, maybe if the rain was diminishing, there could be a possibility of just keeping it at EL 74 for a short time and they discussed that matter with the Dam Safety Regulator, but we were certainly on the borderline at that point and heavy rain had commenced, which Mr Ayre and Mr Ruffini directed us to at about 4 a.m., or a bit later than that, in the catchment.

Heavy rain where?-- In the Wivenhoe catchment, you know, generally, but certainly in the vicinity of the lake. When we look the real time rainfall system, it allows you to look at that very quickly and clearly when you - you know, at any time, most particularly at the start at each shift, and we had a look at that and realised that we were certainly on the borderline at that time. So, my recollection of events were we did a model run.

There was a model run at 7 a.m.?-- That would have been the model run at 7 a.m.

You can look at that if you wish to or you may recall it?-- So, as I said, we got in about 6.30, we had a handover, the guys had finished a long shift, and they left. Understandably they needed to get some rest. We quickly did a model run.

Is that model run 36?-- Yes, that's model runs 36. If we look at model run 36 - sorry, a with forecast. If we look at model run 36, without forecast, we see that we're getting a level well over 74.

What was the level of the dam at the time you commenced your shift?-- It was 73.6, so-----

And the rate of inflow at that time to the dam?-- The rate of inflow was very high, it had gone up - just looking at the models there, it had gone up 200 millimetres since 4 o'clock, and it rose another almost 100 millimetres between 7 o'clock and 8 o'clock. So, I guess, you know, looking at the - that model run, we expected we were going to go to W4. That wasn't - you know, something that - sorry.

The log records some calls between the Flood Operations Centre and the Bureau of Meteorology between 7 and 8. Do you recall were you involved in those?-- I recall those calls, because after we did the model run, we, I guess, just wanted to do a sanity check. The model run really show us we were probably going to go to W4, there was no option, and we wanted to really just make sure that - you know, check the advice of the Bureau, check they were seeing the same thing we were seeing in terms of rainfall on the ground, in terms of what they expected the forecast would be, what they expected the rain would do during the day, whether there was any possibility that they thought the rain might stop suddenly or something of that nature, and they also do model runs for the upper Brisbane, so they're also calculating flows into Wivenhoe.

Do you recall were you directly involved in talking to the Bureau?-- No. Normally if I'm on with Terry, because he's worked for the Bureau, he knows everyone there, he normally does those calls.

Did he report back to you as what the Bureau told him?-- Yeah, certainly. I mean, I can't recall if one of those calls was a conference call or not, I just can't recall it, but I certainly recall him saying, "Look, the Bureau have an expectation the rain will continue. They're seeing the same things we're seeing. We have got to go to W4.", and that's how it was.

Went to W4 at 8 a.m.?-- Yes. I think - you know, we sort of looked at the rainfall through that hour and realised we had no choice. So, at 8 a.m. we made the decision and we started informing people. I think one of us - I think - my recollection was, and I'm not certain if it's reflected in the log, I think it is, was that I started making some phone calls to the CEO of Seqwater, to the Dam Safety Regulator. At that time Terry was finishing off a model run, and then he made some more calls, I believe, to the councils, and could have been others.

There's another model run at 8 a.m.. Can you recall what came first, the decision to move to W4 or the 8 a.m. model run?-- The decision to move to W4 came first. I mean, we didn't - we

had to do the model run because we had to give the outflows to the Bureau, but it was obvious from the rain on the ground, if you look at the rainfall spike that occurred in that period, I didn't need to do a model to know that the next - that run at 8 o'clock was going to show that we were way over the EL 74, you can see it from the rain on the ground.

According to the Flood Report, page 158, at 8 a.m. when you made the decision, the level of the lake was then 73.7, so it's still short of the 74 mark?-- Yes, that's right, but, as I said, I had certainty. You could see from the rain on the ground in the model runs there was just certainty we were going to exceed EL 74, you know, I was certain in my mind that we were going to exceed EL 74 and we had no choice, and not just exceed it either.

Right. Did you appreciate the consequences of moving to W4?-- I did.

Could you see any alternative?-- I couldn't.

Can we look at what happened after you moved to W4 in terms of the rate of releases compared to the rate of inflows? So, I am looking at the Flood Report at page 158. I just want to compare the outflow and the inflow columns. So, at 8 a.m. in the morning the inflow is 8060 CUMECS, the outflow is 2753. Are you with me?-- Not yet. Sorry, at 8 a.m., yes, the inflow was - sorry.

8060?-- Yes, sorry, yes, total inflow.

Inflow is 2753?-- Yes. I can see that.

Over the next few hours the rate of inflow increases up to over 11,000 CUMECS per second?-- Yes.

And the rate of outflow increases fairly quickly?-- Yes.

Until you get to a point where the rate of outflow exceeds the rate of inflow, which looks to be about 5 p.m. - no, 7 p.m.. Am I reading that correctly?-- The outflow exceeds inflow for the first time at 7 p.m., 1900, that's correct.

All right. From that point on, the outflow exceeds the inflow for the next few hours?-- Yes.

Did that represent a situation where the level of the lake had began to fall?-- That's right. The levels stabilises and then at 9 p.m., 2100, it began to fall slowly. Once it began to fall, in the interests of trying to reduce flooding downstream as best we could, we commenced closing the gates.

All right. Thank you. Just a couple of last things before I sit down, one issue that's arisen for the Commission to consider is looking to the future, whether there should be an interim strategy between W3/W4. One suggestion has been that there should be an interim strategy so that if you get a fast rise in the level of the lake but you are not yet at 74, in

other words it's not appropriate to invoke W4, there should be an interim ability to have much higher releases than would generate 4,000 CUMECS at Moggill; in other words, a much wider discretion to the flood engineers during the flood event. Can we get your views on whether you think that would be a benefit or not?-- Well, the provision for discretion is there now and provision for that type of discretion is there now in, I believe, section 2.8 of the manual. So, if the senior flood engineer believes that he can take actions contrary to the manual with the aim of reducing flooding, he could take those actions, actions similar to what you're suggesting. You know, I mean, whether there would be advantages of explicitly having that as a strategy, I couldn't answer that. It would require a lot of discussion. I am not sure how you would frame that provision. I am not sure of the benefit, so I can't - as I said, I think it would require a lot of discussion by a lot of people to - well, firstly frame it and then once you frame it, investigate whether it's - you know, looking at design floods and actual floods, you know, historical floods, make an assessment as to whether it may or may not be beneficial. I don't know, couldn't tell you, couldn't say.

Do you have a view on the question of whether the manual is giving a clearly defined set of rules for the flood engineers or giving them a wide discretion?-- Well, ultimately, you want the best result. Clearly defined is - you know, notionally you'd think that's better, but I question, given the broad range of uncertainties to do with forecasting and flows and modelling and particularly just the nature of the weather, whether it's possible to have procedures that are so clearly defined it's just a step by step, I just - I don't believe it's possible to do that. That's my view. If you could do that, theoretically you could have a computer program to manage the releases. That would be good, but I don't think it's possible. I think unavoidably you have a number of matters when you're operating the dam that because of the uncertainties that require judgments, they just require judgments, professional judgments, and how you avoid that, I don't know. I don't believe you can.

All right. One last thing. Would you mind opening the Flood Report at the Executive Summary, (iv)?-- Is that here somewhere? Yes.

(iv)?-- Yes.

It shows the rate of inflows to Wivenhoe during the flood event?-- Yes.

You have been asked to calculate the volume of inflow on three days, the 9th, 10th and the 11th of January?-- Yes. I was asked that question and I calculated it at approximately 1,000 - one and a half million megalitres.

Thank you. Thank you, Commissioner.

COMMISSIONER: Mr Schmidt?

MR SCHMIDT: To save Mr Tibaldi coming back, I have only got a few questions. Mr Tibaldi, good afternoon. I represent a group of farmers along the Mid Brisbane River under the banner of the Mid Brisbane River Irrigators and one of our major concerns is the drain down phase?-- Yes.

I would just like to ask a few questions about that, if I can?-- Sure.

Since 1988 every flood event in the Mid Brisbane region, large or small, has had an impact either major or minor on the stability of the banks and bank slumping and mainly caused by the rapid drain down face, the seven day phase. Is the reason for this rapid drawdown phase because of the risk of flood events happening in close succession; is that correct?-- That's the reasoning in the manual, yes.

Would there be a percentage of risk in that? I mean, roughly?-- You're asking me to estimate a percentage? I couldn't.

Okay. Well, do you consider that this is a greater risk than the almost 100 per cent risk of damage to the riverine environment?-- Look, I think - you know, damage to the riverine environment is a consideration and since the last review it's there as an objective. Essentially what we try to do is mimic the natural situation as best we can, but certainly, you know, we have talked about this review of the manual and this review's very different to the last review, there will be a lot of people involved, you know, just by the notion of it or the nature of it, I should say, excuse me. You know, the environment - I mean, what you're referring to is important, I am not saying it isn't, and we would welcome input on ways and certainly I - it would be good to put on the table ways of - you know, seeing if there's any way to meet your concerns. I mean, as a flood engineer operating under the manual, the more information I can get from people that are impacted - it comes a bit to this understanding of, you know, flows at Moggill. I mean, that's helpful, you know.

It is just that we have been actually raising this issue with Seqwater for possibly the last five to six years and have been given no - no ability to add our input, so that would be greatly appreciated if we were considered in that project, because I think we have some valuable input to give living right on the river, and that sounds like it could be good. Thank you.

COMMISSIONER: Mr Callaghan?

MR CALLAGHAN: No, thank you, Madam Commissioner. May Mr Tibaldi be excused?

COMMISSIONER: Pretty much on the dot, Mr Tibaldi. You are excused?-- Excellent. Thank you.

WITNESS EXCUSED

COMMISSIONER: Mr Callaghan?

MR CALLAGHAN: That's all we have in this session. I might foreshadow that I will be submitting that a practice direction should issue in relation to the form of proceedings for when we resume this topic, because the time allowed in the hearings that remain in Brisbane is confined and we may have to do something about confining the length of time for which witnesses will be available for cross-examination, but I will be submitting something to you in the next few days and asking you to do that. I just thought I would put the parties on notice that something like that might be coming.

COMMISSIONER: All right. We can adjourn until Toowoomba?

MR CALLAGHAN: Yes.

COMMISSIONER: Adjourn till Toowoomba.

THE COMMISSION ADJOURNED AT 4.33 P.M. TILL 9.30 A.M., MONDAY, 18 APRIL 2011 AT TOOWOOMBA