REPORT OF PROCEEDINGS BEFORE

STANDING COMMITTEE ON STATE DEVELOPMENT

INQUIRY INTO THE ADEQUACY OF WATER STORAGES IN NSW

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At Sydney on Monday 20 August 2012

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The Committee met at 9.30 a.m.

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PRESENT

The Hon. R. H. Colless (Chair)

The Hon. P. Green
The Hon. C. J. S. Lynn
The Hon. Dr P. R. Phelps
The Hon. M. S. Veitch (Deputy Chair)
The Hon. S. J. R. Whan

CHAIR: I welcome everybody to this first hearing of the State Development Committee inquiry into the adequacy of water storages in New South Wales. I acknowledge the Gadigal clan of the Eora nation and its elders, and thank them for their custodianship of this land.

The inquiry's terms of reference require the Committee to inquiry into and report on a range of issues, including the capacity of existing water storages and models for determining water requirements for agricultural, urban, industrial and environmental needs. The inquiry will also examine proposals for the construction and/or augmentation of water storages in New South Wales. Today we will be hearing from representatives from a number of government departments and water management authorities, including the Department of Primary Industries, the Office of Water, the Sydney Catchment Authority, the State Water Corporation and the Dams Safety Committee.

I will make some comments about certain aspects of the hearing. Committee hearings are not intended to provide a forum for people to make adverse reflections about specific individuals. The protection afforded to Committee witnesses under parliamentary privilege should not be abused during these hearings and I, therefore, request that witnesses avoid the mention of individuals unless it is essential to address the terms of reference.

The Committee has previously resolved to authorise the media to broadcast sound and video excerpts of its public proceedings. Copies of the guidelines for the broadcast of proceedings are available on the table by the door. In accordance with those guidelines, a member of the Committee and witnesses may be filmed or recorded. However, people in the public gallery should not be the primary focus of any filming or photographs. In reporting the proceedings of this Committee, the media must take responsibility for what they publish or what interpretation is placed on anything that is said before the Committee.

I remind everyone that any messages for Committee members or witnesses must be delivered through the Committee clerks. I also advise that under the Standing Orders of the Legislative Council any documents presented to the Committee that have not yet been tabled in Parliament may not, except with the permission of the Committee, be disclosed or published by any members of such committee or by any other person. I remind everyone to please turn off your mobile phones, as they interfere with Hansard's recording of the proceedings.

RICHARD FREDERICK SHELDRAKE, Director-General, Department of Primary Industries, and

DAVID ANDREW HARRISS, Commissioner, NSW Office of Water, Department of Primary Industries affirmed and examined, and

STEWART RICHARD WEBSTER, Principal Director, Investment Appraisal, Statistical Analysis and Economic Research, NSW Trade and Investment, sworn and examined:

CHAIR: If you should consider at any stage that certain evidence you wish to give or documents you may wish to tender should be heard or seen only by the Committee, please indicate that fact and the Committee will consider your request. Dr Sheldrake, do you wish to make an opening statement?

Dr SHELDRAKE: The Department of Trade and Investment and the Department of Primary Industries welcome the opportunity to address this Committee, and its inquiry into the adequacy of water storages in New South Wales. The Department of Primary Industries has a strong interest in this inquiry from the over-arching role of the Office of Water in water delivery, water-sharing plans and for storage management practices. Fisheries has a strong interest in the impact on the Fisheries resources of both allocations and the management of delivery and structures. Agriculture NSW has a primary interest in the supply of water to farms, both through stock and domestic supply, and irrigation and water delivery. Our submission addresses each of the terms of reference in turn.

The inquiry has been scoped around storages but we I would like to flag that there is a wider conversation to be had about water security and water use by end users. We are all aware that water is a scarce commodity in our landscape and the evidence that much of the easy water has already been captured in our dams and storage systems. However, there is significant capacity to improve water use efficiency by end users to increase the productive outputs from the water resource. In agriculture water efficiency losses occur through evaporation due to on-farm storage operation or design from crop application methods, resulting in loss to deep drainage, and from channel leakage losses.

In 2007 a review of potential water savings in the northern inland basin of New South Wales by Bailey and others estimated the loss on-farm that could be saved by investment in existing modern technologies could equate to approximately 450 gigalitres. To put that level of saving into perspective the volume equates to more than that capacity of Keepit Dam on the Namoi River. To capture that efficiency we need investment on farms and ongoing investment in research and development. There is no evidence that the market will drive the scale of efficiencies that we know are achievable through infrastructure upgrades.

Currently the department is involved in delivering on-farm infrastructure investment programs in the northern basin for the Commonwealth Government. The project delivers 50 per cent of the water savings to the environment. Under a different program all of the savings could remain with industry. I note some of the changes that are occurring within the water market and I believe we need to look into the impact on water availability for productive use. For example, the Commonwealth Government is moving to be a major holder of general security water licenses across the Murray-Darling Basin. What impact will that have on storage management the allocation decisions and ultimately productive water use?

There are some big questions within the scope of this review. The construction of further storages will come at considerable cost. Who should bear those costs? Who are the beneficiaries and who will be asked to pay? Dam construction has multiple objectives, including flood mitigation, providing water security for urban populations, industrial, agricultural and the environment. Thank you for the invitation to appear this morning.

CHAIR: How do the various agencies with a role in managing water interact with other organisations such as the Metropolitan Water Directorate to manage water across New South Wales?

Dr SHELDRAKE: Clearly within the structure of our organisation NSW Trade and Investment is the overarching organisation; the Department of Primary Industries is part of that organisation and the Office of Water is then part of the Department of Primary Industries. I think the best person to answer that question is David Harriss.

Mr HARRISS: Typically in New South Wales we interact exceptionally well in the management of water and that has been typified as we have gone through drought over the past 10 years. We have worked

cooperatively with Sydney Water in developing the Metropolitan Water Plan in 2006 and again in 2010—they are developed every 4 years. That is conducted through the metropolitan chief executives group, which includes Sydney Water, the Sydney Catchment Authority, State Water, the Office of Water and Primary Industries: all the relevant agencies. In the management of rural water we work very cooperatively with State Water—the asset manager. State Water is responsible for maintaining the assets and the operations of those assets and the delivery of water, whilst the Office of Water is more responsible for developing the protocols and policies for water sharing and interstate water agreements on managing floods, bearing in mind that the primary focus for the management of the dam during a flood in the first instance is dam safety, thereafter it is to effectively enable the free passage of the floodwaters through whilst at the end of the flood peak having the dams full and minimising wherever possible any social dislocations as a consequence of the floods.

Flood mitigation in New South Wales, by the way, is not one of the primary purposes of dam construction. All the dam construction in inland New South Wales is principally for water storage and conservation, recognising that we go through extended dry periods. Every dam does provide some mitigation capacity depending on how much water is in it at the time of a rain event, but certainly we typically have not used those dams for flood mitigation. There is some flood mitigation, for example, Lake Hume at the moment is at 97 per cent and—typically September and October are the wettest months—the Murray-Darling Basin Authority [MDBA] is making pre-releases to provide air space for flood mitigation. That in itself is an issue that has to be debated more fully than it has been so far. We have just come through a drought where Hume Dam got down to about 2 per cent and Dartmouth at 22 per cent and some people legitimately ask the question: Why are we making pre-releases for flood mitigation when we might go into another drought tomorrow? It is all about getting a balance.

To get back to the original question, in terms of managing water around the State, with State Water we manage bulk water supplies well through policy. We also manage water to country towns and urban areas by allocations to them. They have high-security allocations in New South Wales, which means they are the highest priority for water use. We also have a policy that we typically manage the storages so that we have two years at any stage of high-security entitlements. New South Wales has a two-tiered system of water allocation. High security is typically about 10 per cent to 15 per cent of the water use throughout the State. That is a very secure water product, if you like. It is virtually guaranteed in a repeat of all the climatic conditions we have had, albeit sometimes it might have to build up during the course of the season. The remaining 80 per cent to 85 percent of the water is in general security, which means effectively that more water is available depending on the season. So if it is a wet season you have an allocation that is a proportion of your entitlement. In a wet season you can expect to get 100 per cent of that entitlement. In years like we have had where we have gone through severe drought there have been some valleys where there has been zero per cent water availability for general water irrigators for a number of years consecutively.

That as far as I am concerned is one of the world's best water allocation policies because it facilitates climate variability and it is adapted to climate change. In New South Wales you have those industries that need water every year such including secondary industries, horticulture and permanent plantings. They will get their water every year, but more opportunistic crops such as cereal crops, cotton and rice have more water available in wet years and less water available in dry years. Quite frankly that is a good policy setting. It is better than we they have got in Victoria and South Australia, which has one tier of water security. As a consequence, New South Wales went through the drought looking after their industries with very little adverse impact. We also work in cooperation with other jurisdictions in the border rivers area through the Borders River Commission and in the southern part of the Murray-Darling Basin through the Murray-Darling Basin Authority. There is quite a complex network of agencies involved in water management but typically I think it is regarded around the world as one of the best interjurisdictional water management models available.

CHAIR: Will you expand on your statement that every dam built in inland New South Wales has been built essentially for water conservation, irrigation and not flood mitigation?

Mr HARRISS: Yes.

CHAIR: Will you also confirm that those dams were not built for environmental flows?

Mr HARRISS: The last major dam built in eastern Australia was Dartmouth Dam, completed in 1979, and there have been a couple of upgrades. The primary purpose of those dams was for water supply and conservation, given the droughts. They were designed in the early part of the last century following the centenary drought and were constructed over a period of 50 years. They were effectively built to secure water

supply for the populations in inland New South Wales and the water within them was largely allocated to foster economic development through irrigation. It has only been in the last 20 or 25 years I think that we have realised that some of the allocation practices extended beyond the capacity of some of the dams and we have had to claw them back. But typically dams will provide opportunistically for flood mitigation, but I am unaware of any dam in New South Wales that has been built specifically for flood mitigation. I know that Burrendong can be surcharged to 160 per cent of its capacity, which does provide some flood mitigation; equally the Menindee Lakes can be surcharged to 118 per cent of their capacity to provide flood mitigation but they are brought down to that critical supply level reasonable quickly after the peak of the flood has passed. I might also add that there is a bit of pressure coming on a review of all operations of dams following the events in south-east Queensland at Wivenhoe Dam 18 months to 2 years ago.

CHAIR: The Committee will be looking to explore some of those issues.

The Hon. MICK VEITCH: I want to explore a bit further what you have said about flood mitigation. At various times all members of Parliament receive correspondence from constituents right across the State about the flood mitigation roles of our water storages, but you are saying that is not the case.

Mr HARRISS: That is not their primary purpose. If a dam such as Hume Dam has got 50 per cent capacity then any event is actually going to be mitigated. In fact, we probably mitigate the impacts of about 80 per cent of all fresh inflows as a consequence of our dams but it is not their primary purpose. Quite frankly, in New South Wales with the volumes of water we get in some of our major floods the dams are irrelevant. At the beginning of this year we had a flood that passed through the Menindee Lakes in far west New South Wales, I think we ultimately passed 12 times the volume of Sydney Harbour through those dams over a period of three months.

The Hon. MICK VEITCH: Is there anywhere in New South Wales where a flood mitigation dam would serve a purpose?

Mr HARRISS: I think they also have the purpose of flood mitigation simply because even if they are full they have some attenuating role so they can take the peak off, but they all provide an opportunistic flood mitigation capacity. As a water manager when I see a flood go past I want to see those dams full at the end of it because we might go into the next drought tomorrow.

The Hon. MICK VEITCH: I have put questions on the Notice Paper about Blowering Dam and this issue around airspace. I do not whether there was confusion with the people around Tumut or whether there was originally an air space agreement that has subsequently been superseded and not applied, but do any of the dams in western New South Wales have an air space requirement?

Mr HARRISS: That is probably a question you should best ask of State Water; I do not know off the top of my head. With regards to Blowering—I might have to correct this in a letter back, I think we might have provided correspondence before—Snowy Hydro can ask to provide airspace to enable them to generate from Talbingo. They can ask State Water to make releases to provide that airspace but they have to make good that water subsequently. But I think there are some airspace rules around different dams. I know that currently the MDBA is looking at providing 100 gigalitres of airspace in Hume Dam so that flows downstream of Hume are now quite high and have been for some months. Typically the months of September and October in the Murray Valley are the wettest and we have got Hume Dam currently at 97 per cent. So there is a quite high likelihood of getting a fill and spill in just about every dam around New South Wales.

The Hon. MICK VEITCH: How do we capture things like snow melt?

Mr HARRISS: Most of the snow melt, I think seven-eighths of the snow melt, goes towards the Snowy and goes down the eastern side. Little comes back. Some comes back through the Snowy into Blowering and into the Tumut River. Some also comes back into Hume Dam through the Murray. Typically, that is factored in and generates base flows during that time. Where we find where we have floods eventuate as we get in, say, September, October, you get a couple of nice thunder storms in warm weather on a decent snow pack and it melts it reasonably quickly. What we found, however, during the drought was some of that snow was not melting; it was evaporating directly, which was something we had not witnessed before. But something like this year, I know there is about two metres snow pack in the Victorian alps at the moment. It has been quite a good snow season. If we were then to go into a warm spring and get a few thunder storms, that is when you would expect floods to generate in the August spring period.

The Hon. MICK VEITCH: There are some issues at the moment about the releases out of Blowering and how it is causing bank collapse in the Tumut River. That may be a phenomenon that is just for that river because of the velocity of the water. How do we manage things like banks collapsing? There were farmers in last week's Tumut paper talking about taking a class action because they have lost significant amounts of their farmland into the river.

Mr HARRISS: We have active programs of riverbank management in both the Tumut River, which is partly funded by water users and partly funded by Snowy Hydro Limited. We have a similar project in the upper Murray and a project in the Murray below Hume Dam, the Yarrawonga, funded through the MDBA, to look at protecting or repairing banks because currently the delivery—of course, irrigation water requirements are highest during summer. So we have high flows in summer. We have about typically 9,000 megalitres a day in the capacity of the Tumut River. It goes trundling down there for months on end. That does cause some erosion. We had works done, a report done about 10 years ago which demonstrated, however, it was not the only contributing factor. A lot of land clearing down at the edge of the river is also a contributing factor to erosion, and that is the same case in the Murray River downstream of Hume Dam.

But they are not naturally high-power streams but because of river regulation and the need to deliver large volumes of water throughout the course of the summer and autumn they have become high-power streams and subject to erosion. But as I said, we are having active management programs with different riverbank erosion works, revegetation, deep piles, all those sorts of things to try to mitigate some of that erosion. But it is also exacerbated in the Murray River occasionally by having high rivers constantly and boats. I know I will probably offend some of my colleagues who like their wakeboards, but wakeboards generate a wave of up to a metre, and when you have a constant level of a river for three or four months that is constantly undermining the river and leading to substantial erosion.

The Hon. PAUL GREEN: With wakeboarding, is it not true that one storm event can do the damage of 100 years in one go, whereas it might take 100 years of wakeboarding to do the same damage?

Mr HARRISS: I would not have thought so. I am not familiar with that kind of analogy. Typically, you do not get much storm damage to riverbanks. You do get a lot of in-flows and high rivers but that is a natural part of the Australian environment. I think the rivers are pretty well adapted. Australian rivers move. They move across floodplains. They relocate. I think we have an expectation they will not move so we try to do a whole lot of things. But we are constantly trying to prevent anabranches forming in the Murray River, which will take the main carrier. They have become a main carrier and that happens across the State. That is just part and parcel of geomorphology.

The Hon. MICK VEITCH: Most MPs here would have received correspondence, particularly after the flood events in 2010, about the release of environmental flows at the same time as a flooding event. That seems to be an issue. People have alleged or asserted that the environmental flows in the Murrumbidgee, for instance, were released at the same time as the flooding event took place. That does not make sense.

Mr HARRISS: I am not aware of the environmental flows being released during the course of a flood. I think we had no choice but to make those releases. The day before it was coming in it was going out.

The Hon. MICK VEITCH: What is the management process for releasing environmental flows?

Mr HARRISS: Environmental flows have the same characteristics as any other licence. The environmental manager, whether it be the Office of Environment and Heritage or whether it be the Commonwealth Environmental Water holder, will order his or her water in a pattern that best suits their needs, just as an irrigator will order their water in a pattern that suits their needs. Then State Water and ourselves will collectively try to make the arrangements to deliver that water to meet all purposes and within existing constraints at the present stage. One of the inputs from the New South Wales Government into the basin plan has been that there should be no compulsory acquisition of water entitlements; neither should there be compulsory acquisition of land to facilitate flooding of freehold land.

It is something we factor in when we have an order for water. We also look at the weather patterns. We have done that every since I have been around, looking at the eight-day weather forecast. There is a big low coming across the southern ocean, you know there will be rainfall rejection events. You do not release the same volumes of water that you otherwise would do in the middle of a drought. There is a lot of real time

management in the release of water for whatever purpose. But in terms of the environmental flows, when they are released from regulated storages and they are regulated entitlements, they come with the same characteristics and we deliver them within the constraints, as we deliver any other entitlement.

The Hon. STEVE WHAN: In the submission it talks about the 5/10/20 rule for local water utilities, which is about restrictions and the number of restrictions. How many towns or areas in New South Wales would not be able to comply with that 5/10/20 rule?

Mr HARRISS: I would have to take that on notice.

The Hon. STEVE WHAN: Would you do that?

Mr HARRISS: Yes, I will do that.

The Hon. STEVE WHAN: I presume that Nimmitabel would be one that does not comply with it. Can you tell me what the progress is on their new dam?

Mr HARRISS: I will take that on notice.

The Hon. STEVE WHAN: You mentioned before the Queensland floods. Has the department looked at the recommendations of the Queensland Flood Royal Commission and what are the implications of that for New South Wales?

Mr HARRISS: We have looked at the overview provided by the Murray-Darling Basin Authority which has gone through it, and there does not appear to be—one of the major things that has come out is you must have a proper flood operations manual and you must stick rigidly to that flood operations manual. We do have flood operations manuals in New South Wales and for Hume Dam, where it is shared between the other jurisdictions. That is the key issue that has come out. The issue about whether you should provide for flood mitigation capacity is something that needs to be debated, but certainly coastal storages such as in south-east Queensland are completely different storages to those in inland New South Wales. So you have to consider them completely separately. One of the things I think we have got reasonably right in New South Wales is that most of the flood issues, issues about floodplain development, they are subject to pretty good planning controls. For example, when you saw what happened in Wivenhoe, we had quite significant flooding in the Clarence River and the north-east rivers in New South Wales but there was very little of the same kind of damage that was caused.

CHAIR: Wivenhoe was built partially for—

Mr HARRISS: For flood mitigation, absolutely.

The Hon. STEVE WHAN: On the issue of flood planning, one of the things which I know has been frustrating for various authorities over the years is the different responsibilities for river gauges around New South Wales. How many of the gauges around New South Wales are owned, operated and maintained by the department or the agencies? What is the practical barrier to bringing all the gauges under one umbrella around the State?

Mr HARRISS: At the moment throughout rural New South Wales the Office of Water is responsible for hydrometrics and that includes groundwater as well. We probably run the biggest hydrometric network in Australia, when you add surface water and groundwater. Typically, we maintain them and operate them for the Bureau of Meteorology, the SES and State Water under contract. The gauges which are not managed by the Office of Water are those throughout the Sydney catchment, which are managed by the Sydney Catchment Authority. Snowy Hydro maintains their own gauges in their Snowy Hydro scheme. I think estuarine management is done by Manly Hydraulics on behalf of the Office of Environment and Heritage. There is probably no practical barrier. It is just one of those things that has developed over time. It is quite interesting. We manage over 1,000 sites around New South Wales and they are maintained real time. Every one of those sites is updated by nine o'clock every morning. It is a very popular website. Because it is a very popular website, it is almost like a sexy little thing that people want to get their hands on. Everyone wants to take over our hydrometric stations.

The Hon. STEVE WHAN: I am happy for you to keep hold of them as long as somebody is doing the maintenance.

Mr HARRISS: We are doing the maintenance. It was interesting because during the Kennett era the hydrometrics in Victoria was privatised. We have subsequently done customer surveys which say the service we provide, particularly to the Bureau of Meteorology and the Murray-Darling Basin Authority, is a terrific service for real-time management. In a lot of our streams people can only pump when rivers reach a certain height and they have to turn the pumps off when they drop to a certain level, so they have to be able to access this real-time data. During floods like we had a couple of months ago there was enormous interest in what the rivers were doing and dam storage levels—so much so that we had to upgrade our server. Our server in the public domain crashed continuously because we had hundreds of thousands of hits. We maintained a separate server for the Bureau of Meteorology, the State Emergency Service and ourselves so we did not lose the data.

The Hon. STEVE WHAN: After floods there is often criticism about the amount of warning and the ability to predict flows and that is always going to happen because local people have different knowledge and experiences. Do you do reviews of the adequacy of the network and whether or not there are more areas that need that data?

Mr HARRISS: Constantly. We have probably shut down 400 stations over the last 10 years and added 500 stations over the last 10 years. We are trying to keep them updated as much as possible and we are moving all of those to telemetry so you are getting real-time information.

The Hon. STEVE WHAN: The submission indicates that the department is currently reviewing possibilities for augmentation of water storages around New South Wales. What is the current situation with that review?

Dr SHELDRAKE: I will ask Mr Webster to give some details but we have currently—within Primary Industries and Trade and Investment and in conjunction with State Water—looked at the opportunities for effectively enhancing some storage facilities around New South Wales. A submission has gone forward along those lines.

The Hon. STEVE WHAN: A Cabinet submission for funding?

Dr SHELDRAKE: Without going into detail—

The Hon. Dr PETER PHELPS: Good try, Steve.

Dr SHELDRAKE: —a submission is being prepared and is part of government processes.

The Hon. STEVE WHAN: Are you able to provide to the Committee a list of the options being considered or the areas which are possible for augmentation?

Dr SHELDRAKE: I do not know that those documents are public.

Mr WEBSTER: They are not all public but I understand that State Water in their session later today will be discussing some of the projects.

Mr HARRISS: We have been looking at augmenting or changing the operations of the Menindee Lakes in Far West New South Wales.

The Hon. STEVE WHAN: For the last 10 years.

Mr HARRISS: We were successful in getting funds from the Commonwealth. The Commonwealth option was not suitable for New South Wales but we still believe there is potential for improving the storage capacity of those lakes.

The Hon. Dr PETER PHELPS: Is that the quartering option?

Mr HARRISS: No, it is putting in some structural works. The Menindee Lakes are a series of four major lakes spread over about 450 kilometres. There will always be inflows—even during the worst drought

there will be some inflows. The rule is that if you can store them preferentially in the upstream lakes rather than have it spread out over the four you can make substantial evaporation savings. It is a program where we reckon we could save between 35 to 75 gigalitres of water through an investment of $100 million.

The Hon. STEVE WHAN: Your submission talks about the inadequacy of water storages in the lower Hunter and the short-term capacity. Are there other possible sites for new water storages for the lower Hunter other than the Tillegra dam, and if so where are they?

Mr HARRISS: I am not aware of those sites. The Department of Finance and Services is currently doing the water plan for the Hunter Valley.

The Hon. STEVE WHAN: Is the NSW Office of Water involved in that?

Mr HARRISS: It will be the same metro chief executive officers group which prepares the Hunter water plan that prepared the Sydney water plan.

The Hon. STEVE WHAN: What expertise from within the Office of Water or State Water are they using to identify those sites?

Mr HARRISS: They would not be using expertise from the Office of Water because we are no longer into dam construction; we are more into policy and water sharing. Any expertise would be within State Water, the old Public Works or the Department of Finance and Services.

The Hon. STEVE WHAN: I will come back to State Water with that later on. Similarly, in the Northern Rivers there are submissions from councils in the Tweed particularly saying that they have lacked capacity. Is the department involved in considering options for increased storages there?

Mr HARRISS: The department is considering options for storage in the Tweed Valley. I believe that was considered over the last two years but there were high environmental values in the area where it was to be located so it was not progressed.

The Hon. MICK VEITCH: Birrell Creek?

Mr HARRISS: Yes.

The Hon. STEVE WHAN: Is there any further work being undertaken there or has the department been asked by anyone in the Government to investigate other options?

Mr HARRISS: I think as part of the broader review of looking at the options for storages around the State, but nothing specific to that area. We do get regularly asked—in just about every valley—"Why don't you build another dam?" One of the things it is important to remember—Dr Sheldrake made some reference to it—is that they are quite expensive. During the last drought the last spill for every dam in inland New South Wales was in 2000 and the next time those dams spilt was in 2010. That realistically means that any further infrastructure would have been worthless in that intervening period because every bit of water was captured in the existing infrastructure, let alone any additional infrastructure.

CHAIR: Except it would be full now.

Mr HARRISS: Yes.

The Hon. STEVE WHAN: We are conscious of that fact. The point Dr Sheldrake made about the savings is critical. Coming back to one of the projects you mentioned, has the Border Rivers Commonwealth funded program moved past demonstration and on to a broader scale implementation of projects in that area?

Dr SHELDRAKE: It is just about to. The pilot was conducted, we have approval to start the full-scale project and tenders are being called for in September. There will be two calls for projects from farmers to participate in that water efficiency program. The first one will end in November and the second one will end in April. The answer to your question is yes.

The Hon. STEVE WHAN: What has the feedback been from farmers about the pilot projects and the success of the pilot projects?

Dr SHELDRAKE: The best way to handle that is to provide a response to the Committee. There is material on file in our report that we went back to the Commonwealth with. We can provide a detailed answer to that question. There was positive feedback. There was a survey done. There is some really positive feedback. There were some issues at the time that we conducted the pilot which probably meant the pilot did not attract as many participants at the end of the day as we were hoping it would. We learnt from that pilot and in conducting the full project the feedback I am getting is it will be oversubscribed.

The Hon. STEVE WHAN: If we can get more detail on that it would be useful.

The Hon. PAUL GREEN: As a regulator of local water utilities throughout the State is the Office of Water satisfied with the level of forward planning for water storage for urban use in New South Wales towns?

Mr HARRISS: We are very well placed in New South Wales in terms of the forward planning undertaken by the water utilities in their own right. We have appropriate legislation which is suitable for the New South Wales environment. Our towns have high security entitlements which are generally adequate for all of their domestic requirements and if they want additional water for industrial development they have to purchase that on the market like anyone else does. We have a policy to look after high-security entitlements in towns for a minimum of two years wherever possible. In the worst instance, if all else fails, we can suspend water-sharing plans and go back to our legislation through the Water Management Act, which has a priority for water supply in extreme water shortages, and the first priority for that is the domestic component of town water supplies. So we do have our legislation policy settings pretty well done and I think the utilities, by and large, recognise the importance of water and plan appropriately.

The Hon. Dr PETER PHELPS: So when Professor Flannery warns that Sydney has a likelihood of running out of water, there is nothing in your procedures that would give credence to that assertion?

Mr HARRISS: Basically, no. We have a policy around New South Wales—although it is implemented by the Sydney Catchment Authority, Sydney Water and Sydney Basin, as opposed to my area of responsibility, a more rural area—we have a policy where we try to set aside water that will meet two years of supply. We do all of our planning on a conservative basis and we assume the worst previous inflow sequence over that period. That was just blown away in 2006 and 2007 but we now operate on that, so again it is conservative. However, there is nothing to say that we might not go into climate change and there might be worse sequences. We have got through the worst drought in our history and our dams provided and no town ran out of water in New South Wales.

CHAIR: How far do the records go back, Mr Harriss?

Mr HARRISS: Most of the records go back about 110 or 120 years. We did have to supply water by tanker in small towns, we provided ground water. But by and large our dams went beyond their design capacity.

The Hon. PAUL GREEN: Goulburn got pretty close.

Mr HARRISS: It got close but it is a lot better operating in this day.

The Hon. PAUL GREEN: I appreciate the information, and it was good information but I did not ask you were we well placed, I asked you, are you satisfied about the future planning?

Mr HARRISS: When it comes across my desk, I do not have any reason not to be satisfied, other than there may be one or two areas. We are happy that well over 90 per cent of our towns are operating beyond what we require of them.

The Hon. PAUL GREEN: What places would they be?

Mr HARRISS: There are some that do not achieve their full cost recovery that we are trying to get to and one of those is Albury. So I cannot remember off the top of my head the other ones but we have taken it to them that in their planning procedure they have got to be able to recover the costs for upgrading or renewing their infrastructure over the years to come. We have invested about $1.3 billion in the Country Towns Water

Supply and Sewerage Program and you do not want to see that quarter, 20 years on, coming back cap in hand. It has to be cost recovered for future infrastructure allocation.

The Hon. PAUL GREEN: Would you say it is a Catch 22 situation? You are talking about demand management strategies and you are asking rural towns to increase the price but you still want users to use less. Is that not a Catch 22?

Mr HARRISS: It is a bit of a Catch 22 and I know that when you introduce restrictions, the Productivity Commission opposes water restrictions because one cannot then fully cost recover for the operation and maintenance of assets.

The Hon. PAUL GREEN: Also, in your opinion, on the skills capacity of the water industry to ensure dam safety requirements are met, not only now but in well into the future, for instance, do you perceive that there is a shortage of engineering capacity in this critical sector?

Mr HARRISS: I think there is a shortage of engineering capacity in dam maintenance. We have not built a dam since the late seventies and there is little opportunity for further dams, so there is very little attraction for engineers into dam management and construction. A big issue will be in dam maintenance and dam management in the years to come. A lot of our dams are getting close to their design life and living in Albury and working with the Murray-Darling Basin Commission for so long, the Hume dam was constructed in 1919. It has been upgraded since but it is getting to nearly 100 years old. Those dams are going to require a lot of ongoing maintenance.

The Hon. PAUL GREEN: What is the Department doing to address this?

Mr HARRISS: The Department is no longer responsible, the Office of Water is not responsible in terms of dam maintenance but we do however coordinate the Dams Safety Committee and the Dams Safety Committee works through the Office of Water in the Department of Primary Industries. It is very active and has an active monitoring role and identification of where particular issues are. At this stage we do not have to make arrangements to fix those things where necessary.

The Hon. PAUL GREEN: Do you believe that the current model for management of dams throughout the State is appropriate, or should there be a single entity for the whole of New South Wales, including Sydney?

Mr HARRISS: I think that is an issue for government.

The Hon. PAUL GREEN: I am asking you for your expertise.

Mr HARRISS: The point you have made in terms of hydrometrics is the same thing. It is a question of is it better to be centralised or do you get synergies by having it shared between different organisations? I think there are arguments for and against.

The Hon. PAUL GREEN: Coming back to the gauges, for instance, it seems that about 95 per cent of them are in government hands. Would it not be of immense benefit to have one section overlooking the use of that data and data sharing and the funding maintenance of this?

Mr HARRISS: I think that would be appropriate, given that the majority of those gauges are spread across New South Wales.

The Hon. PAUL GREEN: Obviously we are trying to see what the benchmark is for today in terms of water storage, usage, maintenance and everything. Have you seen it being done better anywhere else, either in Australia or the world?

Mr HARRISS: No, I have travelled through the United States and Canada and it is a completely different environment in Australia. If you look at Canada, you can say they have a lake for every person. It is different in Australia. One thing I could refer you to is a paper that was submitted by John Briscoe who was formerly with the World Bank. He was Senior Water Advisor and made a submission to the Senate Inquiry a couple of years ago. He said that Australia was the absolute leader in water management and only Australia could have got through the drought with the minimal economic impact that it did. He compared Australia glowingly with other countries, including the United States.

The Hon. Dr PETER PHELPS: Something that doctor Sheldrake said cut me to my heart. You said that there is no evidence that the market will drive efficiencies. Could you elaborate on that? I think you mentioned gigalitres of potential efficiency. Why will the market not drive that?

Dr SHELDRAKE: The point there is that the opportunities are in improving on-farm water use efficiency or channel efficiency, for example. Those sorts of issues are spread across thousands of farmers and the technology that they need and will need to develop and get to implement, an individual farmer is not going to be able to undertake the research and development to identify whether that is going to work on his farm or not. So there will be application where that farmer will benefit commercially but to undertake the work and to design the projects is best suited to treating that as a single project and then the efficiencies flow through to the broader community.

The Hon. Dr PETER PHELPS: Is the problem that water is priced so cheaply that it is easier to waste it, rather than to invest in capital equipment to save it?

Dr SHELDRAKE: I do not think that is the heart of the problem that I was trying to address. I was really trying to say that if we want to tackle the opportunities that are there across all our cotton irrigation farms or all our rice farms, individual rice growers are not going to have the wherewithal to do it themselves, on their property. They will continue using practices that are best and they will minimise the amount of water. Farmers are smart people and they will reduce the amount of water as much as they possibly can. But if it is about undertaking research and development to get a significant next-step-up gain, they are not in a position to do that as individuals. They are in a position to do that as an industry as a whole.

The Hon. Dr PETER PHELPS: Are you suggesting their industry association should be paying a greater—

Dr SHELDRAKE: There is certainly potential. In Australia the industries, through the research and development corporations, play an important role and do exactly that. So farmers are levied on the product that they produce and the Commonwealth Government meets them on a roughly dollar-for-dollar basis. So, for example, the cotton industry has their research and development corporation; there is the grains meet, et cetera. That is where the potential is. Those projects would then be tendered out to organisations like our own CSIRO or universities.

The Hon. Dr PETER PHELPS: I ask these questions because I am just back from Israel and I noted when I was over there the actual capital intensity of water-saving devices on farms there and the absolute desire which they had to minimise the amount of water to the least that they could possibly use. Does the Department of Primary Industries or the Office of Water have any sort of formal or informal relationship with the Israel agricultural authorities because one thing quoted to me was that between 75 and 80 per cent of all on-farm water came from recycled sources? They do not trust aquifers because significant wildcatting has done damage to aquifers there; they do not have regular rainfall and the only other alternate source is the Jordan. Do you guys have any relationship with Israel, which is one of the world leaders in those sorts of areas?

Dr SHELDRAKE: I will just take a couple of parts and then ask David Harriss to comment on Israel. The purpose of the question that Mr Whan asked a moment ago was to address exactly that issue. It is about upgrading farm management systems and looking at opportunities and educating farmers to upgrade with the latest technology. In trying to improve efficiency that is one way of doing it. In terms of engaging with Israel, there have been a number of delegations and I have certainly met with delegations visiting.

Mr HARRISS: Absolutely. We have a lot of delegations from Asia and Israel visit us regularly and they are usually sponsored by the World Bank. We do not have any formal arrangement with Israel or others but we certainly have good cooperative arrangements through delegations. By way of example, we have helped establish the Mekong River Commission over in South-East Asia to mirror what we have done with the Murray-Darling Basin Commission.

The Hon. Dr PETER PHELPS: The Mekong has a little more rainfall; a little bit more water.

Mr HARRISS: And their interjurisdictional arrangements are a bit different to ours too.

Dr SHELDRAKE: The Israeli companies, of course, are very keen to run a profitable business in Australia as much as they are in Israel so they have taken an interest in what is going on in the Namoi Border Rivers.

The Hon. Dr PETER PHELPS: It is just that one of the things that came out of the Federal Senate inquiry into northern agriculture and the development of northern Australia was an investigation of the Ord River project and what they found was that the pricing of water was such that it was so low that there was simply no incentive for people to make capital investments in their property. They could get comparable levels of productivity with significantly lower levels of water but because the pricing of water was so low, there was no incentive for them to invest in the capital side of things. Is that a problem that is replicated in New South Wales?

Mr HARRISS: The bulk water charges for both their service delivery through State Water and through our resource management activities in the Office of Water are regulated by the Independent Pricing and Regulatory Tribunal and that is on virtually a cost recovery basis, so we put up that cost and that is recovered. Where the economic incentive is for the user, there is now a market in a temporary market—it is not a permanent market for your entitlement is neither here nor there; but there is a temporary market, an annual market, which can be particularly lucrative, particularly in dry sequences. For example, in the Murrumbidgee Valley where the price of water, the permanent sale of water might be $2,000—I would say more like $1,500 than $2,000 a megalitre, during a drought that same megalitre for a lease arrangement would be selling for $400 a megalitre yet the bulk water charges were probably in the order of about $16 a megalitre, so there is an economic incentive for users to be conservative with their water use and to trade that water, either permanently or temporarily. Again we lead most parts of the world in our water trading arrangements.

The Hon. Dr PETER PHELPS: Is there a market incentive for efficiency?

Dr SHELDRAKE: Picking up on the back of David's comment, the information we are getting and the feedback we are getting in moving to the full-scale trial in the north is yes. We believe farmers will take on more because the incentive is there and they can then make a profit from the extra water, either growing product or trading the water.

The Hon. Dr PETER PHELPS: Just moving on from my restoration of faith in the market, why have there been no dams built since the late 1970s, as you have mentioned? Is it because there has been no expected future demand because it has been cost prohibitive or is it because the growth of the environmental movement has meant that everywhere you plan for a dam there is always some spotted tree frog which needs to be saved?

Mr HARRISS: I do not think so. I think in New South Wales we have major dams on just about all of our major river systems already so, quite frankly, the easiest sites for those dams have been selected so any further construction of major dams would not be as effective as those original sites.

The Hon. Dr PETER PHELPS: Are there any rivers in northern New South Wales which sow significant outflows of fresh water to the sea which could be used for damming purposes?

Mr HARRISS: The only one that has been investigated over many years was the Clarence River and that has been shown that it would be both uneconomic and have significant environmental impacts as a consequence. One of the things that have been demonstrated for years is coastal diversions. It is all right in the Snowy Mountains because you have quite a substantial catchment area and you have a number of sites for dams—Jindabyne, Eucumbene, Talbingo, Tantangara. In the coastal ranges further north around the Clarence to get that catchment area to fill the dam you have to have the dam located further down to get enough water so it cannot be at the top. Further down you locate that dam, the higher the pumping cost to get the water back over the top or the tunnelling cost to get it through the dam. For that reason it has shown that it would not be economically beneficial to construct a dam to divert water from the coastal side into the western side because there would be no activity currently which would generate revenue on the megalitre of water.

The Hon. Dr PETER PHELPS: So over the last 30 or so years has it been cost or has it simply been that there has been no expected demand for new large-scale dams?

Mr HARRISS: I think it is probably all of those things, cost included, but with the national water initiative and the water reforms since the early 1990s there has been an expectation that the cost of infrastructure and the ongoing operation and maintenance would be paid for by the beneficiary. When it comes down to

assessing who is the beneficiary and whether they are prepared to pay those costs, it would not be generating returns that would justify it.

The Hon. Dr PETER PHELPS: Is there any need for new dam building or simply perhaps raising storage capacities of the existing catchments?

Mr HARRISS: I think the issues we have tried to raise in our submission are the billions of dollars invested in major infrastructure now, with both public infrastructure and on-farm infrastructure. I think for priority the New South Wales is to use that infrastructure as effectively and efficiently as possible in the first instance rather than investing further in up to millions of dollars in capital expenditure.

The Hon. Dr PETER PHELPS: And enhance the existing infrastructure?

Mr HARRISS: Enhance where possible.

The Hon. Dr PETER PHELPS: Canberra recently has increased the dam wall height?

Mr HARRISS: Yes, to increase from four to 78 gigalitres the capacity of the Cotter Dam.

Dr SHELDRAKE: I think the questions you are asking are getting down to value for dollar and it is about comparing investing in concrete or investing in other opportunities as to where the community as a whole gets the best value from. That is part of the study that will look at the proposals.

The Hon. Dr PETER PHELPS: The trouble is that we, as politicians, have to deal with people who hear hysterical claims like Sydney is going to run out of water and we need assurances from experts like yourselves that claims that we are going to run out of water are not founded on the evidence which you have before you and your projections into the future.

Dr SHELDRAKE: In terms of Sydney I think what New South Wales has done is developed a portfolio of resources. It is not just dams, although dams are a fundamental part of Sydney's water supply, so it is using the water more efficiently. We also have inter-valley transfers from the Shoalhaven, which is still available. We also have emergency groundwater reserves at Kangaloon and Wallacia, and we also have the de-sal plant. Effectively, what Sydney has done is develop a portfolio of water products, which will mean it is not entirely on rainfall. The de-sal plant, can generate 90 gigs a day, I think—whatever it is. Ninety gigs can be doubled in the course of two years, should we get to a further circumstance where water is critically low.

One of the things we did in the 2010 Metropolitan Water Plan was to develop the rules of the de-sal plant so it commences operating at approximately 70 per cent and turns off when it gets back to 80 per cent so you are not getting down to those low periods in the first instance and do not turn it on as a knee-jerk reaction, if you like, if it takes you out of that area where you will be investing billions of dollars and doubling its capacity.

The Hon. Dr PETER PHELPS: I was happy; now you have got me worried. Are you saying that without additional dam capacity Sydney's future is going to be dependent upon the operation of the de-sal plant, or do your projections for the future indicate rainfall will meet dam capacity?

Mr HARRISS: The projections we did for developing the water plan in 2010 said there was no problem with securing Sydney's water supply for at least—we just progressed out to 2025, but it was probably further than that, using the dams we have now, using recycling, plus de-sal, plus inter-valley transfers from the Shoalhaven, plus ground water where necessary. Looking at the worst possible scenario, Sydney is covered.

The Hon. CHARLIE LYNN: In relation to the de-sal plant, on a cost-benefit relationship you mentioned the consumer has to pay. Nothing has been built for the last 35 years. Was a de-sal plant the result of no investment in our water storage and capacity in the last 35 years?

Mr HARRISS: I am probably not in the best place to answer that. The decision to increase the water capacity for Sydney was a decision for the Sydney Catchment Authority and Sydney Water as opposed to the NSW Office of Water.

CHAIR: Thank you. Gentlemen, I will ask a follow-up question from some of the other comments that have been made. Does the NSW Office of Water look after the administration or management of the allocation

of water for irrigation from those dams managed by other authorities, for example, the Sydney Catchment Authority and Snowy Hydro?

Mr HARRISS: The water out of the storages in Sydney is managed by the Sydney Catchment Authority, but they have an operating licence issued by the NSW Office of Water. Snowy Hydro has its own operating licence, which we administer. Snowy Hydro is required to provide a certain volume of water into both the Murrumbidgee and the Murray rivers every year. The timing of release is the call of Snowy Hydro.

CHAIR: Once that water comes into the Blowering Dam and Burrinjuck Dam, does it then become your water?

Mr HARRISS: Then it becomes the State's water for distribution.

CHAIR: On the issue of bulk water charges, I understood you to say that they are around $16 a megalitre.

Mr HARRISS: They vary between valleys, but it is determined by the Independent Pricing and Regulatory Tribunal.

CHAIR: Does that charge pay for water that is issued for environmental purposes?

Mr HARRISS: The same charges will be paid for environmental water holders. There are two kinds of environmental water. One is rules-based water, and that is things like dam translucency: water comes in and goes through, which is not actively managed. It is kept in storage and is actively released by the operator. Where it is issued as an entitlement which is ordered by an environmental water holder, such as an irrigation entitlement is ordered, it will bear the same characteristics and have the same charges levied on it as it would if it was used for town water suppliers or if it was used for industrial or irrigation.

CHAIR: Who pays that?

Mr HARRISS: At the moment, the Commonwealth environmental water holder. The Commonwealth pay their bulk water charges. In terms of payment, they are probably our best customer. In terms of water which is held for the environment in New South Wales, they are issued to the Minister for Sustainability, Environment, Water, Population and Communities or to the Water Administration Ministerial Corporation, which is effectively the Minister for Water. Currently those charges are picked up by the Office of Environment and Heritage.

The Hon. Dr PETER PHELPS: Are there any private dams in New South Wales of any significant size?

Mr HARRISS: There is a lot of on-farm storage, particularly in the northern part of the basin, for example, the Barwon-Darling area, where the water supply is not serviced by major public infrastructure. It is mostly in unregulated areas. There are some major storages at Tandou, south of Menindee, but they are effectively natural lakes.

The Hon. Dr PETER PHELPS: There are no private dams which operate for the provision of water into the public infrastructure?

Mr HARRISS: Not that I am aware of.

The Hon. Dr PETER PHELPS: Presumably councils also—

Mr HARRISS: Councils have some of their own water supply infrastructure, but that is specifically for the—

The Hon. Dr PETER PHELPS: Do you regulate them?

Mr HARRISS: We do not regulate them, but the dams are certainly looked at by the Dams Safety Committee, as are dams which are built for mining purposes.

The Hon. Dr PETER PHELPS: Finally, the Government submission contains a list of redundant dams on Crown land. What makes a dam redundant?

Mr HARRISS: There are a number of dams that were built for whatever purpose that are no longer required, whether they are built for mining—for example, mining around Captains Flat. If the mine closes down that is no longer required.

The Hon. STEVE WHAN: The dam is still required there, though.

Mr HARRISS: There are a couple of dams which were originally built for town water supply which are no longer required for town water supply. They are no longer required: they are redundant.

The Hon. Dr PETER PHELPS: How are these managed?

Mr HARRISS: In some instances they are owned by—

The Hon. Dr PETER PHELPS: The land owner?

Mr HARRISS: Well, the licensee, whether it be the council, the water supply—Sydney Catchment Authority.

The Hon. STEVE WHAN: Can we go back to that question? What would it take to get those redundant dams back up to scratch?

Mr HARRISS: I do not know. We are more in the process of looking at having them removed where they are no longer valuable. We have a couple around the State that I am aware of that if they are not serving a purpose and they cannot legitimately add to any increase in water security in that area then—

The Hon. Dr PETER PHELPS: They are evaporation ponds.

Mr HARRISS: Pretty much, and a lot of them have heritage orders on them because they were built a hundred years-plus ago.

The Hon. MICK VEITCH: Rather than building dams, one thing I take from your responses is that we now have a "portfolio" of arrangements. If this Committee was to look at the best water harvesting project in rural New South Wales where would we go? Where is the best recycling project in New South Wales? I want to understand where the best practice projects are that we have at the moment other than water storages that provide water for our needs.

Mr HARRISS: As I pointed out, in terms of infrastructure, we have just about dammed wherever we can. It is looking at where you can manage them more effectively and more efficiently. Clearly the one which can be managed best is at Menindee because it is so complex. It covers 453 square kilometres and it has two metres net evaporation. If you can reduce that evaporation, you can—the Commonwealth wanted to decommission a part of that as part of their early project. The point was made earlier about climate change. Particularly in south-east New South Wales, there has been a suggestion there will be longer, more extensive droughts and less water available. The same science is saying that in the northern part of the basin there is going to be probably about the same amount of water but in more episodic events. In my mind, that would make Menindee Lakes far more valuable, because if you have less water in storage in the southern part and you are getting more and you have a mid-river storage, that is incredibly invaluable to supply water to South Australia and to offset the use in the Murray Valley and Murrumbidgee Valley, and so on. That is important for investment.

In terms of recycling projects, Israel was pointed out as being very effective in its recycling. I think there is a lot more we can do but, again, it is having the economic incentive to do so. One of those incentives is now to recover water for the environment. The Commonwealth is investing a lot of money in on-farm storage. We are looking at some of those investments in the broader scale of river management to try to effect some of those water savings, not just to recover water for the environment but to increase the security of water supply for existing users. Because we have just been through the worst drought where, yes, a lot of towns did suffer and a lot of industries have suffered. We have got through it but it is not a good place to be and if we can improve that water supply or water security we should do it

The Hon. MICK VEITCH: There is a project in Orange, I think.

Mr HARRISS: Orange has done it.

The Hon. STEVE WHAN: .Stormwater harvesting is quite substantial there.

The Hon. MICK VEITCH: Is that worthwhile for us to have a look at?

Mr HARRISS: I think it would probably be very worthwhile having a look at.

The Hon. Dr PETER PHELPS: What about greywater harvesting, making use of greywater?

Mr HARRISS: I think throughout the drought it was done on a site by site basis. There was a lot of infrastructure so you could harvest your washing water and put it on your own lawn, but there was no big public infrastructure that I am aware of.

The Hon. MICK VEITCH: How much do we spend on projects such as the greywater and rainwater harvesting via tanks within urban communities? What are we spending to encourage people, or the utilities in particular, to move to these?

Mr HARRISS: I could not tell you off the top of my head from what was spent in Orange. We could take that on notice if you like and see if we could find that. But if you are interviewing Finance and Services, recycling is a big part of the future of Sydney, in particular in the development areas, so they are looking at harvesting the greywater for contributions to Sydney's drinking water supply.

Dr SHELDRAKE: Just adding a couple of points there: I mean, in terms of tank storage in backyards and houses the question really is the cost of that megalitre of water you are talking about, and it is very expensive. People like to do it but it is not the most efficient way of getting a megalitre of water to someone's home. The second point is if the Committee was interested—and short of going to Israel if the Chair did not want to go to Israel—I think what I would like to do is identify some examples around best management practices and the latest technology that is being introduced. I think the department could find some sites, you know, visit some farms, cotton operations, whatever, and actually have a look at the sort of technology that is now being installed. I am happy to provide that to the Committee and it is up to the Committee.

Mr HARRISS: The New South Wales Government with the Commonwealth Government in preparing land and water management plans for our five major irrigation areas, recycling dams were a major component of those on-farm waters.

The Hon. STEVE WHAN: We mentioned earlier town water supplies and the security of town water supplies. Is the Murray-Darling Basin Plan changing the way towns can go about getting additional town water supplies? I have heard some feedback from regional-based water authorities that are concerned that expansion of the major inland cities might be hampered by new processes.

Mr HARRISS: No, I would not imagine so. In New South Wales in particular we will allocate new water for any urban area which is developing based on their domestic need. It is pretty conservative. We will not allocate water for any industry that is going into town. The towns can go on the market—

The Hon. STEVE WHAN: They have to buy a high security licence for a new industry?

Mr HARRISS: A high security licence or they can buy a general security licence depending on what kind of industries they are wanting to attract. Some towns have done that.

The Hon. STEVE WHAN: For an urban expansion they do not need to buy additional high security water; they just get it through the process?

Mr HARRISS: They will get it through the process where we will allocate the water required to meet their domestic requirements. I can assure you that just about every town, their expectation of their urban requirements exceeds what we say.

The Hon. STEVE WHAN: A specific question on the Mannus Dam which collapsed at Tumbarumba. I understand they had some significant issues with the cost of rebuilding that dam because of whether the old dam did or did not include a fish ladder, shall we say.

Mr HARRISS: The old dam did not include a fish ladder.

The Hon. STEVE WHAN: I think we might be moving past that. Yes, go on.

Mr HARRISS: I am not sure how far it has progressed. Tumbarumba council was rebuilding Mannus Dam for an alternative water supply. I am not aware of where that is up to. I can take that on notice and find out.

The Hon. STEVE WHAN: I think the issue was funding. I was not sure whether you knew more about that. It was whether they could get enough out of the natural disaster fund.

Mr HARRISS: That is right. No, I am not sure.

The Hon. Dr PETER PHELPS: In relation to the 100-year-old dams and the conservation orders on existing dams, how widespread is that?

Mr HARRISS: It is not very widespread. Hume Dam, for example, has got conservation or a heritage order.

The Hon. Dr PETER PHELPS: But you are not planning on getting rid of Hume Dam?

Mr HARRISS: No, but it does impact on what works we can actually do.

The Hon. STEVE WHAN: Wasn't it shifting on its foundations a few years ago?

Mr HARRISS: It moved 5 millimetres as a consequence of—they knew that there was a crack in where the dam spillway joins the core wall, which is a concrete bit. What they tried to do was they put grout in to try to seal that. When they put the grout in it caused the dam to move a couple of millimetres which dams are not meant to do. As a consequence—that was in 1996—that led to a substantial amount of—

Dr SHELDRAKE: Panic.

Mr HARRISS: Panic and a lot of work. But to Australia's credit we actually acted immediately instead of waiting. We realised that there was something to be done and $85 million was spent within a couple of years getting that dam back and subsequently another $85 million has been spent bringing it up to the stage where it is absolutely safe.

The Hon. Dr PETER PHELPS: Do you believe Environment and Heritage is being unnecessarily prescriptive in what you can do with these heritage dams?

Mr HARRISS: Not really. It has not affected us. We have got around it because when it comes to public safety there is no cause. Public safety is number 1, 2, 3.

The Hon. STEVE WHAN: At the risk of opening up a bigger issue here, Professor Stuart Khan from the University of New South Wales has sent us a submission suggesting that using the suite of water supply options available in Sydney now, the Sydney Catchment Authority should look at reducing the water level in the Warragamba Dam so that it plays a bigger role in flood mitigation for the Hawkesbury River. Have you got an opinion on that?

Mr HARRISS: Warragamba Dam is bit more like Wivenhoe in the fact that if you were going to have a major flood then it is going to impact on public property down the steam.

The Hon. STEVE WHAN: A rather large amount.

Mr HARRISS: A rather large amount and a rather large population. It is all about a matter of balance. We have gone into a long dry spell. If we had gone another year we would have been looking down the barrel of severe restrictions and going into emergency groundwater supplies and things like that. So it comes down to a

balance about what do you need to provide some flood mitigation versus what do you need to secure water supply in an incredibly variable climate.

The Hon. STEVE WHAN: Is that something the department is investigating at all?

Dr SHELDRAKE: I was going to say that in fact the question is probably best asked to the Sydney Catchment Authority [SCA].

The Hon. STEVE WHAN: I was going to ask them.

Dr SHELDRAKE: Because the issues really are also the amount of downstream—the catchment area below the dam wall is quite significant. You get those low pressure lows that come into Sydney, they are not going to just always fall above the dam wall and not below. You have got a massive catchment below. But really that is the sort of modelling that the SCA would be able to give you a much better answer to.

The Hon. PAUL GREEN: I will note some of your earlier comments on the Shoalhaven's generosity of water in the peak time of drought in Sydney. I think it was up to half of the supply. And of course their incredible use of recycling water for those dairy farms around the area that actually did not allow them to get water from the river but to use recycled water. I will declare my interest as being the mayor of the Shoalhaven on top of that. There is one thing that I thought we flew over; that is, the growth of the mining sector and of course the increase pressure on demand of availability of water. I am just wondering what the Department of Primary Industries [DPI] is doing in implementing systems or to manage the growing demand for water in the mining sector.

Dr SHELDRAKE: I will answer the question and then ask David Harriss to comment. The mining sector as a whole takes a fairly small amount of water in terms of overall usage.

The Hon. PAUL GREEN: What percentage?

Mr HARRISS: Off the top of my head, it would probably be about 1 per cent.

Dr SHELDRAKE: The figure for agriculture is 75 per cent. That is not surprising. While mines are large businesses, their footprint relative to farming across New South Wales is small. That is probably putting it in perspective.

Mr HARRISS: From our administrative perspective a mine is no different from any other user and we insist that a mine have a licence for the water it takes whether it wants to take it accidentally, by interception or otherwise. A mine has to have the same sort of licence. For example, if the expansion of a mine in the central west means that it will take additional volumes of water, we expect the operators to go to the market and buy that water, and they have done so previously. There is a number of mining activities further west in the State where we believe there is probably some water available, particularly in the brackish and saline aquifers. They have been hardly touched and they are extensive and deep. We cannot see any reason not to allow access to some of those saline or brackish aquifers. The issue is how miners treat that water.

The Hon. STEVE WHAN: What they do with it?

Mr HARRISS: Yes.

The Hon. PAUL GREEN: The Government submission states that the Department of Primary Industries is currently investigating a number of potential water storages and augmentation projects. Can you advise the Committee about the projects under consideration?

Dr SHELDRAKE: We discussed that matter earlier. Consideration is being given by government as a whole to what opportunities might exist. In that process we will be looking at exactly the same questions as those asked this morning; for example, what would be the economic benefit to the State of that sort of investment.

The Hon. PAUL GREEN: Can you mention one project?

Mr WEBSTER: I understand that State Water will be mentioning some during its session. My branch is an economic appraisal branch that assists all agencies within the Trade and Investment cluster to appraise and evaluate any specific projects they want raised. Typically, an agency will identify a potential problem or objective and a range of options that might satisfy that objective. We will help them to evaluate which of those options is the most cost-efficient way of achieving that objective. We have been working with State Water and it will have something to say about that.

The Hon. Dr PETER PHELPS: Presumably, given what Mr Harriss said earlier about us having dammed every river in New South Wales that it is economically viable to dam, those proposals would be only catchment augmentation.

Mr WEBSTER: What was economically viable 30 years ago might not be now because the value of water changes as an input into various primary production processes. While it appears that the large storage sites have been taken, there may be opportunities.

The Hon. Dr PETER PHELPS: Just not on the Clarence River.

Mr HARRISS: There are opportunities on the Clarence River. What was proposed during the drought—and Malcolm Turnbull promoted it—was to build that dam but then to pipe the water up to south-west Queensland, not to move it into western New South Wales, which was the original proposal. That might have been a bit more economically viable if we were recovering the cost through urban population charges as opposed to the rate charged per kilolitre. However, Queensland was not remotely interested in that. There are some sites, and we mentioned Birrell Creek dam, which is not a big site. There is also the Welcome Reef site near Braidwood. That proposal has been around for about 40 or 50 years. There are some sites. However, the point was made that where it was easy to build a dam 50 or 60—

The Hon. Dr PETER PHELPS: So the low hanging fruit is gone.

Mr HARRISS: Yes.

The Hon. Dr PETER PHELPS: I would like some clarification about the Hunter Valley situation. I think I heard concerns expressed earlier about future capacity constraints on Newcastle, Hunter and Central Coast water. I have heard that there is plentiful water. Is there a problem or is the water plentiful?

Mr HARRISS: Again, the Department of Finance and Services is preparing the Hunter water plan and it would be best placed to answer that. When we were looking at it as the metropolitan chief executive officer's group we acknowledged that the water supply got very low. With a repeat of the drought we would need to look at alternatives and to do what we did in Sydney—that is, to look at the portfolio and determine what is the best portfolio of approaches.

The Hon. CHARLIE LYNN: Your list of redundant dams includes Bethungra Dam. Redundant dams are inspected quarterly, bi-monthly and so on. This dam is inspected twice weekly and it is classified as high risk. What is the situation with that? Will it be inspected until something happens?

Mr HARRISS: I will take that question on notice. I think we are negotiating with council about the ownership and what to do with the dam. I think it provides some significant recreational potential. People use it for fishing.

The Hon. Dr PETER PHELPS: It is used for picnics, swimming, fishing and camping. It is a popular recreational site.

Dr SHELDRAKE: The Government is aware of the Bethungra Dam and has been around the issue for some time. It has a heritage value attached to it. Government must make a decision as to whether it is a dam that it wants to go and how much it wants to invest. It is one of the dams that we are aware of.

The Hon. CHARLIE LYNN: What would be the impact on the community downstream if it broke?

Dr SHELDRAKE: I cannot answer that.

Mr HARRISS: I cannot answer; I do not know.

The Hon. Dr PETER PHELPS: It would not be good.

CHAIR: I refer again to Menindee Lakes. We have had some discussion about that issue this morning. What works were you referring to in terms of argumentation?

Mr HARRISS: I refer the Committee to the Office of Water website. We have a specific area devoted to the Menindee Lakes. We have undertaken investigations over the past 20 years and identified six different kinds of structures and works programs that could be implemented. The one that the Office of Water has promoted for a while includes a block bank between the two bigger lakes—Lake Menindee and Lake Cawndilla. That is the area where it joins and it involves increasing the outlet capacity at the Menindee Lakes outlet regulators. In a drought period there would be smaller inflows and the water would be stored in Lake Menindee and drawn on quickly from there rather than spread out across Menindee and Cawndilla.

CHAIR: Does that include a regulator between Menindee and Cawndilla?

Mr HARRISS: Yes, we would want it to be regulated. When Lake Menindee fills and then Lake Cawndilla fills, way back through the river, Lake Cawndilla will drain back through Lake Menindee until it reaches the still level. We would not want to compromise the capacity of Lake Cawndilla to drain back to Lake Menindee.

CHAIR: Has there been any discussion or are there any plans regarding compartmentalising any of those lakes as has occurred in Barren Box Swamp?

Mr HARRISS: We looked at that as part of the investigations, but the soil is not suitable for that kind of activity. It must be remembered that Lake Menindee is probably 12 kilometres across. Once there is a bit of wind, the wave action would damage the integrity of any sort of structure. We have looked at it. Again, the Office of Water website refers to the "Darling River Water Saving Project Part B Study", which includes putting a bank around the perimeter—just inside—to store water. Again, it was realised that the structure would be unlikely to be able to withstand that kind of wind action.

The Hon. MICK VEITCH: We had a discussion about telemetry sites. I understand some sites have been established along the Murrumbidgee River and that the equipment is very sophisticated. It provides information to farmers and also river flow data. Will that equipment be rolled out across the State? It would be very expensive.

Mr HARRISS: We are. We have been funded by the Commonwealth over the last couple of years to improve the number of stations we have got and to make it telemeter wherever possible. One of the issues we do have though is looking at solar panels to power them up, and they go missing quite regularly.

The Hon. MICK VEITCH: How reliable are our telemetry sites across New South Wales?

Mr HARRISS: They are typically very reliable.

The Hon. Dr PETER PHELPS: When they have solar panels?

Mr HARRISS: That is right. One thing you have to remember, when you are talking about flood management and so on, a lot of these stations do get hit by lightning so we still have to maintain that on ground presence to make sure that they are working in the middle of a flood.

The Hon. MICK VEITCH: Do you think it is worthwhile if the Committee were to look at some of those along the Murrumbidgee?

Mr HARRISS: Certainly, we can arrange showing you around some of those sites.

The Hon. STEVE WHAN: What has the take-up been like for farmers along the Murrumbidgee system with electronic metering on their properties?

Mr HARRISS: We are rolling out a $221 million metering project which is including telemeters. State Water on our behalf is undertaking a pilot project in the Murray which includes the unregulated part of the

Murray, some of the regulated parts of the Murray and also the groundwater. We then intend to roll out that program across the State. We have rolled it out on the Hawkesbury-Nepean. It was very unpopular when it was mooted but now it is probably the most supported exercise that I think we have ever undertaken. Everyone loves their meters. They can now manage their water. They know how much they divert over the year and they can see the potential for selling it in the future.

The Hon. STEVE WHAN: Is the funding for those programs coming largely from the Commonwealth?

Mr HARRISS: They are part of the State priority projects we put up as part of signing onto the Intergovernmental Agreement on the Murray-Darling Basin report. An amount of $221 million was set aside for metering, $137 million for pipelining stock and domestic water supplies, $50 million for flood plain harvesting projects in the north of the State, and originally $300 million set aside for on-farm works in the north of the State and that has been brought down to about $92 million. Now we are looking at the residual of that being used for other water management projects around New South Wales.

The Hon. STEVE WHAN: Have the issues about accounting savings to the Commonwealth been sorted out? I understood that a barrier for some time was how you would account over time for the proved savings that have been achieved?

Mr HARRISS: I think that is always an issue, is it not? It is pretty easy if you were just handed an entitlement—there is an existing entitlement and giving part of that back—but we have through the Living Murray Program and all the other programs we have got an accounting regime where we are trying to demonstrate how much the water savings are. They are independently assessed.

CHAIR: The Committee has resolved in the past that answers to questions taken on notice will be returned within 21 days. The Committee would appreciate it if you would comply with that. The secretariat will contact you with regard to the questions that you have taken on notice. If other members of the Committee have any further questions are you prepared to take those on notice and supply answers to them?

Mr HARRISS: Yes.

Mr WEBSTER: Yes.

Dr SHELDRAKE: If the Committee wants to take up the offer of visiting some locations, would the secretariat contact our office?

CHAIR: Yes, we will meet at the conclusion of today's hearing and discuss that very matter. If we decide to do that you will hear from the secretariat in due course.

(The witnesses withdrew)

(Short adjournment)

BRETT TUCKER, Chief Executive Officer, State Water Corporation and

AMIT CHANAN, Executive Manager Operations, State Water Corporation, sworn and examined:

CHAIR: Gentlemen, I welcome you both to this inquiry. If at any time you should consider that certain evidence you may wish to give or documents you may wish to tender should be heard or seen only by the Committee please indicate that fact and the Committee will consider your request. Would you like to start by making a short opening statement?

Mr TUCKER: Yes, I would. We are here today representing State Water. Our written submission was part of the New South Wales Government submission; we contributed to the content of same. We welcome the opportunity to make some statements and answer questions from the Committee and, hopefully, shed a little more light on some of the activities currently underway in New South Wales. State Water Corporation is the State Government-owned entity responsible for running the regulated rivers in the State other than the greater metropolitan Sydney catchment and Hunter catchment—as in the Hunter Water Corporation catchment. We control some 20 major storages in this State, 280 weirs and regulators which are in the stream as part of the control network. We have some 6,500 customers, ranging from riparian stock and domestic suppliers right through to large irrigation corporations, energy companies, local government areas and everything in between.

The total replacement value of our assets is something like $3 billion to $3.5 billion and our regulated asset base is more like about $700 million, so many of those assets are old and writtendown substantially. We have approximately 310 staff operating in about 46 locations across the State—so we have quite a diverse and distributed geographic network under control. In terms of actual land under control and ownership, including where our storages sit and the foreshore grounds surrounding them, we control something like 240,000 hectares of land as well as the water resources that sit above them. We are responsible for bulk water service delivery for regulated customers across the State. We also manage, under service-level agreements, some unregulated and groundwater customers on behalf of the State that are currently customers of the NSW Office of Water. That also involves a considerable amount of asset management as you might imagine with such a large portfolio of long-life assets. We are the construction authority, from a New South Wales perspective, for Murray-Darling assets. So we have projects underway, joint works between the governments of which State Water is the construction entity.

In terms of season, we are now, hopefully, entering the perfect season for State Water. We have had some decade of drought followed by two extremely wet years, both at either extreme of the data records. As a consequence, since corporatisation State Water has struggled to meet its budget expectations and delivery expectations—either not enough water or too much water. Last year we were the closest we have been to that outcome: we budgeted on 4,600 gigalitres of sales across the State and managed to get about 4,500 giglalitres. Our perfect year is wet in the catchment and dry on the plains, and we are looking at a forecast three to six months out and expecting conditions will go towards that—it is amazing how quickly things turn around after a decade of drought. The average storage at the moment of our storages under management is 97 per cent. That is effectively full across the State apart from about two storages.

In terms of other focus of our activities, from a construction and assets perspective there are three main programs operating at present. We have been spending a considerable amount of money lifting the safety standard of our major storages, with a focus of seven initial storages in particular. Stage one of the dam safety program is nearing an end—probably within the next 18 months to two years that program will cease. That is bringing up our major storages to contemporary standards of dam safety, albeit our storages are already at very safe levels by world standards—like road safety, the bar continues to be pushed higher.

The second major effort, commencing with the pilot programs as you heard from David Harriss earlier, is the Metering program, which is currently operating in the south as two pilot projects. We now have 900 meters in the ground with about 350 to 400 to go in those pilot projects. The Committee would be aware that the State has signed off on an agreement with the Commonwealth to rollout that program across the State—some $200 million in additional funding. State Water will be the construction authority for those and the ultimate owner of the assets. Part of the change that is taking place in this project is that we are moving from landholders owning their own meters through to State owning and maintaining the meters to ensure consistency and fairness across the State. That program is about to commence is earnest.

On the back of that metering program is an important project for State Water of computer aided river management or CARM—I think perhaps it was mentioned earlier. Metering is the backbone to the sorts of smarts and technologies that will drive both on-farm and off-farm efficiencies and improvements in management in coming years. Computer aided river management brings all of that together into an integrated real time management tool for running rivers. At the moment we manage our storages with what is called batch processing. We take a batch of water orders, we take a batch of meter readings, perhaps monthly. Computer aided river management will convert all of that to real time, as well as real time weather information, and give us much better capacity to manage supply and demand balance but also flood mitigation capacity in the years that we have just been through and in 2010.

It is quite an exciting project for us. We are in the process of trying to develop interest to roll that out across the State as opposed to just in the Murrumbidgee catchment, where we partnered with Water for Rivers for that project. In total, we manage about 13,000 gigalitres of storage. It is fair to say that—I think it was mentioned earlier with Mr Harriss—most of the low-hanging fruit across the State has been harvested in terms of suitable sites, although there are some opportunities across the State for augmentation works and/or new assets that we are looking at. Dr Chanan will talk a little bit about those. One relates to the Hunter valley and there are some other projects we are talking with customers about in terms of potential SDL offsets, sustainable diversion limited offsets, as part of the Murray-Darling Basin plan. I would like to leave it there. We are happy to answer any questions you may have in relation to our activities or opinions on various matters.

CHAIR: One of the terms of reference for our inquiry asks us to consider water storages and practices in other jurisdictions. Are there any countries or jurisdictions that you look to for best practice, innovation and that sort of thing?

Mr TUCKER: That is a good question and I present this perspective from both where I have come from and where I sit now. I have been here 12 months. I previously managed the largest customer of State Water before joining State Water. I think it is fair to say that regulated water management in Australia is world leading in terms of innovation and best practice. It is difficult to find another country in the world that has been tackling the difficult issues as consistently and for as long a time as Australia has. Accurate metering, accurate water storage management, dam safety, flood management—if you look across that spectrum of skills base Australia generally is world leading. There are always elements that you could pick up of various disciplines, but I think as a package I would rate Australia as amongst the top and certainly within State Water we would rate ourselves quite high.

Interestingly, just as an aside, during the recent inquiries in Queensland into the Wivenhoe issues, SEQ Water at one stage was keen for us to potentially augment some of their capability while they had their engineers tied up in that flood inquiry. So our flood engineers were considered amongst the best in Australia and at one stage we may have been requested to go up to Queensland and assist them if floods continued into the start of this year, which they were fortunate to avoid this year.

The Hon. Dr PETER PHELPS: Following on from an earlier question in relation to the Hunter's requirements, I have heard quite disparate arguments that the Hunter has a lack of capacity for water. I have heard it has a surfeit of capacity for its water. What is the situation in relation to Hunter, Newcastle, the Central Coast, future residential development, future mining needs and future industrial needs? What is the situation in relation to that area?

Dr CHANAN: Our involvement with the Hunter Water management plan is the fact that State Water actually owns four dams in the valley. One of our dams, Lostock, was built for primarily irrigation purposes. The downstream condition is such that the dairy industry pretty much has moved on from the Paterson valley and there is spare capacity in that dam to supply to the Hunter. So we are part of the lower Hunter water management strategy that Hunter Water, along with Finance and Services, is developing. Lostock appears to be one of the low-hanging options that are on the table but that study is quite a comprehensive study in looking at all the options, not just dam options—looking at desalination, demand management and other options, along with Lostock. So as far as putting forward information about Lostock is concerned, we are certainly keen to see some value out of that asset but we are mindful of the fact that it is part of a larger strategy and once the strategy is done it is likely to pick the lowest hanging fruits first.

The Hon. Dr PETER PHELPS: I will put it as simply as possible. If you were looking at changes in the Hunter it would be towards augmenting existing capacity rather than new dams.

Dr CHANAN: That would certainly be our preference, given that we have an asset at the moment that we feel has capacity.

The Hon. Dr PETER PHELPS: A number of submissions highlight the importance of good storage management practices which maximise the amount of water available for consumers by minimising water losses from evaporation or leakages. What storage management practices does State Water currently implement and are there any storage management practices that you are examining for the future?

Mr TUCKER: First, I briefly touched on computer-aided river management. One of the outcomes from a better match of supply and demand is that you get to hold the water in storage for the longest possible time before release. If you look at the example of the Murrumbidgee, where computer-aided river management [CARM] is being rolled out, we feel that potential opportunities there are something like 80,000 to 100,000 megalitres of water that would otherwise have been released through a batch processing type river run model versus computer-aided river management and real time.

The Hon. STEVE WHAN: Did you say 80,000 to 100,000 megalitres per year?

Mr TUCKER: Per annum, correct. The secret is only to release as much as is absolutely necessary to meet the downstream orders and no more—but not so little that you put too much risk on the supply.

The Hon. Dr PETER PHELPS: Just-in-time water supply?

Mr TUCKER: Just-in-time water supply, absolutely. That is the concept. We are at the stage where we have gone live with computer-aided river management this year. This year we are running our current system, the batch processing model, concurrently with computer-aided river management to verify the benefits. On the basis that those benefits can be demonstrated, we are keen to see that implemented across the State where we feel that the contributions to sustainable diversion limit offsets could be quite significant. You must remember that is not necessarily full savings we are talking about. Just because it is not released from the dam does not mean it is generally water saved but some of that is definitely saved.

The Hon. Dr PETER PHELPS: There is less loss.

Mr TUCKER: You do reduce evaporation and you have less water going into anabranch creeks and runners unnecessarily. Some of the wetlands we are talking about are at risk of being too wet rather than too dry so in-time river management is quite crucial. It is important from a public infrastructure point of view. In the case of the Murrumbidgee the critical Achilles heel of the valley is Mundarlo Bridge at Gundagai, where anything more than 32,000 megalitres a day floods public roads and the bridge. Our operators have to operate within a narrow band of tolerance and computer-aided river management can assist.

Where we will see benefits is in management of environmental flows where it is about right-time right-place. If we can have a real-time model that helps us understand where water should be in relation to downstream tributary inflows it will give us greater control over environmental outcomes. I will allow Mr Chanan to talk about the second element, which is some of the work we are doing with users on other potential projects in this State.

Dr CHANAN: Your question about the leading edge and comparing ourselves with the rest of the world—utopia for river operations is to get to real-time management. Computer-aided river management is taking us there. We are looking forward to the opportunity to take computer-aided river management from the Murrumbidgee to the rest of the State. That will put us at the front of the pack in terms of rural water management.

In terms of other projects, there are some submissions I looked at on the Committee's website from groups such as the Border Rivers and Gwydir working group. There are opportunities for exploring diversion limit offsets in lieu of on-farm storage, which is typically inefficient and there are a lot of evaporation losses. There are opportunities to use deeper storages in the catchment and store water there. That will help not only with water security but to reduce evaporation losses. Some of the submissions that are already on the Committee website are worthy of investigation.

The Hon. Dr PETER PHELPS: That sounds like a new dam.

Dr CHANAN: There is a submission concerning augmenting Pindari dam, where there is an existing footprint.

CHAIR: Are you referring to a further augmentation of Pindari dam? Pindari was the last dam that was augmented in New South Wales, was it not?

Dr CHANAN: That is correct. I have not investigated it in detail. I read the submissions on the Committee's website and there are some diversion limit offset opportunities which fall in the category of environmental works and measures. We will work with the NSW Office of Water and the Murray-Darling Basin Authority [MDBA] in making sure that the works are acceptable to the authority and to the New South Wales Office of Water.

The Hon. Dr PETER PHELPS: The Government submission and earlier testimony discussing the impact of the recent drought makes mention that no rural storage emptied during this drought period—but there were quite severe restrictions. For example, if you were living in Goulburn you had level-five restrictions, which meant your quality of life was substantially reduced. It is a little bit cute to say we have no capacity problems because none of the dams went dry when none of the dams went dry because the restrictions placed on end-users were so onerous. I do not think it is a very good example of New South Wales having wonderful storage capacity if we say none of the dams went dry but in some instances it was due to the onerous restrictions placed on end-users.

Mr TUCKER: From a State Water perspective—we do not manage Goulburn's water supply—none of storages that we managed reached the point where such onerous restrictions were necessary. We were able to supply high-security water and town water to all users in all valleys. Certainly general security did feel the pinch, particularly in the Lachlan Valley, where they had some years at zero per cent. Having said that, general security users go into seasons with an expectation that they will be somewhere between zero and 100 per cent. There is never an expectation that the dams will always be at full levels. They have cropping programs and systems that are adaptable to the season conditions.

It is worth remembering that the drought that we had at the turn of this century was out-of-the-box in terms of both duration and intensity. Certainly the 1940s sequence and the turn of last century sequence were as intense but in a much shorter period, not over a decade long and not down to levels that we saw. It was an extraordinary event. The fact that we were able to get the State through and meet all critical needs was a credit to the operators at the time and the water users. In the Murrumbidgee Valley, when I was the largest customer of State Water down there, we made sacrifices in order to augment the water supply for Adelaide. Horticultural growers agreed to go back to maintenance flows only so that Adelaide would not run out of water supply. When push comes to shove communities do work together to get through extraordinary times and we, as users at that time, recognised that the circumstances were extraordinary.

The other feature that is important to understand about Australian hydrology is that it is not just the variability that we deal with but the unpredictable nature of that variability. Variability can be modelled and constructed against. We have the largest amount of storage per capita in the world. You have to build much larger dams in Australia to get the same water security as anywhere else. The fact that our variability is unpredictable makes it difficult to model what is the upper threshold of storage required. Ultimately you get back to what is the right combination of storage and demand management techniques to get you through those extreme years.

The Hon. CHARLIE LYNN: According to the State Water website State Water has been developing an early warning network for flood warnings. Can you explain how the system works and what feedback you have received in regard to that system?

Dr CHANAN: The early warning network [EWN] sends a short message service [SMS] warning to registered users. People have the opportunity to go on our website and register an interest in a particular dam site and basically they have the option of whether they are interested in flood releases or water delivery releases. Any time we change flows or have larger flood releases an SMS is sent to the users downstream and they are aware of changes in the flow that will be coming from the dam site. It is in use at Glennies Creek Dam. We are gradually rolling it out at all our dam sites. The community has the option of going to the website and registering interest in particular dams.

The Hon. CHARLIE LYNN: The issue of water licensing has been raised in a number of submissions we have received, including the Government submission: Can you explain the different types of water licences your customers hold and how that influences the delivery of water to licence holders in dry conditions?

Mr TUCKER: The NSW Office of Water regulates the operating environment in which we operate. The licences we deliver range from stock to domestic supplies. Domestic supplies take priority in times of water-sharing and extreme drought. Prior to the Water Management Act 2000 there were two categories of high-security: industrial and domestic. They combined those two categories in the Water Management Act 2000. High security supplies—which are next cab off the rank after stock, domestic and urban supplies—and the third category is general security licence holders, which expect some variability between zero and a hundred. I think they would expect closer to a hundred in most years. Finally, supplementary licences, which are the old off-allocation licences.

The Hon. CHARLIE LYNN: A submission received from doctor Stuart Khan of the University of New South Wales discussed the dual roles that dams can play in both water storage and flood mitigation. Do you have any comments on the dual role of dams?

Dr CHANAN: It is always a challenging exercise when a dam is built primarily for irrigation supplies and it does not have the capacity for holding flood volumes. In our case, Burrendong dam is a classic example. It was built with a view to mitigate downstream flood impacts. So we have a volume in the dam to hold flood flows and as a result we can minimise the impact on downstream communities. But in cases where a dam is built without the flood attenuation zone in the design, it is always a challenge because most inflows are passed through the spillways. I read from doctor Khan's submission—he is a good friend of mine—his view is about perhaps removing some capacity in Warragamba, for example, in favour of using recycled water. And reducing the capacity or dropping the full supply level and using that zone for flood mitigation. It is a challenging exercise but at a concept level probably worthy of exploring further.

The Hon. CHARLIE LYNN: When the dams were built, the last of which was about 35 years ago, was the primary purpose flood mitigation?

Dr CHANAN: In most of our dams, with the exception of Burrendong, flood attenuation was not a primary objective of the dams.

The Hon. CHARLIE LYNN: Is there any capacity in downstream dams for flood mitigation?

Dr CHANAN: It is a factor of cost-benefit, I suppose, how much would you invest to mitigate the damage downstream?

The Hon. Dr PETER PHELPS: If the environment wants it, the environment can pay for it, is that it?

Dr CHANAN: Yes, in the case of Burrinjuck for instance, where we had some of the most severe flooding in the Murrumbidgee, we do have a capacity perhaps to build a different type of gate. The current gates on the spillway do not have the capacity to hold water. If we change that, we can possibly mitigate flood downstream, but we are talking in the magnitude of a $26 to $30 million investment on the gates to mitigate flooding downstream. So there are opportunities but it is the cost-benefit of those when you compare building purely for flood mitigation.

Mr TUCKER: It is worth mentioning too that whilst we do not have designated flood mitigation zones, all of our storages to some extent have flood mitigation capacity. During the floods earlier this year, in the case of Burrinjuck, the peak inflows during that event were something like 320,000 megalitres a day, whereas our peak outflow was only 230,000 or 240,000 megalitres a day. So had we not had that storage in the upper catchment, the consequences for Gundagai and Wagga Wagga would have been far more severe than what we were able to buffer as a consequence of using Burrinjuck, albeit without a designated flood mitigation zone.

The Hon. PAUL GREEN: A number of submissions have highlighted the importance of demand management practices to reduce water use, such as capturing storm water run-off and installing domestic tanks. The question is, what demand management practices does State Water currently implement?

Dr CHANAN: Demand management essentially is about finding alternative ways of ensuring water security, rather than investing in supply augmentation. So most of our efficiency works—and Brett mentioned computer aided river management [CARM]—that is one of our strategies in terms of demand management. By making our current operations more efficient we are, in effect, creating that additional supply security. So CARM is one of our primary strategies in demand management.

Mr TUCKER: From the perspective of water users, the difference between rural water use and urban water use is that there is a market in place. The strongest catalyst for demand management within the sector is, in fact, the marketplace operating. So where one previously required, as an irrigator, a thousand megalitres to water a crop, if you find ways on a farm to make that 800, then the 200 becomes marketable, which sets it apart from the urban water centre.

The Hon. PAUL GREEN: In terms of water losses or leakages, do you have a percentage of what that may be?

Mr TUCKER: The current corporate plan aims to manage our operation surplus to less than five per cent in each valley. That is the mismatch between supply and demand. The challenge in a riverine environment is defining what is a loss because much of what we currently consider a loss is going out to anabranches built on as wetlands. To some, it might be considered a loss; to others, it might be considered an asset.

The Hon. Dr PETER PHELPS: It is an unpaid for gain. It is a loss to you but it is an intangible gain.

The Hon. PAUL GREEN: What amounts of water are you talking about—gigalitres, megalitres? What is the less than five per cent?

Mr TUCKER: Gigalitres that would be.

The Hon. PAUL GREEN: How many?

Dr CHANAN: The NSW Office of Water's modelling for the Murrumbidgee area where we are rolling out CARM at the moment, is that we could probably make 200 gigalitres of water savings by using CARM. Our estimates are that you would probably have up to another 100 gigalitres if we had CARM rolled out across the State.

The Hon. STEVE WHAN: Did you not say earlier it was 80 to 100 thousand megalitres?

Dr CHANAN: One gigalitre is a thousand megalitres.

The Hon. STEVE WHAN: But you just said 200 gigalitres.

Mr TUCKER: That was the supply and demand mismatch. There are a number of elements of savings in the CARM project.

The Hon. PAUL GREEN: So given those figures, in terms of rolling out CARM, what is the cost-benefit ratio of that?

Mr TUCKER: I do not have the cost-benefit ratio off the top of my head. I know that the earliest number we have generated for CARM across the rest of the State is some $40 million.

Dr CHANAN: We can take that on notice if you like.

The Hon. PAUL GREEN: Yes, I would be interested in linking the totality of the loss to wetlands or whatever, what that equates to as opposed to the $40 million.

The Hon. Dr PETER PHELPS: There is no way of accounting for wetlands because Environment does not pay for it, do they?

Mr TUCKER: Regulated releases for environmental purposes are paid for by both the Commonwealth and State.

The Hon. Dr PETER PHELPS: But they are not in that five per cent?

Mr TUCKER: No, so a mismatch resulting in over bank events that are not ordered through the environmental water holder in either New South Wales or the Commonwealth are not paid for.

The Hon. Dr PETER PHELPS: It is pure loss.

The Hon. PAUL GREEN: Secondary to that question, some submissions also highlighted the importance of better capturing grey water and using recycled water, particularly for industrial use. What would be classified as grey water and what issues are involved with using recycled water for both domestic and industrial usage?

Mr TUCKER: State Water does not venture too far down the supply chain in respect of urban water supplies. We are the bulk provider to urban authorities. From an agricultural sense, we have spent one or two decades telling farmers not to drain off farm and retain all water on farm. We have said the same thing to irrigation communities. So all our sustainable development incentives over the last 20 years, both at a Commonwealth and State level, have been about capturing on farm and keeping on farm, to avoid contaminants getting back into the river. So it focuses, as well as on supply and delivery, on maintaining water quality for downstream communities.

The Hon. Dr PETER PHELPS: What about town grey water for agricultural purposes?

Dr CHANAN: Regional towns have been quite good at recycling water. If you look at townships outside Sydney and compare that with recycling rates in Sydney, townships are different in terms of the amount of recycled water that has already been used for irrigation purposes. To answer your earlier question, grey water is essentially the water that comes out of the kitchen, with less likelihood of any faecal contamination and the black water is essentially the water from the rest of the house. I think you were after the definition of the two.

The Hon. PAUL GREEN: The Government submission discusses the impact of the recent drought on rural water supplies stating that no major rural storage emptied over the prolonged drought period. Was that your experience? Secondly, what lesson did you learn from that prolonged drought period that we can implement?

Mr TUCKER: That was certainly our experience. The closest and probably the most difficult issues were felt in the Lachlan Valley but even then high security was maintained. Certainly from a general security perspective it was a very difficult period, particularly in the second half of that 10-year sequence. Has that answered your question?

The Hon. PAUL GREEN: The second thing that was: What lessons did you learn?

Mr TUCKER: I know Goulburn got down to about 2 per cent, so it was quite significant.

The Hon. PAUL GREEN: Surely we learnt something?

Mr TUCKER: From a bulk water supply level, certainly we learnt the value of our customer service committees in each of the valleys. State Water maintains through its operating licence a customer service committee in each valley. Those customer service committees were integral to the decisions that were made to share a limited resource during those very difficult years and I think in the absence of those committees and their chairpersons it would have been a very difficult circumstance to get through. I know in our own case in the Murrumbidgee Valley we took a decision not only to share within the valley but outside of our valley with other States. That could not have been facilitated easily without customer service committee support. It is quite a valuable lesson in future operations that we maintain that user base support out there when you get through difficult times.

The Hon. STEVE WHAN: The department mentioned engagement that State Water has with the Government in looking at possibilities for augmentation of water storages around New South Wales and you mentioned a dam earlier. Are you able to provide us with a list of the areas that are being considered for augmentation around the State?

Dr CHANAN: We are currently in the process of finalising the design for augmentation of Chaffey Dam, which is critical for water supply security of Tamworth Regional Council. The other dam I mentioned is part of the lower Hunter water management strategy. We are quite keen to see Lostock as an option but it is certainly part of the strategy development process and if it happens to be, we will be keen to make sure that Hunter's future water security is tied with Lostock Dam.

The Hon. STEVE WHAN: Is that the extent of the statewide opportunities for augmentation?

The Hon. Dr PETER PHELPS: Just say: Wait until you see it in the Cabinet submission.

The Hon. STEVE WHAN: We have a Committee that is looking at this very question so the fact that there is actually a Cabinet submission process where the Government might be identifying opportunities that we do not know about is probably not all that helpful.

CHAIR: Remember when you were back in Cabinet, Steve; would you have exposed it?

The Hon. Dr PETER PHELPS: Would you have liked your officials to have told them what is going to Cabinet?

Mr TUCKER: Any discussions about other potential sites are not sufficiently advanced that we would be in any position to answer that question. Suffice to say, we are talking with water users across the State about what they think are some of the options.

The Hon. STEVE WHAN: In the Northern Rivers what discussions has State Water been having with the local councils in terms of options for supplementation of water storages?

Mr TUCKER: Northern Rivers as in coastal Northern Rivers?

The Hon. STEVE WHAN: Yes, Tweed?

Mr TUCKER: No discussion that I am aware.

The Hon. STEVE WHAN: You mentioned earlier in your opening statements, I think, that the dam safety program stage one was nearing completion in the next 18 months—the seven major dams. Stage one implies that there is a stage two. What would be included in stage two and which dams?

Dr CHANAN: Essentially our dam safety program is based on a portfolio risk assessment approach. We look at all the dams we own; we look at what are the highest risk dams and then we invest in bringing the security level up for the seven of them. Right now we are doing a portfolio risk assessment again, given that we have invested money in seven of the highest priority, It is scheduled to finish by about the end of September-October, which will then give us a feel for what is the level of risk associated with dams at the completion of stage one and then we will develop a program of works for the future.

The Hon. STEVE WHAN: Will you then be seeking funding or will you be funding that out of your earnings from your bulk water supplies?

Dr CHANAN: It is a factor of which dam comes out at the top of the list. The dams that were pre-1997 and known to be deficient, there is a current understanding with Treasury that that is funded through a Treasury program but the dams not known as at 1997 to be deficient come out as the highest risk dams, then we will have to look at recouping that money through ACCC and user charges.

Mr TUCKER: In terms of the standard that we are elevating them to, the highest priority dams were designed typically for one in seven to 10,000 year event. We are augmenting those to get to something like one in 200,000; between a 100,000 and 200,000 year event. If we were to proceed with stage two, we are talking about augmentation to get to one in a million year event, so quite a substantial increase in the security of the storage.

The Hon. STEVE WHAN: Are there any storages at the end of stage one that will not comply with one in 200,000 years?

Dr CHANAN: I will have to take that on notice but it is highly likely that all of our stage ones would be above that number.

The Hon. STEVE WHAN: All stage one, that being seven dams—all of your portfolio of dams across the State. Will you let us know if there are any that do not comply with the one in 200,000 before you move to the one in a million?

Dr CHANAN: The way we do our portfolio risk assessment is the Dams Safety Committee has a line of tolerability above which no dam is allowed to be basically, and that drives our portfolio risk assessment. None of our dams are above that at the present moment.

The Hon. Dr PETER PHELPS: Can I just follow that up? To use a currently fashionable phrase, that sounds like an awful lot of gold plating—a one in a million year event, considering that recorded human civilisation goes back about 6,000 years. Even 200,000 years strikes me as wonderful risk management procedures but one in a million years—

The Hon. MICK VEITCH: Why are you doing that?

Dr CHANAN: It is a regulatory requirement. The New South Wales Dams Safety Committee, depending on the consequence of a dam, has a rating of the dams—extreme hazard, High A, High B—and depending on how big the dam is and what is the likely consequence, the requirements for flood security are determined based on that. Most of our dams are extreme hazard dams because they are large dams and there are population centres downstream so most of our upgrade programs are driven by those regulatory requirements.

The Hon. STEVE WHAN: I turn now to the administration of groundwater. In percentage terms how many licences are there around the State which pre-date having caps on the extraction of groundwater from their properties?

Mr TUCKER: I would probably have to defer to our colleagues from the Office of Water to answer that question.

CHAIR: We might stick to the terms of the reference too, Steve.

Mr TUCKER: We do not manage groundwater per se. We do the meter reads for groundwater on behalf of the Office of Water but do not manage the extractions.

The Hon. STEVE WHAN: The Computer Aided River Management program, which I have had a briefing on in the past and it is a fantastic program—and you mentioned the savings earlier—is funded by Water for Rivers, a program set up to save money for the Snowy and the Murray. Are there identified savings that will go to each of those rivers that are contributing to each of the water targets for the Snowy River?

Mr TUCKER: Yes, there are but I just cannot for the life of me remember what those savings are but certainly there is a component of improved reliability in supplying this matching the Murrumbidgee but genuine savings as a result of that improved supply and demand balance going back to the Snowy River.

CHAIR: Perhaps you could get that information for the Committee.

The Hon. STEVE WHAN: How much does that project actually cost? That has come out of $360 million or so that went for the Snowy package?

Mr TUCKER: My colleague informs me that the modelling component of the software that underpins that program is about $16 million. Having said that, there are a range of other things required to ensure that the software works and that is real time metering and monitoring.

The Hon. Dr PETER PHELPS: Considering the savings, that is quite remarkable, if you are estimating $40 million?

Mr TUCKER: Across the State, yes.

The Hon. Dr PETER PHELPS: Annually?

Mr TUCKER: Yes.

The Hon. STEVE WHAN: That is on the back of all that equipment, electric, metering and all that?

Mr TUCKER: And $40 million is the capital cost to deliver the program across the State on the back of that metering program.

The Hon. STEVE WHAN: Is the metering program for the Murrumbidgee also being funded out of the Water for Rivers or is that a separate funding pool?

Dr CHANAN: The metering project for the Murray is funded through the Commonwealth funding arrangement, but there is a metering component for the Murrumbidgee which is funded through Water for Rivers. There are two pilots. The pilots at the Murray and the Murrumbidgee are being rolled out together.

The Hon. MICK VEITCH: We talked earlier about the risk assessment process for our dams. What is the relationship between your organisation and the Dams Safety Committee and what is the process for how you work together?

Dr CHANAN: The Dams Safety Committee, as the Committee would know, is a panel of dam experts from across the State. One of our senior dam engineers sits on the committee. There are regular reporting requirements on dam owners across the State such as audits of the dam sites. Every five years we do an audit and report on the dam's health, if you like. If there are any major issues identified in the five yearly audits we have to report back to the Dams Safety Committee, including a risk assessment portfolio to make sure that all of our dams are below the tolerable limit. We have a fairly good relationship with the Dams Safety Committee. Over recent years it has moved towards a risk-based approach. So far as the questions asked earlier regarding the justification of getting the dams up to a one in a million years saving type event, that still remains to be answered.

The Hon. MICK VEITCH: Who determined it should be a one in a million years saving?

Dr CHANAN: It is based on the committee's deliberations as well as the national level committee, which is called the Australian National Committee on Large Dams [ANCOLD]. The Australian National Committee on Large Dams determines the guidelines and the States essentially follows those guidelines. There are similar bodies in Queensland and Victoria that also do the same: they follow the guidelines of the Australian National Committee on Large Dams.

The Hon. MICK VEITCH: Can you provide the statistics for the infrastructure improvements and enhancements for the seven projects in the first phase? I want to know the dam and how much was spent.

Dr CHANAN: Certainly, we can provide that.

The Hon. MICK VEITCH: You talked about phase two earlier. Phase one will finish and then phase two will commence. Have those areas already been identified or is that a matter for the State Water Corporation and the Dams Safety Committee?

Dr CHANAN: At this stage, it is a matter for the State Water Corporation to review the portfolio risk assessment once it has been completed, see where the dams are placed and then develop a program of works for the future.

The Hon. MICK VEITCH: Were funds set aside in the estimates for this process, knowing that the money would have to be spent?

Dr CHANAN: For the seven dams that were pre-1997 dams—there are some numbers in the future years, assuming that the current program of works will not get them to the maximum flood compliance. We are in the process of reviewing those numbers to ensure that is essentially what we need. In some cases, dams' hydrologies have changed. In some cases, new methodology has meant that the dam's classification could possibly change. The portfolio risk assessment we are doing at the moment would be the best place for us to consider the future ahead, rather than relying on what was in the previous numbers.

The Hon. MICK VEITCH: Are the phase two projects just for the pre-1997 dams? Are these assessments on all of your stock?

Dr CHANAN: That is correct, but the term commonly refers to those pre-1997 dams, because that is where the Treasury's common reference to stage two is.

The Hon. MICK VEITCH: Who pays for that? Will the cost be spread upon the downstream users?

Dr CHANAN: The cost of the pre-1997 dams is paid by The Treasury.

The Hon. MICK VEITCH: It might have been Mr Green's question, but what I am interested in is the re-use/recycling/water harvesting arrangements. It would appear from the submissions this morning that the construction of new water storages will be a rarity as opposed to commonplace. What degree of water harvesting or recycling do we need in place to generate the equivalent amount of water as a newly constructed dam? Has that modelling been done?

Dr CHANAN: It is primarily the domain of urban water suppliers—typically in the region of bulk water. We do not deal with that.

The Hon. MICK VEITCH: You have talked about the Australian Early Warning Network and the Blowering. When was that put in place?

Dr CHANAN: Following the last flood event. I think it was March.

Mr TUCKER: Fifth of March.

Dr CHANAN: Yes, after March.

The Hon. MICK VEITCH: There were difficulties in the Blowering region during that flood event. It was rapid. Is it in place, tested and fully functional, and is it for the full length of the Tumut River?

Dr CHANAN: I would have to take that on notice to see how many people have registered. For those who have registered, it is functional. In terms of the valleys that are operational, I know for a fact that Glennies Creek is already working. We had put it out to the community in other valleys to register. It is a matter of how many people have registered. The capability certainly is there.

The Hon. MICK VEITCH: If you are putting that out to the public to register, what is the response rate?

Dr CHANAN: That is why I need to take that question on notice: I am not presently sure how many valleys there are and what sort of response we have had.

The Hon. STEVE WHAN: Dams and other structures which are no longer required were mentioned. There has been a program removing weirs and barriers in rivers across New South Wales. Can you give us an update on that?

Dr CHANAN: We have a program of weir removal that is part of our fish passage strategy. We have identified a number of unregulated rivers for removal that no longer have any water supply or community recreational value associated with them. We are working with the Department of Primary Industries in a works program to remove those. We have removed six or seven over the last three years. It is primarily funded through the community service obligation through Treasury.

The Hon. STEVE WHAN: Is that mainly weirs in those cases?

Dr CHANAN: Yes, mainly small weirs, unregulated rivers.

The Hon. STEVE WHAN: There were issues with crossing some of those rivers. I cannot remember the exact river, but one of those was used as a vehicle crossing point. Have those issues been dealt with? Do you look at all issues, including whether or not they are used as river crossings?

Dr CHANAN: That is correct. We do look at the current use of that structure. Only after consulting with the community, with the local residents, and the local council do we select a project for removal.

The Hon. MICK VEITCH: To follow on from that, there was an issue about the augmentation of Wyangala Dam. That was used as a crossing for a community.

Dr CHANAN: Yes. The project required the dam wall to be raised to a point that the road on top would become very narrow—I think less than eight metres—which means that two-way traffic will become a hazard for our staff operating on the dam wall. We proposed to stop the traffic going on top of the dam wall and suggested an alternative route to Wyangala village, which resulted in an inquiry. Now we are constructing a bridge downstream for the villagers to use.

Mr TUCKER: Trout Farm Road.

The Hon. MICK VEITCH: Is Mundarlo Bridge the only impediment to water releases out of Blowering and Burrinjuck?

Mr TUCKER: No, it is just the first. It is notably triggered. Inevitably, when you start major releases, particularly during flood times, if we resolve the weakest link in the chain, if you like, in Mundarlo, the next one would probably be downstream at Wagga Wagga, or somewhere there. There is a range of threshold areas as you move further down the river, particularly in the upper half of each river, that is problematic.

CHAIR: Gentlemen, you mentioned Lostock in particular as one of the ones that looks as though it will be augmented. What is the proposed storage of the augmentation?

Dr CHANAN: I just want to qualify, Mr Chair, that it is part of the Lower Hunter Water Strategy. Provided it comes as the lowest hanging fruit there are a few options that we are looking at. Potentially we could raise it by 5 metres, which would mean that its current capacity of 20 gigalitres will be increased to about 33 gigalitres. The other option is to raise it by 16.5 metres. That will raise it from its current 20 gigalitre capacity to 76 gigalitres. The larger option would cost about $145 million or thereabouts and would ensure the Hunter water supply until about 2050 when implemented in conjunction with other water-saving and demand-management programs. But, again, it is part of the Lower Hunter Water Strategy.

The Hon. Dr PETER PHELPS: And it would antagonise The Greens, so I am fully in favour of that proposal. My final question is what strategies do you have in place given the tree change phenomenon in New South Wales; that is, the movement up and down the coast from the Newcastle, Sydney, Wollongong areas to more coastal residential development which of course will bring with it industry as well? What sort of plans do you have in place to cater for the tree change development up along the coast north and south?

Mr TUCKER: The only two storages that we manage in the coastal areas are Toonumbar in the north and Brogo in the south. Both of those storages are struggling for current demand. The dairy industry in both valleys is subject to issues of affordability of the service provided, so I think there is some capacity in both of those storages to look at substitution of current demand or current diminishing demand with future urban residential demand if that were to take place in both Toonumbar and Brogo.

The Hon. Dr PETER PHELPS: Does that mean we have to hope that dairying decreases? Is that the basis of future expectation?

Dr CHANAN: I do not think that was intended. The dairy industry is shifting towards that direction. And there are a lot of sleeper licences in those valleys where even if dairy as it currently stands continues to use the available water there are sleeper licences where the full entitlements are not being fully used, so there is opportunity for urban utilities to perhaps buy some of those licences for their supply security.

Mr TUCKER: I should also mention that most of the population pressure is not occurring in those valleys. The Brogo Dam is Bega Valley. I think most of the urban sprawl pressures are sort of one to two hours from Sydney, not three to four hours from Sydney, and similarly in the north.

The Hon. Dr PETER PHELPS: So our reliance all the way up north and all the way down south is essentially on local government to provide water storage capacity?

Mr TUCKER: That is correct.

The Hon. Dr PETER PHELPS: Is that a state of affairs which State Water considers to be optimal?

Mr TUCKER: Certainly in our current corporate plan we see opportunities for State Water to take a stronger management role across the State for a bulk water management from everything to sort of augmentation works but also dam safety issues and ongoing maintenance, but that is caught up in difficult issues of local government reform and other matters. But State Water certainly feels as though it has the capability to manage more than what it is currently managing.

The Hon. CHARLIE LYNN: You mentioned 2050 before. Is that a medium-term strategy or a long-term strategy?

Dr CHANAN: I am not sure of the terminology Hunter is using now but I think 2050 was medium term. In fact, you could do two ways of implementing that project. You could do a 5 metre raising first and then eventually go back and raise another 6 metres to make it more capital effective.

The Hon. PAUL GREEN: In terms of capacity and looking at capacity, is Tallowa Dam in the Kangaroo Valley in the firing range, because obviously the last Government was talking about extending that?

Dr CHANAN: I understand the Sydney Catchment Authority will be attending the hearings shortly. That probably is a better directed question to them. We are not fully aware of the Kangaroo Valley scenario.

The Hon. PAUL GREEN: Do you have a comment on Welcome Reef Dam?

Dr CHANAN: Not particularly.

The Hon. PAUL GREEN: In light of coal seam gas being a hot topic of recent times, do you have a view about what impact this could have on the water supplies in New South Wales, or what the department is doing in terms of that?

Mr TUCKER: I think the whole groundwater issue and the relationship between coal seam gas is a matter for the Office of Water which we do not stray into. We purely maintain our operational focus in terms of our groundwater involvement.

The Hon. STEVE WHAN: Just while we were talking about the Brogo Dam and Bega Valley, Bega Valley agricultural water users had some fairly large increases in charges recommended by the Independent Pricing and Regulatory Tribunal [IPART] a couple of years ago, I think. When IPART gave its recommendations on charging have they all been accepted as your new charges or have they been modified and, if so, how have they been modified?

Mr TUCKER: Our organisation works to the IPART regulated charges and endeavours to meet those objectives over the determination period so, no, once set by IPART we work to those charges.

The Hon. STEVE WHAN: My memory of it—and it is a bit of a hazy one—is that the Bega Valley charges increased something like 25 per cent. Is that right?

Mr TUCKER: I cannot recall the percentage but certainly we have issues of capacity to pay in our coastal valleys, so the Hunter, Toonumbar storage in the north and Brogo in the south and also the Peel River on the western side. We receive community service obligations to help augment the cost of providing services in those valleys. As to the next determination which will be under the Australian Competition and Consumer Commission [ACCC], not IPART, it is a bit soon to call on any recommendations for price charge increases in those valleys.

The Hon. STEVE WHAN: When you do see prices increase like that, is it possible to see whether there has been any impact on demand from the higher prices, for instance in the Bega Valley? The difference obviously is they have moved from drought into plentiful water so I assume demand has gone down, but are you seeing that pricing increase having an impact on demand reduction?

Mr TUCKER: Anecdotally there are comments to that effect. It is very difficult to pull that apart from the general condition of the dairy industry at the moment with deregulation and urban pressures in those valleys where land becomes more attractive to housing than it does for dairy farms. There is a whole range of contributing factors. I think just isolating one of those and saying that is the cause of reduced demand is a bit difficult to determine.

The Hon. STEVE WHAN: Finally, have there been any proposals to augment Brogo Dam? The capacity in that area is quite small. Do you run Cochrane Dam as well?

Mr TUCKER: Cochrane Dam is owned by Eraring Energy and run by them. In terms of proposals, I think over the years there have been various submissions by local users down there to potentially augment Brogo. Nothing on our portfolio of interest. It would be nice to get it reaching cost recovery with what we have got existing before we start building any new storages there.

CHAIR: Thank you very much for attending this hearing. The Committee has resolved previously that answers to questions which you did take on notice be returned within 21 days, if you could abide by that. The secretariat will be in contact with you in relation to those questions. If other members here have any further questions would you be prepared to take those questions on notice as well?

Mr TUCKER: We are certainly prepared to take those questions on notice. On behalf of State Water, thank you for the opportunity, Mr Chairman.

(The witnesses withdrew)

(Luncheon adjournment)

SARAH CATHERINE DINNING, Acting Chief Executive, Sydney Catchment Authority, and

IAN NORMAN TANNER, Group General Manager, Assets and Major Projects, Sydney Catchment Authority, sworn and examined:

CHAIR: Welcome to the afternoon session of the first day of the inquiry into the adequacy of water storages in New South Wales. If at any stage you consider that evidence you are about to give or documents you may wish to table should heard or seen only by the Committee please let us know and we will consider that request. Would either or both of you like to make an opening statement?

Ms DINNING: I will make an opening statement and then pass to my colleague Ian Tanner who is an expert on water supply. The Sydney Catchment Authority [SCA] has a statutory responsibility to supply quality raw water to the Sydney Water Corporation and a number of councils, which in turn supply treated water to over 4.6 million consumers in Sydney, the Illawarra, Shoalhaven, Blue Mountains, Southern Highlands and shortly Goulburn. The Sydney Catchment Authority also has a statutory responsibility to manage and protect both the drinking water catchment areas for Greater Sydney and critical infrastructure.

Briefly some history: The construction of the Upper Nepean scheme in the 1880s marked the beginning of the development of Greater Sydney's current water supply system. Work continued in the early part of the twentieth century with the construction of the Upper Nepean dams, the Blue Mountains dams and the Woronora Dam. The Warragamba Dam was completed in 1960 and the Shoalhaven scheme was constructed in the 1970s. This system was augmented in 2006 with the construction of deep water pumping stations at Warragamba and Nepean dams. Accessing the deep water in the storages meant that more than the equivalent of the combined total storage volume of Cataract and Cordeaux dams was added to the available storage. Today the Sydney Catchment Authority operates 10 major dams, 8 minor dams and two weirs for the purposes of drinking water supply. The storages collect water from the river systems of six catchments, these being the Warragamba, Upper Nepean, Woronora, Shoalhaven, Blue Mountains and Prospect. When needed, water is transported mostly by gravity via an interconnected network of rivers, pipes and canals to water filtration plants that treat the water for distribution.

The total storage capacity of Greater Sydney's water supply is almost 2,700 gigalitres. A gigalitre is one billion litres. The Sydney Catchment Authority can now access over 96 per cent of this water. This was not always the case. Until 2006 water at the bottom of Warragamba and Nepean dams was inaccessible. The deep storage project has changed this adding an extra 200 gigalitres, at a cost of $119 million. Total available storage is currently 2,463 gigalitres, or 95.4 per cent. The yield of the system is the volume of water that can be supplied reliably every year over the long term. Yield is different from the storage capacity of the system. It changes with changes to inflows, infrastructure, system design criteria and system operating rules. The yield of the Greater Sydney water supply system is currently 610 gigalitres a year. In 2011-12 Greater Sydney used approximately 485 gigalitres of that water. This includes water released from Warragamba and Tallowa dams to supply North Richmond and Nowra, and also water supplied by the Sydney desalination plant.

Since 2004 the Sydney Catchment Authority has spent almost $80 million on infrastructure to enable environmental flow releases and fish passage to produce the environmental health of the Hawkesbury, Nepean and Shoalhaven rivers. In 2011-12 the SCA released 570 billion litres in environmental flows to assist in improving downstream river health, and a further 2,270 billion litres of uncontrolled releases occurred when the dams spilt. In addition to releases for environmental and urban use, each day the Sydney Catchment Authority releases one megalitre, or a million litres, from the Wingecarribee Reservoir for basic landholder rights and five megalitres from Warragamba Dam to dilute the effluent from the Wallacia sewage treatment plant that discharges into the Warragamba River.

The Sydney Catchment Authority uses computerised models for future water supply planning. It is the Water Headworks Network [WATHNET] software package and it simulates the operation of the water supply system and allows the historical inflow data to be modelled to provide 2,000 synthetic inflow sequences each of 103 years. The model also incorporates groundwater and desalinated water to calculate system yield. WATHNET is being continually updated and enhanced in response to changes in technology, hydrological methods and customer requirements. The model and its efficacy are reviewed as part of the SCA's licence conditions, which require independent reviews of this model. In 2011 an independent review of WATHNET found that the authority's drawdown curves that aim to minimise spills from the dams are close to optimal. This means the system is operated as efficiently as possible.

The SCA also uses computerised modelling to ensure the water it supplies is the best quality available. The Sydney Catchment Authority's reservoir management system, called SCARMS, was developed in 2004 to monitor, model and forecast water quality and lake behaviour. SCARMS integrates historical data and real-time data from instruments in streams and lakes in the catchment with three-dimensional water quality models and a graphical interface to enable analysis and presentation of data and modelling results. SCARMS provides a dynamic reservoir management tool and decision support system both for daily operations and for long-term strategic planning. The SCA manages its various water storages to optimise the quality of water supplied to its customers. It does this by sophisticated water quality modelling supported by an extensive monitoring network, which is SCARMS, carefully selecting the water including the offtake choices within reservoirs, and blending water from various sources, actively managing storages including artificial destratification at some locations.

The SCA selects water from different storages to maximise water quantity and to minimise spills. Dams spill and empty at different rates depending on the size of their catchments, rainfall, inflows, storage volume, evaporation, environmental flow requirements and the demand for water. The SCA has developed draw-down curves for its major dams that allow it to minimise the spills from these dams. This provides the maximum system yield while ensuring that all demands are met. Each storage has its own unique water quality characteristics and the SCA has tools to determine from which storage to source the highest quality water given the level of water available in each of the storages.

In addition to managing storages to optimise water supply, the SCA is involved in long-term water supply planning that also seeks to maximise that supply. Future water demand supply will vary depending on population growth, water consumption patterns, climate change, technology and emerging societal and environmental issues. Understanding these variables and associated uncertainties allows the SCA and Sydney Water to plan the capacity of the greater Sydney water supply system both now and in the future and enables analysis of water supply options that might contribute to future urban water requirements. Future water supply options could include increases in transfer capacities within the supply—which Mr Tanner will probably talk about—and new links between the storages to optimise storage operations and increase yields. During the last drought the SCA improved the link between the Nepean and Avon dams so that the previously vulnerable Illawarra supply zone now has better access to additional supplies from the fast responding Nepean Dam and the Shoalhaven system. There could be new dams, additional surplus water diversions and/or modified storages, access to groundwater and mine water, aquifer storage and recovery, desalination and indirect potable reuse.

The Metropolitan Water Plan has adopted a portfolio approach. This involves analysing different combinations of existing and new water supply-and-demand measures in order to identify the mix that best provides water security and reliability. The SCA works with Sydney Water, the New South Wales Office of Water and other agencies in the review of the Metropolitan Water Plan to ensure that long-term water supply, drought management and environmental river health options for greater Sydney are appropriate and adequate.

CHAIR: One of the Committee's terms of reference asks it to consider water storage and management practices in other jurisdictions. Are there any other jurisdictions or countries that you look to for best practice or innovative ideas regarding water storage?

Mr TANNER: Sydney has one of the largest stored water volumes per capita in the world. That is due to its highly unreliable weather patterns and rainfall. That was identified many years ago and as a result we have 21 dams that are interconnected and supply greater Sydney. Of course, we are a member of the Water Services Association of Australia and we regularly liaise with our counterparts in the urban water industry in other parts of Australia and New Zealand. For example, we have learnt a lot from speaking to our peers in Queensland after the Wivenhoe incident. We are always looking at what is best practice around the water industry.

CHAIR: In reference to Wivenhoe, how long is it since there has been a major flood in the Hawkesbury system? What would be the impact of another major flood? I know the Windsor-Richmond area well—I lived there for three years. What would happen if we had another major flood up to the Thompson Square level in Windsor? What would be the impact on the population growth areas below that?

Mr TANNER: That question is probably best directed to the State Emergency Service as the flood response agency. It must be remembered that 50 per cent of the catchment area for the Hawkesbury-Nepean is below Warragamba Dam. If the rains are coming from the north-west or the north, there could be localised flooding in the Hawkesbury-Nepean valley and Warragamba Dam would not spill. The last time it spilt a large amount of water was in 1992. In the 1998 event water only just trickled over. Earlier this year there was a quite

small event that saw Warragamba fill and spill. You would have to go back to August 1992—20 years ago—for the last large spill event from Warragamba Dam. As for the downstream floods since that spill, I cannot tell you.

CHAIR: What sort of management practices do you have in place when you foresee an event of that nature coming at you?

Mr TANNER: Most of the events that cause Warragamba to fill and spill involve east coast lows. We have an arrangement with the Bureau of Meteorology whereby it contacts us with storm warnings. The timeframe is usually about three to five days. The bureau is not as confident with its longer-range forecasting. Three to five days out it is a little more confident. Warragamba Dam is a water supply dam only; it is not a flood mitigation dam and it has no capacity to do that other than when the water level is reduced. For example, in March this year the water level was 3.3 metres down from full. That held the first 240 gigalitres of water that flowed in. The remaining 600-odd gigalitres flowed out of the dam after the first 240 gigalitres was captured. In that respect it mitigated against flooding downstream.

The gate operating rules for the Warragamba Dam have been in place since the 1960s. All the downstream warnings and processes that the State Emergency Service put in place to evacuate downstream are based on those dam gate operating rules. Essentially, once the dam fills, the gates automatically open and release the incoming floodwaters. If they do not open automatically, a number of backup systems are in place to ensure that they operate as per the protocols. All the other dams in the Hawkesbury-Nepean Valley—the dams in that yellow area, the Nepean, Cataract, Cordeaux and Avon dams—when they fill they spill automatically. There are no gates, it just goes over a weir and adds to the water in the Hawkesbury-Nepean as well.

The Hon. MICK VEITCH: You mentioned the Wivenhoe. Have you had a chance to have a look at Queensland's commission of inquiry and its recommendations to see if there is any impact or application?

Mr TANNER: Yes, absolutely. We have looked at the draft inquiry and studied all the recommendations from that in detail, and converted them into actions for us to improve our systems and processes.

The Hon. MICK VEITCH: Was that done with State Water as well? What agencies were involved? Did you do that on your own or were other agencies involved in that process?

Mr TANNER: We do that ourselves specifically for Warragamba Dam.

The Hon. MICK VEITCH: Other members may want to talk about that later. The Government's submission—you will have to excuse my ignorance here—uses a phrase that says, "The SCA has developed drawdown curves." What is a drawdown curve and how does that apply?

Mr TANNER: The six major dams—Cataract, Cordeaux, Avon and Nepean, plus Woronora Dam plus Warragamba Dam—together constitute probably in excess of 90 per cent of our stored water. They are curves, which are volume to capacity versus height relationships. So we pick and choose which dam to pull water out of such that there is an even chance—depending on the size of the catchment areas—of any dam filling and spilling. In our business, as a water supply business, we do not like to see too much water lost downstream. That is the business we are in. So, we do not want to have one dam too full and one dam quite low. We get a rain event, this dam spills while this one does not fill. So, based on the historical climate, the size of the catchment areas, we can draw dams down at different rates such that if there is a rain event over the whole area they all fill at the same time and, importantly, they deplete and reach emptiness, or towards emptiness, at the same time. It is all about security and reliability of supply, because each dam supplies different parts of greater Sydney, and to make sure everyone has the same security of supply or reliability of supply we try to stop the dams from reaching emptiness so they reach there at the same time or they spill at the same time.

The Hon. MICK VEITCH: I had not heard the term before, that is all. It is interesting. The Government submission also highlights that SCA utilises two models of determining balanced water requirements—for the agriculture, urban, industrial and environmental sectors and the water headworks network and the reservoir management system. How does that fit in with what you just explained and what is the difference between the two?

Mr TANNER: Drawdown curves are then taken and put into the WATHNET model, the water headworks model. It is a water quantity model.

The Hon. MICK VEITCH: What was the short term you used for it?

Mr TANNER: WATHNET, which is essentially a demand node type model. There is a node, there are interconnectors, the rivers or the pipes are just connectors, and it is quite a complex computer model. The WATHNET model can include groundwater, it includes the desalination plant. It allows for incoming and outgoing water. The water coming in from the catchments or water lost through evaporation, water releases for the environment or for irrigation. All that is modelled in WATHNET. The way the whole system works, the operating rules of the system, in other words our drawdown curves, when we take water from that dam and not that dam, that is built into the model. WATHNET is all about water quantity in the short term but also in the long term we use that to do our long-term water supply planning out to 50, 60 or 70 years.

SCARMS—that is the Sydney Catchment Authority reservoir management system—is all about water quality. Lakes stratify, usually warm water at the top, cold water at the bottom. When we get a big inflow event, if it was in winter the cold water that comes into the lake would find the water level is the same temperature. So it would shoot along the bottom of the lake all based on the density of water. If rainfall occurred in summer, it would be a lot warmer, the inflow event would shoot along the top and we can model that and move our offtake screens away from those inflow intrusions. They are usually dirty water, usually a bit of contamination in them. We do not want to supply that to our customers so we will move our screens and at Warragamba we can move our screens up to 60, 70 metres. Depending on where the dirty water intrusion is coming in, we move away from it. The Sydney Catchment Authority reservoir management system does all that modelling for us. It is a series of sensors all out on the lake. There are some chains go to the bottom measuring temperature at one metre intervals—air temperature, wind direction.

The Hon. MICK VEITCH: Pretty sophisticated?

Mr TANNER: Yes, really cutting edge stuff.

The Hon. MICK VEITCH: From what you are saying then if you have done your modelling up to 60 and 70 years, and with Sydney's urban growth, or projected growth—do you do Sydney's projected growth as well?

Mr TANNER: We work with Sydney Water to look at the demands, and the population based on the Department of Planning figures, and we work in with Sydney Water to work out what the long-term demand would be, not just for greater Sydney but, it is important, each nodal point within Sydney. Is Sydney growing faster in the north-west suburbs, south-west suburbs?

The Hon. MICK VEITCH: Is Sydney getting closer to the point—or is there a point where Sydney has a critical water supply issue?

Mr TANNER: At the moment the yield in the system is 610 gigalitres per annum. Last year we used 485 gigalitres. Back in 2003-04, at the early stages of the drought, Sydney was using 630 gigalitres per annum, and now it is back to 485, which shows the impact of some water conservation measures that have been put in place. So, there is a bit of a buffer there, but you have to remember what affects yield, and yield is affected by many different things—and how we operate the system—and drawdown curves can impact on yield. That is why it is important to get that right.

Releases for environmental health of the downstream rivers. The more we release for the health of the rivers downstream the less there is for consumptive use. That impacts on yield. Climate change is a great unknown. A lot of work is being done by numerous agencies led by the Office of Environment and Heritage on downscaling global climate models. We hope to be able to get some good answers from that research and be able to apply it to our WHATNET models to see what that does to yield.

We have a restriction regime. Depending on demand and water restrictions and how successful they are at reducing demand has a great impact on yield as well. There are quite a few unknowns at the moment that may see that gap between 610 and 485 reduce.

The Hon. STEVE WHAN: I want to go back to the point you made earlier about flood planning. You mentioned that the State Emergency Service did most of the flood planning. What engagement do you directly have with local planning authorities in determining where it is safe to build in that catchment? We have one

submission that is suggesting that Warragamba Dam should be reduced from 100 per cent so there is leeway to act as flood mitigation as well. Is that something you have considered?

Mr TANNER: We work very closely with the State Emergency Service when there is an event on.

The Hon. STEVE WHAN: In terms of notifying—

Mr TANNER: In terms of notifying. The State Emergency Service, the Bureau of Meteorology and us are linked up by phone during inflow or spill events. Downstream planning is the domain of councils and the Department of Planning. Under our obligations under the Dams Safety Act we have to do dam break studies—what would happen if there was a sunny day failure of Warragamba or the other dams due to earthquakes or that sort of event. But also for probable maximum flood [PMF] we do planning. Part of that planning looks at inundation levels downstream. Now that is the top end of your spill event. That is the probable maximum flood, the dam break studies—

The Hon. STEVE WHAN: The 1867 level?

Mr TANNER: The year 1867 was a one in 200 year event. PMFs are anything about one in 100,000 year event. We work with the SES during an event.

The Hon. STEVE WHAN: In terms of planning you provide that information to the planners?

Mr TANNER: We do.

The Hon. STEVE WHAN: Basically you keep an active engagement process? Do you have any further involvement in it? Are there areas of urban development in that Hawkesbury area that you would be concerned about at all?

Mr TANNER: It is not the role of Sydney Catchment Authority to get involved in that.

The Hon. STEVE WHAN: The Committee received a submission from Dr Stuart Khan from the University of New South Wales, who suggested that given that there is now a suite of options for water supply in Sydney, including the desalination plant, Warragamba Dam should be used at least in small part for flood mitigation by not keeping it at 99 per cent? Do you look at that?

Mr TANNER: Part of the response to March 2012 spill events is that we, and some of the other agencies, are together looking at what can be done for flood mitigation downstream in the Hawkesbury-Nepean Valley and permanently or temporarily lowering water levels, or changing gate operations slightly through to raising dams. All those options are on the table.

The Hon. STEVE WHAN: What is the timeframe to do that work to consider those options?

Ms DINNING: It is very early days. We are just working with the SES in particular scoping the terms of reference and who will be looking at what. So we have still got some time to go. We are working with Planning and other agencies to set up that review. All those options will have to be developed. Whether it is making some air space in the dams, there has to be a cost-benefit analysis, because then there is a loss of drinking water, infrastructure costs and further work then engaging other agencies, with the impacts further downstream, which is what I think you are asking about.

Mr TANNER: You would have to reduce the water level in the dam quite significantly to create air space.

The Hon. STEVE WHAN: You probably would not capture it all. You may operate as a buffer or a delay but, you are right, you have got to look at all the cost-benefits involved. You said you looked carefully at the Queensland report and have taken lessons from that. Will that feed into that same process or have you made any substantial changes as a result of the Queensland Royal Commission report? Can you highlight any serious issues that you needed to look at?

Mr TANNER: It gave us a good idea of how we can finetune a lot of our procedures, retrain operators, because we have not had a flood and exercising maintenance regimes. We learnt from the standard operating

procedures—Wivenhoe is a very different dam from Warragamba—and from what we could see there was a fair bit of discretion in the interpretation of the procedures that the operators in Queensland had. That is clearly a lesson that needs to be applied here. You need clear triggers that are black and white; the grey areas are not good. We have made sure that our procedures have all been reviewed: how we operate the dams' gates and when we operate them.

The Hon. STEVE WHAN: In relation to future options, I think you mentioned new dams and mine water? Was it mine water or mining water?

Ms DINNING: I think I said mine water.

The Hon. STEVE WHAN: What is mined water?

Ms DINNING: This is just in reference to accessing ground water and mine water. These are just the options that could be considered as part of the supplementation or augmentation of Sydney's water supply. That would be the scope.

The Hon. STEVE WHAN: Is that water coming out of old mines?

Mr TANNER: There are old workings that are close to—

The Hon. STEVE WHAN: That is what I thought.

The Hon. PAUL GREEN: What is the yield of Warragamba Dam? Is that the same as the full volume?

Mr TANNER: No. Yield and volume are two different measurements. Volume is just purely the capacity: how much water does it hold?

The Hon. PAUL GREEN: How much does Warragamba hold?

Mr TANNER: Warragamba has got 2,027 gigalitres, 2 million megalitres and the other dams together hold around 600 gigalitres. So altogether roughly 2,600 gigalitres is our operating capacity.

The Hon. PAUL GREEN: You said that in one year Sydney drained out about 610 gigalitres or 630 gigalitres?

Mr TANNER: It was 485 gigalitres that was the last one. The previous one was 630 gigalitres.

The Hon. PAUL GREEN: Obviously good behaviours have caused that to decrease to 485 gigalitres. What percentage is leaking from the system?

Mr TANNER: If you exclude evaporation—

The Hon. PAUL GREEN: Leakage from pipes—

Mr TANNER: There is no leakage from our pipes. One of the good things for us is that we have very large infrastructure and it is all above ground. If we do have a leak we can see it. We are lucky enough to be able to walk through our pipes.

The Hon. PAUL GREEN: Losses?

Mr TANNER: Evaporation is the biggest loss. It is around 100 gigalitres a year on average in the whole system. If there could be a solution to stopping evaporation that would save a lot of problems.

The Hon. PAUL GREEN: Ms Dinning referred to vulnerabilities in the system and, in particular, the Illawarra. I have also heard that the Blue Mountains is also vulnerable. Will you explain the vulnerabilities there?

Mr TANNER: I would not say Blue Mountains is vulnerable. The upper Blue Mountains has slightly less security of supply than the rest of the system. We are working with Sydney Water and State Water to solve that problem. We actually buy water from the State water system on the other side of the mountains from Oberon and Duckmaloi Weir and import that water into the upper Blue Mountains to supplement the water that is in our five small dams up in the upper Blue Mountains. The middle and lower Blue Mountains can be generally supplied from Warragamba Dam through Sydney Water's pumping system just to get the upper Blue Mountains area as secure as the rest of the system. Security in our terminology means that there is a .001 per cent chance of our system approaching emptiness. Emptiness is defined as 5 per cent dam levels. So there is a .001 per cent chance of that occurring. At the Blue Mountains is not quite down that low.

The Hon. PAUL GREEN: You talked about interconnectedness. What does that mean in terms of the overall storage capacity, given that you have noticed some vulnerability? How interconnected are all these sites?

Mr TANNER: This was the Upper Nepean system that was built at the turn of the twentieth century. The upper Nepean system was the big system that replaced the original Tank Stream and the swamps around Centennial Park. That was the next scheme that was built. These dams were all built in the 1920s, 1930s and 1940s. Nepean and Avon are directly connected now. There is not only a tunnel; there is a deepwater pumping station. The Avon Dam supplies Wollongong—it is the only dam that supplies Wollongong—and sometime ago, yes, it was probably vulnerable but there is a connection now between Nepean and Avon. The Nepean Dam can be filled from Tallowa Dam pumping up through the Shoalhaven system and there is a connection from Wingecarribee Dam across into Nepean. The water from almost down in the Cooma area can get to Wollongong and also water from Cooma can get to the very top end of the northern beaches.

Run of river connects a lot of these dams. We release water from these four dams down to another large weir on the Nepean River. The tunnel through to Campbelltown is the main supply for the whole of the south-west area from Broughton Pass. Then we can connect that through the Upper Canal all the way to Prospect and that is the main distribution point for the vast majority of Sydney. Most of the water comes from Warragamba Dam through pipelines into Prospect and there is also a pumping station at Prospect. So we have quite a lot of in-built flexibility and backup or redundancy, if you like. Should we lose any one of these supplies there are backups, and you need that obviously for a population of 4.5 million people. The Shoalhaven system is connected through to Warragamba as well through to Nepean. Through, pipes, canals, tunnels and rivers the whole system is pretty much interconnected. The small Blue Mountains system up here can get water from—just off the pipelines here there is another pumping station that pumps water up to the Blue Mountains or, as I said, we can get water across from Oberon.

The Hon. PAUL GREEN: During the drought time someone mentioned that there are two sets of pipes coming from Warragamba, is that true?

Mr TANNER: Yes, there are twin aboveground pipelines.

The Hon. PAUL GREEN: Are they both used constantly?

Mr TANNER: Constantly, yes. In fact, we have just finished a very successful outage of both pipelines. So Sydney has been supplied by the Upper Canal and Prospect Reservoir for quite some time whilst we have had the pipelines out for maintenance, which has not happened—

The Hon. PAUL GREEN: Is there any chance of pushing water back the other way in those pipes?

Mr TANNER: Probably not, although we are looking at should there be a problem with the water quality in Warragamba Dam is there a way that we and Sydney Water can get water back into those pipelines after the water is treated at Prospect and feed it back up the pipeline such that we could then distribute it, say, up into the mountains or western Sydney. That is raw water going that way and it would be treated water coming back the other way.

The Hon. PAUL GREEN: Coming from the Shoalhaven you come over the mountain there, what sort of dollars are you talking about pumping there in terms of dollars equating to megalitres per day—electricity costs versus water.

Mr TANNER: I could have told you when the drought was on in 2007 because we pumped—

Ms DINNING: Can we take that on notice?

The Hon. PAUL GREEN: Yes. It would be really helpful for the Committee to know that.

Mr TANNER: It is a 600 metre lift from here up to—

The Hon. PAUL GREEN: From what I understand it is quite a lot of energy.

Mr TANNER: Yes.

The Hon. PAUL GREEN: Will you explain how dam efficiency has increased by accessing deep water in Warragamba Dam and whether this would be an option for other dams in New South Wales?

Mr TANNER: Absolutely. We built a virtual dam back in 2005-06 at the height or the depths of the drought. When Warragamba Dam was built the outlets were about 30 metres above the riverbed. So when it filled—the constructors back then had a temporary connection and they just filled it up with concrete—we could only go down 65 metres but it is 100 metres deep. So there was about 170 gigalitres of water that we could not access, it was below the lowest pipe. We got together with the engineers and worked out how it was best able to access that water. We actually put divers down there for two weeks in the dark diamond cutting a big hole in the bottom of the dam where we have accessed that through into a new lower level outlet, a new low-level pumping station, and once the water gets down to a certain level we can now access that extra 170 gigalitres and that 170 gigalitres is about the same size as our second biggest dam: Avon. We did the same thing at Nepean Dam and we got an extra 30 gigalitres there. Each site was around $50 million or $60 million so for $120 million, which is not very expensive for a 200 gigalitre source of water, we improved our efficiency, if you like, which is the difference between total capacity versus what we can actually get hold of, we went from 87 per cent to 97 per cent. Our dams are very efficient and there is not a lot of water left that we can actually access.

The Hon. PAUL GREEN: How did you manage that water because it is quite different to the top water in terms of ecological and environmental sensitivities? What did you do when you got down that low?

Mr TANNER: The biggest issue is water quality and ability to treat it to the Australian drinking water guidelines. With Warragamba Dam being so deep it turns over. Just about every year there is a complete turnover of the water. We have very cold deoxygenated water at the bottom and as winter comes the top waters get colder and colder and the waters mix, so every year it is generally mixed. We have tested those waters and the quality was fine and within the constraints or the limitations of the downstream water filtration plant at Prospect. That was not an issue at all.

The Hon. PAUL GREEN: Are there any other jurisdictions or countries you think it would be worth this Committee looking into for benchmarking?

Mr TANNER: Not the SCA but the Water Services Association of Australia, the urban water industry has a fairly close association with the Californians and the issues they are going through with drought, with groundwater versus desalination versus storages; that is the main focus that we have been looking at.

The Hon. Dr PETER PHELPS: Ms Dinning, did you say something about doing something in Goulburn in the near future?

Ms DINNING: Goulburn is a prescribed customer to the SCA now.

CHAIR: How long has that been the case?

Ms DINNING: I would have to check the actual time.

CHAIR: But relatively recently?

Ms DINNING: Yes.

The Hon. Dr PETER PHELPS: Have you taken over their water storage facilities?

Ms DINNING: No.

Mr TANNER: No, part of the drought response by the Federal Government, the State Government and the Goulburn Mulwaree Council was to build a pipeline from Wingecarribee Dam through to Goulburn as a drought emergency. That has been not long completed and there is a pumping station and pipeline at the base of our dam at Wingecarribee.

The Hon. Dr PETER PHELPS: That would be the only instance in your system where you are pumping to a dam that you do not control, would it not?

Mr TANNER: I am not sure whether Goulburn Mulwaree Council has sorted out how it is going to operate its system—whether it pumps into a dam or into a filtration plant.

The Hon. Dr PETER PHELPS: Straight into the dam is it not?

The Hon. STEVE WHAN: I do not know. They are building the thing; I hope they know where it is going.

Ms DINNING: The pipeline is finished; I am not sure if it has been commissioned. We also have not sold any water to Goulburn but they are a prescribed customer so we will be allowed to sell to them.

The Hon. Dr PETER PHELPS: There is a large waste facility beside Prospect Reservoir. Has there been any notice about water quality in Prospect Reservoir since that facility has been used?

Mr TANNER: No.

The Hon. Dr PETER PHELPS: It is just an issue that was raised and I wanted to put it out there. Excluding desalination and groundwater, let us say, for example, that there was no desalination plant and you were statutorily prohibited from accessing groundwater for the system. What is a worse case survival period for Sydney's drinking water, given the current infrastructure of the SCA?

Mr TANNER: The 610 gigalitres per annum yield includes both tranches of desalination, the 250 that has been built, with the operating rules of starting and stopping, 70 per cent, 80 per cent of the total dam storage. It also includes the second 250 part of the desalination, which would be built if the dams ever got down to around 30 per cent. So that is all included in our yield calculations. If we excluded desalination and groundwater, which is not a huge component, I would have to get back to you on what the new yield of the system would be without those two pieces of desalination plant.

The Hon. Dr PETER PHELPS: What did you say was the yield for the desalination plant?

The Hon. STEVE WHAN: Ninety.

Ms DINNING: No, that is output.

Mr TANNER: The output of the desalination plant when it is operating is 250 megalitres per day, which is about 90 gigalitres a year. If it ran 100 per cent of the time and not turned on at 70 and off at 80 per cent of our dams, then the yield would equal its output. It would be about 90 but it is not running 100 per cent of the time. In fact, it is not running now. We would have to go back and do our WATHNET model run without the desalination plant to come up with a new yield figure, which would obviously be less than 610. It would not be any lower than 520 because that is the 90.

The Hon. PAUL GREEN: Can we get an indication of when the desalination plant is on and when it is off—the pattern over the last 18 months or whatever it is?

Mr TANNER: It was finished and it ran for two years, a proving period of two years which finished on 30 June this year. For the last two years up to 30 June it was in its defects liability proving period. It is switched off now and it will not go back on again until our dams drop below 70 per cent.

The Hon. Dr PETER PHELPS: How much did it cost?

Mr TANNER: I think it was $1.9 billion. I would have to check that.

The Hon. Dr PETER PHELPS: With regard to water storages under the control of the SCA, we heard earlier that basically all the low-hanging fruit has been taken. There is nowhere where you could build a dam where it would be economically viable at the current time to build a dam. Is there anywhere in your catchment area where you think a dam would be viable, or are you purely looking at augmentation of existing infrastructure?

Mr TANNER: No, we are looking at all options, and new dams are definitely an option.

The Hon. Dr PETER PHELPS: Do you believe that dams could be constructed which would be economically viable in your catchment?

Mr TANNER: I believe so.

The Hon. Dr PETER PHELPS: It is good to have a bit of controversy between witnesses.

Ms DINNING: No, there is no controversy.

The Hon. Dr PETER PHELPS: Do you have any areas where, if someone gave you, say, $1.9 billion and said, "Go and build something", do you have idea? Have you looked at where you would like to build?

Mr TANNER: Part of the SCA's role is to make sure there is long-term water supply system planning undertaken. We do that. Our assets are obviously very big and they are very long lived—100 years plus—so we have to be looking out well into the future. We do that, and we also feed that information into the Government's metropolitan water planning process and that is where that would be addressed.

The Hon. STEVE WHAN: Is Welcome Reef Dam still off the agenda?

Mr TANNER: Welcome Reef Dam was proposed.

Ms DINNING: Indefinitely deferred.

Mr TANNER: Indefinitely deferred. It was proposed way back in the 1970s.

The Hon. STEVE WHAN: I inspected it in the early 1970s with my father. Indefinitely deferred but my understanding is that you are either re-leasing or disposing of the land that you have held under lease. Is that right?

Ms DINNING: We still have all that land and we do have some short-term leases on some of those properties and we are just renewing them as we go when those tenancies come up. In some cases we are not renewing the leases for no reason other than it is very costly to administer some of those leases, but we still have that land that was acquired by the Sydney Water Board for Welcome Reef.

The Hon. Dr PETER PHELPS: Where would Welcome Reef Dam—

The Hon. STEVE WHAN: Welcome Reef is near Braidwood on the Shoalhaven River. I understand that it is fairly shallow as a water storage so it would not be all that effective, which is what I have been told.

The Hon. Dr PETER PHELPS: You could get another Goulburn.

The Hon. STEVE WHAN: Yes, given that the water already flows down to the Tallowa. I thought I heard somewhere that you were getting rid of the land. I must be wrong.

Ms DINNING: We have been looking at what we can do in the short and long term, but it is indefinitely deferred. We will not be getting rid of any of the land; it is just about leases.

The Hon. Dr PETER PHELPS: If there were a policy decision made by the Government not to proceed with desalination or groundwater extraction, the Government would be able to go to you and you would have plans in place which could provide enough storage capacity for the reasonably foreseeable future through the construction of new dams. Would that be correct?

Mr TANNER: I would have to throw in climate change as being a big unknown.

The Hon. Dr PETER PHELPS: I am a massive climate sceptic so let us assume it is all a furphy. Professor Flannery did of course say that our dams would be dry. Let us just assume that that is not so great as claimed, but excluding that, would you have plans which could be accessed which would provide enough water for Sydney for the reasonably foreseeable future?

Mr TANNER: Yes.

The Hon. CHARLIE LYNN: I imagine that Warragamba in particular would be regarded as a key installation. There are many other threats to that besides just water security and I imagine they have been addressed.

Mr TANNER: Water quality is certainly a risk, as is security. Water quality is—I mean, the reason the SCA was created back in 1999 was a water quality event. In 2007 we had a big blue-green algal bloom on Warragamba Dam. We managed that and managed it well. One of the benefits of Warragamba is the fact that it has this 60 metre differential. We can move our off-takes anywhere in that 60 metres or even go to the low level, the deep water.

The Hon. CHARLIE LYNN: From a security viewpoint, the national terror—

Mr TANNER: Yes, we work very closely with the guys who are all in black. They come out and visit us.

The Hon. CHARLIE LYNN: The rangers.

The Hon. Dr PETER PHELPS: Following on with that, what about the canal? The canal seems particularly—every time I drive over it on the Hume Highway I think if I was a terrorist I could just chuck something in there. Is there an issue with the canal?

Mr TANNER: The Upper Canal is 123 years old now. It is the connection for the four, the Avon, Cataract, Cordeaux and Nepean dams through to Prospect. So it can convey up to 30 per cent of Sydney's water supply. It is an open canal.

The Hon. Dr PETER PHELPS: That is the other problem.

Mr TANNER: It is fenced. It has a huge amount of development pressures upon it from the south-west growth sector, all the way from Campbelltown through to almost Liverpool. It is being put under a lot of pressure. There are a lot of extra road crossings. Structurally it is reaching the end of its life. We have plans to do major refurbishments of it and we are also looking at the long-term future of the canal. It is an important conduit—

The Hon. Dr PETER PHELPS: It is the only one.

Mr TANNER: —because it is the only one and it is taking water from the four dams. If you cannot get the water out of those four dams then you are left with four relatively stranded assets, particularly if the aforementioned climate change variability sees rainfall increase in coastal areas. Those dams are pretty close to the escarpment and they do get more water. If you were thinking the climate might change, there is more rainfall in those coastal dams than in the Warragamba catchment.

Ms DINNING: We have an extensive monitoring program for the Upper Canal. The water is tested all the way through and there are security fences. The water arrives at Prospect for treatment in very good condition.

CHAIR: There was one other issue I will ask you about and that is the issue of stormwater harvesting. I know there was discussion about it when the water supply was critical but have there been any further discussions or long-term plans about stormwater harvesting?

Mr TANNER: I would like to say that all those dams harvest stormwater.

CHAIR: The figures received during the inquiry into the desalination plant were that the urban areas of Sydney produce about 600 gigalitres per year of stormwater, which is a sustainable supply for the city itself. Is there any work being done to look at that and implement stormwater harvesting?

Mr TANNER: Certainly not by the Sydney Catchment Authority [SCA]. The Lord Mayor of Sydney is looking at localised stormwater capture using old railway tunnels under the city to store water in. Stormwater in urban areas is a council issue. Sydney Water has some trunk stormwater canals.

CHAIR: Thank you very much for attending today. It has been an interesting session. The Committee has previously resolved that answers to questions taken on notice be returned within 21 days. There have been some issues you have agreed to take on notice. The secretariat will be in contact with you in relation to those specific issues. If there are any other questions from Committee members that they might wish to put on notice would you be prepared to take those as well?

Ms DINNING: Yes, we would. I understand the Committee is having a tour on 29 August.

CHAIR: Yes. The Committee is visiting the Goulburn-Shoalhaven area.

(The witnesses withdrew)

BRIAN WILLIAM COOPER, Chairman, Dams Safety Committee, and

STEPHEN RODERIC KNIGHT, Executive Engineer, Dams Safety Committee, affirmed and examined:

CHAIR: If you consider at any stage of the hearing that certain evidence you wish to give or documents you may wish to table should only be heard or seen by the Committee could you please advise us and we will consider that request. Would one or both of you like to make a brief opening statement?

Mr COOPER: I will make an opening statement. There are two points the Dams Safety Committee wishes to make: almost half the dams that the New South Wales Dams Safety Committee regulates under the New South Wales Dam Safety Act are owned by local government. A number of these dams are very old, some more than 100 years old, and they are presenting increasing risk to downstream communities and are on lists to be upgraded. A lot of the councils find it difficult to afford the upgrade costs because the upgrade costs often represent a very significant amount of their annual budgets and a lot of councils also have small rating bases. While we do not consider affordability in our requirements for certain dam safety standards, we realise it is a fact of life and one of the issues is that there should be some mechanism to make it easier to provide the funding for these upgrades by local government.

The other matter is that with the extent of growth of large urban areas on the outskirts of Sydney a number of farm dams are being absorbed into new developments and are often being converted into flood retarding basins or retention basins. A lot of these farm dams were built to standards that would be well below what we would normally require for a dam imposing risk to downstream communities. We have already had an incident of one farm dam being overtopped by a flood with water rushing by nearby houses. Fortunately it did not cause damage but it caused great concern. We worry a number of those dams are not getting through to us as being prescribed. I will leave it at that for the moment. They are the two concerns that the Dams Safety Committee has.

CHAIR: Could you explain to the Committee what the requirements are that must be met before a dam is prescribed under the Dam Safety Act?

Mr COOPER: It has to be considered a large dam, which means it has a height of greater than 15-metres, and it has to have a consequence category of low or higher. We have a number of consequence categories that are determined by the population at risk downstream of the dam were that dam to fail. Regardless of how good the dam is, if the dam were to fail and lives downstream were at risk then it would be prescribed. The prescription would be extreme, high, significant or low. If a dam falls within any of those categories then it would be a prescribed dam and appears on schedule 1 of the New South Wales Dams Safety Act 1978.

CHAIR: Are there any other cases where dams of less than 15-metres wall height would be required to be inspected by the Dams Safety Committee?

Mr KNIGHT: We do have quite a lot. Brian mentioned 15 metres. If a dam is in a low consequence category but greater than 15 metres high, it would still be prescribed. If it has a significant or higher consequence category and is less than 15 metres, it will be prescribed. We have half a dozen or so dams that are three or four metres high, typically detention basins that are causing us more concern. They come under our bailiwick now, the urban area detention basins. We do have quite a lot of dams of less than 15 metres high.

CHAIR: In terms of the spillway design return periods required, are there any specifications in those?

Mr COOPER: Yes, there are. Depending upon the consequence category, that will determine the standard of flood required and passed by the spillway. So extreme hazard dams, which have a population risk of greater than a thousand people, that would normally require the probable maximum flood [PMF] and then the size of the flood reduces as you go down the consequence categories. However, we do have our risk framework that we introduced in 2006 into cabinet and with that, we can actually design to a lower standard than the PMF, for example, for an extreme hazard dam. We would still have the PMF as a long-term aim in 20 to 25 years time, but with our policy of ongoing progressive upgrading of dams, the main requirement for a dam owner would be to get the dam to present an acceptable societal risk in the short or mid term.

The Hon. Dr PETER PHELPS: We have heard in earlier testimony people say that they were being required to look at one in 200,000 year and indeed, one in million year events. Is that a little excessive?

Mr KNIGHT: I do not believe it is for the higher consequence category dams. We do not look at it as a return period but as an annual exceedance probability. So, for a significant consequence category dam you might need a one in 10,000 annual exceedance probability. You have a one in 10,000 chance of that flood occurring in any one year and it is the same for even a low consequence category dam. Our standards-based approach would be a one in 1,000 annual exceedance probability. You may think that that is a lot for a low consequence category dam but in fact Lake Mannus Dam—which is our only prescribed dam that has failed since the Dams Safety Committee was formed, that was two years ago—was a large farm dam for recreational use in the Tumbarumba area. It failed by overtopping for an event of about a probability of one in 100 or one in 140 as our estimate and that was two years ago. Our standard for that should be a one in 1,000 as a minimum standard. If it had that, it would have been okay. As it turned out, our low consequence category was probably about right. No lives were lost. There was some damage downstream but we were lucky on that. Our consequence category was right but it goes to show you, that dam suffered a greater than one in 100 probability event and it failed by overtopping.

CHAIR: By way of an example, could you give a description of the scenario there? How big was the dam, how wide was the wall, how wide was the spillway, how much freeboard did it have? Those sorts of things.

Mr KNIGHT: The dam was about nine or 10 metres high. It was an earth embankment dam about 150 metres long. It had two spillways, one on the right hand side and an auxiliary unlined spillway in good rock. It had freeboard above the full supply level of something in the order of a metre and a half and it overtopped by about 600 to 700 millimetres for several hours. It actually held in surprisingly well, probably because the type of earth compaction it was composed of turned out to be good for the type of dam it was. But it could not withstand that sort of overtopping and it failed. Even though it had two spillways, one of which was an auxiliary, it still could not meet it and it had much wider spillways than a lot of purely farm dams. This was a recreational dam that the Council owned.

CHAIR: So to upgrade that to one in 1,000 years would require extra freeboard and extra spillway capacity?

Mr KNIGHT: Yes, in fact in my previous incarnation, before I joined the Committee, I came from the New South Wales Public Works dam design section and I had a fair bit of involvement in the concept design for the replacement or the restoration of that dam and you have hit it on the head—extra spillway capacity and bigger freeboard.

The Hon. Dr PETER PHELPS: We hear a lot about gold plating of infrastructure services. I can understand, for example, putting a requirement on Warragamba for a one in 200,000 year event. Even assuming that sort of event happens four times in 200,000 years—a once in every 50 thousand year event—that still is five times longer than recorded human civilisation. It strikes me that mandating a one in a million year event is so excessive—and of course, these things all have cost consequences—that the cost-benefit of requiring protection against that sort of an event so outweighs the benefit as to really draw into question why we should be doing that.

Mr COOPER: I think there is a matter of terminology here. I reiterate what Steve said when he said, we have got to really think in terms of probability, rather than in term period. The mindset with using a term like the "term period" is that if it happens yesterday then we wait another 200,000 years or so before it happens again. Whereas, in fact, it is a probability of that event happening in any one year. Someone wins Lotto every week and there they have odds of one in a million or one in five million or so, but still someone wins Lotto. So those odds come up and they are not impossible odds, even though they might seem extreme. I accept your point but, for example, I was at a dam in Queensland a couple of weeks ago, Borumba dam, which had floods earlier in the year and the annual exceedance probability of those floods was estimated at one in 500. So certainly a lot bigger than what we typically think of as being one in a hundred as an extreme flood—or certainly the public thinks that. So, these big floods do happen.

The Hon. Dr PETER PHELPS: Is your committee purely advisory, or can you mandate that upgrades must be made to dams? Can you require upgrades to be made?

Mr COOPER: We principally advise the Minister, that is our main role. Even though we are called the Dam Safety Regulator, our main role is to advise the Minister. And when we brought in the risk-based

framework, we changed from being a prescriptive regulator where we had a whole bunch of rules that owners had to abide by, to being a goals-based regulator, which means that they would come to us telling us what they planned on doing and then we would advise them accordingly as to whether we thought that they would satisfy normally acceptable requirements.

The Hon. Dr PETER PHELPS: Do you undertake cost-benefit analysis, or do you simply say: We advise that this be the case, and then leave it to others to undertake a cost-benefit analysis?

Mr COOPER: We would expect that the owner would do their own, both risk assessment and economic analysis. They have to put up their own business case for the safety upgrades to Treasury or to whomever. So they have certainly got to do their own benefit cost ratios.

Mr KNIGHT: Still, the dam owner is responsible for the safety of the dam. It is our responsibility to make them aware of those responsibilities and to lay down goals-based requirements that we would like them to aim for.

The Hon. Dr PETER PHELPS: You know how the public service works and that is, everyone suddenly becomes a cowardy custard when they receive a report that says: You must upgrade it to standard X. They think, "Well, we have to do something because I have now received a piece of paper saying that it is upgraded to standard X".

The Hon. PAUL GREEN: Move the liability on.

The Hon. Dr PETER PHELPS: That is right, the liability can shift: "It wasn't us, we did what the report said."

Mr KNIGHT: We certainly encourage them, if they want to use a different sort of approach, to put a case to us. We examine each case on its merits.

The Hon. Dr PETER PHELPS: But you do not have any direct regulatory role in the sense of saying, "We mandate that you must make changes" or do you?

Mr COOPER: While I said that we advise Minister, we would normally expect that the Minister would accept the advice that we are giving her so that the demarcation, if you like, if somewhat blurred, so I suppose you would say that we would like to think that we would be able to be in a position of mandating a particular standard.

The Hon. Dr PETER PHELPS: It would be very courageous of the Minister not to accept your advice?

Mr COOPER: Yes.

The Hon. PAUL GREEN: We were talking to other stakeholders this morning in terms of skills capacity in light of the loss of engineering expertise to mines and all sorts of things. What is your opinion in terms of the skills capacity of the water industry to ensure dam safety requirements are met not only now but well into the future and do you perceive that there is a shortage of engineering capacity in this critical sector?

Mr COOPER: I do not know whether ICOLD and ANCOLD were explained to you. ICOLD is the International Congress on Large Dams, which is the umbrella organisation for the national groups and in Australia it is the Australian National Committee on Large Dams, which is the learned society within Australia. It is made up of the engineering community that works in dams. Certainly the Dams Safety Committee has an active role within ANCOLD. In fact, one of our members is about to become the next chairman of that organisation. Indeed, it offers us a formal way of talking to other dam safety regulators within Australia because at the annual ANCOLD conference we have an Australian dam safety regulators meeting where we are able to update each other on the goings-on of dam safety regulation within Australia and any issues that there may be.

As far as engineering skills, there is a large emphasis on encouraging young people within the various consultants that work in this area to provide presentations, to write papers and so on, and in fact in New South Wales there is a new chapter called the Young Professionals Group, which is aimed principally at developing an interest in the young engineers working in the dams industry. There certainly has been a shift over the years in

that once upon a time all the big dam-owning authorities had their own design branches, with a huge skill base, all doing dam engineering. That is almost lost now; that has gone right over to the consultants and there are probably at least three big ones that are very active in the dams area—and a few smaller ones as well—but they do have a role now in training engineers within this area.

Certainly there are young engineers within those groups who are very enthusiastic regarding dams. As to whether they will be sufficient for the future remains to be seen. The problem is that with so few new dams being built—and a lot of the work being done is purely studies on safety reviews, that sort of thing—there is not the skills base being developed for the actual design and construction of large dams, so that is something that could well be lacking in the future.

At least a couple of the consultants that are actively involved in Australia at the moment are companies that have a large overseas base as well and currently there is design work being done where while the job is being project managed in Australia, there are specialist areas that are being sourced from their overseas branches but that is just because that particular consultant happened to win the job doing the design work. There may well have been another consultant that would have done it all in-house within Australia but certainly all the consultants are well aware of the long-term problems with getting the required skills for this sort of work. While it draws in a large number of areas of civil engineering like geotechnical, hydraulics, hydrology, structural and so on, having all of those skills within one person is often quite difficult to get and there are not that many people who have all of those skills within their own personal skill set.

The Hon. Dr PETER PHELPS: Do you deal with State-listed redundant dams as well? Is that within your purview?

Mr COOPER: Yes. We have had at least one dam that has been decommissioned over recent years—Wellington Dam out at Wellington. That was demolished. There is currently one that we are dealing with at the moment where we are trying to have it decommissioned or at least demolished so that it is not being used by the council—theoretically not being used—and we want to see it brought to a safe level by part demolition anyway.

The Hon. Dr PETER PHELPS: Flowing on from earlier testimony, do you have a problem with heritage listing of particularly the older dams in terms of having to make recommendations which fit within the heritage requirements of those dams and, if so, would you like to see heritage listings removed from water catchments?

Mr COOPER: That has presented a problem but up until now we have been able to get around that in that there have been environmental impact statements done of proposed works and of course heritage listing is one of the issues that is looked at in some detail and in the end that is provided that the upgrade works does not impact on the external fabric of the dam and we have been able to at least upgrade the dams and satisfy the heritage requirements. Demolition of the dam is a different issue.

The Hon. Dr PETER PHELPS: But as engineers would you prefer there not be those heritage requirements placed on existing water storage?

Mr COOPER: I will not necessarily say that there not be a requirement but certainly I would like to see an ability to have a pragmatic solution to any heritage issues that come up.

Mr KNIGHT: The dam that Brian referred to is an old dam and if the solution comes about that we are hopeful for that there will be a cut down of this dam, there will still be significant full height on the abutments. We will still have the existing old structure, which is over 100 years old and will still be shown from a heritage point of view and I think that would be a good solution. All significant or major upgrades of dams have at least a review of environment factors [REF], if not an environmental impact statement [EIS]; they have to handle heritage issues.

The Hon. PAUL GREEN: Some of the members of the Dams Safety Committee are also dam owners and operators. Do you see any conflict with the operation of the regulatory functions?

Mr COOPER: That was the way the Act was set up in the first place: the membership of the committee was prescribed.

The Hon. PAUL GREEN: I understand, but I am not asking you what the Act says; I am asking: Do you see that there is a potential conflict?

Mr COOPER: Until now, no. Whether it will occur in the future it is hard to say. Certainly we have a conflict of interest register and conflict of duty register for the members. Myself, I work as a private consultant as well and I work on some of the dams of New South Wales, so I have to be careful in some cases if I see that there is a potential controversy with that particular dam as far as the committee is concerned of not being involved in that dam. There have been cases where I have done that. In other cases I am quite prepared to work on the dam. I mostly work as a reviewer, but I declare that potential conflict of interest.

Mr KNIGHT: As we look at it, the committee members clearly know they have to wear the different hat when they come in to work on the committee or subcommittee. I suppose it is like in a court of law where lawyers do become members. They represent the justice system when they are the officer of the court and have to act accordingly. That is how we see it, and I think Brian has explained it fairly well.

The Hon. PAUL GREEN: Is it not like dual roles?

The Hon. Dr PETER PHELPS: It is the only way you get experts; otherwise you do not get experts.

Mr KNIGHT: Can I add on to the experience of people, we also now require, under our new guidance framework that developed from 2006 through to 2010, an expert peer review for the higher consequence of categories of dams for any new ones or upgraded dams. Other than the owner's designated dam consultant, we want an independent peer review. Brian, in fact, does a fair bit of that work. I find that often the average age of those people around the country doing independent peer reviews is quite high. I do not mean that disparagingly.

The Hon. Dr PETER PHELPS: Thanks, Brian.

Mr KNIGHT: Brian is one of the younger ones, actually. What I meant, there is a middle ground where there are not that many people in their mid-age who can handle the role that the independent peer reviewers—

The Hon. Dr PETER PHELPS: They have all gone off to more pro-dam jurisdictions. The Greens do not control everything.

Mr KNIGHT: The really experienced dam designers cover a lot of fields that Brian alluded to, the ones who know the four or five different fields that you have to know.

The Hon. STEVE WHAN: In China?

Mr KNIGHT: They have had the experience of growing up under the older system of all the different State governments having their own dam design teams from thirty, forty, fifty years ago, and their immediate successors have now become the reviewers. Maybe that is a problem in the future until the current generation—there is probably another 10 or 15 years coming through.

Mr COOPER: The problem I have found is that the level of internal review within consultants is somewhat lacking, partly because the consultants themselves are so overstretched in their work that the level of supervision of junior engineers is sometimes lacking. While the role of the external peer reviewer is not to check calculations, that sort of thing, sometimes you have to do it to give yourself some degree of faith in what is being done. That makes the job of reviewing that little bit harder.

Mr KNIGHT: That is where great experience comes to the fore.

Mr COOPER: Often times you can see where there is a glaring error and things do not make sense.

The Hon. PAUL GREEN: There was a submission to the inquiry from Essential Water that notes that the Stephens Creek dam and the Imperial Lake dam have been classified as having "a consequence category of 'High C' for both the Sunny Day Failure and the Incremental Flood Consequence Category". What are Sunny Day Failures and the Incremental Flood Consequence Categories?

Mr KNIGHT: Sunny day failures are things such as earthquake. Typically for embankment dams, one of the biggest causes is what we call internal piping through earth and embankments where there is an internal stability problem with the type of material and lack of compaction. Literally, it is like a pipe develops over time, and the back erodes into the storage, storage can start forming through this internal conduit pipe. Indeed, that breaches through the downstream side, then water rushes through, continues building up, and you can get quite catastrophic embankment failures through piping. There are earthquakes. We are looking at anything that is not directly flood-related. It could happen in the middle of the night, but the non-excessive flood situation is what we call a "Sunny Day".

Mr COOPER: Essentially there is a dry river downstream for the water to flow into.

Mr KNIGHT: Yes. One of the largest dam failures ever was essentially a pipe injuring at early filling, was it not, the American—

The Hon. Dr PETER PHELPS: The American one.

Mr COOPER: Teton Dam.

Mr KNIGHT: That was an internal erosion of the foundations.

The Hon. Dr PETER PHELPS: It was not just a straight earth dam, was it?

Mr KNIGHT: It probably had some rock shells, but a very large dam, and that was a catastrophic failure.

The Hon. PAUL GREEN: Like an aneurysm.

Mr KNIGHT: Yes.

The Hon. Dr PETER PHELPS: Spot the nurse.

Mr KNIGHT: That is not a bad analogy.

The Hon. PAUL GREEN: Feel free to use it.

The Hon. STEVE WHAN: I see one of my local dams, Captain Flats Dam, on the cover of your report.

The Hon. Dr PETER PHELPS: That is one for Mickey.

The Hon. STEVE WHAN: That day caused a bit of flooding. You have provided us with a list of all the prescribed dams. The dams highlighted in green are the dams that have been added to the list, is that right?

Mr KNIGHT: That is how it will come out. That is the list for this year's annual report, which we have 90 per cent completed, and it will be released in the next month and a half. They are the new ones that are prescribed. They either have been built or we think they will be built. We prescribed—

The Hon. STEVE WHAN: Or we have just found them.

The Hon. MICK VEITCH: Chinaman's Dam.

The Hon. Dr PETER PHELPS: Any other dams you know about, Mick, that you want to tell us about and get on the record?

The Hon. STEVE WHAN: Where is the information about dams which are considered to be deficient in standards in some way?

Mr KNIGHT: There is also another two-page handout behind the prescribed dams list. It is table 5. These are excerpts from this year's annual report. They have a similar name. We capped it in 1996. That is upgraded dams. Table 5A is called our highest risk dams list. There are 24 there. They are in alphabetical order.

We do have them ranked. We have a numerical system for the reason why they have come to the top of our prescribed dams list as being highest risk. They are the ones that we concentrate a lot of our efforts and resources on throughout the year.

The Hon. STEVE WHAN: Your efforts and resources in terms of monitoring the status of them?

Mr KNIGHT: Yes, and pushing the dam owners. As Brian said, we certainly look at staged upgradings for some of these dams to reduce the impact of coming up with big up-front dollar costs and to go straight to the final solution. We really do emphasise staged upgradings and give the dam owners some reasonably lengthy horizons to meet that, providing they make a substantial immediate increase. That is our highest risk dams list. There is a numerical basis to it. They fall above what we call the limit of tolerability on our societal risk chart, which I will not go into. We can fill you in if you want to pursue that further.

The Hon. STEVE WHAN: You said you make recommendations to the Minister, presumably about classification or action on a dam. What action can the Minister or the Dams Safety Committee take if you believe an owner of a dam is not meeting reasonable goals to upgrade?

Mr KNIGHT: That goes to section 18 of the Act. We have gone through an earlier process of section 15 where information is tardy and we worry about that particular dam. At the end we can go all the way through to a section 18 where the dam owner is on significant notice: he has to do something almost immediately. We have only ever issued four section 18s since the Dams Safety Committee came into being. We have alluded to one, which we are working through at the moment. The only other thing we can do is if the Minister would declare a state of emergency. If it really was an emergency and something was failing straightaway or on the verge of failing and we could prove that, under the Act, if the dam owner is doing nothing—

The Hon. STEVE WHAN: The Minister has the power in a state of emergency.

Mr KNIGHT: Then we can go in and organise remedial works ourselves and then claim them back through the dam owner.

The Hon. STEVE WHAN: You have got the dams which are on the scheduled list there, but what about the range of other smaller dams such as tailings dams, dams for various other purposes around the community and dams which are now in urban areas. You have mentioned some of those before. In terms of risks of failure with those, how much liaison do you do with local authorities, local emergency services? I noticed during some flood situations you have various alert levels on dams. Are you involved directly in that process as well?

Mr KNIGHT: We are subsidiary to it. One of our requirements for information are the dam safety emergency plans. The DSEPs is the acronym we term them. We set our requirements of that through our guidance sheets for what the dam safety emergency plans should entail, and each dam owner which has a prescribed dam needs to have a dam safety emergency plan. If they are only a significant consequence category they can be a modified or lesser standard of dam safety emergency planning, but all the high and extreme categories, it is a fairly substantial document and management process for that. That is worked out with the dam owners, designated designer and closely with the State Emergency Service [SES].

We have some check review roles in that process as well and we in fact have an emergency management subcommittee that meets several times a year with the State Emergency Service and we talk about the DSEPs and the state of them and whatever. The SES for the high consequence and extreme category dams are the principal authority for managing the emergency planning if there is an incident, but we get notified and we have to keep the Minister informed of developments as they proceed.

The Hon. PAUL GREEN: Would you be also connected to the levy audit committee?

Mr KNIGHT: No.

The Hon. PAUL GREEN: You have got nothing to do with that?

Mr KNIGHT: No.

Mr COOPER: We specifically exclude flood levies, rail embankments, road embankments, those sorts of things, unless they have been specifically designed as a dam. There are a couple of situations in Sydney where part of a freeway has been designed as a flood retarding basin. In that case it comes under our bailiwick, but normally no.

Mr KNIGHT: There was one. The Bulli one was a railway embankment, wasn't it?

Mr COOPER: Yes, but it had been retained as a flood retaining dam.

Mr KNIGHT: We had a section 18 two years ago and actually wanted the dam demolished under a section 18. In fact, that was starting to proceed just when another flood emergency came along, alert levels.

The Hon. STEVE WHAN: Where was that?

Mr KNIGHT: Down at Bulli.

The Hon. STEVE WHAN: I remember that one.

Mr KNIGHT: That was the third of our section 18s in our history.

The Hon. STEVE WHAN: Was that a prescribed dam or not?

Mr KNIGHT: Yes. Even though it was a railway embankment as Mr Cooper said, it actually had been designed as a dam embankment. So that was one of those rare circumstances.

The Hon. Dr PETER PHELPS: And what happened?

Mr KNIGHT: The flood did not breach the thing but the owners—

The Hon. Dr PETER PHELPS: It focused the mind enough for them to demolish it.

Mr KNIGHT: Or at least a designer—the New South Wales public works were working on behalf of the owner—instigated some initial emergency work to help by-wash in case the flood had got up during the course of the flood.

The Hon. STEVE WHAN: I think we also evacuated a number of areas.

Mr KNIGHT: Very much so. The SES and the police were in on that one. But that was just ironic that we had the section 18 notice and the owner had actually started the process of demolishing the dam.

Mr COOPER: But again that is a process of bureaucracy because local government downstream had an environmental order against demolishing the dam. They would not approve the development application.

The Hon. STEVE WHAN: How do you identify dams or ponds which are not on the list which may be a risk? Is there a database of those as well which are not on your prescribed list?

Mr KNIGHT: We have at the moment about 380 prescribed dams. In some of my statistics I have talked about the water storage dams. I took out of the 380 detention retarding basins, because usually they are dry, and also mines' tailings dams. But there are some mine water dams. So the 220 I have listed with statistics are what I call the storage dams. Other than the 380 prescribed dams, which include tailings and detention basins, we have about 550 to 600 non-prescribed dams, ones that have become known over the years and we have not prescribed. We keep some basic data on those still so in case they ever came back or—

The Hon. STEVE WHAN: Is there any regular inspection of those?

Mr KNIGHT: Not on those ones there wouldn't be. We try to inspect a lot of our prescribed dams enough per year so that over a five or six year period we hope to get to see most of them. And we certainly concentrate on the highest risk dams, our staff during the course of each year. But not the non-prescribed ones, unless we knew of something that was maybe a problem, such as Chinaman's Dam. We are relying really on

councils and dam owners or prospective dam owners to provide us with information. It is something that we are pursuing one or two other ideas about how we might be able to expand our knowledge of.

The Hon. MICK VEITCH: But the issue with Chinaman's Dam is it was constructed during the 1860s gold rush in Young by the Chinese. Subsequently the wall has been modified and rebuilt and reconstructed over numerous iterations to the point where that flooding event put so much pressure on it that it finally came to notice.

Mr KNIGHT: That is right.

The Hon. MICK VEITCH: I notice in your report you have not put the construction year, but it goes back a long way.

Mr KNIGHT: I am sure it does, even from the name. About two years ago we instigated a send out to all councils in the State to just ask whether they had any knowledge of any dams, not necessarily their own but within their area, whether they owned them or not. We have received responses from all councils except for now about 20. Out of that process we have probably ended up prescribing another 20 or so dams, I suppose, in the last couple of years through that process.

The Hon. Dr PETER PHELPS: They might have an incentive not to tell you because you might tell them that they need to spend money to upgrade them.

Mr KNIGHT: We put it to them that it was not structures that necessarily councils themselves owned but was within their boundary. That is in fact where a lot of them had come from.

The Hon. Dr PETER PHELPS: But the councils would own the medium-sized—

Mr KNIGHT: Not necessarily.

Mr COOPER: One of the things we are looking at doing is following on from a study that has been done in Queensland where they used aerial photographs and geographic information system [GIS] techniques to look at all the water bodies appearing on Google Earth or whatever. They culled through those to determine those that could potentially be a prescribed dam and then sent out teams for inspecting those. Unfortunately at the moment we just do not have the money in our budget to cater for that, although we are allowing something for it in our next budget, but that is certainly a plan that we have got to follow up in the next year or so.

Mr KNIGHT: But to do it as a major exercise would require a special one-off project. We think there are ways we can go about it on a—we might be able to still do something worthwhile for the limited resources we have. That is the way we are pursuing it, as Mr Cooper said, in the next budget.

The Hon. MICK VEITCH: I want to work out why it takes such a long time to get to where we are. If you look at your table 5A, the very first one, Bethungra Dam, the issues were identified in the year 2000. In 2011-12 we are awaiting a design report. That to me sounds like it is a very long, drawn-out process.

Mr KNIGHT: It can well be and it often is.

The Hon. MICK VEITCH: What would cause that to take so long? What is the issue there?

Mr KNIGHT: Trying to identify the specific problems. You get consultants. Sometimes it is not absolutely clear cut what the specific problem is in terms of what values you put on the parameters to do the stability analysis. But more often than not it is just the dam owners dragging the process out themselves by using a series of ongoing investigative reports and also trying to get money together, trying to come to grips with our requirements in terms of can they afford it, is it worthwhile. The community sympathy towards that may or may not be there.

Mr COOPER: I think also with that particular dam there have been a number of changes of ownership of the dam. Each time prior to that change of ownership we have just about been there. We have planned ahead.

The Hon. MICK VEITCH: So that is not the norm; that is the exception?

Mr COOPER: Yes. There are two exceptions, that one and the other dam that we have a section 18 against, and that has been over a protracted period as well, not for the same reasons but—

The Hon. STEVE WHAN: Which dam is that?

Mr COOPER: Redbank Creek Dam.

Mr KNIGHT: The issue there is a dispute over ownership. That has been one of the problems in the last two or three years.

The Hon. MICK VEITCH: As someone who has walked up and down Talbingo Dam wall in a previous life with surveyors, it has to be one of the highest dam walls in New South Wales. Is that right?

Mr COOPER: Yes.

Mr KNIGHT: It is 166 metres high.

The Hon. MICK VEITCH: I was a darn sight fitter than I am now.

Mr KNIGHT: Maybe Dartmouth would be higher but I believe it is the highest in New South Wales.

The Hon. MICK VEITCH: It says here that inadequate flood capacity is one of the reasons that have been identified to go into table 5.

The Hon. Dr PETER PHELPS: The next one is even worse.

The Hon. MICK VEITCH: Yes, structural inadequacy.

The Hon. Dr PETER PHELPS: Under normal operating conditions.

The Hon. MICK VEITCH: How does that come about? I can remember back in the early 1980s the old Snowy Mountains Authority [SMA] doing a significant amount of works on the eastern side of that wall—they did a lot of repair between the embankment and the wall itself. I would be concerned about a dam of that size having structural inadequacy under normal operating conditions.

Mr COOPER: That is right. Currently Snowy Hydro are undertaking a detailed risk assessment of the dam, which means they go through a process of looking at all the ways that that dam can fail, estimating the likelihood of that failure, working out the consequences if the dam were to fail and then putting the two together to come up with the risk to society downstream.

The Hon. Dr PETER PHELPS: Is there something under "normal operating conditions" that we need to know because I read it as everyday operations? Does normal operating conditions in this context mean 1,000-year floods or anything like that?

Mr COOPER: It goes back to the sunny day failure, I guess. There are a lot of dams, especially dams that were built in the 50s and 60s, that were built with a central clay core and there might be rockfill shells on the outside. In between those on the downstream side of the clay core you have to have what are known as filters, which is sand and gravel. That stops the water taking the fine particles of clay through to the rockfill and leading to the piping situation that has been mentioned earlier. A lot of the dams that were built in that period had this. While they had transition zones of sand and gravel they do not satisfy current standards of filters.

Mr KNIGHT: Or the filters were not taken all the way to near the top of the crest, which would be the modern design.

Mr COOPER: That is right. That is what would be meant by normal operating conditions for that case. Burrendong Dam, for example, had a similar situation and when we went through the detailed risk assessment for that dam it was deemed through that process that an unacceptable risk was not presented by the fact that the filters did not meet modern-day standards. That may well be the case with Talbingo Dam.

CHAIR: Why would that have been—purely because of the height of the wall and the water pressure behind it?

The Hon. Dr PETER PHELPS: Or have the standards increased substantially over time?

Mr COOPER: The standards have changed and have increased probably, but certainly with—

Mr KNIGHT: With knowledge of how the filters work the design standards for filters have changed quite a bit in the last 30 years.

The Hon. Dr PETER PHELPS: What sort of magnitude—doubling the amount?

Mr COOPER: Not so much doubling the amount; it is the way the materials are specified. For example, a lot of the filter materials in those days had what we would consider today to be excess fines. In other words they had silt and clay mixed in with them as well as the sand and gravel. That would therefore compromise their performance as properly working filters. I am pretty sure that is the case with Talbingo. As I said, the risk assessment may well give it a clean bill of health. That comes back to what I was saying before about gold plating. We have a much more pragmatic approach now. We are certainly aware of gold plating and the fact that there is not always a desire to have a Rolls Royce solution.

Mr KNIGHT: I was involved quite substantially with Burrendong; I was the design manager for the upgrade on the raising and it involved the filter work and, as Brian says, quite a good pragmatic solution was arrived at for that dam. You could have excavated 20 metres down on the downstream side to put in filters just to notionally meet new design standards and it was not worth it. We came up with a much more pragmatic, much less expensive good value option as part of the raising.

The Hon. MICK VEITCH: This morning we heard testimony that said phase 1 of the dam safety upgrades is completed and we are going to get a list of those dams—

Mr KNIGHT: From State Water?

The Hon. MICK VEITCH: Yes. We are now moving into phase 2. Clearly they are drawing on your expertise. I guess that what worries me. Bethungra is an example of the lag time from identification. How many dams are we looking at for the phase 2 safety upgrades?

Mr KNIGHT: For State Water?

The Hon. MICK VEITCH: Yes.

Mr KNIGHT: They are working on six or seven and I think they have just about finished their first phase. Now we would be looking at, for some of them, a horizon of at least another 10 years. If it is just getting to the final PMF we might even allow up to 20 years for some of them, depending on how much each one has been upgraded in the first phase and what the improvement is. State Water has been very good in doing portfolio risk assessment a couple of times over the years, including one they are doing at the moment. We accept that within their portfolio they can assign where they should put their best dollar values for the next phase. It does not have to be that each dam has to go through one phase after the other. The next phase will be going through the remaining highest risks across their portfolio and we encourage that so they can spread their dollar value over quite a long time horizon providing we are encouraged that they have that plan actively in process and their plan is in the pipeline. We actually like that. We have to be pragmatic and not just demand, "You must go to PMF. Do it in the next five years for each dam one after the other." That is not a sensible way to go.

CHAIR: When a dam is being designed—I am referring to a smaller size farm dam, maybe with a five-metre high wall and 50 megalitre storage—is there any legal requirement that those have to be approved by the Dams Safety Committee prior to construction?

Mr KNIGHT: Not approved, but we would like any prospective dam owner to provide us with information, a D1 form as we call it, which lists the basic data—and the owner usually gets their designated designer to do so for them—and what they think is the assessment of consequence category. Then it will come through the Dams Safety Committee—through our subcommittee and onto the main committee—and we would review that. If we are happy with the consequence category being assigned, it is either a category we prescribe

or do not prescribe. If we are not happy and we believe through our experience and judgement that the consequence category they have assigned is a bit light on we might ask them for more study and more justification for that. We end up endorsing a particular category and that will lead either to prescription or non-prescription. If often does not with small farm dams, but it can do. As I said, we have quite a few small dams around and if they are sitting right above a community in an urban environment and are four or five metres high and there are quite a lot of houses right below the embankment—if the embankment were to fail, regardless of how well it is designed, we still have to prescribe it.

The Hon. MICK VEITCH: Thank you for all the documentation. Is this all publicly available information?

Mr KNIGHT: We are now making it publicly available. It is really coming out of our database, which people can apply to see. I just tried to present it in different ways so you can see. If you want it presented in a different fashion or you want to ask for any more details of particular dams by all means come back to us.

Mr COOPER: There is a lot of information on our website. We have a whole lot of guidance sheets that are set out in a hierarchical order.

Mr KNIGHT: I have set those out on the last page.

The Hon. Dr PETER PHELPS: Do you have authority for Googong?

Mr COOPER: Yes.

Mr KNIGHT: We do, but not for Cotter, which is in the Australian Capital Territory.

The Hon. Dr PETER PHELPS: Even though Cotter would have downstream consequences?

Mr COOPER: That is something that we deal with.

The Hon. Dr PETER PHELPS: Did they even ask you before they increased the height of the dam wall?

Mr COOPER: No, but we did have discussions with them.

The Hon. Dr PETER PHELPS: They did not ask you but you decided to give them your advice anyway?

Mr COOPER: Yes. We deal with a number of States—Queensland, ACT and Victoria—because there are dams in all those States which, if they were to fail, would impact on New South Wales. Dartmouth Dam in Victoria, for example, would flow into Hume Dam and likely lead to the failure of Hume Dam.

Mr KNIGHT: We have just written a letter to the Victorian regulator asking them to give us more information on the status of the upgrade or requirements for where Dartmouth is sitting in terms of its status. We just like to know because if it flowed into Hume through a dam break in Dartmouth that would be disastrous. Mind you, it was designed to quite good standards. In terms of Cotter, ACTEW would have to be using the ANCOLD guidelines. A lot of ANCOLD guidelines form the basis of our guideline sheets. We tweak some of them.

Mr COOPER: The ACT regulator in fact uses all of our guidelines. Tasmania has also used our guidance sheets for a number of years.

Mr KNIGHT: We are probably ahead of the game compared with a lot of States with our guidance sheets and the risk-based approach. The regulations are a bit light on in a couple of States.

CHAIR: Thank you. It has been a very interesting discussion. The Committee has previously resolved that answers to questions on notice be returned within 21 days. If we have any further questions would you be prepared to answer them?

Mr KNIGHT: Certainly.

(The witnesses withdrew)

(The Committee adjourned at 3.32 p.m.)