

Submission from Ian Landon-Jones on
NSW Dams Safety Review

Dams Safety Review
NSW Trade and Investment
GPO Box 5477
SYDNEY NSW 2001

Re: NSW Dams Safety Review – Community Consultation Paper

The NSW Government has invited input to the review of the Dams Safety Act 1978 (“Act”) and the Dams Safety Committee (DSC) and I welcome the opportunity to provide the following input into this review. I currently hold a number of key positions¹ related to activities and functions central to this review. The following views and opinions expressed are my personal views and do not necessarily reflect those of any of the organisations that I am involved with. These roles however provide me with a very good understanding of dam safety regulation and best practices both nationally and internationally. They include roles as a regulator, industry body, major dam owner and representative on international technical committees.

My submission will primarily focus on the issues raised in the Community Consultation Paper but some specific comments on the KPMG Final Report’s (September 2013) recommendations and the general text of the report will be provided in an attachment.

Firstly, it is agreed that a review of the Act and the DSC is overdue and warranted and it is encouraging to see that the NSW Government has taken the important step of seeking public submissions.

Introduction

The limitations of the review as expressed by KPMG in section 3.1 of their report are important to note. In particular ‘...*this information has been insufficient to conduct a complete benefit cost analysis or draw conclusions*’. The limited extent of the investigation and consideration of regulatory frameworks and good practices both nationally and internationally is borne out by some factual errors, incorrect assumptions and apparent lack of a detailed understanding of the unique and technical issues associated with the dam safety industry and DSC practices in some instances.

Despite these shortcomings, some of which will be discussed in more detail later, many of the recommendations have some merit however a considerable number of them essentially just re-state actual current DSC practice. It is also pointed out that a number of statements or conclusions made in the report appear at odds with the vast majority of the responses to the online survey conducted by KPMG.

¹ *Chairman ANCOLD, Senior Executive of Sydney Catchment Authority, Member of DSC and its Policy and Mining sub-committees, Chair of the DSC Emergency Management sub-committee, Member of ICOLD working groups on Dam Surveillance and Seismic Aspects of Dam Design, and Member of ANCOLD Risk Guidelines 2003 working group.*

Comments on Community Consultation Paper

Under section 1.1 Background, it is stated that the in-kind support of member organisations is approximately \$150,000 per member per year. It is in fact more like \$150,000 per year in total not per member. The paper correctly states the extent of the DSC's role regarding dam operations. The KPMG review states that the DSC should have a greater role. Operations and Maintenance matters play a lesser role in ensuring that dams do not pose an unacceptable risk to life and property, except perhaps in the case of dams that have gated spillways.

For this particular type of dam, of which it is noted there are few in NSW, the DSC gives greater attention to the matter of spillway gate reliability to ensure the dams can safely pass their design floods.

The main reason stated for undertaking this review were concerns raised, by the NSW Commission of Audit and an IPART inquiry, that very small reductions in risk were being achieved at a cost that was disproportionate to safety cost/benefit trade-offs in other industries. It was recommended that a thorough risk and cost assessment be conducted to further examine this matter. By the very nature of the limited level of investigation and detail provided by the KPMG review and report and its limitations as stated above it is not considered that this view has been substantiated.

KPMG addresses this issue in section 5.4 of their report. Their evidence is not provided in the report made available but it is stated that it is based on a limited database on which to draw general conclusions. It is likely that in all cases the pre-upgrade risk would have been in the intolerable region as defined by either ANCOLD or the DSC. In addition, it is believed that in almost all dam safety upgrades based on a risk based approach the level of risk reduction achieved would have been substantial. It is also noted that in the case of dams owned by state government entities, who own most of the major dams in NSW, and that involve a significant upgrade (i.e. >\$10M) they would have been required to go through a separate Gateway Review Process. This process requires a formal detailed business case incorporating a financial or economic cost benefit analysis (CBA) in support of approval of the project.

The risk framework adopted by the DSC and endorsed by the NSW Government in 2006 is consistent with many other regulatory and industry bodies including UK Health and Safety Executive (HSE), ANCOLD, United States Bureau of Reclamation (USBR), Canadian Dams Association (CDA), Spanish National Committee of Large Dams (SPANCOLD) to name a few. The DSC framework provides under the 'equity' principle that any risk deemed intolerable should be reduced regardless of the cost to provide the populace with a minimum level of protection.

Whilst it may be appropriate to utilise the ALARP principle or apply CBA in these cases to compare options such principles should not be allowed to dictate whether any risk reduction is required at all.

Once a dam upgrade has reduced the risk to life to a tolerable level (i.e. where the ALARP principle would apply in determining whether further investment was required to reduce risks even further) there would be few if any cases known in Australia where the Cost to Save a Statistical Life (CSSL) measure of the As Low as Reasonably Practicable (ALARP) principle has resulted in the need for further risk reduction investment. It is also pointed out that, in accordance with ANCOLD risk

management guidelines (2003), which have (subject to minor modifications) been adopted by the DSC, the ALARP principle requires satisfaction of a number of criteria with CSSL being only one of those (see more later).

Another important point must be mentioned here and that is in regards to the degree of involvement of the DSC in determining what risk reduction or standards based upgrade may be necessary. There are many varying and conflicting statements and views expressed throughout the KPMG report on this matter but it is of considerable concern that the view is expressed that the intervention of the DSC in requiring structural upgrades to be implemented has led to over investment in dam safety. This is also stated in part 2 of the Consultation Paper.

The DSC, particularly since the introduction of its risk based framework, with a more 'goals' based rather than prescriptive form of regulation, adopts a more "hands-off" form of regulation than what the KPMG report may infer. Legal case law clearly points out, as do the DSC Information Sheets, that the ultimate responsibility for the safety of a dam lies with the dam owner.

The DSC, as correctly stated in section 2.3.5 of the KPMG report, maintains a combination of prescriptive (standards based) and risk based requirements with which dam owners should comply unless they can provide a sound reasoned case to the contrary. The KPMG report is incorrect however in its statement that the DSC determines the required remedial actions. The DSC's current practice, as clearly spelled out in its Information Sheets, is that it is up to the dam owner and maybe in conjunction with their consultant to consider a full range of structural and non-structural options and then to submit a preferred option to the DSC for their consideration demonstrating how it complies with DCS's requirements.

If there may have been an over-investment in dam safety then it is possible that this is due to the dam owner not having considered or recommended a lower cost but still compliant upgrade option.

The KPMG report also makes a strong case that more emphasis should be placed on non-structural options rather than engineering based solutions. Whilst the consideration of such non-structural solutions is fully supported evidence to date has indicated that for the larger dams with considerable life safety risks such solutions rarely if ever achieve any significant level of risk reduction on their own. There are some examples however where the DSC has considered and accepted such a solution but for dams with lower consequences.

A paper by Chas Keys formally from the NSW SES states: *'There will be limitations on the effectiveness of plans which are designed to assist the response to dam-failure flooding. Evacuation plans are not, after all, the ultimate solutions to enormous problems like dam-failure floods. No plan can anticipate all aspects of an event and make provisions for every response detail; indeed to do so invariably leads to over-planning and inflexibility which can be nearly as bad as failing to plan at all.'*

The KPMG report suggests as stated in section 2 of the Consultation Paper that a regulatory approach similar to that used in Victoria would be more appropriate where the regulator has less of a "hands-on" approach to determining compliance strategies for dam owners, and dam owners are more clearly responsible for ensuring and demonstrating compliance with standards. It is worth making three points here.

Firstly, as described above, it is believed that KPMG has misunderstood some of the current roles and practices of the DSC. As clearly documented in its various Information Sheets and policy documents, the DSC has particularly since 2006 adopted a far less “hands-on” approach and has very limited involvement in dam owner’s consideration of options and determining acceptable solutions be they structural or non-structural. Therefore, the difference in approach between DSC and DSE Victoria is far less than what the report infers.

Secondly, it is not agreed that adopting a more Victorian based model will necessarily reduce compliance costs and this is supported by a strong majority of the survey responses. All jurisdictions within Australia be they regulated or self-regulated essentially adopt the industry based good practice ANCOLD guidelines and therefore the level of investment should be independent of the form of regulation. It really depends on the decisions of the individual dam owners, their degree of risk tolerance and the nature of the dams within their portfolios.

Thirdly, there is a distinct difference between the regulated dam owners in each state and this difference does not appear to have been taken into account in the review. Most major dams in Victoria are under the control of large utility organisations with more likely significant dam safety expertise. NSW on the other hand has a larger number of dams owned by a large number of local councils with many only being responsible for a single dam. Therefore it is more likely that they have a lesser degree of dam safety technical expertise and need to rely more on consultants to undertake their dam safety assessments. As clearly stated in a recent local government forum, such dam owners rely on the DSC to provide them with greater support and understanding of what the DSC’s requirements are.

For these reasons it is believed that the current regulatory approach adopted by the DSC is generally deemed appropriate for the particular dam safety regime and dam ownership that exists in NSW. However it is agreed that the DSC could adopt an even greater ‘hands-off’ approach for those dam owners that have well established and sound dam safety management frameworks and programs in place and that the DSC has a higher confidence in their achieving regulatory compliance and for those dams that present a lower risk to the community. This would still clearly fit within the DSC’s goals based and risk based framework whereby the level of regulation is based on the level of risk to the community.

The Consultation Paper identifies three features of the current regulatory framework as contributing to less than optimal NSW outcomes. It is agreed that there would be merit in providing clearer objectives in the Act but it is believed that this would have no impact on any perceived focus on engineering solutions to achieve public safety. It is considered that the current ANCOLD guidelines and DSC Information Sheets provide sufficient guidance material in this regard.

Despite the considerable efforts of the DSC particularly in recent years to consult with its stakeholders on what its requirements are, more could always be done in this area. On the particular topic of ALARP this is a very technical and difficult issue and as stated in DSC Information Sheet DSC1B involves consideration of all the following matters:

- *The disproportion between the sacrifice (money, time, trouble and effort) in making the safety improvement and the risk reduction that is achieved.*
- *The level of risk in relation to the limit of tolerability and the negligible risk level;*
- *The cost-effectiveness of safety improvement options;*
- *Any relevant recognised good practice; and*

- *Societal concern as revealed by the owner's or proponent's consultation with the community and other stakeholders.*

There has been great difficulty internationally in providing clear and concise guidance material on this difficult issue and therefore limited information is currently available. HSE has provided some guidance notes, as has DSE in Victoria recently and also has ANCOLD and DSC. ANCOLD is however looking at providing increased guidance material but consideration of such technical and ethical issues needs to be undertaken by subject experts.

It is pointed out that a high percentage of survey responses indicated that they were satisfied with the guidance material currently available from ANCOLD and DSC. It is believed that the current risk approach adopted by ANCOLD and the DSC is rationally based, consistent with international good practice and achieves both appropriate equity and efficiency outcomes without the need for applying additional benefit cost analyses of which CSSL is a form anyway.

Regarding the concern that some of the current representatives on the DSC are the same as those being regulated the following points are made:

- It is not believed that the current arrangement has ever caused a significant issue for the functioning of the DSC or an inappropriate or less efficient decision or outcome
- It is believed that the DSC membership should consist of the most experienced persons with selection being based on merit. When the DSC was first formed such expertise was mainly available within the larger dam owning organisations and this therefore met the above desire. However, this situation has changed over time
- It is more a matter of "conflict of duty" rather than "conflict of interest" and based on legal advice it is considered that the DSC has appropriate measures in place in this regard
- To select members who have no potential or perceived conflict would significantly limit the pool of available talent as it would preclude any person from a NSW dam owner or from a consultant firm.

It is considered therefore that it would be inappropriate to specifically exclude any person from a NSW dam owner from being a member of the DSC. However, it is agreed that there is no longer the need for the Act to require that specific dam owners nominate a member of the DSC. It should also be pointed out that members are nominated for representation on the DSC i.e. they **do not** represent the interests of their organisation when undertaking their DSC role. They are nominated because of their relevant technical expertise.

The KPMG report recommends that the DSC be comprised of members with expertise in areas such as dams engineering, public safety risk management and benefit cost analysis. It is first mentioned that the DSC already has a significant amount of risk management expertise within its current members but it is agreed that it is critically important that the skills of dams engineering and risk management reside within its members.

The DSC in the course of undertaking its full role undertakes a wide range of activities. Many of these almost exclusively require dam engineering skills such as review of surveillance reports, Dam Safety Emergency Plans, Design documentation Safety Reviews etc. Therefore, the total amount of member time that would require

risk management, cost benefit analysis, emergency management expertise etc. is relatively minor. Therefore, the need for such skills in full time members of the DSC is questioned.

The majority of the activities undertaken by the DSC are dam engineering focused and therefore a majority of such skills are still considered to be required in the composition of the DSC. The consideration of other options or models whereby such additional skills could be incorporated in an advisory or higher level interagency committee whereby a whole of government consideration is given to investment decisions, may warrant further investigation. This could be incorporated within a Gateway type review process or remain separate. The DSC should remain as a more dam safety technically focussed committee.

The Consultation Paper has proposed a new Act objective. In principle this objective is considered reasonable and appropriate. Whilst the objective may be clear the ability to provide clear guidance to ensure that the objective is met is not easy. Attempts in the past have been made in an effort to determine, in the dam safety context, what level of risk would be deemed acceptable to the citizens of NSW. The KPMG report in section 2.2 concurs that it would be difficult for either the downstream community or the community at large to have the information necessary for them to assess in an informed way what is an acceptable dam safety risk for a particular dam or dams in general. ANCOLD as a professional body has undertaken extensive consideration of public safety risk acceptance in developing its Risk Guidelines. Particularly relating to the specific risks associated with low likelihood but extreme consequences dam failure events.

The deterministic and risk based criteria contained within the various ANCOLD guidelines that are adopted by all Australia states in some form or another and that are in line with most developed countries internationally are deemed appropriate in providing an equitable and efficient approach to determining acceptable dam investment decisions.

It is recognised however that the level of risk reduction and investment in dam safety may not be commensurate with other industries e.g. rail, road, buildings however considering the serious magnitude of the consequences of a single dam failure it is considered that they are consistent with other major hazard industries and in line with international dam safety practice in the developed world.

It is however ultimately a matter for the government to determine appropriate levels of government investment across the whole range of infrastructure risks.

On the issue of whether the Act objective should include consideration of risks to economic and environmental risks it is believed that it should as the fundamental basis upon which consequence categories and risk acceptability are assessed internationally takes into consideration all downstream consequences to the community.

A more proactive approach and early engagement by the DSC in the planning approval process for mines that may affect the safety of dams is supported. Whilst there have been some issues raised with the level of DSC involvement in such matters in the past, the DSC has recently become a lot more proactive in such matters and was recently complimented by DoPI on a very comprehensive submission made.

The issue of planned downstream development is more a matter for dam owners than the DSC however it is mentioned that dam owners are required by the DSC to take account of proposed downstream development when determining the consequence category for their dams. This would thereby account for such development when determining the level of safety required for a dam. It is agreed though that to be able to do so the dam owner must be aware of what development is or may be planned.

Another issue worth raising, that has not been mentioned in the KPMG review, is the separate Section 60 approval process under the Local Government Act 1993. Under this Act, *'local water utilities are required to obtain Ministerial approval for any significant modifications to or construction of local water utility dams and flood retention basins...'*

The Government may like to also review the need for what appears to be some duplication of regulation. It is noted however that Section 60 specifically requires the NSW Office of Water to approve such works. The Act also states that it will do so with assistance from the DSC.

Yours sincerely

IAN LANDON-JONES

ATTACHMENT

Comments on KPMG Recommendations

Recommendation 1

See comments provided above in response to the Consultation Paper.

Recommendation 2

The first part of the recommendation is supported and actually reflects the current practice of the DSC. However the DSC could adopt a more risk based approach in determining the degree or level of monitoring compliance for each particular dam owner or dam.

The 2nd part infers that the DSC is directly involved in the development of compliance strategies. This is considered to be an incorrect inference and it is clearly stated in the various DSC Information Sheets that it is the dam owner, and maybe in conjunction with their consultant, who has this specific role. This is despite the fact that some dam owners may actually prefer a greater involvement of the DSC to assist them with the decision process.

Due to the sometimes very involved, lengthy and technical process in assessing various options as to their compliance with DSC requirements the DSC encourages and does sometimes participate in stakeholder engagement with dam owners to assist in providing clarity and transparency to the DSC's assessment of a dam owner's proposal.

The 3rd part regarding enforcement powers is supported and there are provisions in the Act in this regard but they are considered to be less than ideal or effective in ensuring compliance. The DSC is currently forced to use more of an encouragement approach rather than specific enforcement powers to ensure those dam owners reluctant to ensure their dams meet DSC requirements to in fact do so.

Recommendation 3

See comments provided above in response to the Consultation Paper.

Recommendation 4

No comments are provided.

Recommendation 5

This recommendation is supported and essentially aligns with current DSC policies and practices however it is noted that the direct link between dam owners being aware of their legal liability and their aligning of dam safety investment with the risk of preferences of the broader community is not at all obvious or necessarily valid.

Recommendation 6

This recommendation is fully supported in the cases of significant change and is considered to be in line with good regulatory governance. It is noted however that the DSC has undergone extensive stakeholder consultation in the preparation of its Risk Management Framework and the major revisions to its Information Sheets to reflect this new risk informed and 'goals' based approach to dam safety management. It must be pointed out however that some of the matters that are required to be taken into consideration in dam safety assessments are very technical

and complex (e.g. ALARP) and would only really be fully understandable by subject matter experts. For this reason smaller dam owners would be reliant on consultants advising them on such matters.

Recommendation 7

The principle behind this recommendation is supported and is a current policy of the DSC.

Recommendation 8

This would be a broader policy matter for the NSW Government. Previous comments on the Consultation Paper have highlighted the difficulties in gaining informed community feedback on such complex, difficult and ethical issues. The ANCOLD and DSC risk based criteria have been based to a large extent on the work undertaken by the HSE that undertook extensive stakeholder consultation in developing its risk framework.

The DSC encourages dam owners to engage in consultation with the effected downstream community when proposing risk based dam safety upgrades.

A study undertaken by the CSIRO in 1992 (Community Perceptions of Dam Safety Issues: A Preliminary Study) found extreme difficulty in reaching any informed conclusions regarding the perception of the community to dam safety risks. It is considered that it therefore resides with Government, Regulators and other relevant experts to determine what is an appropriate level of acceptable dam safety risk unless a very comprehensive and costly community study was undertaken. The views of an affected community downstream of a dam are likely to be quite different to those of the general community who have to pay but receive no direct benefit.

Recommendation 9

As stated in the comments on the Consultation Paper, in the assessment of dam safety risks and investments it is considered that the approach adopted by ANCOLD and the DSC has a more sound and defensible basis and more in line with international good practice than an assessment based just on a cost benefit analysis. The former approaches are based on sound underlying principles, do take account of costs and benefits and also include the important equity consideration in providing a minimum level of protection across the community.

In the case of state government agencies they would be required in the case of significant dam upgrades to also undertake a cost benefit analysis as part of their Gateway Review Process.

Recommendation 10

This is a sound principle to allow dam owners to better assess the future potential consequences of a dam and thereby take appropriate actions and make better informed investment decisions.

Recommendation 11

There is also strong merit in this recommendation in that the potential impacts of a dam on and the impacts on a dam from downstream planning approvals can be holistically considered as part of the planning process. This does happen currently in regard to mining approvals but could be extended to other approval processes.

Recommendation 12

It is noted that the consultation Paper provides little mention of the DSC's role relating to mining. It is believed that the DSC's role in regards to mining approvals is clearly defined when it relates to ensuring the safety of dams but in regards to stored waters it is less clear.

The DSC's main focus as stated in the foreword to the Consultation Paper is *"to ensure that prescribed dams in NSW do not pose an unacceptable danger to life and property or adversely affect public welfare"*. This is mainly related to downstream impacts and the last few words are considered to be the important issue when assessing DSC's role concerning water storages. It is understood that the DSC currently considers that water quality, loss of water from upland streams or swamps or other catchment environmental issues do not fall under its consideration when evaluating mining proposals. However the potential for loss of a volume of water, either in the short or long term, from a dam's water storage that could have an impact either directly or indirectly on the public welfare (e.g. loss of yield or potential shortage of water to the community) is a matter currently of consideration by the DSC.

Recommendation 13

The issue of Dam Safety Emergency Plans (DSEP) is another not featuring in the Consultation Paper. Firstly, transferring the role of **approval** of DSEPs to the DSC or another regulator appears to be at odds with the current move to a more 'goals' based regulatory framework. There are no compelling reasons given that the current approach adopted by the DSC (more of a quality check and endorsement role) is failing such that greater regulatory intervention is required.

It is noted however that the Queensland Flood Commission of Inquiry recommended that a regulator/s should have stronger approval responsibilities for DSEPs and it is understood that this has since occurred.

Under current arrangements the DSC, SES and the dam owner all play some role in developing, endorsing or approving DSEPs. DSEPs currently serve two main purposes: to provide actions that a dam owner should take to attempt to prevent failure of the dam during an emergency, and secondly to provide appropriate notification and information to the SES such that they can take appropriate and timely actions to prepare for and to effect, if the need arises, actual evacuations. The latter purpose needs to be consistent with and complement the Flood Plans developed by the SES.

Therefore, it would be inappropriate for the DSC itself to approve the components of a DSEP that relate to SES responsibilities or those relating to the dam owner's internal incident management processes.

A number of DSEPs have been activated during recent floods and it is considered that poor or ineffective DSEPs could pose a significant risk to the community. It is my view that all parties currently involved in the development, approval and testing of DSEPs need to take a greater level of effort and rigour.

In regard to the roles played by the DSC and SES in the review and 'endorsement' of DSEPs one of the main problems seems to be resourcing. Of the current 383 prescribed dams in NSW, 310 of those are required to have a DSEP. Each DSEP

should undergo a routine annual review and a major 5-yearly update and test exercise. The effort required to undertake the current role of the DSC/SES is obviously large and would be considerably larger if an approval role was added. Because of this issue both DSC and SES are having to take a risk based approach in determining the level of effort in reviewing DSEPs but it is considered that this level of input may not be sufficient. It is agreed that additional resources need to be made available to roles related to DSEPs.

It is understood that only about 250 of 310 dams that are required to have a DSEP currently have one in place. It is also understood that some dam owners are not updating their plans on a regular basis as they should and that few DSEPs maybe regularly being tested or exercised. It is also understood that the DSC was only made aware of one DSEP being in fact tested during 2012/13 although several were activated and used during real flood incidents.

Therefore it is considered that dam owners need to give greater priority to developing and maintaining effective DSEPs.

Recommendation 14

The DSC and SES jointly through the DSC Emergency Management Sub-committee (it is noted that I chair this committee) have agreed and recently confirmed what the nature and purpose are of the 'dam failure' alerts. Their fundamental purpose is to provide an appropriate and timely notification by the dam owner to the SES such that the SES can plan for and provide the most successful evacuation outcome.

Setting the actual trigger points is no easy task as in a large number of cases the downstream population can be large and live in close proximity to the dam thereby providing very limited warning time to evacuate. In addition dam water levels can rise very rapidly.

Therefore, in some or many cases, in order for the dam owner to provide adequate warning time for the SES to evacuate all the potentially inundated population before they become impacted by the flood water the notification to evacuate may need to be provided very early during the flood. In one known case it is possible that the warning may need to be based on predicted rather than actual rainfall if there is to be a good chance of evacuating the population. There is also the issue of people relocating to areas that become islands that could be later inundated under a dambreak and roads to such areas maybe being cut-off under much lesser floods.

The DSC and SES are well aware of this issue and the fact that 'red' (evacuation) alerts have been triggered where evacuations either didn't proceed or were found to have not been necessary. It is therefore critical that the dam owner and the SES work together, particularly for these difficult dams, to agree on the most appropriate trigger points such that as much warning as possible is given whilst also limiting the occurrence of 'false' alarms. The DSC and SES have recently facilitated workshops with the dams industry in an effort to provide clearer guidance on the setting of 'dam failure' alert trigger points.

Historically most dam owners have used fixed water levels in setting the trigger points. Also in many cases these levels have been more related to the water levels that might cause failure of the dam rather than also taking into consideration required evacuation warning times. This is believed to be one of the main reasons that has

led to unnecessary evacuation warnings being given in recent times. However, it may in some cases be necessary, in order to provide greater assurance that evacuations will be successful, to have some unavoidable evacuations although these should be minimised. It is a real balancing act between these two conflicting issues .

The DSC and SES are considering the effectiveness and appropriateness of trigger points being based on other parameters such as rate of rise, inflow rates and maybe these in conjunction with fixed water levels. Therefore, measures are already being taken to address the issue raised by this recommendation.

Specific comments on KPMG Report

Some additional comments are provided below on the text of the KPMG report not addressed in the above comments.

Section 2.3.1.2 – States that DSC draws heavily on ANCOLD guidelines in implementing standards for dams where risks are assessed as being unacceptably high. Whilst this is true it is pointed out that the DSC draws heavily on ANCOLD's good practice guidelines in developing and setting the majority of its requirements. The DSC Information Sheets normally state that they adopt the ANCOLD guidelines with some specific qualifications. ANCOLD guidelines in general therefore become dam safety requirements in NSW as they do in the other states.

There is a potential issue however in the approach taken by the DSC. The Information Sheets whilst stating that they adopt an ANCOLD guideline also make reference to some of the more important points of a guideline in order to point these out for the assistance of dam owners. In doing so there is a risk that users of the DSC Information Sheets may misinterpret that the whole of the ANCOLD Guideline is not a requirement of the DSC except for those parts that have been modified or specifically referenced. This appears to have been the case for KPMG based on some of their statements.

The report states that DSC is tasked with interpreting when a risk-based approach is preferable. Whilst the DSC does and may provide guidance as to when a risk based approach could or is preferable to be used the ultimate decision is that of the dam owner and/or their consultants as each dam must be considered on a case by case basis. Risk assessments can be very expensive if undertaken properly and therefore it is up to the dam owner to decide the overall most cost effective strategy to meet DSC's 'goals based' requirements.

Further the DSC does not just allow a risk-based approach to be used where risks lie in the ALARP region but other requirements may limit the benefit of a risk assessment outside of this region. However, where a dam pre-upgrade lies above the limit of tolerability a risk-based approach can be useful in comparing options to arrive at a recommended option that satisfies the LOT and ALARP principles.

It is also pointed out that a risk based approach will not necessarily lead to a lower cost upgrade as it may identify additional risks that may not be identified through a standards based approach.

Section 2.3.2 – The statements made here whilst being more correct appear contradictory to others in the report where it is stated that the DSC plays a more intervention role in determining investment decisions (refer section 2.3.5).

Section 2.3.5 pg. 21 – The DSC does not necessarily require prescriptive standards to be applied where risks lie about the 'limit of tolerability' (LOT) they just require that risks must be reduced below the LOT regardless of the cost involved.

Section 2.3.6 pg. 23 – Whilst the DSC does report monthly to the Minister and annually through its Annual Report there may be merit in the DSC providing a more detailed annual dam safety status report that could provide the NSW Government with more detailed information that would assist in the government making better risk informed decisions on allocation of funding. Information could include:

- List of all dams lying above the LOT – or not meeting prescriptive standards on a whole of NSW portfolio basis
- The agreed proposed program by the dam owner to address such deficiencies
- The expected capital investments required on a forward looking basis to achieve such programs.

This would provide a consolidated view on dam safety investment requirements across the State's whole portfolio of dams on a risk based foundation. This could be used for risk based comparison within the dams portfolio or against other industry investment demands.

Section 2.3.6 pg. 24 – There is an example here where the DSC Information Sheets have been misinterpreted by KPMG where it states that “probable loss of life (PLL) is the DSC's preferred method of classifying dams, whereas PAR and PLL is used by ANCOLD”. It is believed that DSC and ANCOLD both allow use of PAR and PLL but would prefer use of PLL for the reasons stated in the report.

Section 3.2 pg. 26 – The bottom statement regarding the level of consistency between the existing regulatory framework and BRO's better regulation principles is at odds with that in the Executive Summary on page 2.

Table 3 pg. 27/28 – It is considered that the current regulatory framework is consistent with both Principles 3 and 5. The DSC generally undertakes considerable stakeholder consultation when amending its requirements. The one example referenced in the table relates to the determination of consequence categories for dams. In this case the DSC updated its Information Sheet to reflect the newly released ANCOLD Guidelines that had undergone significant stakeholder consultation and extensive impact assessment of proposed changes prior to its release.

Table 4 pg. 29 – A far broader and more relevant comparison should have been made in this assessment. Dam Safety Regulation also exists in Queensland and Tasmania and the comparison should have included these jurisdictions. Also no reference has been made to any international regulators (e.g. FERC in the US) and these omissions may have affected the assessment of best practices made by KPMG.

Sections 4.1.2 pg. 32 – A far wider international historical account of the decrease in dam failures due to increased government intervention would have been useful.

Table 5 (Efficiency) – It is believed that the NSW approach does currently meet the Efficiency (cost) criteria for reasons stated elsewhere in this submission.

Table 5 (Level of Regulation and Responsibility of dam owners.) – It is pointed out that the NSW approach does not have an 'Approval' role.

Section 4.2.2 pg. 38 – The misconception by some dam owners regarding their legal liability for dam failure is of considerable concern taking account of the fact that the DSC Information Sheets make this point very clearly. It is not believed that an Act amendment clarifying responsibilities will necessarily on its own address such

concerns. The DSC Information Sheets would be far more widely read than the Act and these already clearly stipulate the roles of the Regulator and the Dam Owner.

Section 4.3.1 – The report suggests the need for the DSC to have access to independent expertise beyond engineering and to incorporate an advisory panel but this does not appear to have been carried through into the recommendations. For reasons stated in comments on the Consultation Paper, it is not considered warranted that some of the suggested other subject matter expertise be added as full members of the DSC. Consideration could be given however to how such expertise can be incorporated as KPMG suggest through another form (e.g. advisory board or high level group).

Section 4.3.4 pg. 43 – Whilst there may be little evidence to suggest that it may appear that dam owners do not comply with DSC requirements there are many examples where dam owners have been very reluctant to do so and the DSC has had to take action including threatening and issuing S18 notices to force a dam owner to comply. Without such intervention by the DSC these dams may not have been upgraded. Some of these are not small dams and have significant consequences downstream.

Even with the DSC taking such action the necessary upgrades to some dams have been delayed for many years with such dams presenting intolerable risks during this intervening period.

Section 4.4 pg. 44 - Whilst it is agreed that the DSC could undertake further consultation to help address some of the matters raised by stakeholders, an underlying fundamental problem is that these matters can be quite technical and complex and difficult to communicate and to be understood by smaller dam owners with limited internal dam safety expertise. In such cases the dam owners may require external technical assistance to help them manage their dam safety responsibilities. Despite some stakeholders raising such issues it is pointed out, based on the survey responses that these issues are not shared by the majority.

Section 4.4.1 pg. 44 – The DSC generally places draft versions of significantly revised Information Sheets on its website for comment and all Information Sheets are available to be viewed and downloaded from the website. DSC has also used email to advise all dam owners, consultants etc. of new Information Sheets.

Section 4.4.3 pg. 45 – Refer to comments provided above on Table 3

Section 5.1.2 Societal Risk – As the predominant risk associated with dam safety is public safety, as would be expected by society, the main societal risk focus by both ANCOLD and DSC is on life safety. However, the ANCOLD guidelines do make reference to the use of F – \$ curves, as well as F – N curves, where risks can be separately assessed in regard to property and other such financial damages. ANCOLD do not provide acceptance criteria in this case for it also involves a dam owner's consideration of what level of risk they are willing or not willing to accept taking account of their particular circumstances. In addition, the CSSL criteria used in the ALARP principle does and should take account of economic damages.

For a standards based approach, damages and losses are specifically taken into consideration when assessing the Consequence Categories for dams which then can dictate what level of safety is required.

Section 5.2.1 pg. 51 – It is first pointed out that ANCOLD is not a regulator but an industry body. It is strongly disagreed that the tolerable risk level used by DSC, ANCOLD and HSE and now also by a large number of other international bodies is subjective and differs across regulators and that a simple benefit cost analysis would be a more suitable approach. ANCOLD and HSE as well as several other organisations have each undertaken very extensive and rigorous quantitative analysis of data from other similar major hazardous industries and examined a range of different approaches before determining their societal risk LOT approach.

The approach adopted by DSC and ANCOLD has a very sound basis and has been rationally derived with input and review by highly experienced internationally recognised practitioners in risk assessment.

The Societal Risk frameworks used by DSC and ANCOLD or very similar versions of such have now become common accepted practice in international dam safety management. Use of the ANCOLD risk guidelines are referenced in many international papers as being of recognised good practice. Some recent examples of other uses internationally of similar societal risk curves are provided below. KPMG did not make any reference or take account of these.

1. *'Risk Analysis Applied to Management of Dam Safety – a technical guide produced by the Professional Association of Civil Engineers and the Spanish National Committee on Large Dams (SPANCOLD), dated 2013'*. Section 6 of this guideline states that in Spain there is currently no legal criteria or recommendation providing quantitative limits within the scope of risk evaluation. For this reason, the guideline makes reference to and suggests use of recommendations published by other international organisations. They specifically make reference to the three most widely used ones being:
 - *USBR: Dam Safety Public Protection Guidelines August 2011*
 - *ANCOLD: Guidelines on Risk Assessment October 2003*
 - *USACE: Safety of Dams – Policy and Procedures ER 1110 – 2 – 1156, October 2011.*
2. There have also been recent guidelines (March 2013) released by the *UK Environment Agency*. Whilst they use the HSE approach they do state that the HSE framework has significantly influenced other approaches including those of ANCOLD.
3. The *USACE* procedure specifically states in section 5.3.5.4 that its societal risk criteria are in fact based on an adaptation of the ANCOLD and DSC societal life safety risk guideline.
4. *The Canadian Dams Association (CDA) Dam Safety Guidelines (2007)* incorporate in Figure 6-1 a societal risk framework including ALARP that is very similar to the DSC.

There is considerable agreement between the societal risk criteria that have been adopted internationally therefore giving strong support to the approaches being adopted by ANCOLD and the DSC. The adoption of the ALARP principle and the use of the CSSL approach for assessing the tolerability and acceptability of societal risks is also a key fundamental basis upon which all the above approaches have been based.

The above provides strong evidence that the approaches currently adopted by ANCOLD and DSC are in line with international good practice for dam safety risk evaluation. A simple benefit cost analysis as suggested by KPMG as an alternate approach would not be.

Section 5.2.2 pg. 51 – KPMG’s statement ‘*Under the ALARP principle, investments should occur if costs to improve dam safety are reasonable*’ is incorrect and does not reflect the commonly accepted definition which incorporates the works ‘grossly disproportional’.

Section 5.2.2 pg. 52 – The statements that ‘*the DSC is directly involved in determining whether investments are ALARP*’ and ‘*there is a greater focus on structural characteristics of dams, unlike Victoria, in which analysis considers broader factors which affect risk*’ are disputed. KPMG provides little if any substantiated justification to support these statements. It is agreed however, as also stated by KPMG, that ‘*it is difficult to evaluate ALARP*’ for a number of reasons and that there is little information available internationally to assist in this regard although recent efforts have and are currently being made to address this matter.

Section 5.2.2 pg. 53 – Through DSC’s endorsement of the ANCOLD Risk Guidelines they have recommended the use of the ANCOLD ratios for gross disproportion.

Section 5.3.1 pg. 53 – It is agreed that for loss of life above 100 there is a difference between the societal criteria adopted by DSC and that of ANOCOLD and that the DSC criteria could result in increased costs of dam safety investments. In this regard the following comments are made:

- There are very few dams in NSW that would fall into this region
- The ANCOLD guidelines were developed in 2003 at a time when dam safety risk assessment was in its infancy both in Australia and internationally and it was considered at the time that current practice would present difficulties in estimating probabilities below the horizontal truncation line. On the other hand the DSC Risk Framework was put in place in 2006 following application of the ANCOLD guidelines and further international developments
- ANCOLD has established a working group that is currently reviewing its 2003 Guidelines on Risk Assessment. Of particular note is the consideration by this group of the continued need for the current horizontal truncation line.

Sections 5.3.2 – KPMG have misinterpreted the DSC requirements in its approach to the use of ALARP. As stated above the DSC has endorsed the use of the ANCOLD Risk Guidelines and whilst the DSC in its risk policy framework document and its Information Sheets make specific reference to some aspects of the application of ALARP it does not negate the need to fully utilise all other aspects of ALARP which involve more than just the CSSL criteria. For example, DSC Information Sheet DSC2D actually states ‘*The approach to risk assessment is to be that of ANCOLD (2003)*’. There is essentially therefore no difference between the DSC and ANCOLD approaches to the application of ALARP.

It is noted however that the DSE in Victoria has recently produced some guidance material on ALARP. ANCOLD’s working group, based on the feedback from practitioners in applying ALARP, will also look at updating its current ALARP

guidance material including the matter of what is considered to be good dam safety practice in a number of areas.

Section 5.4 pg. 55 – It is unfortunate that this information was not made available to see what evidence KPMG assessed as part of their review.

Section 5.5 – Numerous comments have been provided above disagreeing with the KPMG suggested changes to the level of safety standards in NSW. It is strongly believed that ALARP is a better and more rational approach than a simple benefit cost analysis. KPMG recommend that dam owners should be required to develop a business case for major dam upgrades but then go on to state that SCA and SWC would have been required to do so including a benefit cost analysis for their dams. This would indicate that this process has not altered the investment decisions made to meet DSC's requirements.

Section 6.1.2 pg. 64 – As also mentioned above, there would be little benefit and significant cost implications to include representatives of DoPI and other relevant government agencies as formal members of the DSC as their input would only be required on an infrequent and irregular basis. There may be benefit however in considering another model where an advisory panel of such experts could be accessed when required.

Section 6.2.1 pg. 66 – Whilst it is agreed that water loss due to mining is not generally related to dam safety a significant loss has the potential to indirectly affect public wellbeing if there is an impact on water availability and this is a matter for DSC's consideration.

Section 6.2.2 pg. 67 – Despite what the requirements of the DSC may be for stored waters the normal acceptance criteria of DoPI in its approval conditions is negligible loss of stored waters. It is understood that the DSC does not have any specific requirements for the undertaking of a Monte Carlo analysis.

Section 7.1 pg. 71 – The report states the alerts are raised based on rainfall and forecast weather patterns amongst other things but fails to mention that the most common trigger used to date is that of reservoir water level.

Section 7.4 2nd last paragraph – The statements here demonstrate some lack of understanding by KPMG in the process of setting alert level triggers. Generally to date the setting of the trigger levels has been made by dam owners with little input from the SES for a range of reasons. It has been agreed between the DSC and SES that the alerts are almost solely for the purpose of evacuations and therefore the DSC has little input in the setting of the trigger points for flood related events. It is really for the SES to assess their appropriateness in consultation with the dam owner. A DSC role however would be to do an audit review to ensure they adequately reflect the estimated water level at which a dam may theoretically fail.

Therefore because in the majority of cases the dam owner and/or his consultant has set the trigger points, it is they that have potentially set inappropriate trigger points resulting in unnecessary evacuations at times. It is just a matter of the dam owner and SES collaborating in determining the most appropriate triggers. An issue however is the resourcing requirement this would place on the SES.

Section 7.5 – Whilst this suggestion has some merit historical evidence has shown that particularly in the case of dams with potential for larger losses of life increased emergency management has very limited potential to reduce the need for or the cost of structural investments. The findings of the Hawkesbury Nepean Flood Management review may further demonstrate this point.

Appendix A4 last paragraph – It is noted that the stakeholders did not see the need for any other expert advice on the DSC other than a risk expert. The suggestion that the DSC should have a representative for the councils directly conflicts with the independent nature of the DSC. Current members are nominated for membership of the DSC for the expertise that they can provide to assist the DSC in undertaking its various functions. They are **not** nominated to represent the interests of their own organisation although this may be a misconception of a number of people.

Appendix A5 pg. 83 – This section provides very positive support from the majority of stakeholders that the current combination of prescriptive and risk based approaches used by the DSC achieves appropriate levels of public safety and dam safety investments. This appears to be totally at odds with the conclusions reached by KPMG.

Appendix A6 pg. 84 – The response from stakeholders in regards the clarity of DSC information on the risk based approach and ALARP also appears at odds with the conclusions drawn by KPMG. KPMG have provided limited evidence to support an opposite view to the majority of the stakeholders. They appear at times to go along with a very small number of respondents who have suggested an alternate viewpoint.

Appendix D2 pg. 106 – The statement that the concept of gross disproportion does not seem to have translated into the DSC framework is not true as it is specifically mentioned in Information Sheet DSC2D in addition to the fact that DSC endorses ANCOLD's Risk Guidelines.

It is not agreed that the DSC risk criteria are distinctly different to other industrial hazard industry criteria nor that DoP criteria would be more appropriate to be adopted. It is pointed out that in the case of societal risk for probable loss of life of greater than 10 the DoP criteria are in fact more conservative than DSC and would therefore imply increased dam safety investment spending. This appears to be a contradiction with the main body of the report.

Appendix E – States that the *CDA Dam Safety guidelines (2007)* have a risk curve that is in line with the ANCOLD guidelines but it is in fact more in line with the DSC requirements as it does not contain a horizontal truncation. Whilst the recent UK guideline (*Guide to risk assessment for reservoir safety management, Environment Agency, March 2013*) adopts the *HSE framework (R2P2)* for its risk criteria the guideline does state that the framework has significantly influenced the development of risk evaluation approaches for dams in Australia (*ANCOLD 2003*), North America (*CDA 2007*) and US (*USACE 2011*).

The statement that the ALARP principle is not used in Canada and the US is clearly not true. The CDA 2007 Guidelines Figure 6-1 clearly requires the use of ALARP. The USBR and USACE in the United States also have ALARP as a fundamental requirement for assessing societal risks.