

Dams Safety Committee

Annual Report

2005/2006



ANNUAL REPORT

NSW DAMS SAFETY COMMITTEE

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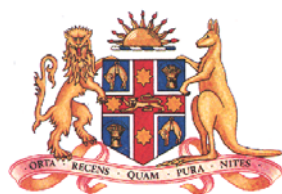
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BUSINESS AND SERVICE HOURS ARE NORMALLY

9.30 am to 4.00 pm MONDAY to FRIDAY

Please note that the NSW Dams Safety Committee (DSC) only has a small number of technical staff who are often away from the office on inspections. Accordingly, technical questions may not be able to be answered immediately, although every effort will be made to pass on messages to ensure a prompt response.



Cover Picture: Lake Canoblas Dam is a 12m high, concrete arch-gravity dam near Orange, which is being analysed to determine its safety status in light of its recently upgraded Consequence Category classification as a result of dambreak studies undertaken by the dam's owner at the DSC's request.

NOTE: The DSC has printed, in-house, 150 copies of this report for distribution to Parliament, relevant organizations, and the public, at a cost of \$1,020.00 (ie \$6.80 per copy).

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ABN 55 079 703 705

The Hon Ian Macdonald, MLC
Minister for Natural Resources, Minister for Primary Industries
and Minister for Mineral Resources
Parliament House
SYDNEY NSW 2000

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Our Ref: 10.102.007

Dear Mr Macdonald,

We have pleasure in submitting to you, for presentation to Parliament, the NSW Dams Safety Committee's Annual Report for the year ended 30th June 2006.

This Annual Report has been prepared in accordance with the *Annual Reports (Statutory Bodies) Act 1984* and the *Annual Reports (Statutory Bodies) Regulation, 2000*.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'Len McDonald'.

Len McDonald
Chairman

A handwritten signature in black ink, appearing to read 'Brian Cooper'.

Brian Cooper
Deputy Chairman

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Overview by Chairman

Our Objectives

The NSW Dams Safety Committee's mission is to develop and implement effective policies and procedures for:

- *regulation of dams safety; and*
- *regulation of mining that could affect dams or stored waters.*

The Dams Safety Committee (DSC) follows a goals-based approach to dam safety. The key goals are that risks to community interests from dams are tolerable, are kept under regular review, and are further reduced where reasonably practicable. Tolerable risk levels take account of modern principles of safety regulation across all industries, of international dam safety practices, and of Australian National Committee on Large Dams (ANCOLD) guidelines. A dam is considered safe if it meets the DSC's requirements.

No prescribed dam has failed but there are continuing failures in other countries, including the developed Western democracies. It is recognized throughout the world that systematic dam safety programs are needed to keep risks tolerable. Programs involve consequence rating, responsible operations, maintenance and emergency preparedness practices, regular surveillance reporting, periodic safety reviews and implementation of necessary risk reduction measures. Most dam owners have such programs.

For the effects of mining on stored waters or dam structures, there is limited guidance from international practice. Over time, the DSC has extended the existing scientific knowledge of these effects through careful monitoring of mining around NSW dams. The resulting DSC requirements enable the safe extraction of coal and mineral resources from more extensive and challenging mining operations, with significant economic benefit to the State.

Targets

The DSC targets are in Sub-section 5.2, Table 2, of this report. The DSC's main focus is still on dam owners having programs agreed with the DSC for activities leading to safety improvements on dams identified as having significant deficiencies. In this way the DSC can monitor progress and follow-up any issues in a timely manner.

Highlights

The DSC managed an unprecedented workload within its modest budget (see Figure 1).

Good progress was made on the review of safety policies to meet modern principles of safety management and good regulation. The review was finalized in late 2005 after taking account of comments by leading safety management specialists, a legal practitioner, dam owners and other stakeholders. The proposed policy framework was submitted for Government approval in June 2006.

Safety improvements commenced on Spring Creek Dam, were substantially completed on Jindabyne Dam and were completed on Company and Sooley Dams. There were further investigations of options for upgrading the flood capacity of Hume, Chaffey and Keepit Dams. The DSC commends the owners for their commitment to public safety. Planning of risk reduction for other dams continued.

Overseas there were damaging floods and earthquakes as well as dam failures with loss of life, but there were no such incidents in NSW. Significant overseas failures included:

- New Orleans Levees, Louisiana, USA – August 2005 - over 1,000 fatalities;
- Taum Sauk Dam, Missouri, USA – December 2005 – several people injured;
- Kaloko Dam, Hawaii, USA – March 2006 – 8 fatalities.

A new Information Sheet on tailings dams was completed and work continued on the preparation of new Information Sheets dealing with dam security, spillway gates and fusible elements, and community consultation. There was good progress on review of three Information Sheets on mining.

Mining around stored waters continued at an unprecedented level throughout the year, without any significant adverse effects. Under DSC oversight, over 12 million tonnes of coal was won from under and near dams – three times the tonnage of the previous year and thirty times the tonnage of 2003/2004. The Dendrobium Mine has almost completed the successful extraction of two longwall panels without adverse effects on the reservoir of Cordeaux Dam.

All targets were substantially met. Some site inspections remained below target, mainly due to the continued high level of activity on mining oversight.

Our People

The DSC members kept their knowledge up-to-date by professional technical activities external to the DSC. The DSC is still represented on the Board of the Mine Subsidence Technological Society and Engineers Australia, and continues to be involved in ANCOLD and ICOLD (International Commission on Large Dams) matters. Most DSC members and technical staff attended the 2005 ANCOLD Conference on Dams. Other training for members and staff included attendance at various relevant seminars and refresher courses.

Once again the DSC wishes to record its appreciation of the dedication, loyalty and innovation of its staff in meeting a large workload with few people.

Our Stakeholders

The DSC values a good working relationship with dam owners, mining companies, and their consultants. By this means the DSC can communicate its goals and requirements to engage co-operation in achieving dam safety. Once they understand DSC requirements, most dam owners and mining companies recognize their responsibilities and liability, and have a strong commitment to dam safety. Regular contact with dam owners and mining companies gives the DSC an opportunity to gauge the level of satisfaction of these key stakeholders.

Education of dam owners and operating staff is especially valuable in improving dam safety. The DSC has continued with the program to update its Information Sheets. Current and draft Information Sheets are available to stakeholders on CD-ROM and at the DSC's Internet site. The DSC assists stakeholders in obtaining ANCOLD and ICOLD publications and other relevant literature. As in previous years, dam operator training courses were conducted jointly with the Department of Energy, Utilities and Sustainability (DEUS), this year in December 2005 and February 2006.

The Future

As soon as its regulatory policy framework is settled, the DSC will cascade the safety principles down into revised and new Information Sheets to establish the new detailed safety requirements. This large task will be a priority effort in the coming year.

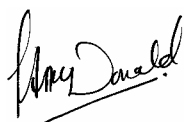
The draft Information Sheets on dam security, spillway control systems and community consultation will be available for stakeholder review and finalized. On the mining side, the revised Information Sheets on administration of mining, management and monitoring, and contingency and closure plans, will also be available for review by stakeholders and finalized. The key Information Sheets on *Demonstration of Safety* and on *Acceptable Flood Capacity for Dams*, are very dependent on the new policy framework and further drafting work will re-commence as soon as the framework is settled. Support of research on piping risks and slope stability will continue.

The DSC will re-visit a 1984 policy on dams in other states, the failure of which would adversely affect NSW communities. Dam safety regulators in the other states will be invited to collaborate in this task.

Efforts will continue in the search for a budgetary mechanism that can cope with marked fluctuations in mining activity near dams.

When the overhaul of the DSC policy framework and the development of detailed safety requirements are completed, New South Wales will be a world leader in dam safety regulation.

The risks posed by dams continue to be reduced. Dam safety management programs are now established for all prescribed dams. Because the consequences of failure for some dams would be catastrophic, the likelihood of their failure needs to be very low – in the order of one chance in a million per annum in some cases. Whilst some NSW dams require further risk reduction, all prescribed dams now have a quite low likelihood of failure. The level status of dam safety in NSW now compares very favourably with that of the best dam safety programs world-wide.



Len McDonald, Chairman

1. Charter

The DSC is required to "formulate measures to ensure the safety of dams in NSW"



NSW Golf Club Dam

DSC staff inspecting a piping failure of this dam in mid-2006. Small private dams, whose failure would not cause loss of life, are not prescribed by the DSC. Several of these dams fail each year and the DSC investigates where practicable to gain valuable dam safety research information

1.1. Why do we have a Dams Safety Committee (DSC) in NSW?

In the 1970's, international concern at several major overseas dam failures led to the Australian National Committee on Large Dams (ANCOLD) raising the need for dam safety regulation in Australian states. There was also significant consideration by the NSW Government as to the extent of mining that should be permitted adjacent to Sydney's major water storages. Against this background, the NSW Government constituted the NSW Dams Safety Committee (DSC) under the *NSW Dams Safety Act, 1978*.

"It is the nature of risk that, frequently, those who create the risk do not bear its consequences or the wider costs. So the market does not function properly as a distributive mechanism. The State must intervene to regulate risk"- [Jenny Bacon, then Director-General of the United Kingdom Health and Safety Executive, 1999].

1.2. What Legislation defines our Function?

The DSC has statutory functions under the *Dams Safety Act 1978*, the *Mining Act 1992* and the *Coal Mine Health and Safety Act 2002*.

1.3. What is the Function of the DSC?

The DSC is required to *formulate measures to ensure the safety of dams in NSW*. It "prescribes" those dams with a potential for failure that could threaten downstream life, cause extensive property or environmental damage, or have a severe impact on the public welfare.

Currently there are 327 prescribed dams (see Appendix B and centre pull-out map) with an enviable safety record internationally compared with countries like the USA which has had over 600 significant dam failures in the last eleven years.

For prescribed dams, the DSC adopts a regulatory ongoing watchdog role to ensure the owners of those dams, and organizations (eg mining companies) undertaking significant activities near their storages, conform to appropriate safety requirements.

The aim of regulation is that the risks of failures, with consequent community and environmental effects, will be tolerably low. In this context, a "safe" dam, or associated activity, is taken to be one that complies with the DSC's current requirements.

2. Access

The DSC's access details are outlined in the inside front cover of this report.

3. Aims and Objectives

In interpreting its legislative charter, the DSC has adopted the following mission statement.

The NSW Dams Safety Committee's mission is to develop and implement effective policies and procedures for:

- *regulation of dams safety; and*
- *regulation of mining that could affect dams or their stored waters.*

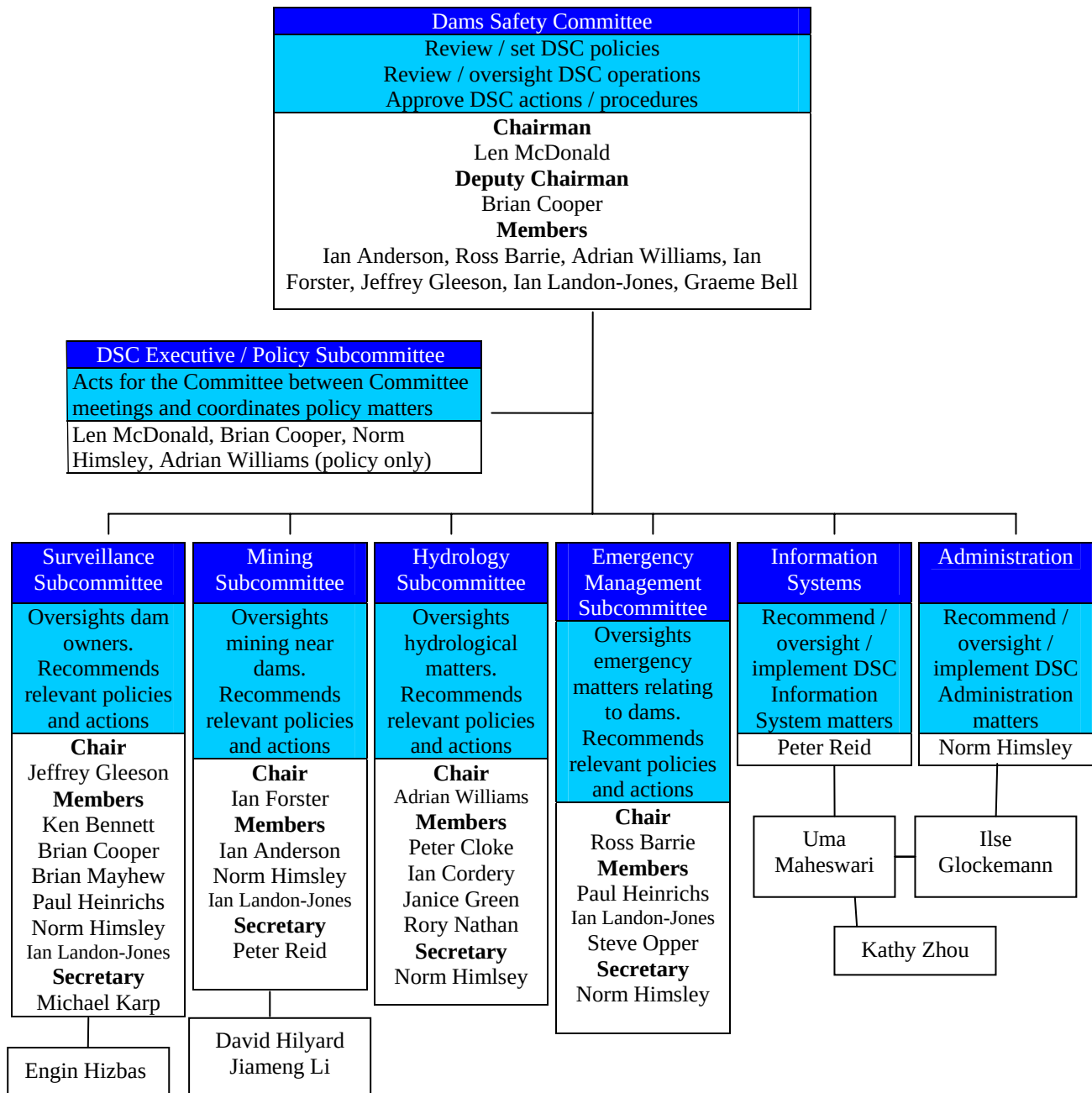
Relevant to this mission statement, the objectives of the DSC are to:

- Protect the safety, welfare and interests of the community from dam failure by ensuring that risks from prescribed dams are tolerable;
- Ensure that risks from prescribed dams remain tolerable over the long-term, by requiring that the risks are regularly reviewed, and further reduced if reasonably practicable; and
- Protect the security of dams and their stored waters from the effects of mining or other activities.

4. Management and Structure

The DSC is a small statutory body with negligible assets or property. It uses staff provided by the Department of Natural Resources and hires contract staff when required. It operates through two Standing Sub-committees (Dam Surveillance and Mining), along with ad hoc Advisory Sub-committees (Policy, Hydrology and Emergency Management). The following chart outlines its organization with most business dealt with initially by the Sub-committees, which report to Committee meetings.

Dams Safety Committee Organization Chart



4.1. Committee Members

The DSC's nine part-time members are appointed by its Minister for four-year terms with eight members nominated for their experience in dams engineering and one for experience in coal mining. In routine matters, the Executive Engineer and standing Sub-committees act for the DSC. Between DSC meetings, its Executive deals with urgent business or emergencies for the DSC. Policy initiatives originate at any level, but are co-ordinated by the Policy Sub-committee before submission for DSC approval. During the year Brian Cooper was elected as Deputy Chairman, taking over from Adrian Williams who stepped down after providing many years of dedicated service in this position.

Committee membership during 2005/2006, with brief member biographies, was as follows:



Len McDonald



Brian Cooper



Adrian Williams



Ian Anderson



Ross Barrie



Ian Forster



Jeffrey Gleeson



Ian Landon-Jones



Graeme Bell

Leonard McDonald, BE, MEngSc, FIEAust, CPEng, LGE (appointed to June 2009). Chairman, Nominee of Engineers Australia. Initially appointed 1987. Len has practised as a private dams' consultant since his retirement as Assistant Principal Engineer, Dams & Civil Section, of the then NSW Department of Public Works and Services. He took over the Chairmanship of the DSC in mid-1997. Until late 2003, he was the Assistant Secretary to ANCOLD and a member of the ICOLD Committee on Dam Safety. Len has more than thirty years continuous experience of dams engineering and safety evaluation, having involvement as a full-time specialist in the design and safety evaluation of many dams.

Brian Cooper, BE, MEngSc, Grad Dip Eng Mgt, MIEAust, CPEng (appointed to June 2009). Deputy Chairman, Nominee of the Minister for Commerce. Initially appointed 1997. Brian recently retired from his position as Principal Engineer, Dam Safety, with the Department of Commerce, Water Technologies Branch and now practices as a private dam safety consultant. He has over thirty years water industry experience including extensive dam design experience working with the Department of Public Works and Services and the Water Resources Commission. He is a member of the DSC's Surveillance Sub-committee.

Adrian Williams, BE, FIEAust, CPEng (appointed to December 2008). Nominee of Sydney Catchment Authority (SCA) until end 2000 and then Engineers Australia. Initially appointed 1986. Adrian was General Manager, Dam Safety in the SCA until retiring in December 2000. He has over thirty years investigation, design and construction experience with dams, through work with AWT/Sydney Water and the former Water Conservation and Irrigation Commission. He is a past Chairman of ANCOLD, past Vice-President of ICOLD and is Chairman of the DSC's Hydrology Sub-committee.

Ian Anderson, BE (Hons.1), ME (Mining), Certificated Coal Mine Manager, Undermanager & Mines Rescueman, Qualified Mine Ventilation Officer (appointed to June 2010). Nominee of the Minister for Mineral Resources. Initially appointed 1994. Ian is a Senior Inspector of Coal Mines with the Department of Primary Industries. He has over thirty years experience in underground and open-cut coal mining and is a member of the DSC's Mining Sub-committee.

Ross Barrie, BE, MEngSc, MBA, MIEAust, CPEng (appointed to March 2007). Nominee of the Water Administration Ministerial Corporation. Initially appointed 1999. Ross is the Assets Services Manager of State Water. He has over thirty years water industry experience and is Chairman of the DSC's Emergency Management Sub-committee.

Ian Forster, BSc, MAIG, RPGeo (appointed to October 2007). Nominee of the State owned Electricity Generators. Initially appointed 1989. Ian is a specialist dam safety consultant with Connell Wagner Pty. Ltd. He is currently responsible for the safety management of dams owned by the NSW State-owned power generators. Ian has over thirty years experience in dam safety management and geotechnical engineering and hydrogeology related to dams, power stations, tunnels and coal mining. He is Chairman of the DSC's Mining Sub-committee and a board member of the Mine Subsidence Technological Society.

Jeffrey Gleeson, BE, FIEAust, CPEng (appointed to December 2009). Nominee of Hunter Water Corporation. Initially appointed 1990. Jeff is Manager, Engineering, Hunter Water Australia, the consultancy division of the Hunter Water Corporation. He has over twenty-five years experience in the water and waste-water field with involvement in various aspects of dam engineering and structural design. He is Chairman of the DSC's Surveillance Sub-committee.

Ian Landon-Jones, BE (Hons), MEngSc, MIEAust, CPEng (appointed to December 2008). Nominee of Sydney Catchment Authority (SCA). Initially appointed 2001. Ian is General Manager, Dam Safety with the SCA. He has over thirty years experience in the water and waste-water fields, through his work with the SCA and previously with Sydney Water, with involvement in various aspects of dam engineering and structural design. He is a member of the DSC's Surveillance, Mining and Emergency Management Sub-committees.

Graeme Bell, BE (Hons 1), FIEAust, MICE(UK), MStructure (UK) (appointed to June 2009). Nominee of Snowy Hydro Ltd. Initially appointed 2005. Graeme is an international specialist private dam safety consultant with over forty years experience in various aspects of dam safety and hydro management.

4.2. Committee Staff

The Committee is assisted by a full-time staff of six, provided by the Department of Natural Resources, with temporary staff assistance where required. Given the extensive workload of the DSC's activities, this small staff provides an effective and efficient service to the DSC's functions. During the year the DSC staff comprised:

Executive Engineer: Norman Himsley, BE, MEngSc, Grad Dip Bus, FIEAust, CPEng. Norm was seconded to DSC in 1986 from a position currently aligned with the Department of Natural Resources (DNR). He has over thirty year's investigation, design and construction experience in dams and engineering services.

Surveillance Engineer: Michael Karp, BE (Seconded 1999-DNR position). Michael has over twenty year's design, construction and surveillance experience in water and dams engineering.

Engineering Geologist and Information Systems Coordinator: Peter Reid, BSc BA (Seconded 1987-DNR position). Peter has over twenty year's experience in geological/mining fields and extensive computer/information technology experience.

Dams Engineer: Engin Hizbas, BE (Seconded 2003-DNR position).

Administrative Officer: Ilse Glockemann, (Seconded 1995-DNR position).

Information Systems Support Officer: Uma Maheswari, (Seconded 2001-DNR pos.).

Mining Regulation Officers: David Hilyard, BA, MAppSc (temp. from June 2003).

Jiameng Li, B.E. (temporary from March 2005).

Information Systems Support Officer: Kathy Zhou (1 month temporary-2005/6).

4.3. Sub-committees

There are two standing Sub-committees, one on Dam Surveillance and one on Mining. There are three ad hoc Sub-committees, the Policy Sub-committee, the Emergency Management Sub-committee and the Hydrology Sub-committee, that meet as required. Membership of the Sub-committees is outlined in the DSC's organization chart (see page 6).

Mr Himsley has been appointed to each of the Sub-committees for his technical input, and to provide effective liaison between the Sub-committees and the Committee. He also provides an important role of liaison with dam owner personnel and other stakeholders.

4.4. Meetings

The Committee held eight normal meetings during the year, of which six were in Sydney and one each at Port Macquarie and at Orange, in association with dam inspections. Attendance at Committee meetings was as follows:-

- | | |
|----------------------|---------------------|
| • Mr L.A. McDonald | attended 8 out of 8 |
| • Mr A.C. Williams | attended 6 out of 8 |
| • Mr I. Forster | attended 8 out of 8 |
| • Mr I. Anderson | attended 8 out of 8 |
| • Mr J. Gleeson | attended 8 out of 8 |
| • Mr R. Barrie | attended 8 out of 8 |
| • Mr B. Cooper | attended 7 out of 8 |
| • Mr I. Landon-Jones | attended 7 out of 8 |
| • Mr G. Bell | attended 7 out of 8 |



Norm Himsley



Michael Karp



Peter Reid



Engin Hizbas



Ilse Glockemann



Uma Maheswari



David Hilyard



Jiameng Li

5. Summary Review of Operations

“Completion of a policy review and preparation of a revised regulatory policy framework with incorporation of risk assessment practices into dam safety management”

“Two deficient dams significantly upgraded in 2005/6”

“DSC updated its records system and procedures”

5.1. Major Achievements for 2005/2006

During the year the following milestones and deliverables were attained:

- Management of a substantially increased workload aligned to the current mining boom, within a modest budget (see Figure 1);
- Completion of a policy review and preparation of a revised regulatory policy framework, with incorporation of risk assessment practices into dam safety management in NSW. The policy framework was submitted for Government consideration in June 2006;
- Further progress in reducing the risks posed by deficient dams in NSW with the upgrading of Company and Sooley Dams, substantial progress with upgrading works at Jindabyne Dam and commencement of upgrading at Spring Creek Dam;
- Substantial compliance with core business activities, as in Table 2 following;
- Investigation and approvals for an unprecedented number of technically challenging applications for coal mining near dam storages;
- Running of two training courses for dam operators;
- Upgrading and networking of the DSC computer systems;
- Upgrading and documentation of DSC procedures;
- Production of updated DSC public information materials including a new Information Sheet on tailings dams and substantial progress on compiling new Information Sheets on dam security, gated spillways, community consultation, and three sheets on mining; and
- Upgrading the DSC's record system, including records' scanning and archiving.

5.2. Performance Indicators

During the year the DSC monitored performance indicators, which reflect the objectives of its mission statement, as shown in the following Figure 1 and Table 2. These indicators illustrate how the DSC has effectively managed a marked increase in workload within its modest budgetary program. Because of the nature of the DSC's work, and the relatively small size of its organization, quantitative indicators are often not entirely appropriate and some of its significant indicators are therefore qualitative.

5.3. Budget Highlights

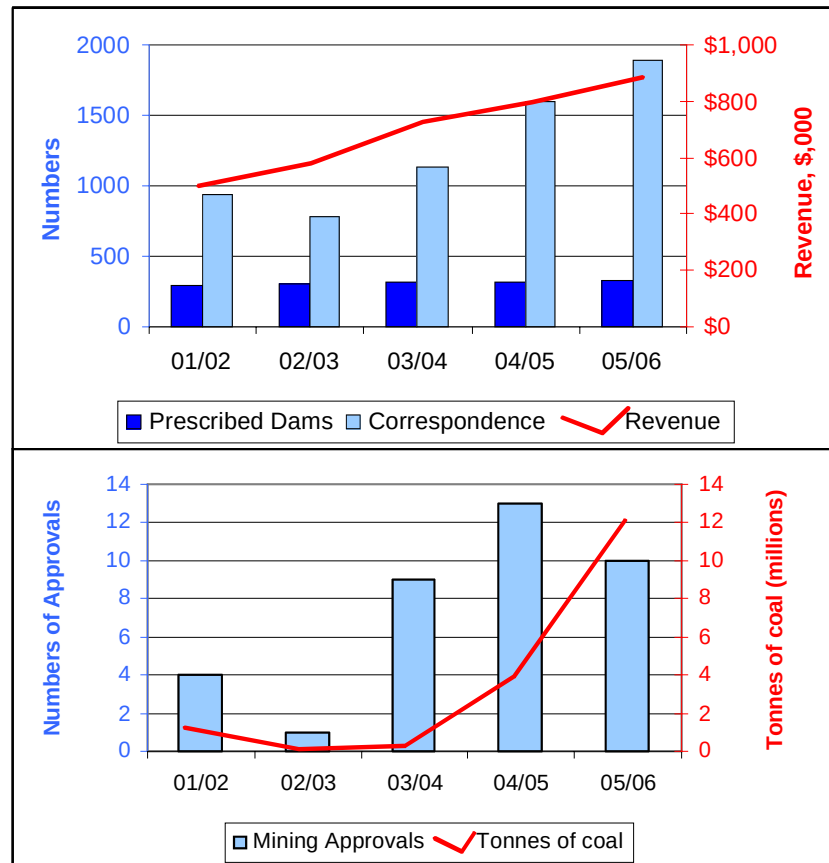
A summary of the DSC's financial performance is shown in Table 1 with full details given in Section 10 of the report. Budgeted expenditure is used, as DSC expenses were included within DNR's funding allocation while new funding strategies are being explored with Treasury.

Table 1 – 2005/6 Budget Highlights

Item	\$
Revised Budget	920,000
Actual Expenditure	956,296

Table 2 - DSC Performance Indicators

#	PERFORMANCE TARGET	PERFORMANCE INDICATOR	RATING
1	Owners programs, agreed by DSC, for safety improvements to significantly deficient dams	Percentage of significantly deficient dams with agreed programs	90% (Good)
2	Follow up action taken within 3 months	Percentage performance	80% (Satisfactory)
3	Reports / programs reviewed and responded within 3 months of receipt	Percentage performance	100% (Good)
4	Inspect significant risk dams (20) yearly	Number inspected this year	16 (Satisfactory)
5	Inspect medium risk dams (30) every 2-3 years	Number inspected this year (average 12 per year)	10 (Satisfactory)
6	Inspect low risk dams (277) every five years	Number inspected this year (average 55 per year)	65 (Good)
7	Request programs for preparation of dam safety documentation for each dam	Percentage of dams with documentation requested	100% (Good)
8	Update DSC education material every 2 yrs	Time since last update issued	Updated in 2005
9	Provide at least one dam safety education course in NSW each year	Number of courses this year	2
10	Compliance with approved DSC budget	Percentage deviation	<4% (Satisfactory)
11	Surveillance Sub-committee	Subjective based on policy progression, reports reviewed (avge 63 reports/yr) and follow ups	Satisfactory. (53 reports)
12	Mining Sub-committee	Subjective based on monitoring compliance, matters followed up and mining impacts as predicted	Satisfactory given high workload
13	Hydrology Sub-committee	Subjective based on policy progression, research oversight and updating of procedures	Good
14	Emergency Management Sub-committee	Subjective based on policy progression, coordination of matters and emergency plans implementation	Good
15	Compliance with Records Management Standards	Subjective based on progression in updating procedures and systems, and programs achieved	Good
16	Administration	Subjective, based on meeting HR, accounting and logistical needs of the DSC	Good



6. The Future

“DSC requires NSW dams to present a tolerably low risk to downstream residents, property, the environment and associated community interests”



Spring Creek Dam, Orange

DSC members and staff inspecting the current construction works to upgrade the flood capacity of the dam to an appropriate safety level.

“The DSC will continue to monitor progress of activities for safety improvements of NSW dams”

“DSC will seek to have a revised policy framework and updated safety requirements in place on key aspects during the coming year”

6.1. Regulation of Dams Safety

The DSC sees that the number of dams in NSW will continue to grow and existing dams will be improved to meet community expectations. The DSC's main objective is to ensure that all prescribed dams present a tolerably low risk to downstream residents, property, the environment and associated community interests.

In particular, the DSC will:

- Continue with its dam safety policy development, with a view to having a revised policy framework and updated safety requirements in place on key aspects during the coming year;
- Complete in the coming year the revised Information Sheet on flood capacity of dams (DSC 11);
- Develop further Information Sheets to assist dam owners on such subjects as spillway control systems (DSC 20), demonstration of safety (DSC 21), embankment dam safety (DSC 22), community and other stakeholder consultation (DSC 23), and dam security (DSC 24);
- Continue to monitor activity programs for safety improvements to dams, especially those identified as having significant deficiencies (Table 5);
- Continue to develop the risk indexing of dams, as a basis for assessing the priority and urgency of safety improvements and activities, in order to achieve the optimum risk reduction with the available resources;
- Continue support of research into dam safety risks, such as the risks of piping (internal embankment erosion) and slope instability;
- Work with NSW dam owners to ensure appropriate dam emergency and security arrangements are in place. Liaise with the State Emergency Management Committee and the State Emergency Service (SES) to facilitate these arrangements;
- Pursue the program to ensure dam owners have in place current Operation and Maintenance Manuals for their dams;
- Maintain liaison with NSW dam owners by continuing the emphasis on education, and by arranging training courses for dam's personnel. The DSC will also arrange staff presentations at meetings and conferences on relevant dam matters, and will provide input to ANCOLD Guidelines;
- Continue to advise dam owners of the value of installing rainfall and flow monitoring equipment to enhance catchment/storage management and flood warning, and to assist in flood analysis, safety review and design. The DSC will continue to promote research into extreme flood estimation and probability;
- Support expansion of the earthquake monitoring network in NSW and collaborate with other agencies in the development of improved seismic analysis of dams, relevant to the characteristics of Australian earthquakes;
- Continue its program to determine the condition of unprotected pressure pipelines through dams and ensure appropriate remedial actions are implemented;
- Maintain liaison with the Department of Environment and Conservation (DEC), Department of Planning and DNR to ensure that DSC dam safety requirements are compatible with environmental protection and planning policies; and
- Hold workshops to explain new policies to stakeholders and to receive feedback on proposed detailed safety requirements.

6.2. Regulation of Mining near Dams

Over the next year, three or four of the fourteen projects actively mining in 2005/6 will cease. However, another three major projects are due to start in the same period. There is also a lag time between the cessation of mining and of monitoring, so it is likely there will be an increase in workload over the next year with this high workload continuing for some years while commodity prices remain buoyant. The DSC is exploring alternative funding options to resource its predicted workload.

The ongoing high operational workload caused the DSC to re-prioritize certain tasks, with a review of its mining regulation policies, programmed for 2005/6, re-programmed to 2006/7.

The DSC's objective is to regulate mining so as not to restrict extraction of NSW coal resources, within the constraint that risks to dams, and their stored waters, are tolerable. It continues to urge mine owners to develop a more scientific approach to prediction of the effects of mining, with the result there has been an increasing sophistication of mining applications reviewed by the DSC.

In addition, improved knowledge and technology is resulting, over time, in the DSC being able to approve the extraction of extra coal from under NSW storages, where mining would have not been approved in earlier years.

The DSC's ongoing initiatives to achieve its objective are to:

- Complete revised Information Sheets on administration of mining near prescribed dams (DSC 32), management and monitoring of mining (DSC 34), and contingency and closure plans for mining (DSC 35);
- Ensure adequate protection of dam walls and stored waters by reviewing the maximum extent of ground movements induced by coal mining and, if necessary, increasing the size of Notification Areas;
- Ensure adequate security deposits are held by the State to allow for the timely implementation of dam safety mitigation works in the event that the safety of a prescribed dam or its storage is threatened by mining;
- Promote compliance within the mining industry, and promote an understanding within other Government agencies, of the DSC's mining regulation requirements;
- Develop a basis for funding its mining regulation function which allows for the variations in workloads due to potentially rapid industry changes;
- Investigate applications of risk management to various aspects of mining developments, and monitor practice and update guidelines accordingly; and
- Explore the use of new equipment and techniques for prediction and monitoring, to provide a clearer picture of mining induced ground behaviour.

6.3. Administration and Information Systems

The DSC will maintain a commitment in 2006/7 to ongoing implementation of Total Quality Management principles. Procedures and practices will be formalised and updated progressively, records management will continue to be updated, and the DSC's database on dam information will be extended and consolidated to assure the timely provision of dam safety information. Training of DSC staff will be kept up-to-date with appropriate requirements to facilitate effective and safe work practices.

The DSC will keep dam owners informed of its current requirements by regularly releasing updated Information Sheets in various formats (eg CD-ROM, DSC website).

"The DSC will investigate applications of risk management to various aspects of mining developments"



Broughtons Pass Weir

The DSC continues to regulate, and monitor the effects on the weir of, nearby longwall coal mining to ensure the weir's ongoing role as part of Sydney's water supply infrastructure.

"The DSC continues to urge mine owners to develop a more scientific approach to prediction of the effects of mining"

"The DSC aims to keep dam owners informed by regularly releasing updated Information Sheets"

7. Review of Operations

7.1. Regulation of Dams Safety

7.1.1. What Dams are Regulated?

The DSC is required to formulate measures to ensure the safety of dams in NSW. The total number of dams in the state is estimated at many tens of thousands, predominantly farm dams. However, the DSC interprets its charter as being to protect life and significant property, environmental and other community interests from the effects of dam failure. That is why the DSC only “prescribes” and regulates the safety of those 327 dams with potential for significant failure consequences as detailed in Appendix B.

7.1.2. Policies and Procedures that Apply to the Regulation of Dams Safety

After being informed of a proposed dam, the initial DSC decision is on the need, or otherwise, for prescription of the dam and its safety regulation by the DSC. These matters are outlined in the DSC’s Information Sheet DSC 1. Then for prescribed dams, as shown in the chart below, the Committee has a range of policies and procedures that facilitate its interactions with dam owners and other affected organizations at all stages of the life of that dam.

Interaction of DSC Over Dam Life Cycle

Phase	Interaction
Investigation	Owners provide proposed dam details DSC decides on prescription and provides ongoing requirements (see DSC 14)
Design	DSC reviews suitability of designers DSC requires design report and reviews major design standards (does not review details)
Construction	DSC requires designer oversight of construction DSC requires Construction Report and Construction Completion Certificate, certifying the designer's agreement with changes during construction
Commissioning	DSC requires Surveillance Report one year after construction DSC requires Operation & Maintenance Manual DSC requires Dam Safety Emergency Plan if downstream lives at risk
Operation	DSC requires regular surveillance and reporting DSC conducts random audits DSC requires submission of Surveillance Reports at regular intervals (usually 5 yearly) DSC requires Safety Reviews at regular intervals (usually 10 yearly) or as needed
Modifications	DSC requirements similar to that for new dam
Decommissioning	DSC reviews proposal DSC requires decommissioning report

For further information on the policies that apply to the regulation of dam safety, refer to the Information Sheets listed in the table below. These are available on-line on our web page (www.damsafety.nsw.gov.au).

Table 3 - Information Sheets for Dams Safety

Document	Description	Update Date
DSC 01	General Information	April 2005
DSC 02	Role, Policies and Procedures	April 2005
DSC 03	Glossary of Terms	April 1998
DSC 05	Advice on Legal Matters for Dam Owners	August 1996(a)
DSC 11	Acceptable Flood Capacity for Dams	August 1992(a)
DSC 12	Operation, Maintenance and Emergency Management Requirements for Dams	April 2005
DSC12-1	Addendum to DSC12	April 2003(a)
DSC 13	Consequence Categories for Dams	March 2002 (c)
DSC 14	Requirements for Submission of Information by Dam Owners	April 2005
DSC 15	Requirements for Surveillance Reports	January 2003(a)
DSC 16	Requirements for Earthquake Assessment of Dams	February 2000(c)
DSC 17	Requirements for Assessment of Flood Retarding Basins	April 2005
DSC 18	Dam Design and Construction Issues requiring Particular Consideration	April 2005
DSC18-1	Addendum to DSC18	April 2005
DSC 19	Tailings Dams	December 2005

Note: (a), (b) indicate revisions of initial Information Sheets. Date changes only when there is a Policy change.

7.1.3. Changes introduced in 2004/2005

During 2005/6 the DSC:

- Completed its review of policy and prepared, for submission for Government approval in mid-2006, its revised policy framework, which consolidates and extends the DSC's earlier policies and proposes a staged implementation of risk assessment methodologies into dam safety regulation;
- Implemented a new Information Sheet DSC 19 on *Tailings Dams*; and
- Substantially completed initial drafts of new Information Sheets on *Spillway Control Systems*, *Community Consultation* and *Dam Security* for stakeholder review in the coming year.

“Staged implementation of risk assessment proposed for dam safety regulation”

7.1.4. 2004/2005 Dams Surveillance Matters

The DSC continually reviews its list of prescribed dams in the light of new proposals, changed conditions, staff inspections and information supplied, to ensure that only dams with the potential for significant failure consequences are prescribed. During the year 15 dams were prescribed and 2 dams were de-prescribed, giving a total of 327 prescribed dams at June 2006 (see Appendix B and centre pull-out map).

For proposed prescribed dams and dam modifications, the DSC requires dam owners to provide design information for its review before construction. In all, 22 such submissions were processed during 2005/6. The DSC usually confines its review to ensure major safety criteria (eg flood capacity, filter provisions) are addressed, and that the designers are competent but may challenge any design aspect that is of concern. The DSC also requires the submission of copies of design reports and independent expert reviews of significant dam proposals.

The DSC requires designers' involvement in the dam construction process, to approve design changes and “sign-off” that the “as-built” design is sound. DSC staff also audit construction and maintain close contact with, and assistance to, the owner's personnel.

Upon completion of construction, the DSC requires dam owners to submit work-as-executed drawings and the “construction completion certificate” (certifying designer's approval of changes) for the DSC's records with thirteen certificates received in 2005/06.

The DSC then requires Surveillance Reports to be regularly submitted, summarising the behaviour of the dam since construction. The first report is to be submitted usually after first filling of the dam, which is a critical phase in dam safety, but no later than one year after construction. Thereafter, Surveillance Reports are required at not more than five yearly intervals (with annual update reports also required for most mining dams).

These reports provide information on the safety status of existing dams and are checked in a staged process by DSC staff, its Surveillance Sub-committee and then the Committee. The reports enable the DSC to monitor whether dam owners are continuing with a responsible approach to their dams at all stages during their lives. The reporting extent varies, with comprehensive reporting required for extreme consequence category dams, down to brief reports for low consequence category dams (see DSC 15).

During 2005/6, the DSC reviewed 53 dam Surveillance Reports (Appendices A and B). This was about 85% of the number that ought to be reviewed to avoid a backlog developing. The difficulty lies with timely submission of reports by the dam owners. The DSC has written to owners with a view to preventing a serious backlog developing. Surveillance Reports are stored in the DSC's record system and progressively incorporated into the DSC database. Provision of electronic copies of each report is now a standing requirement. The DSC considers that the content and presentation of Surveillance Reports is now of a generally high standard and that the majority of owners are responding in a positive and responsible manner to its requirements.



Ashton Tailings Dam

In 2005, the DSC prescribed this tailings dam and oversighted its design and construction. It consists of a collection of banded tailings ponds for the treatment of coal washery waste at Ashton Colliery near Singleton

“15 dams prescribed, 2 dams de-prescribed and 22 dam designs processed in 2005/6”

“53 dam surveillance reports reviewed in 2005/6”

“91 dams inspected during 2005/6”



Grahamstown Dam Spillway

DSC members and staff inspecting the labyrinth spillway which was completed in 2005 to upgrade the dam's flood capacity to an appropriate standard

“The DSC provides regular updated Information Sheets to dam owners on relevant dam safety matters”



Jindabyne Dam Spillway

Upgrading of the spillway at Jindabyne Dam is programmed to be completed in late 2006 to ensure an appropriate flood capacity for the dam and to allow release of increased environmental flows down the Snowy River

The DSC continued with its regular staff inspection of dams, and discussion with owners, throughout the State. Inspections by DSC members in conjunction with country meetings also continued. Overall 91 prescribed dams were inspected during the year (see Appendices A and B) against a target number of 87 dams. However, inspections of significant and medium risk dams were below target, with the continued high level of effort on policy review and mining oversight again diverting resources from dam inspections. The situation is judged to be tolerable for the time being. These inspections and meetings, whilst temporarily not meeting all targets, are essential in the long-term to audit the general safety standard of each dam, its consequence category, and the actual performance of each dam owner in complying with DSC requirements. Any deficiencies detected are brought to the attention of the owner's representative, and any concerns discussed on site. The inspections also provide useful background knowledge and photographs, against which Surveillance Reports can be evaluated and assessed by the DSC.

7.1.5. Status of Dams Safety Assessment

With completion of its major review of safety policies, the DSC now expects to enter a transitional phase in the assessment of dam safety. Dam owners will finally see the impact of changes in safety requirements as revised and new DSC Information Sheets are issued. Owners will have the opportunity to contribute in the development of these detailed requirements through the DSC process of stakeholder consultation.

It is a central tenet of the DSC approach that dam owners, in some situations through their agents, are legally responsible for the safety of their dams and to ensure the risks from their dams are tolerable. As a regulator, the role of the DSC is to ensure that dam owners discharge this responsibility and that community interests are adequately protected.

To assist owners in this regard, the DSC provides regular updated Information Sheets setting out the normal safety requirements of the DSC. However, the policy of the DSC is to judge each case on its merits. It will consider any dam safety proposals from dam owners provided they are soundly researched, within the bounds of accepted practice, and result in tolerable risks. Activity in developing revised and new Information Sheets is currently at a high level.

To adequately assess owners' proposals, the DSC needs to keep itself updated in all areas of dam safety regulation and management. All DSC members continue to be professionally active outside their DSC role. Also, staff and members attend relevant technical symposia, along with meetings with representatives of various dams' organizations, and of hazardous industries generally.

To provide background data needed for safety assessment studies, the DSC has continued to encourage dam owners and Government agencies to install and maintain rainfall/runoff and seismic monitoring equipment.

A process of risk assessment is now considered desirable to assist in evaluating the relative safety of each dam, to assess risk reduction options, and to assign priority and urgency. During the year, the DSC has completed a regulatory policy framework, which integrates the traditional engineering standards-based approach to safety with risk assessment methods in determining the safety status of dams.

The DSC continues to support research into the estimation of risk associated with piping in embankments and foundations, the derivation of extreme rainfall estimates, and the risk assessment of slopes.

The DSC sees that the risk assessment approach of the national standard AS/NZS 4360:2004 *Risk Management* provides a framework for comprehensive assessment of dam safety over the whole range of potential failure situations and provides a better understanding of relative risks and consequences. Risk assessment will better clarify safety and thus provide for more informed decision-making. Risk assessment requires that the analysis team work with the decision-maker, and communicate appropriately with the affected community, to formulate an informed overall judgment of the safety requirements for a dam.

The effectiveness of emergency response actions is a consideration in judging the tolerability of risk. A Dam Safety Emergency Plan (DSEP), required by the DSC for any dam where lives are at risk, is one contribution to risk reduction. For dams with a significant safety deficiency, there is an additional contribution by the SES. For these dams, the DSC, through its Emergency Management Sub-committee, has developed a protocol with the SES for the development of interim emergency response plans.

From information received on dams, the DSC identifies those with possible safety deficiencies and reaches agreements with owners on needed safety improvements, or the activities needed to clarify safety, and a timetable for actions. Once it has been established that a dam has a significant safety deficiency, the owner is to submit a program for safety improvement. To focus the attention of the DSC across owners, it regularly updates its provisional risk index ranking of dams and the SES is informed to guide them with interim flood planning downstream of deficient dams.

With most attention on the dams of Table 5, the DSC then monitors activities against the safety improvement program, which can necessarily extend over many years to allow for detailed investigations and community consultation, financing and implementation.

This process continued throughout the year. Forty three deficient dams have now been modified for safety improvement following the DSC's establishment, as shown in Table 4. For some of these dams, there has been a series of improvements made. In 2005/6 flood upgrading works were completed on Company and Sooley Dams with upgrading works substantially advanced on Jindabyne Dam and initiated on Spring Creek Dam.

Table 4 - Dams Modified for Safety Upgrading

Dam	Upgrade Cost Orders (\$M)	Deficiency	Year Upgrading Completed	Nature Of Upgrading
Ben Chifley	10-100	Flood	2001	Dam raised and spillway post-tensioned
Burrinjuck	10-100	Flood	1996	Dam raised 15m and post-tensioned
Blackbutt	<1	Flood	1995	Spillway upgraded
Bonalbo	<1	Flood	1989	Spillway upgraded
Captains Flat	1-10	Flood/Stability	1993	Dam post-tensioned
Cataract	10-100	Flood/Stability	1987	Dam post-tensioned
Chichester	1-10	Flood/Stability	1995,2003	Dam post-tensioned, abutment stabilised
Coalcliff	<1	Flood/Stability	1999	Spillway enlarged, embankment upgraded
Company	<1	Flood	2006	Spillway enlarged, embankment raised
Cordeaux	<1	Flood	1988	Internal drainage improved
Dungowan	1-10	Flood	1992	Spillway augmentation, dam raising
Dunn Swamp	<1	O&M	1995	New outlet, wall repair
Emigrant Creek	1-10	Flood	2001	Dam post-tensioned, abutments raised
Foothills Rd	<1	Flood	1997	Embankment stabilised, new spillway
Glenbawn	10-100	Flood	1986	Dam raised, storage augmented, new spillway
Googong	10-100	Flood	1992	Dam raised, spillway stabilized
Grahamstown	10-100	Flood	2001,2005	Dam core raised, face armoured, spillway upgraded
Green Meadows Basin	<1	Flood	2003	Embankment & crest stabilised, new spillway
Honeysuckle Ck	<1	Flood	1991	Post-tensioned and raised
Hume	10-100	Stability/ Earthquake	1973,2003	Embankments stabilised, gates/outlets upgraded
Killara	1-10	Stability	1994	Embankment walls stabilized
Lyell	10-100	Flood	1996	Dam raised, spillway and storage augmented
Manly	1-10	Flood	1984	Dam post-tensioned
Mardi	1-10	Earthquake	1991	Embankment stabilized
Moolarben	<1	Flood	1993	Spillway augmented
Nepean	10-100	Flood/Stability	1992	Spillway augmented, dam post-tensioned
Northmead Basin	<1	Flood	1994	Embankment raised, strengthened
Oberon	10-100	Flood	1996	Dam raised, additional spillway
Orange Agricultural	<1	Flood	1997	Spillway augmented
Palm Tree Grove	<1	Flood	1990	Embankment raised, strengthened
Pindari	10-100	Flood	1993	Dam raised, storage augmented, new spillway
Prospect	10-100	Earthquake	1997	Upstream dam embankment stabilised
Rydal	1-10	Stability/Flood	1993	Dam wall stabilised, spillway augmented
Rylstone	<1	Flood	1995,2003	Auxiliary embankments removed.
Sooley	10-100	Flood	2005	Dam raised and buttressed, new spillways
St Joseph Sch. Basin	<1	Flood	2001	Bank stabilisation and new spillway
Tilba	<1	Flood/Stability	1997,2003	Dam wall raised, toe drained
Tumbarumba	<1	Stability	1999	Embankment drainage installed
Warragamba	>100	Flood	2001	Dam post-tensioned, raised 5m, new spillway
Wentworth Falls	<1	Flood	1993,2003	Dam raised, spillway augmented
Wellington	<1	Flood/Stability	1996,2002	Dam demolished
Wollondilly Washery	<1	Flood	1998	Dam raised, emergency spillway installed
Woronora	<1	Flood	1988	Internal drainage improved

The dams currently identified as posing significant safety risks are ranked in Table 5, together with the year in which the deficiency was determined, and the status of the safety improvement program for each dam. Dam owners have commenced safety deficiency studies, improvement options studies or design of improvement works for all of these deficient dams, and the DSC monitors their progress. If owners fail to achieve satisfactory progress, the DSC works with the owners to ensure an improved outcome. Should owners not respond positively, the DSC could issue a notice under Section 18 of the *Dams Safety Act*. It was not necessary to issue any Section 18 notices during the year. In addition, the DSC is monitoring owners' progress in developing action programs for dams with minor deficiencies, and owners' investigations of several other dams to confirm their safety status (see Appendix B).

As mentioned in previous DSC Annual Reports, significant safety improvement works at Hume Dam have been completed at a cost of over \$80 million. In addition, a DSEP by the owner, and a downstream flood plan by the relevant emergency agencies, has been instituted and tested several times to minimise the risks to downstream residents. The remaining safety evaluation area for the dam, the dam's flood capacity, is currently nearing the end of its investigations as a prelude to development of improvement options.

The DSC has continued to liaise closely with State Water on the reduction of risks at Keepit, Chaffey and Bethungra Dams. At Keepit and Chaffey Dams, interim safety improvements have been implemented and community consultations continued to facilitate planning for long-term safety improvements. An interim flood warning system has been implemented at Bethungra Dam while community consultations continue into long-term options.

In 2005, Snowy Hydro Ltd commenced construction of a major flood capacity and environmental flow upgrading of Jindabyne Dam at a cost of over \$50million. These works are programmed for completion in late 2006.

Work continued, during the year, on a prioritised program to improve the safety of 20 deficient dams in the portfolio of dams owned by local government councils. This portfolio is under the jurisdiction of the Department of Energy, Utilities and Sustainability. Rylstone and Wentworth Falls Lake Dams were improved in 2003, Sooley and Company Dams upgraded in 2005/6 and upgrading construction works were commenced in 2006 on Spring Creek Dam.

Table 5 - Status of Dams with Significant Safety Risks

Dam	Deficiency		2005/2006 Upgrading Progress
	Type	Identified	
Hume	F	1994	Stability/seismic works completed, studies of flood requirements continuing (FWS).
Redbank Creek	F,E,S	1996	Design of improvements in progress (FWS).
Spring Creek	F,S	1994	Safety improvements under construction (FWS).
Lake Endeavour	F,E,S	1995	Upgrading options being investigated.(FWS).
Coeypollly Ck 2	F	1993	Upgrading options being investigated (FWS).
Bethungra	F,E	2000	Upgrading options being finalized for construction (FWS).
Dumaresq	F,S	2000	Upgrading design programmed for 2006/7 (FWS).
Keepit	F	1995	Interim works completed. Finalizing long-term options (FWS).
Chaffey	F	1995	Interim works completed. Finalizing long-term options (FWS).
Burrendong	F,S	2003	Investigating long-term options (FWS).
Imperial Lake	F	2000	Upgrading options being investigated.
Jindabyne	F	2001	Upgrading commenced in May 2004 for completion in late 2006 (FWS).
Lake Rowlands	F,S	2003	Consultant engaged for detailed safety review.
Khancoban	F,S	2001	Upgrading options being investigated (FWS).
Winburndale	F	1995	Revised dambreak studies commissioned (FWS).
Lake Canobolas	F	2002	Surveillance Report recommendations being reviewed.
Blowering	F	1996	Staged upgrading works programmed to commence in 2006/7 (FWS).
Cecil Park Basin 3A	F,S	2004	Upgrading being designed
Rocky Creek	S	2005	Investigating upgrading options (FWS)
Talbingo	F, S	2005	Upgrading investigation program requested (FWS)
F - Inadequate Flood Capacity			E - Inadequate Earthquake Structural Resistance
S - Structural Inadequacy under Normal Operating Conditions			FWS - Flood Warning Systems installed

7.1.6. Flood Capacity and Hydrology

The continuing drought in NSW has dam owners pre-occupied with drought security. However, floods can occur at any time and the DSC is maintaining the effort to bring all dams to an acceptable flood capacity as soon as reasonably practicable.

World-wide, inadequate flood capacity continues to be the most serious dam safety problem. This is the experience in NSW also, as reflected in the deficient dams listing (Table 5). The main reason for the many dams with inadequate flood capacity is the steady advance in the understanding of extreme events by meteorologists and hydrologists. It is now recognized that flood estimates made some decades ago were generally too low. Because of advancing knowledge about floods, the DSC requires NSW dam owners to undertake regular reviews of the flood capacity of their dams to see if safety improvements are needed.

Initially, generalised Probable Maximum Precipitation (PMP) estimates are required to define extreme storm rainfalls for each dam. The Bureau of Meteorology sets the procedures for this work. These PMP events, while very rare, are plausible and several near PMP events have occurred (ie a record storm at Dapto in 1984 dumped 515mm of rain in 6 hours). Generalised procedures are now available in NSW for PMP storms of any duration and area.

Rainfall estimates then need to be converted to flood predictions by the dam owner's hydrologists, using approaches outlined in *Australian Rainfall and Runoff*, produced by Engineers Australia.

The DSC has put on its Internet site a draft of its updated flood requirements (Information Sheet DSC 11), which it plans to finalize in the coming year. In setting its requirements, the DSC has been guided by the advice of its Hydrology Subcommittee, which maintains a close liaison with ANCOLD, Engineers Australia, and with hydrologists from various authorities, and academia, throughout Australia.

As rainfall and flow data are very limited in Australia, the DSC has continued to encourage dam owners to install hydrologic instrumentation around their dams to assist in calibration of hydrologic models, and to contribute to the improvement of knowledge of rainfall/runoff processes within the industry. The data will also assist in estimating available yield for water supply, as well as providing valuable input to planning and warning for flood conditions.

7.1.7. Earthquake Structural Capacity

Historically, several earthquakes of around Magnitude 7 have occurred in Australia and the 1989 Newcastle earthquake (Magnitude 5.6) provided a reminder that large damaging earthquakes can occur. Seismologists indicate that major earthquakes (ie up to Magnitude 7.5) could occur anywhere in NSW and that a Magnitude 7.5 earthquake has about 1,000 times the destructive power of the Newcastle earthquake.

Many overseas dams have survived nearby earthquakes up to Magnitude 8. Experience has shown that well-constructed concrete dams and compacted earth/rockfill dams on good foundations are inherently stable during earthquake events. Fortunately these types form the bulk of NSW prescribed dams.

The DSC initially directed its earthquake stability concerns to the owners of the few vulnerable dams and, following investigations by their owners, earthquake stability improvement works have been completed at Mardi, Prospect and Hume Dams. Whilst it is expected that few dams are vulnerable, earthquake stability reviews are required to be included in the regular safety reviews of all prescribed dams. To provide current guidance for designers and reviewers, the DSC issued revised earthquake safety requirements in Information Sheet DSC 16 in 2000.

“A record storm at Dapto in 1984 dumped 515 mm of rain in 6 hours” – a near PMP event



Sooley Dam, Goulburn

Raising and strengthening of this 15m high concrete dam was completed in 2005 to provide increased water storage and flood capacity

“Seismologists indicate that major earthquakes up to Magnitude 7.5 could occur anywhere in NSW”

In 2005/6 the largest seismic events in NSW were Magnitude 3.5 earthquakes near Boorowa in September 2005 and near Inverell in March 2006. The largest national event was a Magnitude 5.1 earthquake near Oodnadatta in South Australia in June 2006.

Scarcity of long-term seismic data in NSW to use as a basis for determining the earthquake design loadings for dams remains a concern for the DSC.

The seismic monitoring network, installed on Sydney Catchment Authority (SCA) dams in the early 1990s, has recorded evidence of minor seismicity in the area and has provided beneficial data for future design use on dams and other structures in the Sydney area.

The SCA network complements the Newcastle network installed after the 1989 earthquake, along with some seismic stations at State Water and Snowy Hydro dams, and the national grid installations of Geoscience Australia. The DSC has continued to support expansion of this seismic network throughout NSW.

“In 2005/2006 the largest seismic events in NSW were Magnitude 3.5 earthquakes near Boorowa in September 2005 and near Inverell in March 2006”

“The largest national event was a Magnitude 5.1 earthquake near Oodnadatta in South Australia in June 2006”

7.1.8. Structural Safety under Normal Operating Conditions

Dams are long life structures, with the oldest dam in Europe some three thousand years old, and the oldest prescribed dam in NSW, Lake Parramatta Dam, being 150 years old in 2007. Given that the average age of major NSW dams is over 40 years, the structural safety of these dams under normal operating conditions is considered to be generally satisfactory when checked using current methodology. Where deficiencies have been revealed, the DSC has required owners to undertake safety reviews and to implement any consequent improvement action.

Particular areas of concern to the DSC include:

- The safety of older earth dams, without intercepting filters to control piping and seepage, which may require buttressing and/or supplementary drainage. Piping causes almost as many dam failures as inadequate flood capacity. Hume, Mardi, Tilba, Rydal and Tumbarumba Dams have been upgraded in this regard. In addition, there appears to be no clearly recognized international practice on piping safety for old dams without modern filters. The DSC has plans for an Information Sheet (DSC 22) to guide owners on safety against piping.
- The deterioration, with time, of unencased pressure conduits through embankments could lead to uncontrolled high-pressure leakage through the embankment, leading to washout and dam failure. A number of dams have failed from this cause overseas. The DSC requires dam owners to investigate and monitor their conduits.
- The need to better understand piping and slope instability risks of embankment dams. A research program initiated in 1996 by the University of NSW and sponsored by the DSC and several major dam owning organizations has developed valuable new understanding in this area. The DSC will continue to sponsor further research in this area.
- The reliability of spillway control systems, given several serious incidents and dam failures world-wide involving gate failures. The DSC requires NSW dam owners to regularly review their gates' safety and to ensure high reliability through systems upgrades and proper operation and maintenance procedures. The DSC has initiated the production of a DSC Information Sheet (DSC 20) for guidance on this aspect of dam safety. The new DSC 11 will set out how gate reliability is to be considered in the assessment of a dam's flood capacity.
- The safety of tailings dams usually associated with mining. Several incidents on prescribed tailings dams have highlighted the special vulnerability of these types of dams. The DSC has concluded that there is a need to develop safety policies specific to tailings dams and an Information Sheet (DSC 19) has been completed and placed on the DSC's website for dam owner guidance.



Pejar Dam, Goulburn

The DSC monitored cracking in the upstream coffer dam section of this 23m high earth/rockfill dam caused by drawdown effects of the ongoing drought

“The average age of major NSW dams is over 40 years with the oldest nearly 150 years old”

7.1.9. Operation, Maintenance and Surveillance



Kalingo Dam, Cessnock

As directed by the DSC, the dam's owner has removed trees from, and stabilized, the downstream face of the dam to maximize its ongoing safety

Dams require care throughout their lives to keep them in a safe condition, since materials, components and machinery deteriorate with time. Ongoing operation, maintenance and surveillance is essential and cost-effective, otherwise reduced life expectancy or failure could result (eg a near piping failure of a Hunter Valley tailings dam in 2003 was averted by timely detection). The rehabilitation works (eg Bethungra Dam, Redbank Creek Dam), or decommissioning (eg Wellington Dam), found necessary for some older NSW dams illustrate the deterioration that can occur as dams age. Concepts developed in other industries, such as Failure Modes and Effects Analysis (FMEA) and Failure Modes Effects and Criticality Analysis (FMECA) are now being introduced to dams to provide a more rational and better targeted basis for maintenance and replacement programs.

The DSC Information Sheet DSC 12 requires dam owners to develop and maintain operation and maintenance (O&M) manuals, based on organized programs and systematic inspections. The DSC maintains an active education program in this area and audits performance through the owner's five yearly Surveillance Reports and by regular inspections of dams by DSC members and staff.

Dam safety specialists throughout the world recognize the necessity for systematic and documented dam safety management programs. The ANCOLD Guidelines on Dam Safety Management-2003 set out contemporary requirements in this area, based on industry best practice. They provide a basis for a more uniform national approach to proper dam safety management, and the DSC has adopted them as its requirements for use in NSW. The DSC's Executive Engineer was the Convenor of the working group, which produced these guidelines.

7.1.10. Dams Safety Emergency Management

"The DSC continually promotes the need to develop and maintain basic operations and maintenance programs and manuals for NSW dams"

The DSC's primary objective is to protect the public from the uncontrolled release of water from dam storages and it requires that dam owners prepare Dam Safety Emergency Plans (DSEP) for dams posing a risk to downstream residents. Most dams now have such plans. This planning covers monitoring procedures, actions to be taken by the owner's personnel, pertinent advice to emergency management agencies, relevant information concerning the nature of dambreak flooding and communication protocols. These plans also take into account the general increase in security required world-wide for strategic assets such as dams. The initial draft of Information Sheet DSC 24 *Dam Security* is almost ready for stakeholder review.

Responsibility for developing and maintaining flood plans in NSW rests with the State Emergency Service (SES). The DSC looks to dam owners to assist the SES in developing flood plans to protect residents against the impacts of major floods that pass through their dams, including a potential dam failure. The value of these plans, even for dams that meet normal safety requirements, was demonstrated in 1999 with activation of the Lyell Dam DSEP, facilitating the timely evacuation of campers after the unexpected failure of the dam's inflatable spillway section. Also, further demonstration was provided during the late 2000 Tamworth floods, with the timely evacuation of residents downstream of Chaffey Dam.

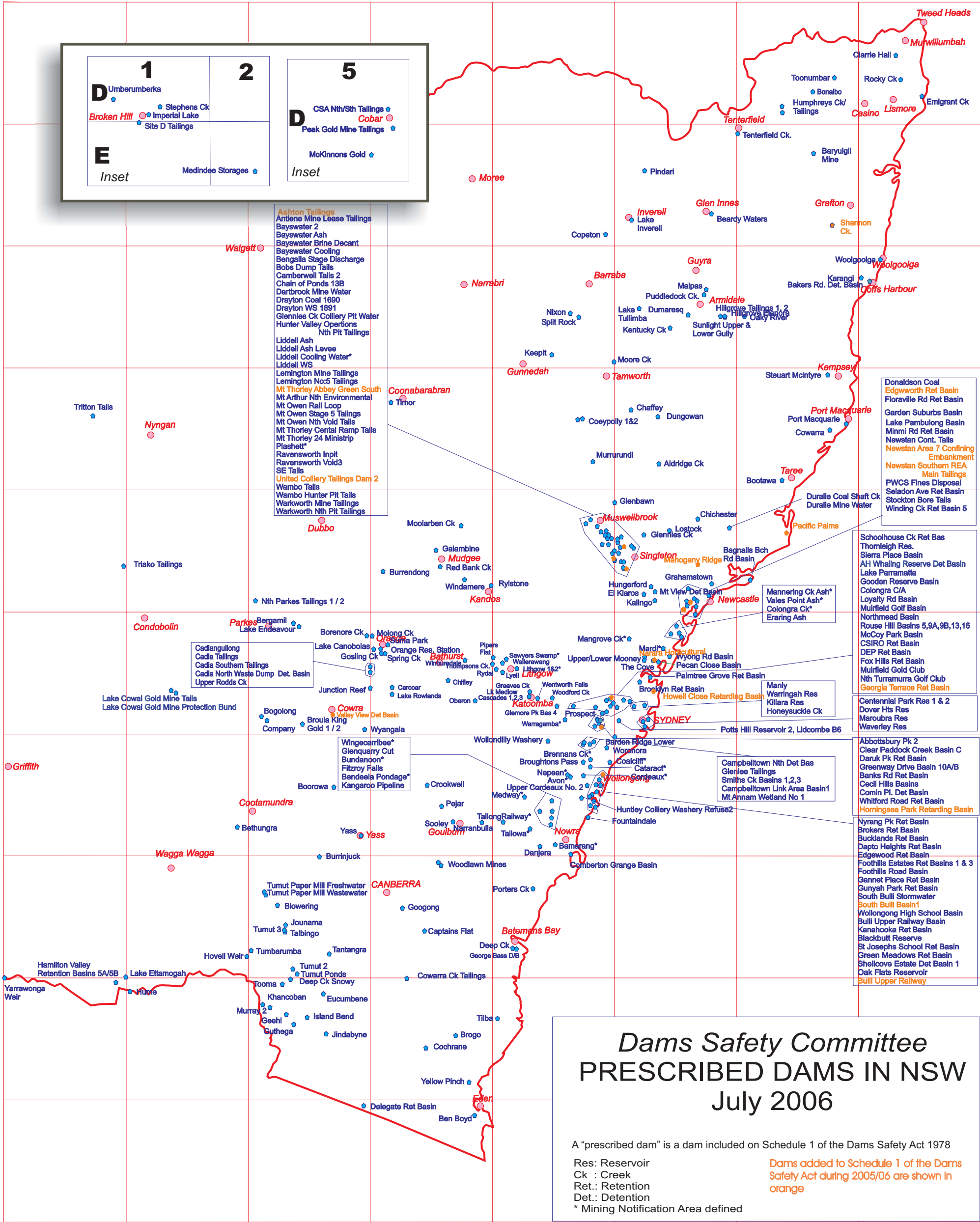
The SES has continued to prepare and update flood plans for communities downstream of deficient NSW dams during the year. An important aspect of flood planning is early and comprehensive public awareness campaigns to inform affected residents of the details of these flood emergency plans.

To mesh the responsibilities of dam owners and the SES, the DSC's Emergency Management Sub-committee meets, as necessary, to review and monitor the procedures used by the agencies concerned. As a result, dam incident warning protocols have recently been developed, and are being implemented, with all of the emergency agencies. The Sub-committee also provides a channel for information exchange between the DSC and the SES, giving the SES regular updates on the safety status of dams in NSW.



Bootawa Dam, Taree

DSC members and staff inspecting this 25m high earthfill dam. The owner has recently completed a revised dambreak study of the dam as a precursor to updating the dam's emergency planning arrangements



7.1.11. Flood Retarding Basins

Flood retarding basins can have great value in reducing flood magnitude in urban areas. Most are small, typically with an embankment only a few metres high, but there are a few large structures, such as the Loyalty Road Retarding Basin, upstream of Parramatta, which is formed by a concrete dam over 20m high.

During the short periods that these basins store water they act as dams, and their failure could be damaging. The DSC prescribes those basins that would pose a significant threat to downstream communities or the environment in the event of failure. The potential threat of retarding basins to a community can be as significant as that from a major dam since houses are often located immediately downstream. Because the embankments forming most basins are dry for long periods, their response to floods is as for the “first-fill” phase of dam life, which is much more prone to failure than other periods. Accordingly, retarding basins need to be designed and constructed in accordance with good dams engineering practice.

Traditionally, retarding basins have been seen as an element within an urban drainage scheme. For such schemes, the focus has been on floods up to the 1 in 100 Annual Exceedance Probability (AEP) flood, which has been the typical *design flood*. In the past, few owners and stakeholders have recognized that a greater flood could occur and would cause a sudden increase in discharge or, in the worst case, could fail the embankment to put those downstream in danger. The community at risk generally does not appreciate the potential for larger floods to occur. Recent examples of events exceeding the 1 in 100 AEP mitigation limit were the storm events in Wollongong (in August 1998), the southern Newcastle area (in April 2001) and Mudgee (in February 2003). The DSC has intervened to protect the community from these dangers and to educate all involved. These efforts are beginning to pay dividends in improved protection.

It should be noted that with several hundred basins in NSW, there is a strong possibility that one or more basins could be tested annually by an extreme storm.

The DSC’s requirements aim to ensure that basins will withstand appropriately large floods, or that basin failure does not involve a significant risk to life. The design needs to allow for the effects of future development in the area and the “domino effect” of basin failure if there are multiple basins in a cascade arrangement, as is fairly commonly the case.

The DSC requires that prescribed retarding basins are subject to relevant procedures regarding surveillance, inspection, operation and maintenance but continues to be concerned with the poor maintenance some basins receive. Inspections still reveal basins with partially blocked outlets which can significantly reduce the basin’s flood capacity. This reinforces the need for basins to be inspected monthly, as part of their maintenance schedule, as well as after significant flood events.

The DSC continues to maintain close liaison with basin owners during the design stage, particularly to oversight urban drainage designers whose experience of dams engineering is often limited to small structures. DSC staff carry out regular basin inspections and the DSC has prepared an Information Sheet on retarding basins (DSC 17-updated in 2000).

“The DSC requires that flood retarding basins are designed and constructed in accordance with good dams engineering practice”

“The DSC is concerned with the poor degree of maintenance of some flood retarding basins”



Cecil Park Basin 3A

Stabilising of a sewer pipeline across the downstream toe of the basin has been completed.

The DSC has approved upgrading designs to meet flood and stability safety criteria, which the owner plans to implement in 2006/7

7.2. Regulation of Mining near Dams

7.2.1. Background

“In NSW....risks to dams from mining are independently assessed from a civil engineering perspective”



Brennans Creek Dam

The DSC has approved further underground coal mining within the Notification Area of this dam in the southern coalfield, with monitoring requirements on the dam and mining operations to ensure the integrity of the dam

“During 2005/6...over 12 million tonnes of coal were extracted near prescribed dams in NSW”

In NSW, legislation creates a system where the risks to dams from mining are independently assessed from a civil engineering perspective. Usually this is done by the DSC under the *Mining Act 1992* but it is sometimes done under the *Dams Safety Act 1978*. The DSC ensures that risks to dams and their reservoirs from mining are tolerable in terms of the community's interests.

The most common regulatory mechanism requires the DSC to set Notification Areas around selected prescribed dams (see Appendix B). Mining within these areas requires Ministerial approval acting on advice from the DSC. Alternatively, the DSC may use its powers under the *Dams Safety Act 1978* to direct actions be undertaken to ensure the safety of a prescribed dam.

7.2.2. 2005/6 Overview

All but one of the mining projects considered by the DSC during the year were for mining coal by underground or open-cut methods. There has been a record interest in coal mining near dams and storages, apparently related to strong coal prices. Ten new applications were endorsed as follows:

Underground Mining	Open-cut Mining
3 approvals for the Dendrobium Mine near Cordeaux Reservoir	Wambo Mine near Wambo Tailings Dams
3 approvals for the NRE#1 Colliery near Cataract Reservoir	Duralie Mine near its Mine Water Dam
United Colliery under Wambo Tailings Dam	Drayton Mine near Liddell Ash Levee

During 2005/6, under the DSC's guidelines, over 12 million tonnes of coal were extracted near prescribed dams in NSW (three times the tonnage of the previous year), either in Notification Areas or their equivalents, without reducing safety below acceptable limits. Prior to the formation of the DSC, much of these coal deposits would not have been mined, due to the safety concerns of dam owners.

More of the DSC's resources have been allocated to mining regulation in response to an increasing workload over the past three years with appropriate funding obtained from Treasury.

7.2.3. Details of New Applications and Currently Monitored Mines

Appin Colliery commenced longwall mining 400m from Broughtons Pass Weir in 1998. The weir is a vital part of Sydney's water delivery system. Minor cracking of the weir was recorded, although the safety of the structure was maintained at all times. Mining is continuing 2.5km from the weir with induced movements still being recorded without further cracking of the weir.

Westcliff Colliery applied to develop drifts within the Notification Area around Brennans Creek Dam which supplies water to the Colliery. This application is still being processed.

Dendrobium Colliery commenced longwall mining in Area 1, adjacent to Cordeaux Reservoir in April 2005. Cordeaux reservoir supplies water to the Sydney metropolitan area. Mining to date has had no significant impact on the stored waters. Applications to extend a longwall in Area 1 and for longwall mining in Area 2 are still being considered.

The DSC expressed concerns over the progress of investigations for the new Dendrobium applications during the year. There are some difficult technical issues related to this application that require careful consideration. The DSC continues to seek good quality supporting documents provided in a timely fashion to enable the DSC to undertake its required consideration.



Duralie Coal Mine Water Dam

The DSC has required appropriate mine management plans to ensure the ongoing safety of the mine water dam adjacent to current open-cut pit coal mining operations

“In 2005/6, United Colliery continued mining a series of longwalls under Wambo NE Tailings Dam and in 2006 Wambo Colliery commenced open-cut mining immediately downstream of the dam”

NRE No. 1 Colliery's new owners satisfied the DSC that it could manage the extraction of coal adjacent to Cataract Reservoir, and an application was renewed. NRE completed a small area of pillar extraction and then received an extension endorsement. Mining in the extended area has finished, with monitoring indicating negligible impacts on the reservoir waters which supply the Sydney metropolitan area. Monitoring will continue for a period to confirm this. In another area, the DSC has endorsed first workings under the reservoir. Mining has commenced, with monitoring to date indicating negligible impacts on the storage.

Duralie Colliery continued open-cut mining near its water supply dam. A management plan has been implemented to minimize the risk resulting from the active open-cut pit located immediately downstream of the dam. Details from a requested geotechnical review should be supplied shortly.

United Colliery continued mining a series of longwalls under Wambo Tailings Dam. Although disused, the dam contains tailings which are still able to flow and the risks, to an active open-cut pit immediately downstream, need to be managed. Monitoring is increased and operational procedures triggered, as the longwall passes under the embankment.

Wambo Colliery received an endorsement for existing open-cut pit mining immediately downstream of Wambo Tailings Dam, which is also being undermined by United Colliery. A management plan has been implemented.

Mannering Colliery continued to mine by bord and pillar methods adjacent to Mannering Creek Ash Dam, which stores ash from a nearby power station. Monitoring to date indicates the impacts on the dam are negligible.

Drayton Mine implemented a management plan aimed at minimizing the risk of open-cut mining adjacent to Liddell Ash Levee. The Levee is a dam which retains ash from a nearby power station.

Newpac Colliery finished mining by pillar extraction adjacent to Ravensworth Void 3 Ash Dam, which stores ash from a nearby power station. The monitoring program also finished during the year.

Ravensworth Colliery applied to mine by open-cut methods within the Notification Area around their water storage dam. The application is being processed.

7.2.4. Policies, Procedures and Organizational Updates

A full review of mining policies was commenced but, due to the heavy operational workload, is incomplete. Existing policies are outlined in the Information Sheets listed in Table 6 below and available on-line on our web page (www.damsafety.nsw.gov.au).

An internal system for checking compliance with mining conditions was implemented during the year. Checking compliance is now faster, and a timetable for future reports is generated. The latter is used for workload management and for reminders to mining companies to deliver material on time.

The services of contract staff were used during the year to manage the high mining audit workload.

Table 6 - Information Sheets for Mining near Dams

Document	Title	Date
DSC 32	Notes on the Administrative Role of the Dams Safety Committee in the Granting of Mining Leases and Approval of Mining Applications	June 1998
DSC 33	Mining in Notification Areas of Prescribed Dams	June 1998
DSC 34	Typical Monitoring Program Requirements for Mining near Prescribed Dams	August 2000
DSC 35	Mining Contingency Plans to Minimise Loss of Stored Waters from Dams	June 1998

7.2.5. Mining Statistics

Table 7 - Mining in Notification Areas

Item	2003/4	2004/5	2005/6
Coal Removed from Notification Areas (million tonnes)	0.4	4	12.1
Current Approvals:			
Actively Mining	2	11	14
Actively Monitoring	7	18	14
Applications Processed	9	13	10
Variations to Existing Approvals	0	2	8
Coal Titles Processed	3	2	6
New Proposals Discussed	7	6	9
Site Inspections (person days)	15	20	19

Table 8 - Monitored Approved Mining 2005/2006

Approval	Colliery	Dam	Mining Type	Possible Effect on			
				Active Mining	Dam Storage	Dam Structure	Currently Monitoring
Bellambi-14/ NRE#1-1	NRE#1	Cataract	Pillar Extract	Yes	Yes	No	Yes
Bellambi-15	NRE#1	Cataract	Longwall	Yes	Yes	No	Yes
Wambo-1	Wambo	Wambo Tails	Open-cut	Yes	Yes	Yes	Yes
Appin-2	Appin	Broughtons Pass Weir	Longwall	Yes	Yes	Yes	Yes
Dendrobium-1	Dendrobium	Cordeaux	1 st workings	Yes	Yes	No	Yes
Dendrobium-2	Dendrobium	Cordeaux	Longwall	Yes	Yes	No	Yes
Dendrobium-3	Dendrobium	Cordeaux	Longwall	Yes	Yes	Yes	Yes
United-2/3/4	United	Wambo Tails	Longwall	Yes	Yes	Yes	Yes
Mannering-1	Mannering	Mannering Ck Ash	1 st workings	Yes	No	Yes	Yes
Newpac-1	Newpac	Ravensworth Void3 Ash	Pillar extraction	Yes	Yes	Yes	Yes
Duralie-1	Duralie Open-cut	Duralie Mine Water	Open-cut	Yes	Yes	Yes	Yes
Drayton-1	Drayton	Liddell Ash Dam Levee	Open-cut	Yes	Yes	Yes	Yes

7.3. Information Systems

“In 2005/6 the DSC updated its existing databases and computer facilities”

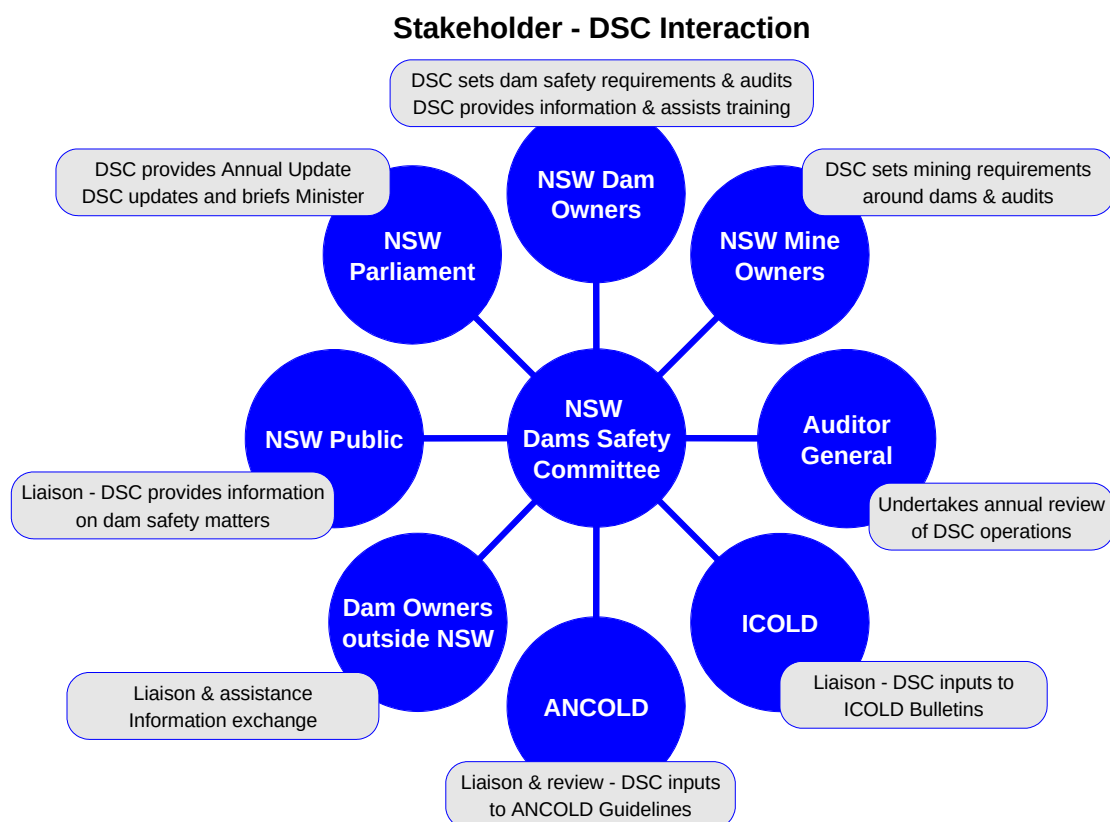
During 2005/6 the DSC information systems personnel:

- Updated the DSC’s public documents, Information Sheets, Annual Report and Website (<http://www.damsafety.nsw.gov.au>) ;
- Updated a full text searchable database of DSC minutes;
- Produced a range of internal reports for use by the DSC members and staff;
- Continued to digitise critical technical information on dams to improve access and create a backup (ie GIS dam mapping, updated mining approval plans);
- Consolidated and maintained computer facilities for staff and members including implementing new server and upgrading computer hardware and software;
- Continued to upgrade and document DSC procedures; and

Continued to maintain and upgrade the DSC’s record system (eg correspondence lists, automatic requests for Surveillance Reports).

8. Stakeholders

The DSC's role as a regulator of dam safety in NSW requires interaction with a wide range of stakeholders as summarized in the following diagram:



8.1. Liaison with Stakeholders

In line with modern principles of good regulation, the DSC has adopted a goal of full “transparency”. During the year, it continued to work toward having all its safety policies accessible to all stakeholders, by their incorporation into Information Sheets, available on the DSC Internet site.

The DSC recognizes that to be effective as a dam safety regulator, it needs to give all stakeholders an opportunity to comment on its policies. During the year, policy proposals were placed on the DSC's Internet site and comments were invited.

The DSC has a role to educate dam owners on their responsibilities and on international standards, practice and technology. It communicates its objectives and concerns to dam owners and their representatives through various avenues, including its Internet site. The DSC has assembled a considerable library of publications and videotapes on various aspects of dams and their management. This material is freely loaned to dam owners to assist in staff training.

Close contact is maintained by the DSC with the major NSW dam owning authorities, through their nominees on the DSC, and through meetings held during the year to discuss specific dam requirements and general procedures.

“The DSC considers it essential to give all stakeholders an opportunity to comment on its policies”

“DSC staff were involved in running two dam safety training courses for NSW dam operators in 2005/6”



Cowarra Dam, Port Macquarie

Dam operators inspecting this 40m high earthfill dam during a training course in March 2006 jointly run by the DSC and DEUS

“DSC members and staff attended relevant conferences and courses during the year to keep abreast of modern developments”

The dam safety education of local government authorities, mining companies and private dam owners is of particular interest to the DSC, because their staff do not usually have specialist engineering knowledge of dams. Education of these owners is assisted by regular site visits by the DSC and/or its staff to meet owners' representatives to discuss relevant issues. Such meetings are invaluable in reaching a common understanding of the problems facing these owners in regard to asset management and responsibilities to the community, and obtaining feedback for enhancing the DSC's education role.

The DSC ran its first training course in 1991 for Local Government and private dam owners. As a result of the positive feedback, regular training courses for dam operators are now run in NSW with the assistance of DSC staff. Three-day courses for dam operators were run by the Department of Energy, Utilities and Sustainability in December 2005 and February 2006 at Port Macquarie as part of this program. This work is seen as a key part of the DSC's educational role for dam owners in NSW and accordingly DSC cost recovery was limited to expenses associated with attending or running these sessions.

DSC members and staff addressed Council and community meetings on a number of occasions during the year.

The increasing emphasis by the DSC on owner education in NSW has been reflected in numerous requests from dam owners outside NSW for educational assistance. Such involvement is of value to the DSC in broadening its experience of dam safety management issues and in benchmarking its own performance against the procedures and practices of similar authorities.

8.2. Education and Training of Members and Staff

The DSC's members and staff have extensive and varied experience in dams' engineering and mining. However, it is essential in any organization to keep abreast of modern developments in all the technical and societal fields related to its functions. This is particularly important in the case of the DSC, because of the diverse technical knowledge required from its small staff. Accordingly, the DSC's members and staff attended relevant conferences and courses during the year.

In November 2005, the Chairman, Executive Engineer, Surveillance Engineer, Dams Engineer and Geologist attended the ANCOLD Conference on Dams, held in Fremantle, Western Australia. Several other DSC members also attended, as representatives of their own organizations. Papers were presented on community, legal and environmental concerns with dams, along with recent developments in dam engineering.

During the year, DSC staff attended relevant local technical seminars to update their proficiencies.

In June 2006, Mr Ian Landon-Jones attended the ICOLD 74th Annual Meeting, ICOLD 22nd Congress, and associated technical committee meetings, held in Spain. Whilst this attendance was not arranged or funded by the DSC, the knowledge gained benefits the development of the DSC's policies.

9. Administration and Human Resources

DSC members are subject to the Premier's Department Conduct Guidelines and the DSC staff is subject to the Department of Natural Resources' (DNR) Code of Ethics and Conduct. As an extension of those requirements, the DSC has established policies on Managing Conflicts of Interest and on Interactions with Stakeholders and the Public. The DSC has a policy of Delegated Authority, with a Schedule of Delegations, to guide members and staff.

The DSC rents office space with the DNR in Parramatta and, to maximize the effectiveness of DSC staff, reimburses the DNR for its administration and human resources assistance, accounting, insurance scheme and legal services. Other authorities, that nominate members to the DSC, continue to provide technical assistance in specialised areas and the DSC wishes to acknowledge their assistance.

As part of the DSC's administrative alignment with the DNR, the DSC's Freedom of Information (FOI) statistics are published in that Department's Annual Report. A supplement, pursuant to the Annual Reporting Requirements issued by the Premier's Department on 27 June 1991, will accompany the DSC's statistics. There were no requests for information under FOI legislation during the year.

The DSC has adopted DNR's Occupational Health, Safety and Rehabilitation (OHS&R) practices, with necessary minor adaptations, to ensure the maintenance of appropriate standards of work practice in the DSC. In relation to OHS&R there were no work injuries to DSC staff during the year and DSC staff regularly update their first aid training to facilitate safe inspection practices.

As part of its contracted administration assistance to the DSC, the DNR implement Equal Employment Opportunity (EEO) and Ethnic Affairs matters (including Ethnic Affairs Priorities Statement program) for, and with, the DSC. The DSC is aware of, and committed to, the principles of multi-culturalism, but all policies relating to this area are programmed under the DNR's overarching banner. The DSC continued with technical training of a new migrant professional, Kathy Zhou, for one month as a follow on to a scheme organized by the Office of Employment, Equity and Diversity of the NSW Premiers Department. Feedback at the conclusion of the training period indicated that the scheme was extremely beneficial to both Kathy Zhou and the DSC. The DSC's Internet site provides initial information about the DSC in several languages.

The DSC is progressively implementing the Government's Waste Reduction and Purchasing Policy by implementing more electronic storage of information and use of recycled paper.



Campbelltown Link Area Basin 1

This 6m high retarding basin was completed in 2004 as part of Sydney's western corridor transport link and the DSC reviewed its initial Surveillance Report in 2005 outlining minor maintenance issues to be addressed.

10. Finance

10.1. Dams Safety Committee Certificate

DAMS SAFETY COMMITTEE **Certificate under Section 41C (1B) and (1C)** **of the Public Finance and Audit Act 1983**

Pursuant to the Public Finance and Audit Act, 1983, we declare that, in our opinion:

- a) The accompanying financial statements exhibit a true and fair view of the financial position of the Dams Safety Committee as at 30 June 2006, and transactions for the year then ended.
- b) The statements have been prepared in accordance with:
 - applicable Australian Accounting Standards (which include Australian equivalents to International Financial Reporting Standards (AEIFRS));
 - Other Authoritative pronouncements of the Australian Accounting Standards Board;
 - Urgent Issues Group Interpretations; and
 - the requirements of the *Public Finance and Audit Act* and Regulation.
- c) There are no circumstances, which would render any particulars included in the financial statements to be misleading or inaccurate.

For and on behalf of the Committee.



L A McDONALD
CHAIRMAN

Dated:
13 September 2006



B COOPER
DEPUTY CHAIRMAN

10.2. Auditor General's Certificate



GPO BOX 12
Sydney NSW 2001

INDEPENDENT AUDIT REPORT

Dams Safety Committee

To Members of the New South Wales Parliament

Audit Opinion

In my opinion, the financial report of the Dams Safety Committee (the Committee):

- presents fairly the Committee's financial position as at 30 June 2006 and its performance for the year ended on that date, in accordance with Accounting Standards and other mandatory financial reporting requirements in Australia, and
- complies with section 41B of the *Public Finance and Audit Act 1983* (the Act) and the *Public Finance and Audit Regulation 2005*.

My opinion should be read in conjunction with the rest of this report.

Scope

The Financial Report and Board's Responsibility

The financial report comprises the income statement, statement of changes in equity, balance sheet, cash flow statement and accompanying notes to the financial statements for the Committee, for the year ended 30 June 2006.

The members of the Board of the Committee are responsible for the preparation and true and fair presentation of the financial report in accordance with the Act. This includes responsibility for the maintenance of adequate accounting records and internal controls that are designed to prevent and detect fraud and error, and for the accounting policies and accounting estimates inherent in the financial report.

Audit Approach

I conducted an independent audit in order to express an opinion on the financial report. My audit provides *reasonable assurance* to Members of the New South Wales Parliament that the financial report is free of *material* misstatement.

My audit accorded with Australian Auditing Standards and statutory requirements, and I:

- assessed the appropriateness of the accounting policies and disclosures used and the reasonableness of significant accounting estimates made by the Board in preparing the financial report, and
- examined a sample of evidence that supports the amounts and disclosures in the financial report.

An audit does *not* guarantee that every amount and disclosure in the financial report is error free. The terms 'reasonable assurance' and 'material' recognise that an audit does not examine all evidence and transactions. However, the audit procedures used should identify errors or omissions significant enough to adversely affect decisions made by users of the financial report or indicate that the Board had not fulfilled their reporting obligations.

My opinion does *not* provide assurance:

- about the future viability of the Committee,
- that it has carried out its activities effectively, efficiently and economically, or
- about the effectiveness of its internal controls.

Audit Independence

The Audit Office complies with all applicable independence requirements of Australian professional ethical pronouncements. The Act further promotes independence by:

- providing that only Parliament, and not the executive government, can remove an Auditor-General, and
- mandating the Auditor-General as auditor of public sector agencies but precluding the provision of non-audit services, thus ensuring the Auditor-General and the Audit Office are not compromised in their role by the possibility of losing clients or income.



M T Spriggins
Director, Financial Audit Services

SYDNEY
13 October 2006

10.3. Audited Financial Report

Income Statement for the year ended 30 June 2006

	Note	2006 \$'000	2005 \$'000
Revenue			
Revenue	2	1049	938
Other Income	3	5	8
Total revenue		1054	946
Expenses			
Personnel services expenses	4	(659)	(573)
Other operating expenses		(440)	(386)
Total Expenses		(1,099)	(959)
(Deficit) for the year		(45)	(13)

Statement of Changes in Equity for the year ended 30 June 2006

Income and Expense recognised directly in Equity	-	-
Deficit for the Year	(45)	(13)
TOTAL INCOME AND EXPENSE RECOGNISED FOR THE YEAR	(45)	(13)

Balance Sheet as at 30 June 2006

Current Assets			
Cash & cash equivalents	5	13	54
Receivables	6	5	78
Total Current Assets		18	132
Total Assets		18	132
Current Liabilities			
Payables	7	78	163
Provisions	8	16	-
Total Current Liabilities		94	163
Total Liabilities		94	163
Net Assets		(76)	(31)
Equity			
Accumulated Losses	9	(76)	(31)
Total Equity		(76)	(31)

Cash Flow Statement for the year ended 30 June 2006

		Inflows/ (outflows)	Inflows/ (outflows)
Cash Flows From Operating Activities			
Receipts from customers and Government (including GST)		984	752
Payment to Suppliers (including GST)		(1,026)	(730)
Interest Received		1	7
Net Cash Flows from Operating Activities	10	(41)	29
Net Increase / (Decrease) in Cash and Cash Equivalents		(41)	29
Cash and Cash equivalents at the beginning of the financial year	5	54	25
Cash and Cash Equivalents at the end of the financial year	5	13	54

The accompanying notes form part of these financial statements

Notes to and forming part of the financial statements for the year ended 30 June 2006

1. SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES**(a) Reporting Entity**

The Dams Safety Committee (the 'Committee') was constituted in 1979, under the *Dams Safety Act 1978* to ensure the owners of the State's major dams conform to appropriate safety requirements in order to prevent uncontrolled loss of their storages with consequent effects on the community, environment and water supply.

The Committee operates in New South Wales, Australia. The office is located on Level 3, 10 Valentine Avenue, Parramatta, NSW 2150.

The Committee is a Statutory Body and separate reporting entity. There are no other entities under its control. The Committee is a not-for-profit entity (as profit is not its principal objective) and it has no cash generating units.

These financial statements have been authorised for issue by the Chairman of the Committee on 06 October 2006.

(b) Basis of Preparation

The Committee's financial report is a general purpose financial report which has been prepared in accordance with:

- applicable Australian Accounting Standards (which include Australian equivalents to International Financial Reporting Standards (AIFRS));
- Other Authoritative pronouncements of the Australian Accounting Standards Board; and
- the requirements of the *Public Finance and Audit Act 1983* and *Public Finance and Audit Regulation 2005*.

The financial report is prepared in accordance with the historical cost convention.

Judgements, key assumptions and estimations management has made are disclosed in the relevant notes to the financial statements.

All amounts are rounded to the nearest one thousand dollars and are expressed in Australian currency.

(c) Statement of Compliance

The financial statements and notes comply with Australian Accounting Standards, which include AIFRS.

This is the first financial report prepared based on AIFRS and comparatives for the year ended 30 June 2005 have been restated accordingly unless otherwise permitted.

In accordance with AASB 1 *First-time Adoption of Australian Equivalents to International Financial Reporting Standards* and Treasury Mandates, the date of transition to AASB 132 *Financial Instruments: Disclosure and Presentation* and AASB 139 *Financial Instruments: Recognition and Measurement* has been deferred to 1 July 2005 and, as a result, comparative information for these two standards is presented under the previous Australian Accounting Standards which applied to the year ended 30 June 2005. Under previous Accounting Standards, financial instruments were recognised at cost.

Reconciliations of AIFRS equity and profit or loss for 30 June 2005 to the balances reported in the 30 June 2005 financial report are detailed in Note 15.

(d) Income Recognition

Income is measured at the fair value of the consideration or contribution received or receivable. Additional comments regarding the accounting policies for the recognition of income are discussed below:

1. Contributions from Government and other bodies are generally recognised as income when the agency obtains control over the assets comprising the contributions. Control over contributions is normally obtained upon receipt of cash.
2. Sale of Goods: Revenue from the sale of goods is recognised as revenue when the agency transfers the significant risks and rewards of ownership of the assets.
3. Rendering of Services: Revenue is recognised when the service is provided or by reference to the stage of completion (based on labour hours incurred to date).
4. Investment Income: Interest revenue is recognised using the effective interest method as set out in AASB 139 *Financial Instruments: Recognition and Measurement*. Rental revenue is recognised in accordance with AASB 117 *Leases* on a straight-line basis over the lease term.

(e) Personnel Services**1. Personnel Services**

Personnel Services liabilities in respect to salaries and wages (including non-monetary benefits), annual leave and paid sick leave that fall due wholly within 12 months of the reporting date are recognised and measured in respect of employee's services up to the reporting date at undiscounted amounts based on the amounts expected to be paid when the liabilities are settled.

Personnel Services liabilities covering long-term annual leave is measured at present value in accordance with AASB 119 *Employee Benefits*. Market yields on government bonds of 5.875% are used to discount long-term annual leave.

Unused non-vesting sick leave does not give rise to a liability as it is not considered probable that sick leave taken in the future will be greater than the benefits accrued in the future.

2. Long Service Leave and Defined Benefits Superannuation

The Committee has no liability for long service leave and defined benefits superannuation as personnel services are acquired from the Department of Natural Resources (for the period 29 August 2005 to 30 June 2006) and previously the Department of Infrastructure, Planning and Natural resources (for period 1 July 2004 to 28 August 2005). The liability of these items has been assumed by the Crown Entity.

(f) Insurance

The Committee's insurance activities are conducted through the NSW Treasury Managed Fund Scheme of self insurance for Government agencies. The expense (premium) is determined by the Fund Manager based on past experience.

Notes to and forming part of the financial statements for the year ended 30 June 2006

(g) Accounting for the Goods and Services Tax (GST)

Revenues, expenses and assets are recognised net of the amount of GST, except:

- where the amount of GST incurred by the agency as a purchaser that is not recoverable from the Australian Taxation Office is recognised as part of the cost of acquisition of an asset or as part of an item of expense.
- Where receivables and payables are stated with the amount of GST included.

(h) Receivables

Receivables are recognised initially at fair value, usually based on the transaction cost or face value. Subsequent measurement is at amortised cost using the effective interest method, less an allowance for any impairment of receivables. Short-term receivables with no stated interest rate are measured at the original invoice amount where the effect of discounting is immaterial. An allowance for impairment of receivables is established when there is objective evidence that the entity will not be able to collect all amounts due. The amount of the allowance is the difference between the asset's carrying amount and the present value of estimated future cash flows, discounted at the effective interest rate. Bad debts are written off as incurred.

(i) Other Assets

Other assets are recognised on a cost basis.

(j) Payables

These amounts represent liabilities for goods and services provided to the agency and other amounts, including interest. Payables are recognised initially at fair value, usually based on the transaction cost or face value. Subsequent measurement is at amortised cost using the effective interest method. Short-term payables with no stated interest rate are measured at the original invoice amount where the effect of discounting is immaterial.

(k) Comparative Information

Comparative figures have been restated based on AEIFRS with the exception of financial instruments information, which has been prepared under the previous AGAAP Standard (AAS 33) as permitted by AASB 1, paragraph 36A. The transition to AEIFRS for financial instruments information was 1 July 2005. The impact of adopting AASB 132/139 is further discussed in Note 15.

2. REVENUE

	2006 \$'000	2005 \$'000
Contribution from Department of Natural Resources	906	805
Committee Support in Kind Contribution	143	133
	1,049	938

- (i) The Department of Natural Resources was established by Administrative Order on 29 August 2005. Prior to that date the contributions were received from the Department of Infrastructure, Planning and Natural Resources.

3. OTHER INCOME

Interest	1	3
Other	4	5
	5	8

4. EXPENSES

Personnel services expenses (i)		
	659	573
Other expenses		
Auditor's remuneration (ii)	6	6
Committee Member's expenses (iii)	30	22
Contractors	95	30
Fees for services	19	15
Accommodation	60	52
Plant / Vehicle	13	14
Travel	13	11
Computer Expenses	13	10
Telephones	5	4
Staff training	8	5
Maintenance Contract-Office Equipment	15	7
Equipment	-	16
Other	20	61
	297	253
In Kind expense contribution incurred by other NSW entities not charged to the Committee		
Committee members' expense	143	133
Total	1099	959

Notes to and forming part of the financial statements for the year ended 30 June 2006

(i) Personnel services are acquired from NSW Department of Natural Resources and the cost comprises:

Salaries & wages (including recreation leave)	571	514
Staff on-costs	88	59

In prior periods, the Committee's financial report recognised and classified all personnel service expenses and liabilities as employee benefits, as if the staff were employed by the Committee. During the year, the Committee discovered that the staff were in fact employees of the NSW Department of Natural Resources until 17 March 2006 and from 17 March 2006 they were confirmed employees of the NSW Department of Natural Resources by virtue of the Public Sector Employment Legislation Amendment Act 2006. To correct this, amounts previously disclosed as employee related expenses and liabilities have been reclassified as "Personnel Services" to reflect that other organisations supplied personnel services to the Committee. This prior period adjustment has no impact on the operating result or equity of the current or prior reporting periods.

(ii) For the audit of the financial statements. The Auditors received no other benefits.

(iii) Committee members received no other benefits.

5. CURRENT ASSETS - CASH & CASH EQUIVALENTS

	2006 \$'000	2005 \$'000
Cash at bank and on hand	13	54

6. CURRENT ASSETS - RECEIVABLES

Interest receivable	1	1
Goods & Services Tax recoverable	4	4
Prepayments	-	1
Other	-	72
Total	5	78

7. CURRENT LIABILITIES - PAYABLES

Accrued personnel services	47	-
Creditors	8	7
Accruals	19	156
Other	4	-
Total	78	163

8. CURRENT LIABILITIES - PROVISIONS

Personnel services and related on-costs
Personnel services provision

16	-
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9. CHANGES IN EQUITY

	Accumulated Losses \$'000
Opening balance at 1 July 2005	(31)
Changes in equity - other than transactions with owners as owners	
Deficit for the year	(45)
Closing Balance - 30 June 2006	(76)
Opening balance at 1 July 2004	(18)
Changes in equity - other than transactions with owners as owners	
Deficit for the year	(13)
Closing Balance - 30 June 2005	(31)

The Committee's activities are substantially supported by contribution from the Department of Natural Resources. The Department has undertaken to ensure that debts of the Committee are able to be paid as and when due.

10. NOTE TO CASH FLOW STATEMENT

Cash

For the purpose of the Cash Flow Statement, cash includes cash on hand and cash at bank. Cash at the end of the financial year as shown in the Cash Flow Statement is reconciled to the Balance sheet in Note 5.

Reconciliation of (deficit) for the year to net cash flows from operating activities.

	2006 \$'000	2005 \$'000
(Deficit) for the year	(45)	(13)
(Increase) / Decrease in Receivables	73	(67)
Increase / (Decrease) in Payables	(69)	109
Net Cash Flows from Operating Activities	(41)	29

Notes to and forming part of the financial statements for the year ended 30 June 2006

11. COMMITMENTS FOR EXPENDITURE**Operating lease commitments**

Aggregate operating lease commitments for office accommodation, motor vehicles and computer equipment.

Contracted but not provided for at balance date, payable:

not later than 1 year	77	74
later than 1 year, but not later than 5 years	237	69
later than 5 years	59	-
	373	143

12. CONTINGENT LIABILITIES

The Committee is not aware of any material contingent liability.

13. FINANCIAL INSTRUMENTS**(a) Cash**

Cash comprises cash on hand and bank balances within the Treasury Banking System. Interest is earned on daily bank balances at the monthly average NSW treasury Corporation (TCorp) 11am unofficial cash rate adjusted for a management fee to Treasury.

(b) Receivables

All trade and other debtors are recognised as amounts receivable at balance date. Collectability of all debtors is reviewed on an ongoing basis. Debts which are known to be uncollectible are written off. An allowance for impairment is raised when some doubt as to collection exists. The credit risk is the carrying amount (net of any allowance for impairment). No interest is earned on receivables. The carrying amount approximates net fair value.

(c) Bank Overdraft

The Committee does not have any bank overdraft facility.

(d) Trade Creditors and Accruals

The liabilities are recognised for amounts due to be paid in the future for goods and services received, whether or not invoiced. Amounts owing to suppliers (which are unsecured) are settled in accordance with the policy set out in Treasurer's direction 219.01. If trade terms are not specified, payment is made no later than the end of the month following the month in which an invoice or a statement is received. Treasurer's Direction 219.01 allows the Minister to award interest for late payment. No interest was applied during the year (nil in 2005). The carrying amount approximates net fair value.

(e) Interest Rate Risk

	Weighted average effective interest rate	Floating Interest Rate	1 year or less	1 to 5 years	More than 5 years	Non Interest Bearing	Total Carrying amount as per the Statement of Financial Position
30 June 2006	%	\$'000	\$'000	\$'000	\$'000	\$'000	\$'000
Financial Assets							
Cash	5.42	13	-	-	-	-	13
Receivables		-	-	-	-	-	5
Total Financial Assets		13	-	-	-	5	18
Financial Liabilities							
Payables		-	-	-	-	94	94
Total Financial Liabilities		-	-	-	-	94	94

30 June 2005							
Financial Assets							
Cash	5.29	54	-	-	-	-	54
Receivables		-	-	-	-	78	78
Total Financial Assets		54	-	-	-	78	132
Financial Liabilities							
Payables		-	-	-	-	163	163
Total Financial Liabilities		-	-	-	-	163	163

Notes to and forming part of the financial statement for the year ended 30 June 2006

(f) Credit Risk

Credit Risk is the risk of financial loss arising from another party to a contractor / or financial position failing to discharge a financial obligation thereunder. The Committee's maximum exposure to credit risk is represented by the carrying amounts of the financial assets included in the Balance sheet.

14. AFTER BALANCE DATE EVENTS

There are no events subsequent to balance date which affect the financial report.

15. THE FINANCIAL IMPACTS OF ADOPTING AUSTRALIAN EQUIVALENTS TO INTERNATIONAL FINANCIAL REPORTING STANDARDS (AEIFRS)

The Committee has applied AEIFRS for the first time in the financial statements to 30 June 2006.

In the opinion of the Committee, the entity is a "not-for-profit" entity (as defined by AEIFRS).

The adoption of AEIFRS has had no material impact on the financial statements, has not required the restatement of equity as at 1 July 2004 or 30 June 2005, or the restatement of the surplus for the financial year ended 30 June 2005.

The Committee has carefully considered the potential impacts of AEIFRS on the Committee's accounting policies. Some of these impacts arise because AEIFRS requirements are different from previous Australian Accounting Standards Board (AASB) requirements, known as Australian Generally Accepted Accounting Principles (AGAAP). Other impacts arise from options in AEIFRS. To ensure consistency at the whole of Government level, NSW treasury has mandated options that must be applied by NSW public sector agencies.

The Committee's consideration was based on Treasury's mandates and policy decisions, and was assisted by officers of the Department of Natural Resources (prior to 29 August 2005 - Department of Infrastructure, Planning & Natural Resources) who undertake the Committee's accounting and finance functions.

The Committee's accounting policies may also be affected by a proposed standard designed to harmonise accounting standards with Government Finance Statistics (GFS). This standard may change the impact of AEIFRS and significantly affect the presentation of the income statement. However, the impact at this stage is uncertain, as the proposal has not been progressed to a legally enforceable standard.

The Committee, as a not-for-profit entity, has applied the requirements of AASB1004 Contributions regarding contributions of assets (including grants) and forgiveness of liabilities. There are no difference in the recognition requirements between the new AASB1004 and the previous AGAAP AASB1004. However, the new AASB1004 may be amended by proposals in Exposure Draft ED147 Revenue from Non-Exchange Transactions (including Taxes and Transfers). If the ED147 approach is applied, revenue and/or expense recognition will not occur until either the Committee supplies the related goods and services (where grants are in-substance agreements for the provision of goods and services) or until conditions applied to grants are satisfied. ED147 may therefore delay revenue recognition compared to AASB1004, where grants are recognised when controlled. However, the impact at this stage is uncertain, as the proposal has not been progressed to a legally enforceable standard.

A number of Australian Accounting Standards have not been adopted as they are not yet effective. The impact of these standards, AASB119 (effective December 2004), AASB2004-3, AASB7, AASB2005-10, in the period of initial application on the Committee is not known or reasonably estimable.

End of Audited Financial Report**10.4 Dams Safety Committee 2005/2006 – Budgetary Information**

	Revised 2005/6 Budget	2005/6 Actual	2006/7 Budget
	(\$)	(\$)	(\$)
Income			
Consolidated Fund	913,000	906,000	950,000
Interest Income	3,000	1,000	1,000
Miscellaneous (eg Training etc)	4,000	4,000	9,000
Total	920,000	911,000	960,000
Expenditure			
Administration (incl Audit-\$6,000)	239,000	226,301	173,000
Dam Surveillance	365,000	378,056	402,000
Mining Investigations	316,000	351,939	385,000
Total	920,000	956,296	960,000
Operating Surplus / (Deficiency)	0	(45,296)	0

Appendix A – Dam Owner Summary 30 June 2006

Dam Owner	Prescribed Dams	Surv. Reports Rec'd 05/06	DSC inspections 05/06
Councils	128	24	40
Sydney Water / Catchment Authority	37	5	6
Delta, Macquarie Generation, Eraring Energy	17	5	7
State Water	22	2	6
Other State Authorities	9	1	3
Snowy Hydro	15	3	3
Non State Authorities	3	1	1
Mining Companies	74	9	23
Other Ownership	22	3	3
TOTAL	327	53	91

Appendix B – 2006-Current Prescribed Dams in NSW

Dam	Map Ref	Presc. 2005/6	Surv. Report	Safety	Built	Type	Height (m)	Storage (ML)	Owner
Abbotsbury Park Pond 2	F10				2004	TE	6	18	RTA
AH Whaling Reserve Basin	F10				-	TE	2	7	Baulkham Hills Council
Aldriges Creek	D11				1994	TE	24	1200	Hunter Pastoral
Antiene Mine Lease Tails	E11				2000	TE/ER	15	3000	Rio Tinto Coal
Ashton Tails *	E11	P			2004	TE	5	96	Ashton Coal
Avon	G10				1927/71	PG/ER	72	214400	SCA
Bagnalls Beach Rd Basin	E12				1998	TE	2	5	Port Stephens Council
Bakers Road Basin	C13				-	TE	7	200	Coffs Harbour Council
Bamarang	G10				1983	TE	26	3800	Shoalhaven Council
Banks Rd Basin	F10				1997	TE	4	40	Liverpool Council
Barden Ridge Lower	F10				-	TE	18	35	Sutherland Council
Baryulgil Mine	B12				1996	TE	8	70	Dept. of Mineral Resources
Bayswater Ash	E10				1985	TE	39	22000	Macquarie Generation
Bayswater Brine Decant	E10				1986	TE	21.5	650	Macquarie Generation
Bayswater Cooling Makeup	E10				1984	TE	16	460	Macquarie Generation
Bayswater 2 Main	E10				1979	TE	27	1200	Bayswater Colliery
Beardy Waters	B11				1932/60	PG	8.5	500	Glen Innes Municipal Ccl
Beargamil	F8				1914	TE	16	480	Parkes Council
Ben Boyd	J9				1978	TE	29	800	Bega Valley Council
Ben Chifley	F9				1957/2001	TE	27	30000	Bathurst Council
Bendeela Pondage	G10				1973	TE/ER	18	1200	SCA
Bengalla Mine Raw Water	E10				2000	TE	11	270	Bengalla Mining Co P/L
Bethungra *	G7			R	1895	PG	13	580	State Water
Blackbutt Reserve *	G10				1957/95	TE	6	25	Shellharbour City Council
Blowering *	H8			R	1968	TE/ER	112	1628000	State Water
Bobs Dump Tails *	E10				-	TE/ER	25	2100	Coal & Allied
Bogolong	F8			M	1932	TE	11	360	Central Tablelands Cnty Cncl
Bonalbo	A12			M	1969/89	TE	13	55	Kyogle Council
Boorowa	G8				?	PG/TE	8	180	Boorowa Council
Bootawa *	D12			I	1967	TE	25	2270	North Power
Borenore Creek	F8			I	1928	VA	17	230	Cabonne Council
Brennans Creek*	G10				1976	DR	17	320	Coal Cliff Collieries Pty Ltd
Brogo	I9				1976	DR	43	9800	State Water
Brokers Rd Retarding Basin	G10		S		2000	TE	5	70	Wollongong Council
Brooklyn Retarding Basin	F11				1995	ER	5	5	State Rail Authority
Broughton Pass Weir *	G10		S		1888	PG	6	50	SCA
Broula King Tails 1	F8				-	TE/ER	18	138	Broula King Joint Venture
Broula King Tails 2	F8				-	TE/ER	18	25	Broula King Joint Venture
Buckland's Retarding Basin	G10				1991	TE	5	2	P. Buckland
Bulli Upper Rail Embankment	G10	P			?	TE	5	28	Multiplex Developments
Bundanoon	G10				1960	VA	35	2040	Wingecarribee Council
Burrindong	E9			M	1967	TE/ER	76	1188000	State Water
Burrinjuck	H8				1928/56/96	PG	93	1026000	State Water
Cadiangullong *	F8				1997	PG	45	4200	Cadia Holdings Pty Ltd
Cadia Southern Tails *	F8		S		2001	TE/RE	79	91000	Cadia Holdings Pty Ltd

Dam	Map Ref	Presc. 2005/6	Surv. Report	Safety	Built	Type	Height (m)	Storage (ML)	Owner
Cadia Tails Stage 2 *	F8				1997/2000	TE/ER	56	40000	Cadia Holdings Pty Ltd
Cadia-Upper Rodds Ck *	F8				2001	TE	31	3000	Cadia Holdings Pty Ltd
Cadia Waste Dump Basin *	F8				2002	TE/ER	18	50	Cadia Holdings Pty Ltd
Camberwell Tails 2	E11		S		-	TE/ER	40	1660	Camberwell Coal P/L
Campbelltown Link Basin *	G10		S		2003	ER	6	26	Landcom
Campbelltown Nth Basin	G10				2001	TE	3	30	Campbelltown Council
Captains Flat	H9				1939/93	PG	16	820	Yarrowlunla Shire Council
Carcoar	F9				1970	VA	46	35800	State Water
Cascade 1	F10				1915	VA	15	160	SCA
Cascade 2	F10				1926	TE	26	320	SCA
Cascade 3	F10				1938	TE	30	1700	SCA
Cataract	G10				1907/87	PG	56	94300	SCA
Cecil Hills Basin 100	F10				2001	TE	4	30	Liverpool Council
Cecil Park Basin 3A *	F10		S	R	1992	TE	6	52	Liverpool Council
Centennial Pk Res No. 1	F11				1899	PG	7	82	Sydney Water
Centennial Pk Res No. 2	F11				1925	PG/TE	11	89	Sydney Water
Chaffey *	D11			R	1976	TE/ER	54	61800	State Water
Chain of Ponds 13B	E11				-	TE	18	4000	Liddell Coal operations
Chichester *	E11				1923/84/95	PG	41	21000	Hunter Water Corporation
Clarrie Hall	A13			M	1982	DR	43	16000	Tweed Council
Clear Paddock Ck Basin	F11				2005	PG/TE	6	70	Fairfield Council
Coalcliff	G10				1971	TE	7	130	Illawarra Coke Co Pty Ltd
Cochrane *	I9		S		1958	TE	29	3085	Eraring Energy
Coeypoll Ck 1 *	D10				1932	VA	19	860	Liverpool Plains Council
Coeypoll Ck 2 *	D10			R	1955	TE	21	5435	Liverpool Plains Council
Colongra Ck Ash	F11				1965	TE	6	5550	Delta Electricity
Comberton Grange Basin	G10				1990	TE	15	65	Shoalhaven Council
Comin Place Basin	F10				2000	TE	5	20	Fairfield Council
Company *	F8				1867/2006	TE	6	113	Weddin Council
Copeton	B11			M	1976	TE/ER	113	1364000	State Water
Cordeaux	G10				1926/77/88	PG	49	93600	SCA
Cowarra *	D12		S		2001	TE	40	10000	Hastings Council
Cowarra Creek Tails	H9			M	1986	ER	23	52	Horizon Pacific Ltd
Crookwell	G9				1937	PG/VA	15	450	Crookwell Council
CSA Tails	D5		S		1960	TE	8	1932	Cobar Management / DMRes
CSIRO Retarding Basin	F10				1990	TE	6	58	Holroyd Council
Danjera	G10				1971	CB/ER	30	7700	Shoalhaven Council
Dapto Heights Basin	G10				1991	TE	7	16	Wollongong Council
Dartbrook Mine Water	E10				2000	TE	11	450	Dartbrook Mine
Daruk Park Basin	F10				1987	TE	3	47	Liverpool Council
Deep Creek	H10				1983	TE	31	4500	Eurobodalla Council
Deep Creek (Snowy)	I8				1961	PG	21	5	Snowy Hydro
Delegate Retarding Basin	J8			M	1984	TE	7	7	Bombala Council
DEP Retarding Basin	F10		S		1990	TE	9	110	Blacktown Council
Dover Heights Reservoir	F11		S		1929	PG/TE	8	85	Sydney Water
Drayton 1690	E10				1993	TE	16	440	Drayton Coal Pty Ltd
Drayton W.S.	E10				1980	TE/ER	18	390	Drayton Coal Pty Ltd
Dumaresq *	C11			R	1896	PG	12	440	Armidale Council
Dungowan *	D11		S		1957/92	TE	31	5900	Tamworth Council
Duralie Coal Shaft Creek *	E11				2003	TE/ER	17	1400	Duralie Coal Pty Ltd
Duralie Mine Water *	E11				2003	TE/ER	18	1100	Duralie Coal Pty Ltd
Edgewood Retarding Basin	G10				2002	TE	7	19	Illawarra Land Development
Edgeworth Ret. Basin	E11	P			-	TE	3	12	Lake Macquarie Council
Elanora (Hillgrove)	C11			I	?	TE	7	100	Hillgrove Mine
El Klaros	E11				1995	TE	25	200	Mawipalivier P/L
Emigrant Creek	A13				1968/2001	TE/PG	12	820	Rous County Council
Eraring Ash *	F11		S		1982	TE	25	20500	Eraring Energy
Eucumbene	I8				1961	TE/ER	116	479800	Snowy Hydro
Fitzroy Falls	G10				1974	TE/ER	14	22200	SCA
Floraville Road Basin *	F11				1992	TE	4	20	Lake Macquarie Council
Foothills Estate Basin 1	G10				1994	TE	5	20	Wollongong Council
Foothills Estate Basin 3	G10				1995	TE	5	20	Wollongong Council
Foothills Rd Basin	G10				1982/97	TE	5	24	Wollongong Council
Fountaindale	G10			I	1915	VA	15	61	Kiama Council
Fox Hills Basin *	F10		S		1990	TE	4	127	Blacktown Council
Galambine	E9				1982	TE	18	227	Gooree Pastoral Co
Gannet Place Basin	G10		S		1992	TE	10	5	Wollongong Council
Garden Suburbs Basin 2 *	E11				2000	TE	8	17	Lake Macquarie City Council
Geehi	I8				1966	ER	91	21100	Snowy Hydro
George Bass Drive Basin *	H10		S		2000	TE	3	11	Eurobodalla Council
Glenbawn	E10				1958/86	TE/ER	100	750000	State Water
Glenlee Tails	G10				U/C	ER	29	1500	Sada Pty Ltd
Glenmore Park Basin	F10				1997	TE	4	232	Penrith Council
Glennies Creek	E11			M	1983	DR	67	283000	State Water

Dam	Map Ref	Presc. Surv. 2005/6 Report	Safety	Built	Type	Height (m)	Storage (ML)	Owner
Glennies Ck (Possum Skin)	E11		S	2004	TE	14	1250	Glennies Ck Joint Venture
Glenquarry Cut	G10			1974	PG	18	34510	SCA
Gooden Reserve Basin	F10			1997	PG	5	380	Baulkham Hills Council
Googong	H9		S	1977/1992	ER	67	124000	ACT Electricity & Water
Gosling Creek *	F9		S	1890	PG	8	650	Orange Council
Grahamstown *	E11			1964/96/01	TE	11	132000	Hunter Water Corporation
Greaves Creek	F10			1942	VA	17	320	SCA
Green Meadows Basin *	G10			1981/93	TE	4	165	Shellharbour Council
Greenway Dve Basin 10A/B	F10			2000/3	TE	5	132	Landcom
Gunyah Park Basin	G10		S	1992	TE	4	5	Wollongong Council
Guthega	I8		S	1955	PG	34	1550	Snowy Hydro
Hamilton Valley Basin 5A	I6			1993	TE	4	135	Albury Council
Hamilton Valley Basin 5B	I6			1993	TE	3	62	Albury Council
Hillgrove Tails 1	C11			1982	TE/ER	40	700	Hillgrove Gold NL
Hillgrove Tails 2	C11			U/C	TE/ER	40	1280	Hillgrove Gold NL
Honeysuckle Creek	F11			1962/91	PG	9	12	Killara Golf Club Ltd
Horningsea Park Ret Basin	G10	P		-	TE	3	25	Liverpool Council
Hovell Weir	H7		M	1986	TE	8	2000	Tumbarumba Council
Howell Close Ret Basin	F11	P		-	TE	3	5	Pittwater Council
Hume *	I7		R	1936/1967	PG/TE	51	3038000	MDBC
Humphreys Creek	A12			1988	TE	15	750	Norminco Ltd
Humphreys Creek Tails	A12		M	1989	TE/ER	15	1100	Norminco Ltd
Hungerford Hill *	E11			1970/2002	TE	8	545	Southcorp Wines P/L
Hunter Valley Nth Pit Tails *	E10			U/C	TE/ER	50	20000	Coal & Allied Operations
Huntley Colliery 2	G10			U/C	TE	28	59	Powercoal
Imperial Lake	D1		R	1967	TE	8	700	Country Water
Island Bend	I8		S	1965	PG	49	3020	Snowy Hydro
Jindabyne *	I8		R	1967	ER	72	690000	Snowy Hydro
Jounama	H8			1968	ER	44	43500	Snowy Hydro
Junction Reefs	F8		S	1898	MB	19	300	State Water
Kalingo *	E11		S	1920	TE	9	81	Southland Mining Ltd
Kanahooka Basin *	G10		S	1993	TE	5	26	Forest Grove Estate
Kangaroo Pipeline	G10			1974	ER/PG	20	23500	SCA
Karangi	C13			1980/96	TE/ER	38	5600	Coffs Harbour Shire Council
Keepit *	C10		R	1960	PG/TE	55	423000	State Water
Kentucky Creek	C11			1944/84	PG	12	500	Uralla Shire Council
Khancoban *	I8		R	1966	TE	18	21500	Snowy Hydro
Killara Reservoir *	F11		S	1931/94	PG/TE	11	166	Sydney Water
Lake Canobolas *	F9		S	1918	VA	12	700	Orange City Council
Lake Cowal Gold Tails *	F7			2004	TE	20	3600	Barrick Gold Australia
Lake Cowal Protect Bund *	F7		S	2004	TE	5	194000	Barrick Gold Australia
Lake Endeavour *	F8		R	1940	TE	21	2400	Parkes Shire Council
Lake Ettamogah	H6			1993	TE	13	2100	ANM Mill
Lake Inverell	B11			1938	PG	13	1500	Inverell Shire Council
Lake Medlow	F10			1907	VA	20	290	SCA
Lake Pambulong Basin	E11			2002	TE	5	57	Hammersmith Mgt
Lake Parramatta *	F11		S	1857/98	VA	14	490	Parramatta Council
Lake Rowlands *	F9		R	1953	CB/TE	20	4690	Central Tablelands Council
Lake Tullimba	C11			1982	TE	18	1200	New England Uni
Lemington Mine Tails	E10			1991	TE/ER	12	2000	Lemington Mine
Lemington Mine Tails 5 *	E10			2000	TE/ER	22	2000	Lemington Mine
Lidcombe Ret Basin 6	F11			2003	TE	4	11	Sydney Olympic Park Auth.
Liddell Ash *	E10			1971/82	TE	31	28500	Macquarie Generation
Liddell Ash Levee *	E10		S	U/C	TE/ER	21	Variable	Mac. Gen / Drayton Coal
Liddell Cooling Water	E10			1968	TE	43	148000	Macquarie Generation
Liddell Water Supply	E10			1970	TE	31	4500	Macquarie Generation
Lithgow 1 *	F10		S	1896	VA	11	69	Lithgow Council
Lithgow 2 *	F10		S	1907	VA	27	440	Lithgow Council
Lostock	E11			1971	TE/ER	38	20000	State Water
Loyalty Rd. Ret Basin *	F11			1995	PG	27	1520	Upper Parramatta Trust
Lyell *	F10			1983/96	DR	50.5	33500	Delta Electricity
Mahogany Ridge	E11	P		-	TE	18	373	Mahogany Ridge Dev.
Malpas *	C11		S	1968	TE/ER	31	13000	Armidale Council
Mangrove Creek *	F11		M	1983	DR	80	170000	Gosford Council
Manly	F11			92/1922/84	PG	18	2000	Sydney Water
Mannering Ck Ash *	F11			1963	TE	12.5	20000	Delta Electricity
Mardi *	F11		M	1963/91	TE	26	7280	Wyang Council
Maroubra Reservoir	F11			1966	PG/TE	12	128	Sydney Water
McCoy Park. Basin	F11			1989	TE	6	500	Parramatta Council
McKinnons Gold Project	D5			1996	TE	17	3030	Burdekin Resources
Medway	G10			1964	VA	23	1270	Wingecarribee Council
Menindee Storages	E2		S	1960	TE	12	2287280	State Water
Minmi Rd Retarding Basin	E11			1995	TE	5	55	Newcastle City Council
Molong Creek *	F9		M	1987	PG	16	1000	Cabonne Council

Dam	Map Ref	Presc. Surv. 2005/6 Report	Safety	Built	Type	Height (m)	Storage (ML)	Owner
Moolarben Creek	E9			1957/93	ER	12	375	Ulan Coal Mines Ltd
Mooney Lower	F11		M	1937	VA	13	310	Gosford Council
Mooney Upper	F11		I	1961	VA	27	4630	Gosford Council
Moore Creek *	C10			1898	VA	19	220	State Water
Mt Annan Wetlands 1	G10			-	TE	7	80	Landcom
Mt. Arthur Nth Environment	E10			2002	TE	17	1260	Coal Operations Aust
Mt Owen Nth Void 2 Tails	E10			2003	TE/ER	14	2000	Hunter Valley Coal Corp.
Mt Owen Rail Loop Tails	E10	S		2003	TE/ER	12	5000	Hunter Valley Coal Corp.
Mt Owen Tails 5	E10			-	TE	11	5000	Hunter Valley Coal Corp.
Mt Thorley AG Tails	E11	P		-	ER	10	5800	Coal & Allied
Mt Thorley Ministrip Tails	E11			-	ER	50	2520	Mt Thorley Operations
Mt. Thorley Ramp Tails	E11			U/C	TE	75	4700	Mt Thorley Operations
Mt View Basin	E11			1987	TE	4	247	Cessnock Council
Muirfield Golf Club *	F11			1969	TE	8	6	Muirfield Golf Club
Muirfields Golf Ret Basin	F11		I	1993	TE	4	12	Baulkham Hills Council
Murray 2	I8			1968	VA	43	2310	Snowy Hydro
Murrurundi *	D10			1984	TE	11	170	Murrurundi Council
Narara Horticultural *	F11	P	S	1985	TE	9	43	Dept of Primary Industries
Narranbulla	G9			1966	TE	7	1445	Narranbulla Pastoral Co.
Nepean	G10			1935/92	PG	81	81400	SCA
Newstan Area 7 Tails	E11	P		-	Te	9	135	Centennial Coal
Newstan Contingency Tails	E11			2003	TE/ER	20	78	Newstan Colliery
Newstan Sth REA Tails	E11	P		-	TE	53	5316	Centennial Coal
Nixon	C10			1971	TE	16	222	J. Nixon
Northmead Ret Basin	F10		S	1990/94	TE	6	30	Baulkham Hills Council
North Parkes Tails *	E8		S	1993	TE	20	25000	North Parkes Mines
Nth Turramurra Golf	F11			2001	TE	5	10	Ku-ring-gai Council
Nyrang Park Basin	G10		S	1993	TE	4	21	Wollongong Council
Oak Flats Reservoir *	G10		S	1978	TE	15	56	Sydney Water
Oaky River	C12			1956	PG/ER	18	2700	New England County Cncl
Oberon	F9			1949/96	CB	34	45400	State Water
Orange Research Station	F9			1993/97	TE	7	175	NSW Agriculture Dept
Pacific Palms	E12	P		?	TE	6	8	Calmjoy P/L
Palm Tree Grove Basin	F11			1975/90	TE/ER	3	3	Gosford Council
Pasminco Site D Tails	E1			1998	TE	26	6600	Pasminco Broken Hill Mine
Peak Gold Mine Tails	D5			1990?	TE	13	4200	Peak Gold Mines P/L
Pecan Close Basin	F11			1998/03	TE	5	100	Gosford Council
Pejar *	G9		S	1979	TE/ER	23	9000	Goulburn-Mulwaree Council
Pindari	B11		I	1969/93	DR	85	312000	State Water
Pipers Flat	F10		M	1920	TE	10	645	Centennial Coal Pty Ltd
Plashett	E10		S	1987	TE	46	70000	Macquarie Generation
Porters Creek	H10		M	1968	TE/PG	17	2541	Shoalhaven Council
Port Macquarie *	D12		S	1980	TE	19	2500	Hastings Council
Port Waratah Fines Disp	E11		S	1990	TE	5	1750	Port Waratah Coal
Potts Hill Res. 2	F11			1923	PG/TE	8	799	Sydney Water
Prospect	F10			88/1979/97	TE	26	50200	SCA
Puddledock Creek	C11		M	1928	VA	21	1730	Armidade Council
Ravensworth Mine Inpit *	E11			1994	TE	12	1000	Peabody Resources
Ravensworth Void 3 Ash *	E11			2001	TE	20	12000	Macquarie Generation
Redbank Creek	E9		R	1899	VA	16	180	Mudgee Council
Rocky Creek	A13		R	1953	TE	28	14000	Rous County Council
Rouse Hill Ret Basin 5	F10			1993	TE	4	72	Sydney Water
Rouse Hill Ret Basin 9	F10			1993	TE	5	46	Sydney Water
Rouse Hill Basin 9B	F10			2001	Te	7	55	Sydney Water
Rouse Hill Ret Basin 13	F10			1994	TE	5	99	Sydney Water
Rouse Hill Ret Basin 16	F10			2000	TE	4	13	Sydney Water
Rydal *	F10			1957/96	TE	15	370	State Water
Rylstone	E9			1953	VA	15	3210	Rylstone Council
Sawyers Swamp Creek Ash	F10			1979	TE	40	8500	Delta Electricity
School House Ck Ret Basin	F10			1989	TE	4.5	138	Penrith Council
Seladon Ave Ret Basin	E11			1993	TE	2	3	Newcastle Council
SE Tails *	E10			Prog	ER	35	1200	Coal & Allied
Shannon Creek *	B12	P		-	TE/ER	44	30000	North Coast Water
Shellcove Estate Basin	G10			2003	TE	7	27	Shell Cove Estate
Sierra Place Basin	G10			1991/2001	TE/ER	9	213	Baulkham Hills Council
Smiths Ck Ret Basin 1 *	G10			2001	TE	9	55	Campbelltown Council
Smiths Ck Ret Basin 2 *	G10		S	1996	TE	8	50	Campbelltown Council
Smiths Ck Ret Basin 3 *	F10		S	1996	TE	7	32	Campbelltown Council
Sooley *	G9			1930/61/2006	PG	15	4500	Goulburn-Mulwaree Council
South Bulli Basin 1 *	G10	P		-	TE	6	50	Gujurat NRE Aust.
South Bulli Stormwater *	G10			1992	TE	9	89	Gujurat NRE Aust.
Split Rock	C10			1987	DR	66	397370	State Water
Spring Creek *	F9		R	1931/47/69	TE/VA	16	4700	Orange Council
Stephens Creek	D1		M	1892/1909	TE	15	20400	Country Water

Dam	Map Ref	Presc. 2005/6	Surv. Report	Safety	Built	Type	Height (m)	Storage (ML)	Owner
Steuart McIntyre *	D12				2000	TE	25	2500	Kempsey Council
St Josephs School Basin	G10				1990/2001	TE	5	17	Shellharbour Council
Stockton Borehole Tails	E11				1982/1985	TE/ER	21	360	Broken Hill Prop. Co Ltd
Suma Park *	F9			M	1962	VA	34	18000	Orange Council
Sunlight Gully Upper Dam	C11			I	1900?	TE	4	28	Hillgrove Gold NL / D Hanlan
Sunlight Gully Lower Dam	C11			I	1900?	TE	5	65	Hillgrove Gold NL / D Hanlan
Talbingo *	H8			R	1970	ER	162	921400	Snowy Hydro
Tallong Railway	G10		S		1883/1975	MB	7	318	State Rail Authority
Tallowa	G10				1976	PG	46	110200	SCA
Tantangara	H8				1960	PG	45	254000	Snowy Hydro
Tenterfield Creek	B12			M	1930/74	PG	11	1170	Tenterfield Shire Council
The Cove	F11			M	1972	TE	7	140	Old Sydney Town
Thompsons Creek	F9		S		1992	TE/ER	53.5	27500	Delta Electricity
Thornleigh Reservoir *	F11		S		1971	TE	9	409	Sydney Water
Tilba	I10			I	1970/97	TE	17	135	Bega Valley Council
Timor	D9				1961	VA	19.5	1140	Coonabarabran Council
Tooma	I8		S		1961	TE	67	28100	Snowy Hydro
Toonumbar	A12				1971	TE/ER	44	11000	State Water
Triako Tails *	E6		S		1989	TE	12.5	950	Triex Ltd
Tritton Tails	D6				2004	TE	14	5500	Tritton Resources Ltd
Tumbarumba	H8			M	1972	TE	6	68	Tumbarumba Council
Tumut Mill Freshwater	H8				2001	TE	11	190	Visy Pulp & Paper
Tumut Mill Winter Storage	H8				2001	TE	11	700	Visy Pulp & Paper
Tumut Pond	H8				1959	VA	86	52800	Snowy Hydro
Tumut 2	H8				1961	PG	46	2700	Snowy Hydro
Tumut 3 Inlet	H8				1971	PG	35	160000	Snowy Hydro
Umberumberka	D1				1914	PG	26	8180	Aust. Inland Energy & Water
United Collieries Tails 2	E10	P			2006	TE	12	400	United Colliery
Upper Cordeaux 2	G10				1915	VA	19	1200	SCA
Vales Point Ash	F11				1984	TE	6	42000	Delta Electricity
Valley View Ret Basin	F8	P			2006	TE	5	10	Cowra Council
Wallerawang	F10				1978	TE	14	4300	Delta Electricity
Wambo Hunter Pit Tails *	E11				-	ER	50	8300	Wambo Mining Corp.
Wambo NE Tails *	E11				U/C	TE	26	2060	Wambo Mining Corp
Warkworth Tails *	E11				1992/94	TE	24	3500	Warkworth Mining
Warkworth Nth Pit Tails *	E11				1997	TE	21	1900	Warkworth Mining
Warragamba *	F10				1960/92/02	PG	113	2091800	SCA
Warringah Reservoir	F11				1936/95	PG/TE	8	77	Sydney Water
Waverley Res. WS133	F11				1917	PG/TE	8	19	Sydney Water
Wentworth Falls Lake *	F10				1906/93	TE	10	300	Blue Mountains Council
Whitford Rd Basin	F10				1997	TE	4	44	Liverpool Council
Winburndale	F9			R	1936	PG	25	1850	Bathurst Council
Windamere	E9				1984	TE/ER	67	368000	State Water
Winding Creek 5 Basin *	E11				1993	TE	5	72	Hunter Water Corp
Wingecarribee *	G10			M	1974	TE/ER	20	34510	SCA
Wollondilly Washery	G10				1968	ER	18	150	Sada Pty Ltd
Wollongong High Basin	G10		S		2001	TE	5	80	Wollongong Council
Woodford Creek	F10				1928/48	VA	18	850	SCA
Woodlawn Mine Evap	H9				1989	TE	6	750	Woodlawn Mines
Woodlawn Mine Evap. 2	H9				1989	TE	10	290	Woodlawn Mines
Woodlawn Nth Tails	H9				1977	TE/ER	18	2100	Woodlawn Mines
Woodlawn Sth Tails	H9				1982	TE/ER	25	2400	Woodlawn Mines
Woodlawn West Tails	H9				1989	ER	35	2400	Woodlawn Mines
Woolgoolga	C13				1967	TE	14	270	Coffs Harbour Council
Woronora	G10				1941/88	PG	63	71800	SCA
Wyangala	F8			M	1971	TE/ER	85	1220000	State Water
Wyong Road Basin	F11		S		1975	TE	3	50	Wyong Council
Yarrowonga Weir	I6				1939/2001	PG/TE	7	120000	MDBC
Yass	G8				1927	VA/PG	12	1125	Yass Council
Yellow Pinch	I9				1987	ER	40	3000	Bega Valley Council

LEGEND:

*: DSC Inspected-2005/6
 R: Sig. Risk Dam
 M: Medium Risk Dam
 I: Dam under Investigation
 U/C: Under Construction

TE: Earthfill dam
 DR: Decked rockfill
 PG: Conc. Gravity
 CB: Concrete buttress

ER: Rockfill dam
 MB: Masonry buttress
 VA: Concrete arch



Cadia Mine South Tailings Dam near Orange

DSC members and staff inspecting the raising construction for this tailings dam during a site inspection in 2005

South Bulli Stormwater Dam

DSC staff undertaking an audit inspection of the dam with the owner's staff in 2006



Blowering Dam

The current drought has had one beneficial effect in that it has allowed owners to economically inspect and upgrade dam structures that are normally under water