SYDNEY CATCHMENT AUTHORITY

Annual Report 2001–2002

SYDNEY CATCHMENT AUTHORITY

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1 Bulk Water Supply

The SCA's primary function is to provide quality bulk water to its customers – which include Sydney Water Corporation, local councils and other authorised persons – through effective asset, resource and risk management.

1.1 QUANTITY OF WATER SUPPLIED TO SCA CUSTOMERS

A total of 629,209 megalitres (ML) of raw water was supplied from various SCA storages during the year. Most of the bulk water (99 per cent) was supplied to Sydney Water Corporation's (SWC) water filtration plants and privately owned plants that are contracted to SWC. Shoalhaven City Council, Wingecarribee Shire Council, and customers drawing water directly from the pipelines and the Upper Canal accounted for the other one per cent. Table 1 shows the quantities supplied during the year.

TABLE 1: WATER SUPPLIED TO SCA CUSTOMERS

Customer	Bulk Water Supplied (ML)
SWC	625,378
Wingecarribee Shire Council	3406
Shoalhaven City Council	82
Direct users – Upper Canal	221
Direct users – Warragamba Pipeline	67
Others	55
TOTAL	**629,209**

1.2 RAW WATER QUALITY

Water quality over the year has been of a high standard. Bulk water supplied to each SWC water filtration plant must meet water quality parameters specified in the Bulk Water Supply Agreement (BWSA). In 2001–2002, bulk water supplied to SWC achieved 98 per cent conformance with quality standards specified for each plant in the agreement.

The SCA also demonstrated good progress against its Operating Licence conditions with respect to bulk water quality. Bulk water delivered to SWC during 2001–2002 was fully compliant with the health guideline values set out in Schedule 4 of the Operating Licence.

The $2.1 million rebate provided to Sydney Water Corporation for supply of water that did not meet turbidity and colour parameters was significantly less than the target long–term annual average of $3.2 million.

Table 2 shows the quality of water supplied to SWC and other bulk raw water customers throughout the year.

TABLE 2: QUALITY OF WATER SUPPLIED

	Target	Actual
Health Related Aesthetics (per cent compliance to	100	100
Overall compliance to Bulk Water Supply Agreement (per cent)	>95	97.9

1.3 WATER SUPPLY MANAGEMENT INITIATIVES

Bulk Water Supply Agreement with Sydney Water and Other Customers

During the year, amendments to the Bulk Water Supply Agreement (BWSA) between the SCA and SWC were negotiated and agreed upon. On 24 June 2002, IPART reviewed the proposed changes to the agreement and noted the strong support for the changes. A copy of the proposed BWSA was forwarded to the Minister for the Environment for consideration and approved.

The SCA has also been negotiating with Wingecarribee Shire and Shoalhaven City councils to finalise bulk water supply agreements. Agreements with each council are anticipated during 2002–2003.

System Security and Reliability

The SCA commenced a detailed study to evaluate the capability of the SCA bulk water supply infrastructure system to operate under a wide range of possible future conditions, and to assess the yield of the SCA system.

Yield is defined as 'the amount of water that can be withdrawn from a reservoir on an ongoing basis with an acceptably small risk of reducing the reservoir storage to zero' (Nevada Division of Water Planning, US).

The study uses simulations of the synthesised and historic inflows through the SCA operational storage network.

The SCA system assessment is based on the robustness, reliability and security criteria specified in its Operating Licence. The results of the model indicate that the SCA fully complied with the requirements of the Operating Licence.

The yield of the SCA's water supply system is estimated at around 600,000 megalitres of water available for consumption by SCA customers.

Bulk Water Supply cont'

Bathymetric Surveys

Lake Burragorang is formed by Warragamba Dam, which was completed in 1960. It is the largest urban water supply in Australia, and accounts for about 80 per cent of Sydney's water supply.

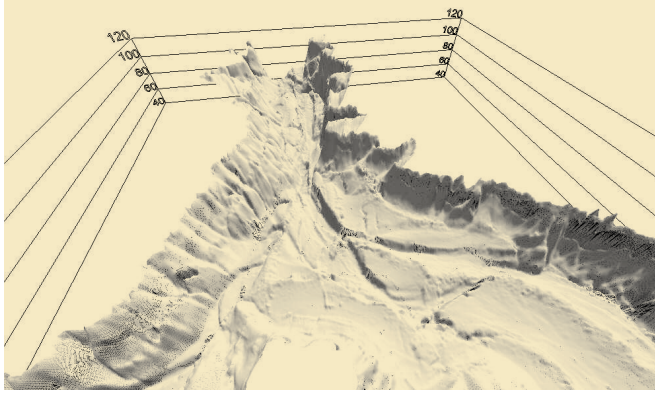
The SCA conducted a bathymetric survey of Lake Burragorang to:

- estimate the level of sedimentation
- determine a basis for the current storage volume
- provide a baseline for future surveys to determine the rate of sedimentation, and
- inform catchment rectification plans.

The study employed advanced echo sounder technology coupled with Global Positioning System (GPS) navigation and is the most detailed survey of the lake–bed made to date.

According to the survey results, the depth of sediment in the lake varies between zero and approximately 2.5 metres. The sedimentation was greatest at the dam wall where the sediment depth ranged between 2–2.5 metres.

Based on the survey results, the active storage is accurately estimated at 1,857,000 ML. This is a reduction of 1.5 per cent of the previous figure (1,886,000 ML), which was established in the 1950s using traditional survey methods.



Bathymetric survey of Lake Burragorang.

Upper Nepean Transfer System

The Upper Canal consists of a 65–kilometre system of tunnels, open channels and piped aqueducts that transfers water from Pheasants Nest below the Upper Nepean dams to Prospect Reservoir. Inspections and scientific studies have identified 'hot spots' which present potential threats to water quality.

This system has been in operation without substantial change for over 100 years. The Water Supply Network Plan requires the continuance of the system's role and function. To maintain its operational capability, significant ongoing maintenance is now required.

Short–term rectification actions have been carried out over the last three years. However, before the SCA commits funds to maintain the system for the medium to long–term, a review of the best way to meet the required role and function is being undertaken.

Options under consideration range from retaining the system with minimum modifications – to totally replacing the existing infrastructure with a network of tunnels. The review will look at issues relating to hydraulic capacity, water quality, flow rate control, land management, and environmental and social impacts.

Bulk Water Supply Protocols

The Bulk Water Supply Protocols, which contain procedures for operating and communicating during both routine and abnormal periods, were finalised with Sydney Water. Awareness sessions were conducted for all relevant staff in the SCA, SWC, and Builder Owned and Operated (BOO) plants.

The document sets the framework for the SCA, SWC and their contractors to work together in delivering safe and healthy water to customers. It contains protocols for communication in relation to water quality requirements, raw water quality management, database management and data sharing, planned maintenance shutdowns, day–to–day operational change requests, and invoicing. These protocols provide a consistent approach to communication with SWC and its contracted water filtration plant operators.

1.4 RAINFALL AND STORAGE BEHAVIOUR

The SCA operates 88 water level recorders and 155 rainfall stations in the catchments, storages and downstream of the dams. They collect information on water levels and rainfall on a continual basis.

The water supply catchments received less than the long–term median rainfall during the year. As a result there was a net negative change of 9.1 per cent in storage levels over the year. The drop in storage was three times higher than in the previous year. This was attributed to the El Nino phenomenon. The tables and figures below show the rainfall received and the movement in storage levels.

Drought Response Plan

The SCA, in consultation with SWC, has developed a draft Drought Response Plan outlining:

- how the SCA, in coordination with SWC, will use its various storages to maintain supply to SWC and its other customers
- how SWC will assist by achieving demand reductions below normal drought levels, and
- inter–organisational management structures required to coordinate SCA, SWC and other government authorities.

Under the plan, the Government and the public will be informed of the progress of a drought and the actions they should take to maximise the balance between supply and demand.

THE YEAR AHEAD

As part of its requirement to reach agreement with its customers on supply arrangements, the SCA will finalise bulk water supply agreements with Wingecarribee Shire Council and Shoalhaven Water, the water supply subsidiary of Shoalhaven City Council.

A bathymetric survey of Lake Yarrunga is proposed to further the SCA's understanding of the extent of sediment entering and contained in its storages, and to inform plans for catchment rectification. Similar studies will be conducted for other storages over the coming years.

The impact of land use on catchment yield will be a focus of study and modelling in forthcoming years to help the SCA identify how it can improve the amount of water collected from the catchments.

The coming year will see the Bulk Water Network Plan expanded and enhanced to become the Bulk Water Supply Plan. Additional information on yield, average day demand, and supply site options will be incorporated to provide long–term supply capability.

The Prospect Raw Water Pumping Station will be progressed towards detailed design and construction. When complete, this facility will improve the security of supply in the event of a water quality incident in the Warragamba system by providing an alternate short–term supply source.

TABLE 3: STORAGE LEVELS AS AT JUNE 30 2002

	Full operating storage (ML)	Storage level (m)	Available storage (ML)	Available storage (%)	Net annual change (m)	Net annual change (ML)
Cataract	94,300	–3.55	67,090	71.1	–2.32	–17,110
Cordeaux	93,640	–4.09	65,550	70.0	–1.72	–10,900
Avon	146,700	–5.70	91,880	62.6	–1.45	–12,940
Nepean	40,810	–1.90	34,860	85.4	0.05	150
Woronora	71,790	–0.14	71,260	99.3	2.57	9,050
Warragamba	1,857,000	–5.35	1,474,060	79.4	–2.56	–209,090
Prospect	8,870	–0.78	4,960	55.9	–0.43	–2,130
Wingecarribee	24,100	–1.30	18,570	77.1	0.00	–7,180
Fitzroy Falls	10,000	–0.32	8,390	83.9	–0.07	–360
Tallowa	36,000	0.05	36,000	100.0	–0.10	390
Blue Mountains	2,790	*	2,020	72.4	*	–470
Total	**2,386,000**		**1,874,640**	**78.6**		**–250,590**

* There are five storages – no composite figure available for storage levels

Bulk Water Supply cont'

FIGURE 1: MOVEMENT IN AVAILABLE STORAGE

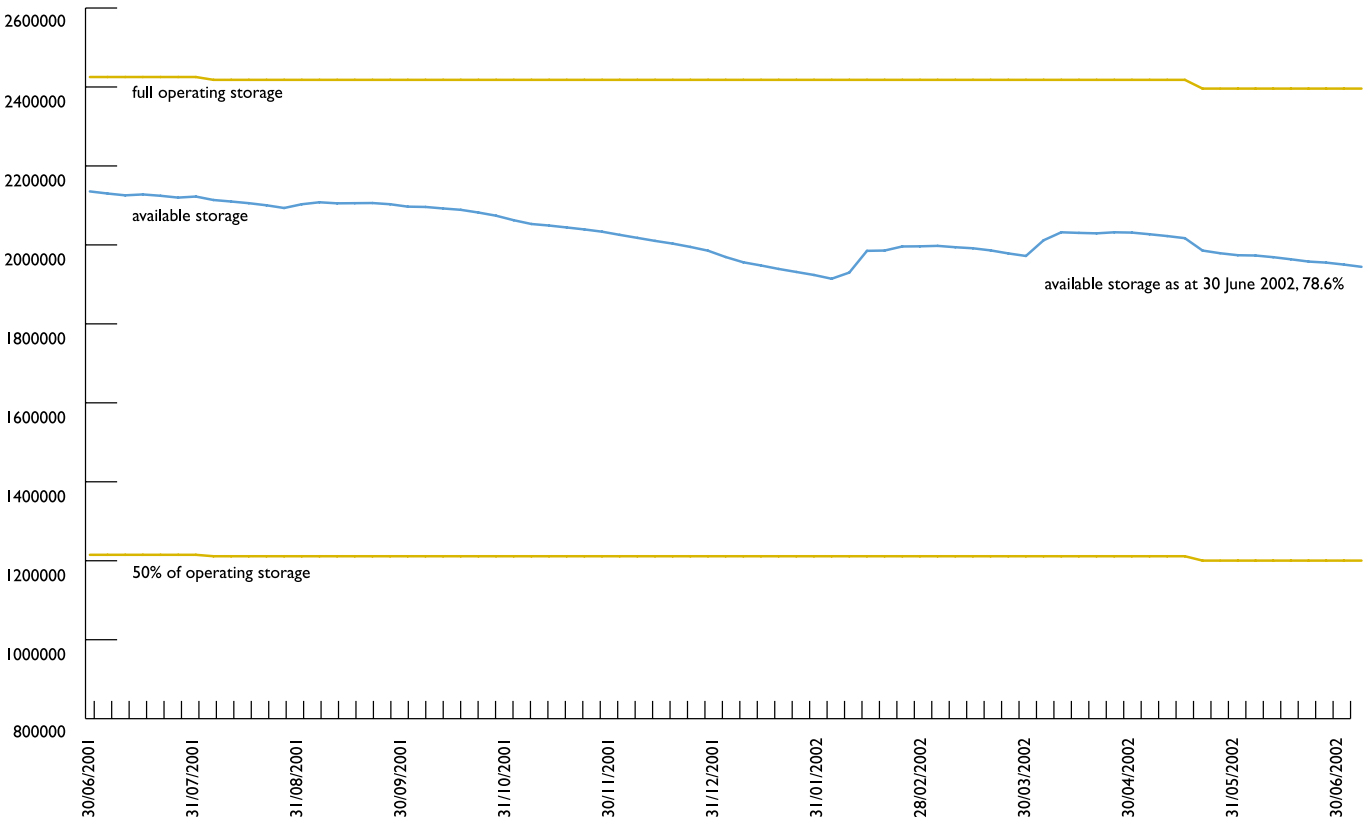
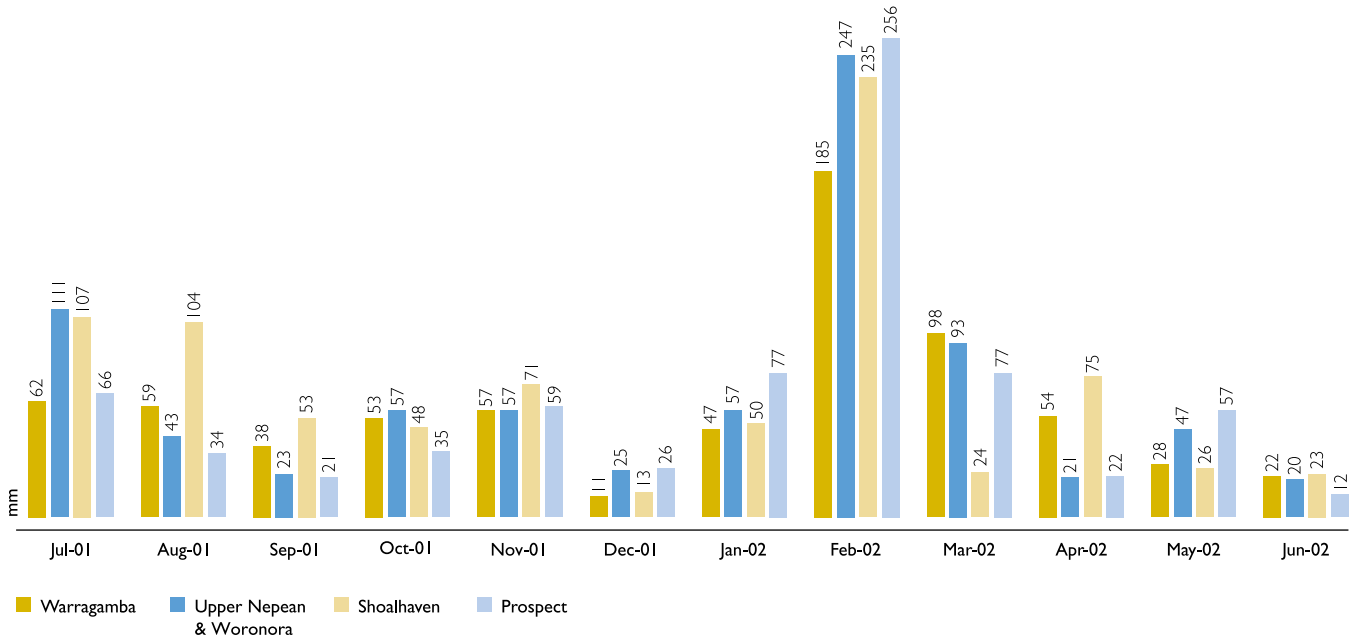


FIGURE 2: RAINFALL



2 Asset and Infrastructure Management

The SCA owns assets with a book value of approximately $686 million that are critical to delivering a reliable source of quality bulk water to its customers. All SCA assets – which include infrastructure, buildings and land as well as cultural and heritage assets – need to be maintained, replaced and/or upgraded to ensure reliability and to allow the SCA to perform its function effectively.

2.1 ASSET MANAGEMENT STRATEGY

The SCA commenced a review of its current Asset Management Strategy (AMS), which is predominately focused on catchment infrastructure (bulk water) assets. In keeping with the strategic, holistic approach identified in the 2002–2007 Business Plan, the SCA will be extending the strategy to include all assets.

An independent audit is to be undertaken in 2002–2003 and will determine how well the SCA is applying the Government's Total Asset Management Guidelines. The outcomes will indicate effectiveness, suggest improvements, and determine how well the planning process drives the capital works program. Appendix 12 details the SCA's major asset categories as at 30 June 2002.

2.2 ASSET OPERATIONS

System Management Plans

As part of the rolling program, the system management plans (SMPs) for Warragamba Dam, Warragamba Pipeline, Shoalhaven, Upper Canal and Upper Nepean dams were reviewed during the year. SMPs are proving effective in serving as reference documents for integrated decision–making on asset management.

Operations and Maintenance Manuals

The SCA continued its task of compiling operations and maintenance manuals for all bulk water assets. Manuals for Bendeela Pondage, the Cascade dams, Fitzroy Falls Reservoir, Wingecarribee Reservoir, Kangaroo Pipeline Control Structure and Glenquarry Cut were completed during the year.

Standard Operating Procedures

Further rationalising of existing standard operating procedures (SOPs) was undertaken to develop generic SOPs to replace those covering similar activities. Testing and reviewing of SOPs was undertaken on an ongoing basis.

2.3 ASSET MAINTENANCE

Asset Maintenance Management Manual (AMMM)

The SCA updated its Asset Maintenance Management Manual (AMMM) to fully complement the Asset Management Strategy (AMS). The manual focuses mainly on the catchment infrastructure assets including dams, pipelines, canals and pumping stations.

Failure Modes, Effects and Criticality Analysis

In line with best practice in asset management, the SCA undertook failure modes, effects and criticality analyses (FMECA) for Blue Mountains and Warragamba dams. This involved:

- assessing the criticality of the assets with respect to safety, environmental impact, production, failure frequency, downtime and heritage issues, and
- performing FMECA for functional failures of the critical assets in order to determine the optimum maintenance approach.

The results have led to a number of improvements that are being incorporated into the SCA's system management plans.

Benchmarking of Mechanical and Electrical Maintenance of Utilities

The Water Services Association of Australia (WSAA) commissioned a benchmark study of mechanical and electrical maintenance activities among 14 leading water industries in Australia, including the SCA.

Mechanical and electrical maintenance activities for six key asset groups were compared across the areas of breakdown, and scheduled and renewal maintenance.

The study found that the SCA:

- demonstrates characteristics of having very defined and well managed key performance indicators for maintenance, and
- has a computerised maintenance management system designed to maintain accurate and easily accessible technical data.

Further improvements were recommended and will be addressed in the coming year.

Pipeline Maintenance

Pipeline maintenance carried out during 2001–2002 included:

- a section of the Warragamba No. 1 pipeline was isolated for major periodic maintenance. Inspection of another section of the pipeline was carried out concurrently, involving the development of a new method for safe access along shafts and inclines
- ongoing preparation and painting of the Warragamba Pipeline was carried out
- the Upper Canal was shutdown for two months to enable a condition assessment of the stop logs and trash racks, as well as removal of debris and vegetation, and
- the Kangaroo and Bendeela Pipelines were also shutdown for two months to enable inspection and maintenance work to be successfully carried out.

2.4 CAPITAL WORKS

The Capital Works Program for 2001–2002 encompassed a range of projects including renewals and upgrades of existing water supply infrastructure, which focused on dam safety, asset reliability, environmental and Occupational Health, Safety and Rehabilitation (OHS&R) improvements, water quality and catchment enhancement projects.

The major component of the Capital Works Program was the continuation of the Warragamba Dam Auxiliary Spillway Project, which accounted for $12.1 million of the $16.3 million total expenditure for the year.

TABLE 3: CAPITAL WORKS EXPENDITURE FOR 2001-2002

Project	**2001-2002 Expenditure ($000s)**
Warragamba Spillway Project	12,137
Warragamba Dam Upgrade Lifts	24
Warragamba Dam Renewal of Jetties	109
Warragamba Pipeline Upgrade Flow Control	7
Warragamba Pipeline Install Access Platforms	350
Warragamba Pipeline Upgrade Ancillary Valves	41
Warragamba Pipeline Fencing	38
Upper Nepean Dams Upgrade of Roads	2
Upper Nepean Dams Upgrade Effluent Disposal	700
Avon Dam Communication Cable Renewal	5
Upper Canal Refurbish Channel	101
Prospect Reservoir Upgrade Scours	27
Prospect Reservoir Upgrade Channel	124
Shoalhaven System Upgrade SCADA	2
Tallowa Dam Offtakes	24
Kangaroo Valley Water Supply	7
Land Acquisition for Catchment Areas	462
Warragamba Catchment Refurbish Bridges	192
Catchment Areas Renewal/Upgrade	2
Fencing of Braidwood Lands	52
Woronora Dam Modifications for Environmental Flows	72
Upgrade Hydro/Water Quality Monitoring	69
Site Office Fitouts	166
Bulk Water Access Road Upgrades	276
Office Accommodation at Penrith	232
Buildings	273
Upgrade Conference Facilities	12
Mobile Water Quality Monitoring Trailers	382
Sewer Relining Equipment	3
Working Plant & Equipment	296
Office Equipment	87
Computer Equipment	21
Office Amenities	12
Total	**16,307**

Warragamba Dam Auxiliary Spillway Project

The auxiliary spillway component of the Warragamba Dam Auxiliary Spillway Project, which began in 1998, was completed.

The project involved the construction of an auxiliary spillway at Warragamba Dam to allow the dam to fully comply with dam safety requirements in the event of extreme flood. For the past three years this has been the largest dam project under construction in Australia.

The new spillway will, in conjunction with the existing gates spillway on the dam wall, allow the dam to safely pass all floods up to the Probable Maximum Flood level. The dam now meets the most stringent internationally accepted standards for dams of such critical importance.

The civil engineering contract for the project reached practical completion on 14 June 2002. With the achievement of this milestone, the spillway is now capable of performing its primary function of safeguarding the dam.

The remaining work over the next three years relates to upgrading the existing spillway drum and radial gates, construction of the new visitor and operations centre, and major site restoration.

Warragamba Dam Auxiliary Spillway

Warragamba Dam Outlet Upgrade

An option study was undertaken for upgrading the emergency closure on the outlet works at Warragamba Dam. The works will allow water supply outlets at the dam to close safely under emergency conditions, in accordance with recognised international best–practice.

The preferred project option involves the replacement of the existing upstream and downstream gate valves and the needle valve on each outlet. It also includes a suitable emergency closure valve and a downstream isolating butterfly valve.

The work will commence in 2002–2003, with a target completion date of 2006–2007.

2.5 DAM SAFETY

The SCA owns 21 structures that have been classified as 'prescribed dams' by the NSW Dams Safety Committee (DSC) under the *Dams Safety Act 1978*. The SCA undertakes regular surveillance and monitoring of all the dams in accordance with the Australian National Committee on Large Dams (ANCOLD) guidelines and in compliance with DSC requirements.

Annual inspections, which were undertaken of all dams, did not indicate any significant dam safety issues. A review of surveillance and monitoring data has indicated that all SCA dams continue to perform satisfactorily.

Dam surveillance reports must be prepared for each dam every five years, for submission to the DSC. During 2001–2002, the reports for Cataract and Cordeaux dams were submitted and obtained the DSC's endorsement. Surveillance reports have also been prepared for Warragamba, Woronora and the three Cascade dams in the Blue Mountains.

Operation and maintenance manuals for seven high hazard dams (Avon, Cataract, Cordeaux, Nepean, Prospect, Tallowa and Woronora dams) were finalised and issued in 2001–2002. Manuals for the remaining ten high and significant hazard dams are being finalised.

Updated Dam Safety Emergency Plans (DSEPs) for all the high hazard and significant hazard dams were issued for SCA's internal use. The State Emergency Service (SES), in collaboration with the State Emergency Management Committee (SEMC), DSC and the NSW Police, is finalising protocols to be followed by dam owners when notifying external emergency agencies in the event of a dam safety emergency. Following agreement on the protocols, the SCA will finalise all DSEPs and issue them externally.

A comprehensive safety and risk assessment study of Wingecarribee Dam was undertaken to review its safety in the light of modern dam design criteria and current hazard assessment. An external expert panel has been engaged to review the assessment and help determine the safety status of the dam.

2.6 MINING

Underground coal mining continued within the SCA's catchment areas, particularly in the areas of Cataract Dam, Broughton's Pass Weir, Cataract Tunnel and the Upper Canal near Appin, and under the catchments of Woronora, Cordeaux and Avon dams.

Several applications for the continuation of longwall coal mining that have the potential to impact on SCA infrastructure were submitted to, and approved by, the Department of Mineral Resources (DMR). These applications were extensively reviewed by the SCA and approval conditions were imposed to ensure that SCA assets and infrastructure would not be adversely impacted upon as a result of mine subsidence. These conditions included the need to undertake preventative measures and implement monitoring programs and management plans.

The SCA provided a submission to the Commission of Inquiry into BHP Billiton's proposed Dendrobium Underground Coal Mine. The Minister for Urban Affairs and Planning approved the development on 20 November 2001. The SCA provided considerable input to the process of developing consent conditions. These conditions define various ongoing consultation, regulation and monitoring roles for the SCA. Many of these are already being implemented with BHP Billiton preparing management plans and starting construction of airshaft facilities within the Special Area. Coal extraction under the catchment is not due to start until 2004.

Rehabilitation plans have been developed for all the closed coalmines in the Burragorang Valley and Oakdale area. One company has completed all necessary works and relinquished their lease. Rehabilitation, revegetation and weed control is continuing on other sites. There are a number of areas of surface coal waste currently burning that were lit by the Christmas bushfires. These areas continue to be monitored by the DMR and leaseholders at the behest of the SCA and Rural Fire Service.

2.7 IMPACT OF BUSHFIRES ON ASSETS

The Christmas 2001 bushfires had widespread impact on the SCA's assets, including catchment lands, infrastructure, facilities and heritage items. One of the worst affected areas was the Warragamba Dam site, where a number of structures, equipment and heritage items were damaged or destroyed.

Amongst those buildings completely destroyed by the fire was the Warragamba Community Education office and theatrette. The 1947 Warragamba suspension bridge was severely damaged, along with a mobile crane and other equipment associated with the Warragamba Dam outlet works.

Around 130,000 hectares or one–third of the SCA's Special Areas (land closest to the water storages) were burnt. Woronora and Avon Special Areas were the worst affected with around 97 per cent of the total area burnt. Significant amounts of fencing and signage were destroyed. New fire trails, which were constructed to help combat the fires, require rehabilitation to prevent erosion.

A number of gauging stations located in the catchment streams were also damaged. A special water quality monitoring program to examine the impact of the bushfires on the quality of water was instigated (see chapter 4).

2.8 CULTURAL HERITAGE

The SCA is responsible for managing a diverse range of cultural heritage items including dams and associated infrastructure, weirs, homesteads, mining infrastructure, walking tracks and bridges. There are also many sites of significance to indigenous history and culture. These include middens, rock shelters and engravings.

In accordance with Section 170A of the *NSW Heritage Act, 1977*, the SCA reports on the condition and management of assets listed on its draft Heritage and Conservation Register. The condition of the SCA's cultural heritage assets and works undertaken during the year, including inspections, maintenance, upgrades and development of conservation management plans, is contained in Appendix 23.

Asset and Infrastructure Management cont'

THE YEAR AHEAD

The SCA will start a five–year program to review the seismic safety of all SCA dams in accordance with NSW DSC's Requirements for Earthquake Assessment of Dams (February 2000).

The five yearly surveillance reports for Warragamba, Woronora and the three Cascade dams will be finalised and submitted to the DSC. Surveillance reports for Greaves Creek, Woodford Creek, Lake Medlow and Prospect dams will also be submitted to the Committee in 2002–2003. The SCA will also finalise the Wingecarribee Dam safety review and risk assessment study and determine the safety status of the dam.

The SCA will finalise and issue operation and maintenance manuals for the remaining ten high and significant hazard dams.

Existing mine subsidence management plans will continue to be updated and implemented to ensure the ongoing integrity and performance of all SCA assets against the impacts of underground coal mining.

The review of the Asset Management Strategy, which focuses on infrastructure assets, will be progressed to cover all assets, including land and property.

A range of capital works projects within the five–year Capital Works Program will be successfully completed.

The SCA will undertake major periodic maintenance of the water supply conduits as per the program. Failure modes effect and criticality analyses for SCA catchment infrastructure assets will be progressed.

3 Catchment Management and Protection

In a year marked by the Christmas 2001 bushfires, there was continued action to address threats to water quality, progress towards evidence–driven, risk–based strategies and solid gains in managing and protecting the catchments.

3.1 CATCHMENT HEALTH & RISK ASSESSMENT

Second Catchment Audit

In December 2001, Dr John Williams, Chief of CSIRO Land and Water, presented the Minister for the Environment with the initial report of the second independent audit of the state of the catchment lands. The Audit of the Sydney Drinking Water Supply Catchments Managed by Sydney Catchment Authority:

- highlighted that the SCA had established effective relationships with other agencies, local councils and the catchment community
- recommended action to address the complex institutional and consultative processes currently in place
- reinforced the need to continue to move towards whole–of–catchment management, and
- identified some important gaps in information and knowledge, which will inform the development of the SCA's Catchment Information System and refinement of the SCA's research program.

The audit found that the SCA had responded positively to the recommendations of the 1999 audit. It further concluded that 30 per cent of the catchment area has water quality and catchment conditions that align with the best found in NSW. However, some 20 per cent of the catchment was found to fall in the moderate to poor category.

The SCA's new Business Plan provides a focus for addressing the issues raised by the report. In particular, the SCA's Healthy Catchments Program has provided significant assistance to addressing pressures and hazards identified by the audit. The Accelerated Sewerage Scheme being implemented by the SCA, councils and the Department of Land and Water Conservation (DLWC) will also result in a more rapid upgrade of sewage treatment plants in the catchment.

Pollution Source Risk Management Plan

In December 2000, the SCA prepared a five–year Pollution Source Risk Management Plan (PSRMP) to identify and mitigate pollution sources in the water supply catchment area.

A significant proportion of the actions identified for 2000–2001 have begun, highlights of which include:

- completing a Sewerage Needs Analysis for the catchment
- commencing the SCA Accelerated Sewerage Scheme in conjunction with the DLWC Country Towns Water Supply and Sewerage Program
- delivering eight high priority projects to address stormwater quality and management involving local councils
- beginning SCA's Contaminated Sites Program, and
- commencing the SCA's Environmental Assessment of Sites and Infrastructure (EASI) projects to better understand the occurrence and nature of catchment pollution sources (see page 20).

The SCA Operating Licence also requires the plan to be reviewed following completion of catchment audits. The SCA began scoping the next version of the plan following completion of the second Catchment Audit in December 2001. This revised plan will be prepared using the greater knowledge of pollution sources and catchment processes derived from research and investigation work carried out by the SCA in 2001–2002.

Environmental Assessment of Sites and Infrastructure Program

A key component of the SCA's risk management program is the identification of hazards to water quality and catchment health in the SCA's area of operation.

During the year, a systematic Environmental Assessment of Sites and Infrastructure (EASI) Program was undertaken to provide a comprehensive inventory of potential threats to water quality.

These EASI projects are intended to identify pollution sources and collect information required to carry out a quantitative risk assessment of assets in catchment areas. Projects are being conducted for the following industry/facility types:

- mining
- quarries and extractive industries
- telecommunication and energy infrastructure
- commonwealth facilities
- sewerage systems
- intensive livestock industries
- intensive horticulture/forestry industries
- waste disposal sites, and
- commercial and manufacturing facilities.

Once the baseline information is gathered, the SCA will carry out a quantitative risk assessment of all sites and use the outputs to establish priorities for remedial action.

Soil Landscape Mapping

The SCA and DLWC project team completed soil and landscape data for the entire SCA catchment area. A database of comprehensive soil and landscape information is now available for use.

The information is designed to contribute to development assessments in the catchment and catchment inspection and operations. The mapping information will also inform the Strategic Land and Water Capability Assessments (SLWCAs), and the Rectification Action Plans (RAPs), which will be required when the Regional Plan – *Sustaining the Catchments* is in place.

3.2 CATCHMENT PLANNING

Development Control and Implementation of SEPP58

The SCA has a major role in reviewing development proposals that may present a risk to water quality.

During 2001–2002, the SCA had a significant role in the assessment of two major proposals:

- the Dendrobium underground coal mine located in the Upper Nepean Special Area, and
- the expansion of the Goulburn abattoir.

The contribution of the SCA has resulted in comprehensive consideration of water quality issues.

The SCA responded to a total of 200 concurrence applications and 504 notification applications during the year. Over 98 per cent of applications were responded to within the statutory period. The inclusion of conditions required or requested by the SCA has helped to protect water quality.

On 1 February 2002, State Environmental Planning Policy 58 (SEPP58) was amended by the Minister to provide a concurrence role for the SCA in the Kangaroo Valley catchment, where previously the SCA had a notification role.

Improvements to the SCA computerised development register were substantially completed. A systematic post–approval inspection program was implemented to ensure compliance with approval conditions.

Draft Regional Plan

The SCA has provided substantial assistance to PlanningNSW in the ongoing development of the draft Regional Plan called *Sustaining the Catchments – A Regional Plan for the Drinking Water Catchments of Sydney and Adjacent Regional Centres.*

The objectives of the Regional Plan are to:
- improve water quality
- rehabilitate pollution sources and degraded areas
- increase knowledge of the catchment
- provide for cost–sharing between land managers and water consumers
- ensure cooperative and efficient management of the catchment, and
- support sustainable development.

The draft plan is being revised in response to concerns raised by stakeholders and the community during public exhibition from October 2000 to March 2001. PlanningNSW and the SCA are working closely with local government, industry, landholders and interest groups to address many of these issues, while upholding the objectives of the plan.

Changes have been made to the draft plan to minimise the social and economic effects of the plan. New information provided by the recent Catchment Audit has informed the revised draft. Improved mapping of the hydrological boundaries has been undertaken. The revised draft will also include guidelines for assessing neutral or beneficial effect on water quality, a draft Pollution Offset Scheme and a draft guide to Rectification Action Planning.

The draft Regional Plan is due for re–exhibition in the coming months.

3.3 ON–GROUND ACTION

Accelerated Sewerage Scheme

The SCA has negotiated with the DLWC to fast–track programs, as identified under its Country Towns Water Supply and Sewerage Program, within Sydney's drinking water supply catchments. The initiative will fund works that will raise the standard of treatment and prevent overflows during wet weather to improve the quality of catchment waters.

The nominated sewerage projects involve the local government areas of Goulburn, Wingecarribee (Bowral, Robertson, Bundanoon, Burradoo and Yerrinbool), Greater Lithgow (Lithgow, Wallerawang), Shoalhaven (Kangaroo Valley) and Mulwaree (Taralga). The SCA has allocated $20 million over five years.

The goal of the Accelerated Sewerage Scheme is to eliminate under–performing sewerage systems in the catchment by 2007. During the year, the SCA made the first of five $4 million payments to DLWC, who in turn will allocate the funds to priority sewerage upgrade projects.

Healthy Catchments Program

The Healthy Catchments Program is the SCA's umbrella program for catchment protection, enhancement and community involvement programs. The SCA has worked on a number of strategic on–ground catchment protection activities, in collaboration with local councils, other agencies, and groups such as Landcare. During 2001–2002, these programs have encompassed:
- refurbishing aging sewage collection systems in catchment towns to restore capacity and integrity
- improving stormwater quality to reduce the impact of run–off on the catchments
- sealing critical roads and stream intersections to reduce the effect of silt washing into catchment streams
- restoring damaged riparian zones, and
- improving lands degraded by erosion.

Support of two key sub–programs – the Catchment Protection Scheme and Catchment Protection and Improvements Grants – also continued.

Catchment Management and Protection cont'

> Catchment Protection Scheme

In partnership with DLWC, the SCA delivered the Catchment Protection Scheme, investing nearly $1.5 million to remedy land degradation in the catchment. The program is designed to assist landholders carrying out erosion control and land management work. It targets sites that will have the greatest benefit on water quality.

> Catchment Protection and Improvement Grants

Grants of up to $8,000 (excluding GST), with another $2,000 available for equipment hire, were again provided to support community projects consistent with the SCA's objectives. During the year, the SCA received 40 applications for funding, and after assessing these against its objectives, awarded funds to 17 applicants to a total value of $130,791 (excluding GST). A table listing successful grants is contained in Appendix 15.

Priority Industries Program (Dairy)

The Pollution Source Risk Management Plan (PSRMP) has identified intensive livestock industries, such as dairies, as sources of risk to water quality. This is of particular concern in the Wingecarribee and Kangaroo River catchments where blue–green algae is present in the storages.

The SCA established its new Priority Industries Program (PIP), combining landholder cooperation, expert advice and funding to improve dairy waste management practices throughout the catchment. In collaboration with dairy farmers and the Department of Agriculture, the SCA began the systematic upgrade of dairy effluent systems, initiating 27 projects and investing $200,000 in support for system construction during 2001–2002.

Chemical Collections

The SCA's Chemical Collection Program is designed to give landowners and residents in its catchment areas a chance to safely get rid of unwanted household and agricultural chemicals.

During the year, collections were held at eight different locations throughout the catchment, two of which were in conjunction with the Environment Protection Authority's ChemCollect program. Approximately 22,500 kilograms of chemicals – ranging from household paints and batteries to scheduled wastes including organochlorine pesticides – were received at these collections.

Unused chemicals that lie around people's homes or properties, or that are poured down drains or put in the garbage bin, are a potential hazard to people, creeks, and the broader environment. Surveys of participants revealed that most of the chemicals collected would have otherwise been left at home, thrown in the garbage or buried.

By supporting the Chemical Collections, the SCA and residents in the catchment areas are working to protect their local environment and waterways.

The SCA will continue to support the Chemical Collection Program in 2002–2003, with collections planned at 14 sites throughout the catchment.

Collecting unwanted hazardous chemicals helps to protect the catchment environment and waterways

3.4 LAND MANAGEMENT

Special Areas

Special Areas are those areas surrounding Sydney's drinking water supply storages, often containing areas of pristine bushland. Special Areas help protect the water supply by acting as a buffer zone, to prevent nutrients and other substances from entering the storages.

Special Areas Strategic Plan of Management

The SCA and NPWS have jointly developed the Special Areas Strategic Plan of Management (SASPoM) – a comprehensive and long–term plan for managing Sydney's drinking water catchments. It was developed consultatively with stakeholder groups and relevant technical experts. The Minister for the Environment formally adopted the SASPoM on 9 May 2001.

The plan aims to provide high quality water in the storages, ensure ecosystem integrity and improve the environmental quality of the Special Areas.

Under the plan, the joint partners have adopted a whole–of–catchment management approach to educate, build relationships, negotiate agreements, and work with government organisations, community groups, landholders, and other key stakeholders.

Notable achievements in 2001–2002 have been:
- identifying 691 derelict mines in the drinking water catchment and developing priorities for rehabilitation based on contamination risk
- significant progress in 1:25,000 scale vegetation mapping of the Special Areas
- developing profiles for 22 threatened species in the Special Areas by the NPWS, along with species recovery plans and threat abatement strategies
- appointing a Special Areas Strategic Management (SASM) Secretariat that introduced a model to ensure future implementation of the plan will leverage the respective skills and resources of the joint sponsors, and
- developing a draft Charter of Public Disclosure by the SCA detailing how the joint sponsors will provide for public input and feedback on the implementation of the plan.

Wingecarribee Swamp and Special Area Plan of Management

Wingecarribee Swamp is one of mainland Australia's largest peat swamps and has significant environmental attributes. The Minister for the Environment launched the Plan of Management for the swamp and Special Area on 3 May 2001. Under the plan:
- weed control work, costing $374,000, has reduced invasive weeds over approximately one third of the swamp, enhancing ecological integrity
- water quality monitoring has been improved and has shown good water quality in the swamp, and
- an archaeological assessment of sites of Aboriginal significance has commenced.

A seasonal quantitative analysis of flora and fauna has shown that there are more threatened species in the swamp than formerly supposed.

A report that assesses the ecological values of Wingecarribee Swamp against the criteria for nomination as a Wetland of International Importance under the Ramsar Convention has been completed and forwarded to NPWS for assessment.

Cooperative research projects with the University of Wollongong have:
- studied the habitat requirements of the threatened species *Lysimachia vulgaris* var. *davurica* (Yellow Loosestrife)
- found that groundwater is a significant contributor to water volume in the swamp and reservoir, and
- established that the probable age of the peat is significantly less than the 15,000 years previously proposed.

Land Transfers

On 28 June 2002, the SCA transferred ownership of approximately 18,000 hectares of land in the Special Areas to the Minister for the Environment.

To ensure the ecological integrity of these high quality ecosystems, the transferred land has been added to:
- Blue Mountains National Park (15,450 ha)
- Nattai National Park (1050 ha)
- Burragorang State Recreation Area (326 ha)
- Wollondilly River Nature Reserve (612 ha)
- Morton National Park (185 ha), and
- Dharawal State Recreation Area (170 ha).

The transfer was completed according to the Minister's determination under section 45(3) of the *Sydney Water Catchment Management Act 1998*. Details of the transfer are covered in Appendix 9 of this report.

Braidwood Lands

The SCA commissioned the development of a Land Management Plan (LMP) for the SCA Braidwood Lands. The LMP began in February 2002 and was completed in June 2002. It addresses management strategies, allocation of responsibilities, work schedules and implementation, resource allocation and forecasting, and review processes. The SCA is currently reviewing the plan.

3.5 IMPACT OF BUSHFIRES

Two months of the year were devoted to fighting the most intense bushfires in 40 years. The bushfire activity commenced for the SCA on 3 December, when a series of thunderstorms moved through the Warragamba Special Area igniting 19 separate fires. The SCA seasonal fire crew responded rapidly and succeeded in extinguishing many of the fires. However, the Allum River and Lakesland fires near the village of Nattai became well–established, requiring declaration under Section 44 of the Rural Fires Act.

The SCA, NPWS and Rural Fire Service crews fought these fires until they were finally contained on 21 December, with a total of 4,000 hectares of bushland affected by the fires.

The Christmas 2001 bushfires began days later and burnt 130,000 hectares of the Special Areas surrounding the water storages, before being controlled. SCA staff made a major contribution to fighting the fires, and protecting water supply continuity and quality during and after the fires.

Short–term impacts on water quality were contained by the prompt installation of containment booms to prevent excessive amounts of soil from gaining access to the storages and floating material from clogging the intakes.

The SCA conducted an intensive research effort that collected a large amount of useful information to guide future bushfire management actions.

THE YEAR AHEAD

PlanningNSW will be exhibiting a revised draft Regional Plan in 2002–2003. The SCA will be involved with the exhibition and community consultation process, and will have a major role in implementing the development control and catchment strategies contained in the plan.

As part of the implementation of the plan, the SCA will develop and implement Rectification Action Plans for sub–catchments to ensure that funds applied to water quality initiatives bring about cost–effective results.

Work to reduce sewage effluent impacts will continue through the Accelerated Sewerage Scheme and other initiatives, including a systematic risk assessment of identified public and private water sewerage systems.

Increased emphasis will be given to diffuse source risks to water quality with the development of a comprehensive program, in conjunction with the Environment Protection Authority and local government.

4 Protecting and Enhancing Water Quality

The SCA protects and enhances water quality in the catchments through a variety of activities and programs. An effective water quality monitoring network is a vital component of this multi–faceted approach. Environmental flows play an important part in maintaining the ecological health of the rivers downstream of the dams.

4.1. WATER QUALITY MONITORING

The SCA operates and maintains an extensive water quality monitoring network. Information on the chemical and biological quality of the water in catchment streams, storage dams and delivery systems is collected and analysed for regulatory, operational and planning purposes.

A document that sets out the locations, frequencies and intensity of monitoring for the 2002–2004 Water Quality Monitoring Program was developed and formally approved by NSW Health, the Department of Land and Water Conservation and the Environment Protection Authority in June 2002.

All water quality reports were supplied on time and as specified in the various protocols. The Annual Water Quality Monitoring Report, a comprehensive report of results of all water quality monitoring undertaken during the year, was produced in November 2001, and forwarded to IPART as required under the Operating Licence. The report is available on the SCA's website www.sca.nsw.gov.au.

Major system improvements during the year included establishing a new database that consolidates all historical data. It contains details of half a million samples collected over the past 20 years and about three million analytical results. Water quality trends can be tracked quickly and efficiently, and the automated data transfer system has greatly improved net turnaround time for data availability.

4.2 SPECIAL MONITORING PROGRAMS

Pathogen Monitoring

The pathogens *Cryptosporidium* and *Giardia* were monitored:

- six days a week at Warragamba Dam and Broughtons Pass Weir
- twice–weekly in Prospect Reservoir
- weekly in Werriberri Creek (the nearest inflow to Warragamba Dam) and Wingecarribee Dam, and
- monthly in the Wollondilly and Coxs rivers.

Automatic samplers were installed at seven locations around Lake Burragorang to help monitor pathogens during storm events. The SCA continued 'hot spot' monitoring for pathogens at a number of sensitive locations around the catchment, such as sewage treatment plants, sale yards, and piggeries.

A suitably qualified laboratory, Australian Water Technologies, carried out sampling and testing for pathogens (protozoa). In addition, a percentage of all samples, as well as all samples that tested positive, were checked by another independent laboratory, the Australian Water Quality Centre, in South Australia.

Pesticides and Chemicals

Schedule 4 of the Operating Licence requires monitoring of specified pesticides, chemicals and radiological compounds in the inflows to the water filtration plants of all SCA customers. The SCA continued monitoring for these compounds during 2001–2002 and reported 100 per cent conformance.

Bushfire Monitoring

The SCA supplemented routine monitoring with special programs to monitor the impact of the Christmas 2001 bushfires on the quality of water in the inflow streams and storages. Despite the vast extent of the fires in the Special Areas surrounding the storages, there were no immediate adverse impacts on quality of water supplied to SCA customers. Monitoring for medium–term impacts is continuing.

Monitoring water quality in Woronora catchment after the bushfires. Photo by Jon Reid.

Managing Blue–Green Algae

The SCA continued to monitor blue–green algae as per the Blue–Green Algae Contingency Plan. Timely notification of the results was provided to customers, stakeholders and regulators.

During summer, high levels of potentially toxic species were present in Wingecarribbee and Fitzroy Falls reservoirs, and high toxicity in Bendeela Pondage. As a result, Wingecarribee Shire Council activated its Powdered Activated Carbon plant as a precaution and no water quality problems were encountered.

The SCA liased closely with Eraring Energy to minimise the impact of water movement for power generation on the quality of water supplied to Shoalhaven City Council's water treatment plant at Kangaroo Valley.

The draft Cyanobacterial (Blue–Green Algal) Risk Minimisation and Management Strategy was developed to identify and mitigate activities within the catchment that contribute to cyanobacteria in our waterways and storages. This proactive strategy focuses on short–term and long–term prevention to reduce the incidence and severity of blue–green algae outbreaks. It will be subjected to expert peer review in the coming year.

4.3 ENVIRONMENTAL FLOWS

The SCA achieved 99.94 per cent of its environmental flow targets as required under the Operating Licence with only six occasions out of 3,285 being slightly below specification. This was mainly due to the timing of inflow data, to which releases are linked, becoming available to operations staff.

Woronora Dam Environmental Flow Releases

The SCA began work to provide a facility for environmental flow releases from Woronora Dam into the river downstream. Interim work will allow releases to be made from 1 January 2003.

The permanent facility at Woronora Dam will be capable of making short–term high flow releases (up to 800 ML/day) and continuous low flow releases (between 0–50 ML/day).

As an interim measure, an offtake on the Woronora Pipeline was constructed and is capable of releasing 0.5 – 18 ML/day.

The interim arrangement will be in use until the permanent facilities are completed and commissioned in 2003.

Hawkesbury–Nepean River Management Forum

In response to the Healthy Rivers Commission report on the Hawkesbury–Nepean River, the Government established the Hawkesbury–Nepean River Management Forum (HNRMF). Eight government agencies, including the SCA, and various stakeholder groups including irrigators, fishers and environmentalists, are represented on the forum.

The HNRMF is to make specific recommendations on environmental flow provisions for inclusion in the SCA Water Management Licence. In developing its recommendations, the forum takes advice from an independent expert panel.

During the year, the SCA provided the HNRMF and the DLWC with modeling tools to help develop environmental flow regimes.

THE YEAR AHEAD

Interim works on the Woronora Pipeline will allow environmental flows to be released from January 2003. Work on the permanent facility that will allow high flow releases of up to 800 ML/day will continue during the year, with a target completion date of 2003.

The SCA will work closely with DLWC and the independent expert panel in providing trial releases for further investigation towards formulating optimum environmental flow regimes for the Hawkesbury–Nepean River.

Development of drinking water safety plans will begin. These plans aim to help prevent contamination of source waters, adequately reduce or remove contamination that is present through treatment processes, and prevent re–contamination during storage, distribution and handling.

5 Researching the Catchments

The SCA's commitment to improving water quality is underpinned by a comprehensive and wide–reaching research program that will provide information on the health of the SCA's catchments and identify key problem areas.

5.1 RESEARCH PLAN

The SCA adopted a Research Plan in September 2000 covering three key programs:

- Special Areas Strategic Plan of Management (SASPoM) Research Program
- Wingecarribee Swamp and Special Area Plan of Management (WSSAPoM) Research Program, and
- Water Quality (WQ) Research Program.

SASPoM and WSSAPoM Research Programs

The SASPoM and WSASPoM research programs are managed under the umbrella of the SASPoM process, which in turn is managed through the Special Areas Strategic Management (SASM) Secretariat. All research is undertaken jointly with the National Parks and Wildlife Service (NPWS).

During 2001–2002, a research and monitoring strategy was developed. The program will consider ecological processes, flora and fauna, biodiversity, ecological integrity and heritage issues.

Water quality and biodiversity experts from the SCA and NPWS have formed a research and data team to oversee the scientific program under SASPoM's Implementation Plan. The team is charged with finalising the establishment of an expert scientific panel.

Water Quality Research Program

The Water Quality Research Program is managed directly by the SCA. Research questions specific to the SCA are being investigated and funded directly by the SCA. However, broad, generic research questions are being answered through collaboration with formal and informal consortia. These include:

- Cooperative Research Centre for Water Quality and Treatment (CRCWQT)
- Water Services Association of Australia (WSAA)
- Cooperative Research Centre for Freshwater Ecology (CRCFE), and
- American Water Works Association Research Foundation (AwwaRF).

There are three subprograms within the Water Quality Research Program. These are:

> Pollution Source Tracing

This program is establishing the relative contribution of pollution from different sources. Knowledge from these studies is being applied in setting priorities for catchment rectification.

The most significant current work is the piecing together of a variety of data to produce a "budget" of pollution in the Wingecarribee subcatchment – the location of the proposed pilot Rectification Action Plan (RAP) under the proposed new Regional Plan. Information on specific pollution sources, landuse and landcover data, source tracing evidence, and water quality monitoring data is being integrated through modeling tools.

The work involves staff from Ecowise Environmental, the University of New South Wales Centre for Water and Waste Technology, the CSIRO, the Australian National University, and Bales Environmental Services.

Researching the Catchments cont'

> Pollution Control Measures

This program investigates practices and technologies that can be used to reduce or prevent pollution from reaching waterways. The new knowledge emerging from these studies is being incorporated into development assessment tools and other catchment planning processes.

Sampling sites in the Sydney catchments have been chosen to represent areas under intensive development pressure.

The work involves staff from Ecowise Environmental, the University of New South Wales Centre for Water and Waste Technology, and the Dutch Water Research Institute. Funding comes from AwwaRF, CRCWQT, Melbourne Water and WSAA.

Expert group assessing erosion in the catchment

> Reservoir Function

This program is providing the best possible understanding of reservoir function to enable the provision of the best quality water from the SCA's reservoirs. Knowledge from these studies is being applied both in long–term resource management planning and in operational decision–making.

The most significant current work is the development of a highly advanced limnological model for Lake Burragorang and Prospect Reservoir. Limnology is the study of bodies of fresh water in relation to their physical, geographical, biological and other features. The model will enable accurate forecasting of the quality of water at different points in the reservoir, based on data gathered in real time by in–lake and inflow monitoring systems. The SCA can switch between storages and between different depths within given storages. This will enable the optimal quality of water within a lake to be harvested at all times.

During the year, the SCA:

- installed lake diagnostic systems in Lake Burragorang and Prospect Reservoir
- installed lake monitoring and modeling software on SCA computers, and
- carried out two intensive field monitoring campaigns.

Early versions of the system are already in use. The model will enable scenario testing and prediction, which will assist in long–term planning of resource management.

The work involves staff from the University of Western Australia, the University of Western Sydney and the Australian Water Quality Centre. Funding comes from AwwaRF, CRCWQT, Melbourne Water and WSAA. Work on this $2 million project will continue into 2002–2003.

THE YEAR AHEAD

The SCA has allocated around $3 million to its research and development program for the coming year to improve management of water quality and the environment.

The SCA has a desire to broaden its research program beyond the current scope, which is largely driven by the need to meet compliance obligations. There are plans in place to undertake a systematic knowledge audit, which will lead to a knowledge strategy.

The SCA intends to move to the use of research agreements over the next year to enable direct collaboration with universities. In addition, there are plans for engaging with research and development corporations and other collaborative research establishments to build up the SCA's understanding of land management practices and other pollution control measures.

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Hours: 10am to 4pm daily,
except Christmas Day
and Good Friday

Other SCA dams

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Hours: 9am to 5pm
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Emergency Reporting
(24 hours)

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