Chapter 9
Audit Recommendations

9.1 Overview

Chapter 2 of this report described how the 2007 Auditor undertook a review of the progress made on 25 recommendations made by the 2005 Auditor. Chapters 3 to 6 examined the state of the Catchment within each of the four Audit themes in the 2007 Audit period, and the Auditor made recommendations as the need arose on a range of matters that emerged from the findings and implications within those four themes.

The purposes of this concluding chapter are to:

- record the outcomes of the review of the 2005 Audit recommendations and their status in 2007
- record the retention of 2005 recommendations where relevant
- record new recommendations where sufficient progress had not been achieved since 2005
- record new recommendations arising from the 2007 Audit
- compile all the above recommendations into a single set of 2007 recommendations to support the successful delivery of future catchment audits.

9.2 Review of the 2005 Recommendations

To review the 2005 Audit recommendations, the 2007 Auditor sought responses from resource management agencies in the Catchment on the nature and extent of actions they had undertaken in line with those recommendations. The Auditor then assessed those responses for their adequacy and effectiveness in addressing the original recommendations.

Table 9.1 summarises the outcomes of the review, and presents the status of all 25 recommendations from the 2005 Audit at the end of the 2007 Audit period. The 2007 Auditor's responses are also presented.

Table 9.1: Progress of the 2005 Audit Recommendations

	2005 Recommendation	Status in 2007	Auditor's response
1	DEC, the SCA and the NRC give further consideration to integrating catchment and natural resource management audit processes and NSW State of the Environment reporting.	under way SCA anticipates that the review of the *Sydney Water Catchment Management Act 1998* (the Act) will progress this.	The Auditor notes that the next review of the Act will be in 2009. Next SoE report is in 2009, coinciding with the next Audit, and with the first natural resource (MER) reporting through the SoE process. Further action is required. See later in this Section for recommendation(s).
2	The SCA work with DNR and councils to establish a spatial information system to track and record the date, type and location of all on-ground works being undertaken or funded by Government for the purpose of water quality and ecosystem health management in the Catchment.	under way A Land Management Database (LMD) is already used by H-N CMA. SCA is investigating options for spatial information systems including LMD.	The Auditor notes that progress is being made, but spatial information on works in the Catchment under various programs was not yet available for the Audit. Further **coordinated** action is required. See Chapter 6 Section 6.2 for recommendation(s).

	2005 Recommendation	Status in 2007	Auditor's response
3	The SCA examine the potential for, and benefits of, integrating ecosystem water quality, macroinvertebrate, fish (when developed) and riparian vegetation condition monitoring programs.	under way SCA will consider during its review of the water quality monitoring program in its Operating Licence.	The Auditor notes that the current monitoring program runs to the end of 2009, and that the SCA is developing a strategy and timeframe for further improving the monitoring program by 30 November 2007. The Auditor believes that further examination of integration is required, in SCA's planned November 2007 work. It is necessary, also, to consider how SCA monitoring intersects with monitoring programs being developed under the NSW MER Strategy and the Hawkesbury-Nepean Integrated Monitoring Program being developed by the DECC. See Chapter 6 Section 6.2 for recommendation(s).
4	The SCA further develop L-THIA nutrient modelling for all sub-catchments to assist in prioritising nutrient reduction programs.	not adopted SCA relies on risk assessment methodology to prioritise nutrient reduction programs.	The Auditor notes that SCA has moved to a risk assessment methodology, as described in its 'Water Quality Risk Management Framework' document provided to the Audit. The Auditor notes that modelling is a part of the SCA's management process. See Future Directions in Section 3.1 for further comment. No further action is required on the specific recommendation.
5	The SCA focus its programs for nutrient reduction from diffuse sources on the Wingecarribee River (priority), Wollondilly River (priority), and Mulwaree River (priority) sub-catchments, and encourage other organisations undertaking related programs to focus on these same sub-catchments where possible.	under way SCA Catchment Planning Process has produced a list of priority issues and actions in the identified areas, for implementation through partnerships under the Healthy Catchments Program.	The Auditor notes that identified issues and actions are reported in the SCA's 'Report on Catchment Management and Protection Activities' provided to the Audit. Continued action is required to address the prioritised nutrient reduction issues.
6	The SCA identify the cause of exceedence of the Bulk Water Supply Agreement (BWSA) for turbidity, pH and algae at water filtration plants.	completed SCA, Department of Health and Sydney Water investigations concluded that the drought was responsible. The ability of filtration plants to produce drinking water to standards was not compromised.	The Auditor found increased compliance with BWSA requirements in the 2007 Audit period. Continued action is required to address exceedences reported in the 2007 Audit.
7	The SCA identify the cause of the 'high' incidences of algal blooms in the Kangaroo River (priority), Wingecarribee River (priority), Mid Coxs River (priority) and Lake Burragorang sub-catchments and develop specific management strategies for each location.	completed SCA has Cyanobacterial Risk Management Strategy, and Rectification Action Planning identifies these sub-catchments as very high risk.	SCA has provided its 'Cyanobacterial Risk Management Strategy' document to the Audit, and management strategies have been formulated. However, the specific cause of the incidences has not been identified. The Auditor found that the presence of algal blooms persisted in the water storages. Further action is required. See Chapter 3 Section 3.3 for recommendation(s).

	2005 Recommendation	Status in 2007	Auditor's response
8	The SCA investigate the source of *Cryptosporidium* oocysts at Gibbergunyah Creek and Prospect WFP and the source of *Giardia* cysts at Gibbergunyah Creek, Kedumba Creek, Wollondilly River at Jooriland and Murray's Flat, and develop a management response at each location to reduce the incidence of C*ryptosporidium* and *Giardia* oocysts and cyst presence.	under way Further monitoring and collaborative research have been done to validate the results that generated this recommendation.	SCA has provided the 2007 Audit with a list of research undertaken on this matter. No investigation has been undertaken on source identification. The Auditor notes the persistent presence of pathogens in certain creeks. Investigation of the **causes** is required. See Chapter 3 Section 3.4 for recommendation(s).
9	The DNR undertake research into the impact of different levels of water extraction and harvesting of water in farm dams on flow regimes and ecosystem health within the Catchment, focussing on the sub-catchments most under pressure from water extraction and water harvesting.	completed SCA states that DWE did a study that indicated 'no significant impact' on flow regimes and ecosystem health. DWE describes preparation of draft Greater Metropolitan Region water sharing plan, in which hydrological stress attributable to farm dams was not addressed, rather than completed and assessed as 'not significant'.	The Auditor notes the agencies' expressed positions on this recommendation. The Auditor also notes work in a recent unpublished report on the distribution of farm dams in the SCA's area of operations provided to the Audit by the SCA. The report includes internal SCA recommendations for examining knowledge gaps in farm dam proliferation and environmental impacts, which the Auditor endorses for continued action.
10	The DNR use the results of research and improved knowledge about the impacts of water extraction and water harvesting in periodic reviews of Water Sharing Plans in the Catchment.	not applicable SCA notes that Water Sharing Plans have not yet been finalised. DWE describes how hydrology modelling used in the preparation of the draft Greater Metro Region Water Sharing Plan has used available understanding and local knowledge to develop draft access rules, extraction limits and environmental flows.	Noted. See Chapter 4 Section 4.3 for recommendation(s).
11	The DNR require groundwater extraction volume metering and reporting with a priority for implementation on licences in the Southern Highlands, Kangaroo River (priority), Werriberri Creek (priority) and Wingecarribee River (priority) sub-catchments.	under way SCA reports that DWE is rolling out a program of metering water extraction across the State over a number of years. DWE undertakes to consider the listed sub-catchments as priorities in its program.	The Auditor accepts that satisfactory progress is being made on this recommendation. However, the Auditor notes that there is no specific commitment by DWE that the nominated sub-catchments will be given priority status. Continued action is required on this issue.

	2005 Recommendation	Status in 2007	Auditor's response
12	The DNR give consideration to locating new monitoring bores in the Southern Highlands, Kangaroo River (priority), Werriberri Creek (priority) and Wingecarribee River (priority) sub-catchments.	under way SCA reports that DWE will include these areas for consideration when setting drilling priorities over the next 2 years. DWE reports that it has considered these sites, but new bores will not proceed at this time, due to a lack of drilling resources. DWE notes that it will receive data from new SCA monitoring bores in the Southern Highlands.	The Auditor accepts that satisfactory progress is being made on this recommendation, and continued action is required.
13	The DNR develop a hydrological model that investigates the interaction between surface and groundwater systems and that can be used to manage surface and ground water extraction from the Catchment.	not adopted SCA reports that development of this model is not a DWE priority. DWE reports that groundwater investigations in the Catchment are being led by SCA, and its submission indicates that monitoring rather than modelling is the primary tool for assessing surface / groundwater interaction.	Noted. The Auditor accepts the agencies' views that a different investigative approach is being used but notes that this issue remains one of high priority.
14	The DNR develop and implement systems for measuring and reporting of flow and flow variability for all sub-catchments to support the implementation of extraction rules and periodic review of the Water Sharing Plans.	under way SCA reports that DWE will address this during the implementation of the Water Sharing Plans (once they're finalised). DWE reports that a new State-wide water information communications system is being developed. Data from the SCA's river flow and storage gauges will contribute. However, there's no commitment to cover all subcatchments.	Noted. See Chapter 4 Section 4.3 for recommendation(s).
15	The SCA implement measures recommended by the Wetlands and Woodlots for rock armoury and vegetative stabilisation in Doudles Folly Creek and Glenquarry Creek as an interim measure to reduce streambank erosion caused by bulk water transfers.	under review Action depends on outcomes of Metro Water Plan investigations on bulk water transfers.	The SCA has provided the Auditor with a 2006 assessment of bulk water transfers that concludes that hard structural measures to stabilise the channel were not necessary or appropriate. The Auditor accepts this conclusion.

	2005 Recommendation	Status in 2007	Auditor's response
16	The SCA and the Department of Planning prepare a detailed land use map at five year intervals. The resolution and categorisation should be sufficient so that change from the previous map can be determined.	under way SCA is preparing updated land use mapping, with a review of land use classes.	The Auditor notes that progress is being made, and that DECC is a partner in producing this work. However, updated mapping was not available in time for this Audit. Continued action is required on this recommendation.
17	The SCA identify high risk activities where there is no documented best practice benchmarks, and work with relevant agencies, industries and landholders to develop and implement recommended management practices.	under way SCA notes that development of recommended practices is a Regional Environmental Plan requirement, and that there are 28 documented practices to date.	The Auditor accepts that the action to date is a satisfactory response to the recommendation. Periodic review of the coverage of high risk activities by documented recommended practices is required.
18	The SCA develop pollution prevention or rehabilitation programs at sites identified as very high, high and medium risk to water quality, in consultation with relevant agencies, operators and landholders.	under way SCA has identified 23 very high risk drainage units for certain pollutants.	The Auditor notes the satisfactory progress reported in the SCA's 'Report on Catchment Management and Protection Activities' provided to the Audit. Continued action is required on this recommendation.
19	The DNR develop systems in consultation with the SCA for recording the location, nature and extent of actual cases of soil erosion and land salinity in the Catchment.	under way SCA's Catchment Protection Scheme partnership with CMAs address high active erosion areas, and results are reported in LMD (2005 Recommendation 2). Land salinity mapping is not a priority.	The Auditor notes that salinity data was provided to the Audit for the H-N CMA area only. Continued action is required on this recommendation.
20	Programs addressing soil erosion and salinity in the Catchment target areas with identified risk, and integrate with other programs for riparian and vegetation management where possible.	under way SCA reports that active erosion mapping has been completed for the whole Catchment, and a list of issues and corresponding actions produced. Erosion programs will be implemented through partnerships under Healthy Catchments Program.	The Auditor notes the progress reported in the SCA's 'Report on Catchment Management and Protection Activities' on soil erosion projects provided to the Audit. Continued action is required on this recommendation.
21	The SCA review its water quality monitoring program to ensure that appropriate ecosystem water quality monitoring is undertaken in all sub-catchments.	under way SCA will consider as part of monitoring program review required by its Operating Licence.	The Auditor believes that the review should take place in November 2007 when the SCA undertakes planned strategy development work for further improving the monitoring program. See Chapter 6 Section 6.2 for recommendation(s).
22	The SCA review its macroinvertebrate monitoring program to ensure that monitoring is further integrated with water quality monitoring (i.e. the sites are monitored for both macroinvertebrates and water quality parameters).	under way SCA describes existing macroinvertebrate sampling program. 2006 sampling reporting (due in May 07) will inform a review of overlapping sites.	The Auditor believes that there are still too few overlapping sites to achieve an appropriate level of integration. Further action is required. See Chapter 6 for recommendation(s).

	2005 Recommendation	Status in 2007	Auditor's response
23	The SCA consider follow-up monitoring at macroinvertebrate monitoring locations that have significantly impaired or severely impaired AusRivAS ratings.	under way SCA advises that an impaired rating is one of the criteria for determining roaming site selection.	The Auditor believes that the SCA's approach does not address the issue adequately. See Chapter 6 for recommendation(s).
24	The NSW DPI, in consultation with SCA, develop a fish community monitoring program for the Catchment to assist the management of aquatic ecosystem health.	under way SCA notes that a new environmental monitoring program for the Hawkesbury-Nepean is being collaboratively developed, that includes a fish monitoring component.	The Auditor notes that DPI has commenced a fish monitoring program that includes sites in the Catchment. Data from the program was provided to the Audit (Chapter 6). Continued action is required on this recommendation.
25	The DNR, DEC and SCA jointly undertake vegetation condition mapping of areas outside the Special Areas.	under way SCA reports that 1:100,000 veg mapping has been completed, but it doesn't deal with condition. Initiative to standardise methods of vegetation information management is under way.	The Auditor accepts that satisfactory progress has been made on this recommendation. Continuing action is required on this recommendation.

Note: DWE has assumed the functions of the former department of Natural Resources (DNR) therefore any reference to the DNR is a now a reference to the DWE.

It would be of benefit to future audits if timeframes were established by the relevant parties for implementation of Audit recommendations, to assist future audits in assessing the timeliness of progress being made.

As indicated in the responses in Table 9.1, the Auditor believes that further actions on 2005 Recommendations 1 and 2 are required. New recommendations for these purposes are put forward below.

2005 Recommendation 1: Integration of reporting processes

DEC (now DECC), the SCA and the NRC were to give further consideration to integrating catchment and natural resource management audit processes and NSW State of the Environment (SoE) reporting.

The intended focus of this recommendation was on better alignment of the timing of the processes. The next Catchment Audit and the next SoE Report are due in 2009. The first reporting of the natural resources monitoring (MER) process will occur by the end of 2008, and it will be presented in the SoE 2009 Report. The Auditor understands that the current three year frequency of SoE reporting has been recently confirmed at an inter-agency level for the foreseeable future.

Therefore, better alignment of the Audit with other catchment reporting processes would be achieved if the frequency of Audit reporting was extended to 3 years. This changed frequency could be implemented from 2009, and it would require an amendment to Section 42 of the Sydney Water Catchment Management Act 1998. The SCA advised the Auditor prior to publication of this report that a Bill to amend the Act to give effect to this recommended frequency change is currently being prepared.

Recommendation 10: The frequency of the Audit should be changed to every three years, instead of two years, from 2009 to align with State of Environment (SoE) and Monitoring, Evaluation and Reporting (MER) timeframes.

Opportunities for further integration would be in the form of common or complementary indicators. DECC has a lead role in MER strategy development and implementation, and the NRC is a contributor. However, the SCA is not represented in the committee driving the MER strategy. The SCA is a stakeholder in the development of MER indicators that would relate to the Catchment, and should maintain a watching brief to

identify any practicable opportunities for integration and/or sharing of indicators between the two reporting processes that may impact on the SCA's monitoring and reporting activities.

The Auditor notes that the NRC will audit progress against State-wide natural resource management standards and targets under the State Plan, and that there could be some synergy in securing a greater NRC contribution to future catchment audits.

Recommendation 11: Opportunities for the development of common or complementary indicators between the Audit SoE and MER reporting processes should be examined.

2005 Recommendation 2: Spatial information system

The Land Management Database (LMD) was developed by DECC (formerly DNR) for recording on-ground works with linkages to government funded projects. LMD provides a standardized approach to mapping and recording of funded on-ground activities and reporting on project outcomes. Data is spatially recorded and stored in geodatabases. Currently the primary user is the CMAs. The Auditor has made numerous references in this report to the absence of such information, and to the resulting lost opportunities for land managers to have an effective tool for recording and reviewing locations of past actions when planning and prioritising new programs and activities to improve the state of the catchment. Accordingly, the Auditor believes that insufficient progress has been made on the 2005 recommendation, and that it needs to be renewed.

Recommendation 12: The SCA, DECC and CMAs should work together to establish a spatial information system to track and record information on all on-ground works being undertaken or funded by Government for the purposes of water quality and ecosystem health management in the Catchment.

9.3 Compilation of the 2007 Audit Recommendations

The following twelve recommendations have arisen in the preceding chapters and sections of this report, and from the overall conduct of the 2007 Audit. Where relevant, particular sub-catchments to which the recommendation(s) apply are identified. The Auditor commends these recommendations to the Minister, for subsequent referral to relevant parties for their consideration and appropriate action.

	Raw water quality
1	The operators and regulator(s) of the sewage treatment systems in the Catchment should continue efforts to reduce current levels of nutrient loads discharged into the Catchment.
2	The SCA should continue the process of understanding the causes of the 'high' incidences of algae in the water storages of the Kangaroo River (priority), Wingecarribee River (priority) and Lake Burragorang sub-catchments, to help ensure that specific management strategies are in place for the short, medium and long term in each sub-catchment.
3	The SCA should investigate the causes of the continued presence of pathogens in the Nattai River (Gibbergunyah Creek), and in the Wollondilly River, Mid Coxs River and Werriberri Creek (priority) sub-catchments.
4	The SCA should undertake sampling for the presence of pathogens in the Kangaroo River (priority) sub-catchment.
	Managing water resources
5	DWE should work with stakeholders to complete a Water Sharing Plan that covers the Catchment as soon as practicable.
	Land condition
6	The SCA, DECC and CMAs should undertake programs that address soil erosion and salinity in the areas with identified and observed risk, and integrate them with other programs for riparian and vegetation management where possible.
	Ecosystem health
7	The SCA should investigate the reasons and drivers for declines in both water quality and macroinvertebrate health in those regions where declines have been documented.
8	The SCA should review its water quality monitoring and macroinvertebrate sampling programs to ensure that integrated ecosystem monitoring is undertaken in all sub-catchments
9	The SCA should undertake follow-up monitoring at macroinvertebrate monitoring locations that have significantly impaired or severely impaired AusRivAS ratings.
	General
10	The frequency of the Audit should be changed to every three years, instead of two years, from 2009 to align with State of Environment (SoE) and Monitoring, Evaluation and Reporting (MER) timeframes.
11	Opportunities for the development of common or complementary indicators between the Audit SoE and MER reporting processes should be examined.
12	The SCA, DECC and CMAs should continue to work to establish a spatial information system to track and record information on all on-ground works being undertaken or funded by Government for the purposes of water quality and ecosystem health management in the Catchment.