Chapter 2
Audit Methodology

2.1 Overview

The 2010 audit Terms of Reference require that current methods used for SoE reporting be adopted. The main assessment tool in SoE reporting is the ‘Pressure-State-Response’ (PSR) model, and this model has been used in this and previous audits.

Pressure-State-Response model

The PSR model identifies the cause-effect chains that help us understand and scientifically analyse environmental resource use and problems. The PSR approach assumes that human activities exert pressures on the environment which can induce changes in the state of the environment. Society then responds to changes (in pressure or state) with environmental/economic policies and programs that prevent, reduce or mitigate pressures and/or environmental damage. In this model, indicators are an essential source of information about environmental systems. An indicator quantifies and aggregates data that can be measured and monitored to determine the pressure or state, and to assess whether change is taking place. Accordingly, indicators are selected to provide information about the functioning of a specific system to support decision making and management (Figure 2.1.1).

Figure 2.1.1: Simplified representation of the Pressure-State-Response model
Audit indicators

The catchment audit must assess the state of the catchment area having regard to the catchment health indicators approved under Section 42 of the Act, as in force at the time of the assessment. In October 2008 the Minister for Water, the Hon. Phillip Costa, MP, appointed the DWE (now the NSW Office of Water within DECCW) to develop, approve and publish catchment health indicators for the Catchment area.

In consultation with the SCA and other stakeholders, DWE developed a list of 18 gazetted indicators that were approved and published in the NSW Government Gazette on Friday 19 December 2008. The report, *Development of Catchment Health - indicators for the drinking water catchments - Sydney, the Illawarra, Blue Mountains, Southern Highlands and Shoalhaven* (NOW 2009), listed the catchment health indicators, outlined the process for indicator selection, summarised the recommended methodology for data collection and identified the agencies responsible for collecting indicator data. The 18 approved Catchment health indicators, arranged by themes, are presented in Table 2.1.1.

**Table 2.1.1: 2010 audit indicators**

<table>
<thead>
<tr>
<th>Theme</th>
<th>Approved indicator</th>
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<tbody>
<tr>
<td>Land Use and Human Settlements</td>
<td>Land use</td>
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<td></td>
<td>Sites of pollution and potential contamination</td>
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<td></td>
<td>Soil erosion</td>
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<td>Population settlements and patterns</td>
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<td></td>
<td>Community attitudes, aspirations and engagement</td>
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<tr>
<td>Biodiversity and Habitats</td>
<td>Macrionvertebrates</td>
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<td></td>
<td>Fish</td>
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<tr>
<td></td>
<td>Riparian vegetation</td>
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<td></td>
<td>Native vegetation</td>
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<td></td>
<td>Fire</td>
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<td></td>
<td>Wetlands</td>
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<td></td>
<td>Physical form</td>
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<tr>
<td>Water Availability</td>
<td>Surface water flow</td>
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<td></td>
<td>Environmental flows</td>
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<td></td>
<td>Groundwater availability</td>
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<tr>
<td>Water Quality</td>
<td>Ecosystem and raw water quality</td>
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<td></td>
<td>Nutrient load</td>
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<td></td>
<td>Cyanobacterial blooms</td>
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</table>
2.2 Arrangements for the audit

Agreement with the SCA

A written agreement was negotiated between the SCA and DECCW for the conduct of the audit. The agreement defined the roles of the SCA as the agency responsible for the administration of the Act, and a nominated member of DECCW as the Auditor in accordance with Section 42 of the Act. The agreement documented the Terms of Reference, an itemised budget and key milestones for the audit, the obligations and undertakings of the parties that ensured the successful completion of the audit, and the primary points of contact within both parties.

The Audit Team

The Auditor was Dr Klaus Koop (Director Environment and Conservation Science, DECCW). The Auditor was supported by a project team assembled for the duration of the audit. Team members were:

Project Manager: Martin Krogh
Senior Project Officer: Jocelyn Dela-Cruz
Project Officers: Simon Hunter and Russell Cox

The audit report

This audit report was submitted to the Minister in November 2010. In accordance with Section 39 of the Act, the audit report is also to be laid before both Houses of Parliament within the specified one month of being submitted to the Minister. The audit report will also be made available on the DECCW’s and SCA’s websites, and copies will be mailed to interested stakeholders.

2.3 Conduct of the audit

Information gathering

The primary data and information sources for the 2010 audit were the SCA, DECCW, CMAs, NOW, the Department of Industry and Investment – Fisheries (I&I Fisheries – formerly DPI Fisheries) and the OHN. These agencies have responsibilities as resource and catchment managers or as coordinators of river management. Data and information for selected indicators were also obtained from the NSW Department of Planning (DoP), Rural Fire Service (RFS), Australian Bureau of Statistics (ABS) and local government authorities. The 2010 audit also sought information from relevant agencies on the nature and extent of actions undertaken in response to the recommendations made in the 2007 audit report.

The 2010 audit recognised the potential breadth of knowledge, information and data that may also be available from other stakeholders in the Catchment. Invitations to provide information and submissions were circulated through individual letters and general press advertisements throughout the Catchment. This was achieved by:

- directly writing to 66 stakeholders, including relevant government agencies, CMAs, local government, industry associations, local Aboriginal land councils and other non-government organisations
inviting submissions from the general public through notices in *The Sydney Morning Herald, Daily Telegraph, Koori Mail* and 21 regional and local newspapers.

The newspaper notice text was similar to the written stakeholder invitations, and is reproduced in Figure 2.3.1.

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**Advertisement**

**Audit of Sydney Water Catchment**

In accordance with the Sydney Water Catchment Management Act the Minister for Water has commissioned the NSW Department of Environment, Climate Change and Water (DECCW) to undertake an audit of Sydney’s drinking water catchments. The audit is undertaken every three years to provide a snapshot of the health of the catchment.

This audit will use a ‘pressure-state-response’ model that examines human pressures on the condition of the Sydney Drinking Water Catchment area. The audit will assess the condition of the catchment using indicators relevant to raw water supply, managing water resources, land condition and ecosystem health.

DECCW is inviting interested parties to make a submission presenting any information or data that may assist the conduct of the audit and provide comments relating to the state of the catchment.

Please send submissions to:

**Sydney Drinking Water Catchment Audit**
c/- Martin Krogh
NSW Department of Environment, Climate Change and Water
PO Box A290
Sydney South NSW 1232

or email them to:

SWCA2010@environment.nsw.gov.au

The closing date for the receipt of submissions is 13 August 2010. Inquiries regarding the audit and its terms of reference can be made to Martin Krogh on (02) 9995 5619, or Jocelyn Dela-Cruz on (02) 9995 5509.

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**Figure 2.3.1: Notice inviting submissions**

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**Aboriginal communities in the Catchment**

The 2010 audit and previous audits before it recognised that Aboriginal communities in the Catchment were stakeholders in the process for a range of reasons. There is Aboriginal presence in the Catchment, both past and present. The Blue Mountains National Park, Nattai Conservation Area and other reserves around the Catchment are known to contain some of the most culturally significant sites of Aboriginal
occupation of the land. Parts of the Catchment are Country for the Deerubbin, Dharawal, Pejar, and other Aboriginal peoples. Aboriginal communities own significant tracts of land in the Catchment.

For the past 3 audits, the Auditor wrote to the NSW Aboriginal Land Council, extending an invitation for them to make a submission. The 2010 Auditor also extended the invitation to five local Aboriginal land councils in the Catchment. The 2010 invitation to make a submission on the existing audit indicators did not receive any responses from any of the Land Councils.

The Auditor notes that the current audit timeframe is too short for effective Aboriginal community engagement. The Auditor is aware that the SCA, DECCW and the CMAs in the Catchment have officers and programs whose core businesses include effective engagement of Aboriginal communities on a range of government activities. DECCW’s *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (DECCW 2010a) relates primarily to the issuing of Aboriginal Heritage Impact Permits, however, it could also be used as to guide for consultation in the context of the audit.

The Auditor believes that a communication and engagement package for effective Aboriginal community engagement still needs to be developed for future audits. This may require more time than that traditionally allocated to the audit process.

**Recommendation 1:** The SCA investigate ways to achieve effective Aboriginal community engagement in the audit prior to the commencement of the next Sydney Drinking Water Catchment audit.

**Catchment inspections**

The Audit Team undertook catchment inspections in August, September and October 2010 in order to view some of the specific localities and premises that represented known issues in the Catchment. Some areas (e.g. Upper Coxs sub-catchment) had already been visited previously as a result of previous DECCW studies. Officers from the SCA, DECCW and/or the Hawkesbury–Nepean CMA (HNCMA) accompanied the Audit Team at different times and locations and provided expert advice on catchment management issues. Issues of particular interest to the Audit Team during the current audit included:

- creek bed cracking and swamp impacts (in areas where longwall mining has already occurred)
- point source pollution and/or remediation (e.g. sewage treatment plants, mines, erosion sites, rehabilitation sites)
- areas of land use change.

Catchment inspections occurred at the following locations:

- Upper and Middle Coxs River and Farmers Creek around Lithgow
- Mulwaree and Wollondilly Rivers around Goulburn
- Nepean River catchment, Wingecarribee River and Reservoir, and the Kangaloon Borefield in the Southern Highlands
- Kangaroo River, Tallowa Dam, Bendeela Pondage and Fitzroy Falls Reservoir.
- Waratah Rivulet (Woronora River)
- Thirlmere Lakes.
The outcomes and findings from the inspections are incorporated into case studies and the following chapters of this audit report.

### 2.4 Submissions received

Thirty-five submissions were received from a range of State Government agencies, Local Government Agencies, environmental groups, mining and power companies, the NSW Minerals Council and private individuals. The Audit Team acknowledged all submissions in writing and has used the information and data provided. Individuals and organisations that provided a submission are listed in Appendix B.

Information, data and issues from the submissions were compiled and catalogued, and information identified for later analysis within their appropriate theme(s) and indicator(s) (see Table 2.1.1). Many submissions canvassed more than one issue and a summary of the issues raised is provided in Figure 2.4.1. The most frequent issue raised was that of mining impacts, particularly those associated with water flow, water quality and wetlands. A brief discussion of the major issues identified in submissions follows:

#### Mining impacts

Ten submissions were received regarding longwall mining, particularly in the Upper Nepean and Woronora Special Areas. Submissions that raised issues about longwall mining came from the OHN, SCA, local councils (Campbelltown and Sutherland), environment groups (4 organisations) and two private individuals. The NSW Minerals Council submission (not counted in the 10 above) emphasised the economic and social benefits of mining in these areas.

#### Water quality

Eight submissions were received regarding water quality. The primary catchments involved were: the Upper Nepean/Woronora catchments because of longwall mining (licensed colliery discharges were also raised but this occurs in the nearby Upper Georges River catchment); the Upper Coxs River because of Delta Electricity's licensed discharge (and other licensed discharges); and the Kangaroo River sub-catchment (pathogens and turbidity/suspended solids).

#### Flow

Eight submissions were received regarding water flow. This included concerns about environmental flow releases under Water Management Licences (e.g. Delta Electricity's Water Management Licence for the Upper Coxs River) or the potential for reduced or no flow as a result of longwall mining.
Wetlands
Six submissions were received regarding wetlands. These were all related to longwall mining impacts.

Development
Six submissions were received regarding development in the catchments. Some of the major issues raised were about upstream developments affecting downstream environments, inappropriate development, and rural subdivision.

Licensed discharges
Five submissions were received regarding licensed discharges. This included Delta Electricity’s discharge, mining company discharges and sewage treatment plant discharges.

Compliance
Five submissions were received regarding compliance. This included concerns about meeting State Plan targets, illegal dumping, Special Areas enforcement, auditing of success of the Healthy Catchments Program (HCP) and perceived weak legislation.
**On-site systems**

Four submissions raised the issue of on-site systems with some of these systems identified as failing.

**Monitoring**

Four submissions raised the issue of monitoring. Some called for increased monitoring while others raised the issue of public access to monitoring data.

**Algae**

Four submissions raised the issue of algae and/or cyanobacterial blooms.

**Other**

Three submissions each raised the issues of cumulative impacts and sustainability; pests and weeds; fish passage, fish kills and pest fish species; and fire. Two submissions each raised the issues of Riparian Zone Management; Recreational Use; Public Health – pathogens; Implementation of Recommendations; Groundwater, and Erosion. Other single issues identified included: Water Balances; Adequacy of Vegetation Mapping; Stormwater; Population Growth; Implementation of the Neutral or Beneficial Effect test; Land Use; Land Capability; Geomorphology; Farming Practices; Farm Dams; Education; and Contaminated Sites.

Where relevant, case studies were identified to highlight issues, utilising information provided by stakeholders in their submissions and from observations made during catchment inspections.

The 2010 audit recognises that many pressures (e.g. land clearing and erosion, development etc) occur throughout all or most of the sub-catchments; whereas other pressures (e.g. mining and power station discharges) are restricted to one or just a few of these sub-catchments. Where detailed information is available, the 2010 audit has compiled and presented information on a sub-catchment basis to highlight the state of individual sub-catchments and the variety of pressures on them (see Appendix C).