Chapter 4
Protecting and Improving Land Condition

Key Points

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Status of Indicator</th>
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<tbody>
<tr>
<td>4.1 Changes in land use</td>
<td>The large areas of agriculture, increases in intensive agriculture and increased urbanisation and rural residential development will all continue to put pressure on water quality within the Catchment.</td>
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<tr>
<td>4.2 Sites of pollution and potential contamination</td>
<td>Identification of potentially polluting sites has been undertaken. Risk assessment and management process for these sites needs to be progressed.</td>
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<tr>
<td>4.3 Soil erosion</td>
<td>11% of the Catchment has very high or high estimated rill or sheet soil erosion, while 82% has low or very low estimated rill or sheet erosion.</td>
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<tr>
<td>4.4 Salinity</td>
<td>Salinity is not a major problem in the Catchment. However, there are areas susceptible to salinity that require appropriate management.</td>
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Pressures in the Catchment

Land condition is closely linked with water quality and the biotic environment, and the key pressure affecting land condition is land use. There are urban centres and rural residential areas in the Catchment, plus large agriculture and livestock farming. These broad types of land use are altered from the natural landscape in varying severities by their intensity. The more intense and invasive the land use, the more altered the landscape and generally poorer the land condition, however all land uses have the potential to degrade land condition if improperly managed.

More specific pressures occur from land uses such as land clearing, livestock grazing, and the agricultural practices of irrigation and chemical application. If poorly managed, these can result in the erosion, degradation and contamination of soil, salinisation, and the loss of riparian zones and habitat, which in turn can impact upon other parts of the catchment ecosystem. Poor land use practices can greatly increase the impacts on land condition, for example, unchecked irrigation can cause the salinisation of agricultural land, and the unrestricted access of stock can cause soil erosion and degrade riparian zones.

Urbanisation and rural residential development are also potential sources of pressure on land condition, especially during the site preparation and construction phase when vegetation is cleared and soil exposed.

Industry is necessary and economically important in the Catchment. However, industry includes some very intensive land uses, which if inappropriately managed can have significant impacts on land condition. Activities including mining, electricity generation, and intensive livestock industries can cause land pollution...
or contamination, which may spread to other areas including water bodies. Other types of sites, including waste disposal, operate in the Catchment and are also a potential threat.

There is sometimes subsidence due to underground mining, particularly longwall coal mining. Subsidence occurs when the overlying rock mass moves toward a mining void. This can have serious impacts on the environment, including soil erosion, diversion of water flow, reduction in water quality, and physical disturbance of the geological and built environments.

The 2001 census indicated that approximately 111,000 people were living in the Catchment. This was an increase of 5.9% over the 1996 population. This growth was primarily focused in the urban areas of the Catchment and reinforces the importance of managing the impact of urban development. Figure 4.1 provides a map of the population density within the Catchment and confirms that population in the Catchment is concentrated in urban areas.

These figures may understate the growth of rural residential development within the Catchment, especially where these premises are used as rural retreats and therefore not reflected in census population counts.

4.1 Changes in land use

Background

Different land uses and how they are managed are a major reason for differences in environmental condition. A clear understanding of land use within the Catchment is critical in identifying likely impacts on water quality in drinking water storages. Extensive clearing of vegetation has altered the physical, chemical, biotic and hydrologic balances in the landscape, accelerating the degradation of soils, water and vegetation. Changes in land use can include transferring from one type of land use to another or changing the intensity of land use. Examples include moving from native pasture to improved pasture, pasture to cropping or intensive agriculture and agriculture to urban or rural residential. The changes in land use have both the potential for greater impact and an opportunity to improve performance where best management practices are applied.

The Sydney Drinking Water Catchment is generally composed of native bushland areas or land that has been cleared for agricultural purposes. To identify the extent of change in land use over the audit period the number and type of SEPP 58 development applications submitted to SCA was used for trend assessment.

Findings

The Upper Wollondilly, Mulwaree River, Wingecarribee River, Reedy Creek and Braidwood Creek sub-catchments have large areas of pasture (Figure 4.2). Large urban areas are Goulburn, Bowral, Moss Vale, Lithgow and Katoomba (Figure 4.2). The urban areas in the Kangaroo River, Wingecarribee River and Wollondilly River sub-catchments are continuing to expand with the greatest number of SEPP 58 development applications received for dwellings during the audit period (Figure 4.3). The Bungonia Creek, Kangaroo River, Nattai River, Upper Wollondilly River, Wingecarribee River and Wollondilly River sub-catchments had the greatest number of SEPP 58 developments that did not include dwellings or subdivisions (Figure 4.4). These developments include agriculture, effluent/biosolid disposal, forestry, mining, poultry farm, tourism and vineyards.

Implication

Increases in urbanisation, rural residential and commercial developments occurred in the Nattai River, Upper Wollondilly River, Wingecarribee River, Wollondilly River and Kangaroo River sub-catchments from the previous audit period. This will continue to put pressure on water quality in these sub-catchments. Other

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1 SEPP 58 applications are for specified development types of a potentially polluting nature which must be sent to SCA for approval
Figure 4.1 – Map of population density in the Sydney Drinking Water Catchment, 2001
Figure 4.2 – Map of land cover in the Sydney Drinking Water Catchment
changes in land use such as improvement to pasture through cultivation and application of fertiliser are more difficult to quantify as they are not subject to planning approval processes. Similarly, changes in management practices can significantly change the impact of activities for better or worse but these are difficult to quantify.

Developing processes to track such changes through remote sensing or sampling would greatly assist in better understanding and managing the pressures arising from these changes.

Figure 4.3 – Number of SEPP 58 development applications for dwellings per sub-catchment for the current audit period, 2001–02 to 2002–03

Source: SCA data, as at 2003

Figure 4.4 – Number of SEPP 58 development applications excluding dwellings and subdivisions per sub-catchment for the current audit period, 2001–02 to 2002–03

Source: SCA data, as at 2003
Future directions

A detailed landuse map that characterises use at a fine scale (i.e. 25m grid squares) using land use categories relevant for nutrient and erosion modelling would provide both a sound benchmark for determining trends in land use change and provide a valuable input for nutrient load and erosion indicators and related management processes. Given the anticipated rate of land use change across the Catchment it is envisaged that this map would be updated at 5–10 year intervals depending on advances in remote sensing technology and analysis.

During intervening periods supplementary indicators such as development applications could be used to indicate type and amount of land use change occurring in the Catchment.

**Recommendation 13:** That SCA prepares a detailed land use map for program planning purposes. The resolution and categorisation used for this map should be sufficient for robust nutrient export and erosion modelling.

Changes in land use, particularly those changes leading to the removal of native vegetation and disruption of soil almost inevitably lead to increased impact. However, with appropriate design and management such impacts can be minimised and potentially can lead to overall improved outcomes especially where degraded landscapes are rehabilitated and best practice water sensitive design principles implemented. Therefore, it may be appropriate to develop an indicator of level of management as a supplementary pressure indicator to inform the land use indicator. Given the complexity of this task, development could be targeted to the most relevant land use(s) as a pilot for the next audit.

**Recommendation 14:** That relevant agencies commission the development of methods and tools to indicate the effectiveness of management practice applied to reduce water impacts from different land uses, for use in nutrient export and erosion modelling.

Targets

Existing and new developments and activities moving towards sustainability by:

- all new developments incorporating ecologically sustainable development principles (e.g. water sensitive urban design)
- all land use incorporating sustainable best practice
- no increase in the cumulative impact of developments and activities.

4.2 Sites of pollution and potential contamination

Background

The pollution and contamination of the land is a common side effect of human activity. Many industrial or agricultural processes are capable of polluting the land during operation and/or by leaving contaminated materials behind. Any resulting contamination of the land can potentially be mobilised from a localised problem to a widespread problem by entering surrounding water bodies. Therefore, it is important to identify active and historical sites within the Catchment that have a potential to pollute the Catchment.

The proposed indicator for this issue is the progress of the risk assessment and management process for each site. The process began with the preparation of the Pollution Source Risk Management Plan in December 2000. This plan identified and ranked activities that were expected to occur in the Catchment and that have the potential to pollute land. SCA has commissioned nine Environmental Assessment of Sites and Infrastructure (EASI) reports, which were aimed at identifying all specific instances of activities occurring in...
the Catchment. The output of this process is reported here to show the extent of these activities within the Catchment (Figure 4.5 and 4.6).

**Findings**

The EASI reports identified 1025 locations of potential polluting activities or contamination, excluding mines and quarries (Table 4.1 and Figure 4.5). There are a large number of commercial and manufacturing facilities and intensive horticulture sites in the Catchment (Table 4.1). The majority of these sites of potential contamination are located in the Wingecarribee River, Kangaroo River, Werriberri Creek, Upper Coxs River sub-catchments and the area around Goulburn (Figure 4.5). Primarily the waste facilities and manufacturing sites are in the towns of Bowral, Moss Vale, Goulburn, Katoomba, Lithgow and Braidwood. There is a large concentration of horticultural sites in the Werriberri Creek, Wingecarribee River and Kangaroo River sub-catchments (Figure 4.5).

The EASI report on Telecommunications and Energy production is generally comprehensive and is able to suggest with confidence that these activities are generally of low risk to the Catchment. Most other information for the above sites and industry is generic, and conclusions cannot yet be made.

The Mining EASI report (Environmental and Earth Sciences 2002) identified operating sites with existing licences, leases, titles and claims and old mines in highly sensitive areas. The study found 33 sites were relevant to the SCA for further investigation (see Wallerawang Colliery Case Study). The EASI report (R.W. Corkey and Co. 2003) on quarries identified 433 quarries and of the 95 operational quarries, 11 have environment protection licences but 29 had no formal approval (if not otherwise regulated, councils are the regulators under the Protection of the Environment Operations Act 1997 (POEO Act)). The licensed quarries were generally the larger quarries, and only one of the 11 has reported licence non-compliances (see Penrose Quarry Case Study). No risk assessment was done on the quarries identified in this EASI report.

The Survey of Derelict Mines Report (Coffey 2001) identified 891 potential sites of interest. Following desktop assessment and ranking, 21 sites were selected for field assessment. The field assessment was used to allocate remediation resources. Seven sites were selected as in need of remediation works to prevent contamination of waterways. These sites and the 33 mines identified in the EASI report are shown in Figure 4.6.

The Yerranderie Silver Field is made up of a number of separate leases and is number one on the top 50 derelict mine sites list of NSW published by the Department of Mineral Resources (DMR). This area was not included in the Survey of Derelict Mines Report because a taskforce responsible for remediation of the site has already been established. The Yerranderie Silver Field is also represented on Figure 4.6.
Table 4.1 – Type and number of potentially polluting sites in the Sydney Drinking Water Catchment

<table>
<thead>
<tr>
<th>Type of site</th>
<th>Number of sites</th>
<th>Type of site</th>
<th>Number of sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial and Manufacturing Facilities</td>
<td>463</td>
<td>Intensive Livestock Industries</td>
<td>96</td>
</tr>
<tr>
<td>Automotive sites</td>
<td>330</td>
<td>Aquaculture</td>
<td>2</td>
</tr>
<tr>
<td>Farm, grain, building and garden supply</td>
<td>8</td>
<td>Dairy</td>
<td>37</td>
</tr>
<tr>
<td>Fertiliser manufacture and distribution</td>
<td>6</td>
<td>Feedlots</td>
<td>1</td>
</tr>
<tr>
<td>Food manufacture</td>
<td>13</td>
<td>Saleyard</td>
<td>5</td>
</tr>
<tr>
<td>General manufacture</td>
<td>34</td>
<td>Horses</td>
<td>30</td>
</tr>
<tr>
<td>Metal industry</td>
<td>35</td>
<td>Livestock processing</td>
<td>3</td>
</tr>
<tr>
<td>Timber Industry</td>
<td>6</td>
<td>Piggery</td>
<td>3</td>
</tr>
<tr>
<td>Construction Industry</td>
<td>31</td>
<td>Poultry</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Domestic animals</td>
<td>5</td>
</tr>
<tr>
<td>Intensive Horticulture/Forestry</td>
<td>226</td>
<td>Sewage and Water Treatment</td>
<td>196</td>
</tr>
<tr>
<td>Vegetable growing</td>
<td>36</td>
<td>Sewage Treatment plant</td>
<td>11</td>
</tr>
<tr>
<td>Floodplain cropping</td>
<td>37</td>
<td>Water pumping station</td>
<td>11</td>
</tr>
<tr>
<td>Grapes</td>
<td>46</td>
<td>Sewage pumping station</td>
<td>103</td>
</tr>
<tr>
<td>Flowers</td>
<td>5</td>
<td>Water filtration plant</td>
<td>15</td>
</tr>
<tr>
<td>Forestry</td>
<td>6</td>
<td>Effluent irrigation</td>
<td>18</td>
</tr>
<tr>
<td>Fruit</td>
<td>52</td>
<td>Biosolids disposal</td>
<td>14</td>
</tr>
<tr>
<td>Nursery</td>
<td>10</td>
<td>Swimming pool</td>
<td>12</td>
</tr>
<tr>
<td>Olives</td>
<td>24</td>
<td>Small STP</td>
<td>12</td>
</tr>
<tr>
<td>Nuts</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Berries</td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waste Disposal</td>
<td>44</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating Landfill</td>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Former landfill</td>
<td>13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recycling drop off</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transfer station</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waste storage</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Illegal Dumping site</td>
<td>6</td>
<td></td>
<td></td>
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</tbody>
</table>

Source: Meinhart, 2003; URS, 2003a, b, and c; Woodlots and Wetlands, 2003

There were 3 mining-related development SEPP 58 applications made between July 2001 and June 2003. These were two ancillary applications in the Upper Nepean River sub-catchment and one Part-4 application in the Upper Coxs River sub-catchment.
Figure 4.5 – Map of commercial and manufacturing facilities, intensive horticulture/forestry and waste disposal sites in the Sydney Drinking Water Catchment

Note: Information was not provided by SCA on the location of the intensive livestock industries.
**Implications**

There are a large number of activities within the Catchment with the potential for impacting water quality if they are not appropriately managed. These are concentrated in the Kangaroo River, Upper Coxs River, Werriberri Creek and Wingecarribee River sub-catchments. While there has been good progress in identifying these sites for most activities there does not appear to have been a specific on-site assessment of risk. Such an assessment is necessary in order to develop action plans to address issues that might be identified. Consequently there is little data available to indicate the effectiveness of environment management at these sites or what the actual risks that they may pose to the environment and water quality.

**Case Study – Wallerawang Colliery**

Wallerawang Colliery is an underground coal mine 15 km north of Lithgow in the Upper Coxs River sub-catchment. The mine has, for all accounts, ceased operation, and has been undergoing rehabilitation since 1991. The rehabilitation process has been slow and unorganised and there remains a large area still in need of final rehabilitation (Figure 4.7). Areas of the site are acid generating which also creates a threat to water quality. The site is licensed to discharge water to Neubecks Creek, which is a tributary of the Coxs River. The site has numerous environmental controls, including sediment traps, neutralising ponds (Figure 4.8) and retention basins, but there have still been some exceedences of environment protection licence conditions.

![Figure 4.7 – Wallerawang Colliery, August 2003](image1)

![Figure 4.8 – Wallerawang Colliery neutralising ponds, August 2003](image2)

Between 2000–01, there were two non-compliances reported. One was the exceedence of water quality licence guidelines by mine water discharge. The second was the late reporting of the non-compliance. In 2001–02, there was one non-compliance reported, where the pH of discharged water exceeded the 6.5–8.5 licence limits for the entire 12-month period.

Rehabilitation is underway, and it is expected that progress in rehabilitation will reduce these licence non-compliances. To address acid being generated by the site’s waste material, a project has been underway since 1999 which involves creating briquettes from coal fines excavated from a former pond for sale to Mount Piper Power Station. A rehabilitation plan for the site is currently being finalised by DMR. The plan is being closely reviewed by SCA and has been viewed by the Department of Environment and Conservation (NSW).
Case Study – Penrose Quarry

Penrose sand quarry is in Paddys River in the Wingecarribee River sub-catchment. The quarry has council development approval with water management conditions and is licensed under the POEO Act. The quarry has some sediment control measures in the form of ponds and silt fences. It is located close to Hanging Rock Swamp, which is a heritage-listed peat swamp.

The most recent available information of licence compliance under the POEO Act is for 2001–02, when the quarry reported two non-compliances. One was the discharge of sediment to Hanging Rock Swamp, described below. The other was a stormwater erosion control failure, but the discharged water was mostly captured by secondary measures and the discharge off the premises was thought to be minimal.

The quarry was responsible for an incident in 2001 where 500 tonnes of sand slurry entered the swamp. The Clean-up Notices were issued and the quarry operators were forced to clean up the site. Prosecution for the event occurred in March 2003 and a fine was issued. The quarry operators were also required to undertake a year-long flora study of the swamp (completed August 2003) to assess swamp recovery. The pollution of Hanging Rock Swamp was directly due to machinery adjustments by the quarry operators, but inadequate control measures were also blamed for the severity of the incident.

Following a recent inspection (2/09/03) by the EPA the reported environmental management of the quarry is active and significantly improved. The flora study on Hanging Rock Swamp shows recovery to a good condition and no further work from the quarry operators in the swamp is considered necessary. The SCA was encouraged by the progress and, if the environmental management remains proactive, it will no longer consider Penrose Quarry as a potential ‘hot spot’.

Future directions

The next step is to assess actual risk at each site and to take necessary action as required until it can be classified as a low risk site. Active sites will need to be flagged for reassessment at relevant intervals depending on the inherent risk of the activity. More information needs to be collected for each site on type of activity or operation, potential pollutants, exact pollution source, how the pollutant is discharged and the identification of processes, equipment, and materials that can impact on water quality. Cooperation with relevant regulatory bodies at all levels of government, involved in the approval or ongoing regulation of each activity, is also vital to managing this risk. Unlicensed sites, such as most quarries or illegal waste dumps, are especially in need of review.

Recommendation 15: That SCA sets specific time frames for progressing and completing risk assessment and management processes for activities identified as ‘sites of pollution and potential contamination’.

Targets

Risk assessment and rehabilitation at all sites with potential polluting activities in the Catchment is completed. The final outcome would be no contamination of waterways from sites of potential pollution or contamination.
Figure 4.6 – Map of mines, identified in the EASI and derelict mine reports, that need further investigation in the Sydney Drinking Water Catchment
State of the Catchment

4.3 Soil erosion

Background

Soil erosion leads not only to a loss of organic matter and soil nutrients from the surface, but also the deposition of sediments and nutrients in streams. Soil erosion involves the dislodgement of soil particles, their removal and eventual deposition away from the original position. This natural process is fundamental in landscape and soil development. Susceptibility to erosion and the rate at which it occurs depends on land use, geology, geomorphology, climate, soil texture, soil structure and the nature and density of vegetation in the area. Erosion is a natural process that is accelerated by human activities. The clearing of native vegetation and agricultural land use activities have been major contributors to accelerated rates of erosion. The potential for soil erosion increases wherever vegetation cover is removed, soil is disturbed or exposed, and where high intensity rainfall or wind occurs. The main categories of soil erosion are sheet, rill, gully, tunnel, stream bank and wind erosion.

The estimated sheet and rill erosion was calculated by the National Land and Water Resources Audit (NLWRA) using the Revised Universal Soil Loss Equation (RUSLE). The following attributes were used in the RUSLE: soil erodibility (data derived from NSW Soil and Land Information System and the Australian Soil Resource Information System); rainfall erosivity (data from National Rainfall erosivity surface); slope gradient and length (derived from the National Digital Elevation model); and ground cover (Satellite imagery from Normalised Difference Vegetation Index – NDVI).

Findings

The area within the Catchment with very high estimated sheet and rill erosion is 4.9%, this area includes parts of the Upper Coxs River and Wollondilly River sub-catchments. The Upper Wollondilly River, Mulwaree River, Reedy Creek and Braidwood Creek sub-catchments also contained areas of high estimated erosion, which covered 5.6% of the Catchment (Figure 4.9).

Multi-attribute mapping which also addressed gully and stream bank erosion as well as sheet and rill erosion was undertaken by the Soil Conservation Service in 1985 using air photo interpretation and ground truthing. This process identified that 8.9% of the Catchment was affected by severe sheet and rill erosion.

Observing actual erosion is a labour-intensive and time-consuming process and has only been completed in the Braidwood lands. The total area affected by erosion is 185 ha (1% of total Braidwood area).

Implications

Areas within the Upper Coxs River, Upper Wollondilly River, Wollondilly River, Mulwaree River, Reedy Creek and Braidwood Creek sub-catchments are the most susceptible to soil erosion. Therefore, programs addressing soil erosion need to specifically target these areas to ensure that appropriate strategies and management controls are in place to prevent and remediate soil erosion.

The audit only had limited access to information on the multi-attribute mapping and so was unable to determine the reason for the apparent different assessment of the extent of severe rill and sheet erosion to the NLWRA process. However developing a reliable assessment of degradation will help guide an appropriate level and targeting of response.

**Recommendation 16:** That programs addressing soil erosion in the Catchment demonstrably target areas with high estimated erosion rates.
Future directions

Using the NLWRA approach, a precise estimation of sheet and rill erosion can be calculated for future audits using the more detailed soil landscapes data of the Sydney Drinking Water Catchment that is now available. More detailed slope gradient and length data is also available from the State Digital Elevation model.

However consideration should also be given to alternate approaches to gathering and presenting information on land condition. In addition to the NLWRA and multi-attribute approach there is also the land degradation survey undertaken by the Soil Conservation Service In 1987-88. While relatively broad scale the survey methodology provides a comprehensive assessment of land condition with ten forms of land degradation being recorded. Prior to the next audit relevant agencies should investigate the most appropriate methodology for both monitoring trends in land condition and providing an information base for appropriate land management programs.

Land use practices are a major factor that contributes to soil erosion, as poor land use practices can cause erosion in even low risk areas and are able to change in the short-term. Inclusion of land use and management practices in the erosion risk models would increase their accuracy and better enable changes over short-time periods (years) to be observed. This, together with new information collected on soil landscapes, slope gradient and length and ground cover, could provide a more powerful management tool (see also discussion at 4.1).

### Recommendation 17

That DIPNR in conjunction with SCA develops a land degradation map incorporating land use and land management for erosion risk management and future audit reporting.

**Target**

To reduce potential soil erosion to very low levels.

There is a link between the above target and the Warragamba Catchment Blueprint target SLMT3: By 2012 there is a 20% reduction in the area of historic moderately to severely degraded land and 10% of priority streambank is stabilised.

### 4.4 Salinity

**Background**

Salinity can be a threat to the health and productivity of a catchment, as plants and soil organisms are killed, or their productivity is severely limited, on affected lands. There are two kinds of soil salinity: inherent and induced. Salinity occurs when the natural balance and distribution of salt in the landscape is disturbed. The removal of native vegetation through land clearing and the adoption of unsuitable land uses and practices have resulted in ground water tables rising. This allows salts to move close to the soil surface where they are concentrated by evaporation or discharged into surface waters. Discharges of saline waste water from mines, power stations and STPs are other sources of salts reaching waterways.

The risk of salinity was determined by DIPNR using the Soil Landscapes data for the Catchment. The risk was placed into three categories: widespread – areas where saline soils occur or where scalding, salt effrescence, vegetation dieback, salt tolerant vegetation and water logging can be found; localised – scattered areas of scalding and indicator vegetation have been noted; no risk – small likely hood of salinity occurring. The areas identified as widespread risk areas of salinity may not necessarily be affected by salinity at present, but, if land use practices change, these areas have a high potential to be affected by salinity. The observed salinity distribution is of areas which are currently affected by salinity and do not necessarily occur in high risk areas. The observed salinity within the Catchment was associated with soil erosion.
Figure 4.9 – Map of estimated sheet and rill erosion in the Sydney Drinking Water Catchment
Figure 4.10 – Map of salinity risk and observed salinity in the Sydney Drinking Water Catchment
Findings

Salinity is not a major problem within the Catchment. There are however, areas that are susceptible to salinity. The area of the Catchment that has a widespread risk of salinity is 2.8%; this area is located in the Boro Creek, Mid Shoalhaven River and Nerrimunga Creek sub-catchments (Figure 4.10). The Boro Creek, Nerrimunga Creek, Mulwaree River Mid Shoalhaven River, Mongarlowe River and Wollondilly River sub-catchments have a number of areas with identified salinity (Figure 4.10).

Implication

Areas within the Boro Creek, Mid Shoalhaven River and Nerrimunga Creek sub-catchments are most susceptible to salinity. Salinity issues may be emerging at several sites not within these sub-catchments where there has been extensive effluent re-use. These together with areas where irrigated land salinity is occurring should be identified, prioritised and appropriately managed.

Future directions

Given the salinity risk profile within the Catchment there is a need to monitor the incidence of salinity and be able to reliably report trends.

Recommendation 18: That DIPNR and SCA investigate the development of a methodology to identify and report on areas of land affected by salinity.

Target

No increase in the area of the Sydney Drinking Water Catchment affected by salinity. Ultimately to reduce the area of land affected by salinity.

There is a link between the above target and the Warragamba Catchment Blueprint target SLMT4: By 2012 there is a 20% reduction in the area of severely to moderately degraded saline discharge sites.
Actions and Response

Response to issue

The two primary responses to protecting and improving land condition are to prevent or at least mitigate against the potential impacts from future activities, and where scientifically and economically feasible, to repair lands already degraded. Reducing pollution from both point and diffuse sources all contribute to reducing the impact on land condition. These are dealt with in section 2. This section covers the major actions aimed at protecting and improving land condition in the Catchment. These include:

- programs to reduce land degradation from urbanisation
- programs to reduce land degradation from changes in land use
- programs to reduce land degradation from identified high risk industries
- programs to reduce land degradation from agriculture
- programs to reduce land degradation from mines
- programs to reduce land degradation within Special Areas
- programs to protect high quality catchment land outside the Special Areas
- programs to reduce land degradation from bushfires.

Urbanisation

There is a range of programs relating to the management of urbanisation, these include:

- sewage management programs that exist between the NSW Government and local councils to deliver improved outcomes from STPs, unlicensed sewage treatment systems (excluding single dwelling on-site systems), on-site sewage treatment systems and sewerage infrastructure. All of these programs are discussed in Chapter 2.
- stormwater programs have been allocated funds from the NSW and federal governments to help local government manage stormwater generation, conveyance and discharge. Work in collaboration with other agencies to identify and implement best stormwater management practices for reducing runoff from urban areas are discussed in Chapter 2.

Changes in land use

The management and control of land uses within the Sydney Drinking Water Catchment is primarily guided by the Environmental Planning and Assessment Act 1979. Local councils also have a range of powers under the Local Government Act 1993 and the POEO Act that can be used to manage specific land use issues. Planning documents that cover the uses of land as well as the way it is managed include:

- State Environmental Planning Policy 58 (SEPP 58) – SEPP 58 establishes controls over development that may have an impact on water quality within the Sydney Drinking Water Catchment. Consent authorities, primarily local councils, are required to refer particular applications to the SCA, so the effect of the development on water quality can be assessed. Depending on the type and the location of the development the SCA will either have a concurrence or an advisory role. SEPP 58 was introduced as an interim measure and is to be replaced by a Regional Environmental Plan (REP) that has yet to be finalised.
During the year SCA reviewed 231 concurrence applications and 418 notification applications (compared to 202 and 532 respectively in 2001–02). Most applications were for unsewered residential developments with more than 90 percent of the applications being processed within the statutory period.

- **Local Environmental Plans (LEP)** – All councils within the Catchment have LEPs that cover specific land use controls within their area. They list the land use zones and specific controls on land. LEPs must be consistent with relevant REPs or SEPPs.

- **Regional Environmental Plan (REP)** – The SWCM Act requires an REP to be prepared as part of a broader regional plan. The regional plan will make provision for the control and management of all land uses within the Catchment. It will also make provision for the preparation of a series of strategies and action plans aimed at improving the land management and ultimately water quality within the Catchment. A draft REP was first exhibited in October 2000. The SCA has been working with DIPNR towards re-exhibiting the REP. In light of changes to institutional arrangements including the creation of DIPNR and Catchment Management Authorities, no announcement on when the REP will be exhibited has yet been made.

- **Rectification Action Plans (RAPs)** – The SWMC Act also requires the development of action plans to rectify existing land uses that do not have a neutral or beneficial effect on the quality of water, within certain time limits after the gazettal of the REP. RAPs must be prepared for each sub-catchment or a combination of sub-catchments in consultation with relevant councils, State agencies, natural resource management groups, interest groups and communities. RAPs are to be used by both the SCA and other government agencies to inform budgetary decisions and programs. Development of RAPs has been postponed due to the delay in re-exhibiting the REP.

- **The Sydney Drinking Water Catchment Management (Environment Protection) Regulation 2001** – Enables the SCA to exercise certain regulatory functions under the POEO Act with regard to non-scheduled premises and activities. During 2002–03, 5 Clean-up Notices, 1 Prevention Notice, 2 notices requiring information and ten Penalty Infringement Notices were issued in the water supply catchment area.

**Identified high risk industries**

In 2001 the SCA undertook a preliminary Pollution Source Risk Management Plan (PSRMP) as part of the SCA’s 2000–2005 Operating Licence. The plan identified and assessed sources of pollution, set out actions that must be undertaken to improve the quality of bulk water, and identified agreements with other agencies. However, this plan only identified risks at an industry type level and therefore an inventory of specific sites was necessary to fill gaps and understand the scale of the risk.

The SCA has carried out a process of EASI projects within the Catchment during the past 2 years, which has continued to reduce identified gaps in knowledge. There are nine EASI reports which cover intensive livestock industries, commercial and manufacturing facilities, sewerage systems, water treatment plants and bio-solids application sites, intensive horticulture and forestry industries, Commonwealth facilities, telecommunications and energy supply, waste disposal sites, quarries and extractive industries and mining. The EASI projects are a useful part of the process in identifying and quantifying risks to water quality as part of a risk management program, but further actions will be necessary to produce on-the-ground improvements to manage risk within the Catchment through the use of rectification and rehabilitation programs.

**Agriculture/rural lands**

The SCA has developed a range of strategies, programs and actions to protect water quality and catchment health in Sydney’s hydrological catchments. The management of rural lands is a major component of these initiatives.

- **Strategic Land and Water Capability Assessments (SLWCAs)** – The SCA has developed a tool to allow identification of land uses that are either currently impacting on water quality or have the potential to affect water quality in the future. To date SLWCAs have been completed for the Wollondilly River,
Upper Wollondilly River, Mulwaree River, Wingecarribee River and Nattai River sub-catchments. These assessments are intended as an input to the REP and LEPs.

- **Ecosystem Services Scheme** – An ecosystem services approach provides a potentially effective tool for rectifying the negative impact of existing agricultural activities on water quality. In the Sydney Drinking Water Catchment, a process of service payments is being developed to provide a means of implementing priority actions under the Riparian and Rural Lands Strategy of the Healthy Catchments Program. In addition it is intended that work undertaken as part of the ecosystem services project will link with the RAP process under the REP.

- **Healthy Catchments Program (HCP)** – has been implemented by the SCA to integrate strategies (including the Rural Lands Strategy and Riparian Strategy) in response to continuing urban, rural and industrial development to improve catchment health. Each strategy is comprised of programs and projects that focus action on identifying, understanding and rectifying impacts to water quality and catchment health, and form a basis for working with other agencies, councils and community groups.

- **Catchment Protection Scheme** – This joint initiative between landholders, SCA and DIPNR across the Sydney Drinking Water Catchment provides financial assistance and professional advice to landholders trying to manage moderate to severe erosion on their properties.

**Mining industries**

Government agencies including DMR, SCA, the Department of Environment and Conservation (NSW) and DIPNR are working closely with mine operators to initiate programs to ensure that the Sydney Drinking Water Catchment is not impacted by mining. These actions which relate to active and derelict mines as well as subsidence and water re-use issues are as follows:

**Derelict mines**

The Derelict Mine Committee sets priorities for the Derelict Mine Program which is aimed at reducing the safety and environmental risks posed by derelict mines. It is administered by DMR, but involves the Department of Environment and Conservation (NSW), Department of Lands, and the NSW Minerals Council.

A Derelict Mines Report (Coffey 2001) identified all known derelict mines in the Catchment. Site inspections of 21 sites believed to exhibit the highest potential environmental impact revealed that seven of these sites require remediation. In addition to this the Yerranderie site has a taskforce chaired by DMR and involving other agencies including SCA, the Department of Environment and Conservation (NSW) and DIPNR who are working to rehabilitate the Yerranderie Silver Mine Field (identified as a real threat to water quality). So far initial actions to improve safety and assess rehabilitation options funded by an Environmental Trust grant has cost $631,320.

**Active mines and mines on existing leases**

The SCA and the Department of Environment and Conservation (NSW) are currently developing a strategy to address mining and extractive industry in the Catchment. The strategy proposes close cooperation with the DMR in its implementation. The SCA commissioned a report to identify all mines that were active or on active leases in the Catchment, and examined the 33 resulting mines. The information was added to their Pollution Source Database for later use. The EPA includes PRPs in licences to encourage reductions in contaminants, for example, Clarence Colliery must resolve high metal concentrations in mine water discharge.

**Subsidence Management Plans (SMP)**

To address the issue of river-bed cracking due to mine subsidence any mining activity that may cause subsidence must prepare an SMP in line with a new approval process under the Mining Act 1992. These plans must account for all possible impacts of potential subsidence to provide adequate protection for the
natural and built environments. SMP approval is essential and will involve primarily DMR but will also involve other state agencies and the community.

**Re-use of mine water**

The Coxs River Water Management Committee comprising of community, government and industry representatives was established to develop a water management plan for the area. The Committee is considering the use of mine water during the development of the water management plan.

**Special Areas**

The Special Areas Strategic Plan of Management and the Wingecarribee Swamp and Special Area Management Plan are comprehensive plans for managing Special Areas. The plans were prepared jointly by the SCA and the NPWS and developed in conjunction with stakeholder groups and technical experts.

Compliance in the implementation of both these plans is assessed annually as part of the Sydney Catchment Authority Operational Audit (IPART 2003).

**High quality land outside the Special Areas**

The main government response to terrestrial ecosystem decline outside protected areas has been to:

- encourage conservation on private land under joint agreements between the landholder and government agencies to provide permanent protection for areas of high conservation value on private property, protect the native plants and animals on a property as well as sites that are significant for the conservation of natural heritage
- implement legislative and planning controls on clearing of native vegetation and protection of threatened species
- improve knowledge and collect data on biodiversity and ecosystem condition.

**Bushfires**

Hazard reduction burns and grass slashing have been used by the NPWS and SCA to reduce fire fuel on land owned and managed by the SCA. During the cooler months, controlled hazard reduction burns take place in dry sclerophyll habitat to reduce the potential for summer bushfires. These hazard reduction burns (HRB) are conducted according to fire management plans, which are based on district plans approved by the Rural Fire Service. HRB are approved by a multi-agency bushfire committee for the local fire district prior to the commencement of burning operations. The HRB are controlled to minimise the impacts on water quality from increased runoff with high sediment and nutrient loads due to reduced vegetation cover.

NPWS under the joint management arrangement with the SCA undertook a number of HRB in 2002–03 in parts of the Warragamba Catchment that remained unaffected by recent bushfires across other parts of the Catchment. However during 2002–03 only one HRB was undertaken by SCA at Kangaloon in August 2002, as bushfires during the year made other planned HRB unnecessary. In 2001–02 the SCA undertook four HRB at Nepean (August 2001), Blackheath (May 2002) and two at Katoomba (May 2002).

**Effectiveness of response**

Sustaining the Catchments REP has not been gazetted. During 2002–03 the REP remained in draft form, undergoing major revisions by DIPNR. Delays in the finalisation of the plan have adversely impacted upon the commencement of important sub-components of the plan.
The external consultation of RAPs has been postponed indefinitely while waiting for the REP to be exhibited. While the REP would provide a useful framework for RAPs it is not essential for it to be in place prior to commencing RAPs. Given the delay in progressing the REP there would be value in progressing the RAPs independently.

The development of ecosystem services schemes such as the green offsets which have already been established downstream of the Sydney Drinking Water Catchment should be given a high priority.

EASI projects are an important part of a risk management program, but their usefulness is limited without a structured plan to prioritise and carry out rectification and rehabilitation works.

Local Councils play a significant role in the monitoring of erosion and sediment control for construction activities. Further gains may be achieved through councils in the catchment adopting a cooperative role with government agencies similar to the ‘Sitewise’ best practice model as developed in Western Sydney.