

Implementing the National Water Quality Management Strategy – Insights from Capacity Building Workshops around Australia

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Abstract:

The National Water Quality Management Strategy (NWQMS) provides nationally agreed policies, processes and a set of guidelines that form part of the Council of Australian Government's Water Reform Agenda. They provide the information and tools aimed at helping communities achieve sustainable use of the nation's water resources by protecting and enhancing their quality while maintaining economic and social development. The key NWQMS documents are the *Implementation Guidelines*, the *Water Quality Guidelines* and the *Monitoring Guidelines*. These guidelines can play an important part in developing and implementing the water management components of integrated catchment/natural resource management (NRM) plans. However, despite the NWQMS being a nationally agreed strategy, its uptake around Australia has been patchy. In particular, its incorporation into regional NRM strategies has been limited. Also, the breadth and complexity of these guidelines can make them difficult for water quality (WQ) managers to use. As one means of addressing these issues, the Australian Government recently funded localised water quality workshops in seven regions around Australia. The workshops were conducted between March and June 2005 in regions expressing interest in them. They aimed to improve the capacity of regional planners and catchment groups to understand and use the NWQMS and its associated guidelines and tools. The workshops, run by the Coastal CRC, provided insights into water quality management across Australia, such as the levels of awareness and understanding of the NWQMS, confusion with new NRM programs and terminology, issues with the NWQMS documents and their practical implementation and issues with the scope of the NWQMS and its interface with other NRM strategies. This paper documents these insights and provides recommendations for possible improvements in water quality management.

Keywords:

Capacity building; national strategy; water quality management.

INTRODUCTION:

Regional bodies across Australia are developing natural resource management (NRM) plans and investment strategies to achieve national natural resource outcomes associated with the National Landcare Program (NLP), the National Action Plan for Salinity and Water Quality (NAP) and the Natural Heritage Trust (NHT) programs. The waterway components of these plans and strategies provide an excellent opportunity to implement the National Water Quality Management Strategy (NWQMS). The NWQMS forms part of the Council of Australian Government's Water Reform Agenda and provides nationally agreed policies and processes, water quality (WQ) and monitoring guidelines, and guidelines for managing point and diffuse source pollution. The objective of the Strategy is "*to achieve sustainable use of the nation's water resources by protecting and enhancing their quality while maintaining economic and social development*".

Although the NWQMS is a nationally agreed strategy, its incorporation into the NRM plans being developed by regional NRM bodies is very limited. This was a source of concern to the Australian Government Department of Agriculture, Fisheries and Forestry (DAFF) and also to its national NWQMS contact group. As one means of addressing this issue, DAFF recently commissioned the Cooperative Research Centre for Coastal Zone, Estuary and Waterway Management (Coastal CRC) to develop and run two-day workshops for seven regions across Australia that were seeking to increase their capacity to implement the NWQMS. These workshops were run between March

and June 2005 in the following regions: ACT (pilot workshop), Mackay-Whitsunday (Qld), Burdekin Dry Tropics (Qld), NT (tropical - Darwin), South-Coast (Albany, WA), Far North Qld (Tully) and NT (arid - Alice Springs).

While the overall aim of the workshops was to improve the capacity of regional NRM groups to understand and make use of the whole NWQMS, DAFF's brief indicated that the workshops should focus on the three key NWQMS guidelines, namely:

- *Implementation Guidelines* (ANZECC/ARMCANZ, 1998);
- *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC/ARMCANZ, 2000) – the *WQ Guidelines*; and
- *Australian Guidelines for Water Quality Monitoring and Reporting* (ANZECC/ARMCANZ, 2000) – the *Monitoring Guidelines*.

Martin et al. (2005) provides background information on the workshops and Mackenzie et al. (2005) reports on all workshops. The latter report includes detail on the educational approach used in the workshops and the outcomes in terms of improving capacity of regional NRM groups. In brief, the Coastal CRC developed an initial training package (workbook, presentations, CDs, workshop activities) and undertook a pilot workshop in the ACT region. Learnings from the ACT workshop were used to refine the package for the six subsequent workshops.

Outline of this paper

Based on observations made at these workshops and from the authors' previous experience, there appear to be a number of factors that have limited the uptake and implementation of the NWQMS. This paper groups these insights under the following two main headings:

- general lack of awareness of the NWQMS and, more recently, confusion with NAP and NHT management frameworks and terminology; and
- issues with the NWQMS documentation, understanding and its application by practitioners.

As background to discussion of these insights, this paper presents the NWQMS WQ management framework and then a conceptual approach that helped simplify the understanding of waterway management (by addressing some of the insights in the first 'bullet' point above). Finally, the paper discusses potential future directions for the NWQMS.

NWQMS WATER QUALITY MANAGEMENT FRAMEWORK

The *Implementation Guidelines* and the *WQ Guidelines* detail a process for managing water quality based on an adaptive management framework (Vision, Plan, Act, Monitor and Improve). This NWQMS WQ management framework (Figure 1), which depicts this process and its components, was used as the basis of the regional capacity building workshops.

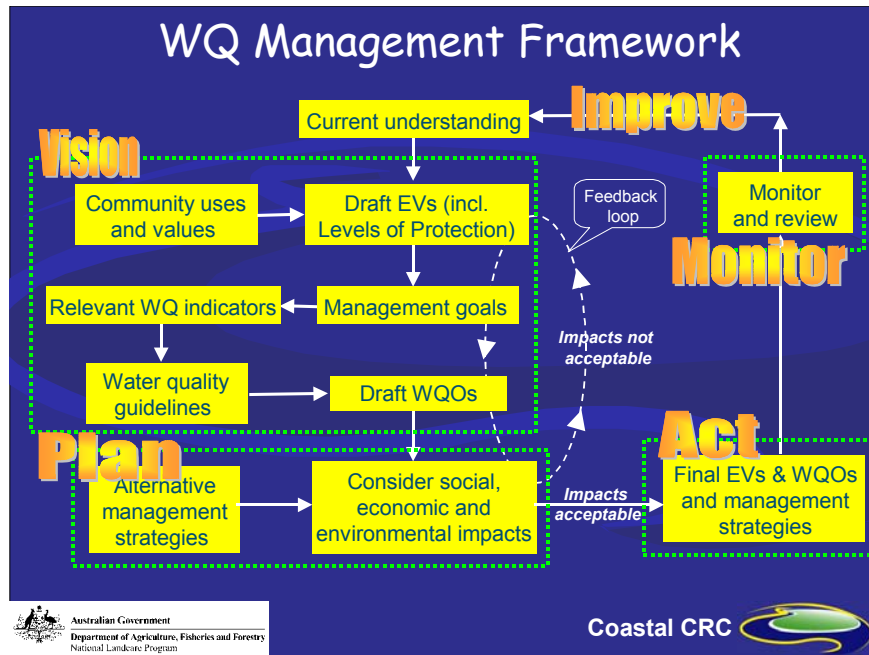


Figure 1. NWQMS Water Quality Management Framework

CONCEPTUAL APPROACH TO SIMPLIFY WATER QUALITY/WATERWAY MANAGEMENT

Evaluation of the pilot workshop in the ACT revealed that, due to the complexity of waterway management, there was a need to simplify terminology and use terms consistently. Figure 2 shows the conceptual approach developed to achieve this and used for the subsequent workshops. It consists of ‘causal pressures’ which result in ‘consequent in-stream pressures’ which impact on ‘values and uses’ and is discussed in more detail below. Figure 3 shows the five ‘causal pressures’ (i.e. activities [causes] on land and in-stream that are the focus of management actions).

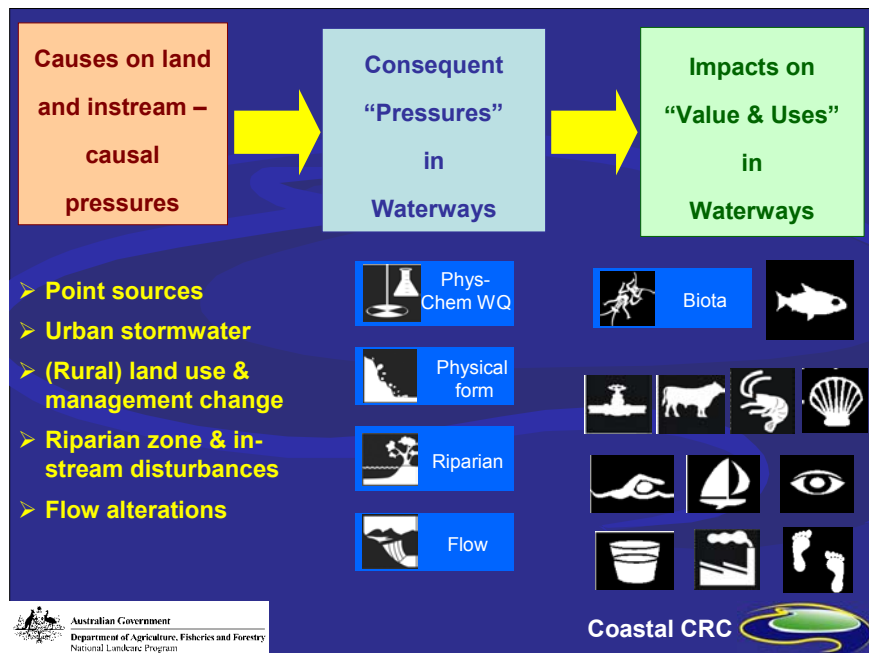


Figure 2. Simplified conceptual approach to waterway management

[Using this approach, for example, a point source discharge from a sewage treatment plant would be a ‘causal pressure’, a high *Escherichia coli* count in the waterway would be a ‘consequent in-stream pressure’ and illness from swimming in or drinking the water would be an ‘impact on the value/use’.

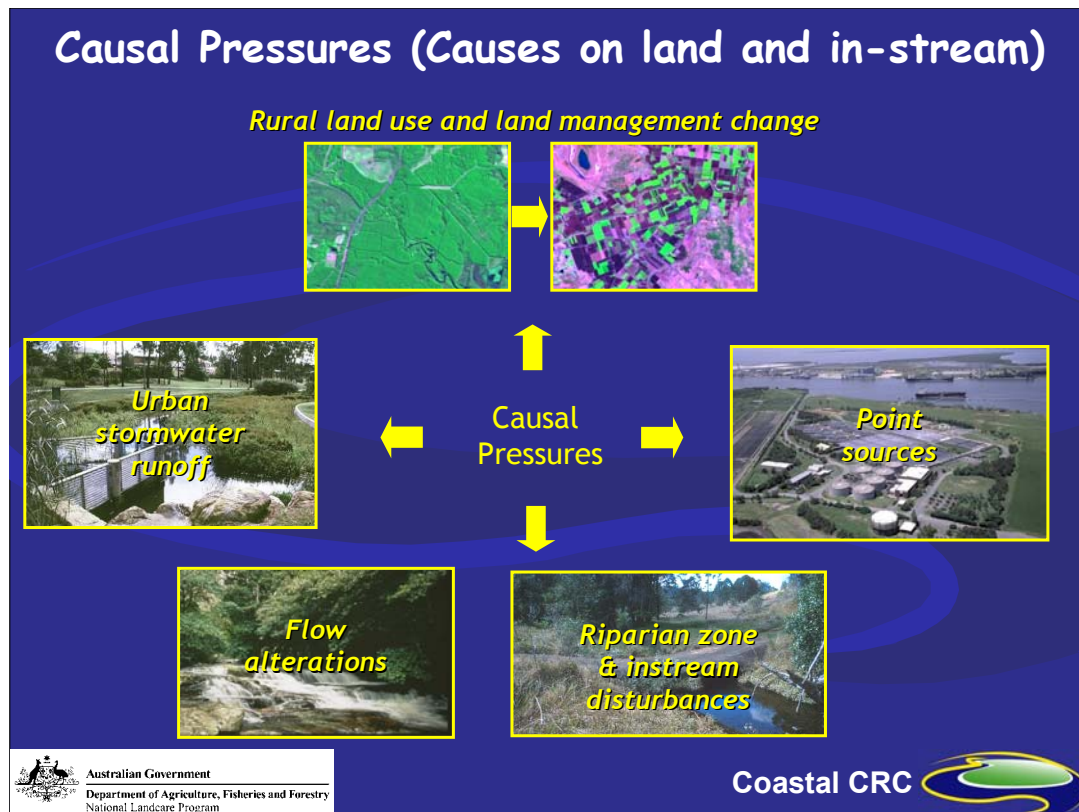


Figure 3. 'Causal pressures' (activities for management)

In summary, this conceptual approach simplified the training in waterway management by:

- (a) simplifying and using consistent terminology, while still allowing regions to adapt this to their terminology where needed (e.g. change 'causal pressures' to 'threatening processes');
- (b) focusing on the activities to be managed to improve water quality (called 'causal pressures' – see Figure 3) and grouped the common areas of management into five categories based on these causal pressures, namely: point source management, rural land use and land management, riparian and instream management, flow management and urban stormwater management. This overcame the possible confusion between 'causes' and 'symptoms'. 'Symptoms' typically then fell into the next stage of the conceptual approach, that is 'consequent in-stream pressures';
- (c) grouping aspects of the aquatic ecosystems environmental value (EV) into the following five categories:
 - (physical-chemical) water quality;
 - riparian habitat;
 - flow;
 - physical form; and
 - biota,

based on a comparison of indicators used in waterway condition assessments around Australia (Bennett et al., 2005 [pp 128-9]); and

- (d) making explicit the links between the 'causal pressures', 'consequent in-stream pressures' and 'impacts on values/uses (i.e. environmental values)'. This is similar to the Pressure-State-Impact components of the Pressure-State-Impact-Response model. With regard to the 'impact on value and uses' component, the approach used the 'environmental values' (EVs) defined in the NWQMS documents (ANZECC/ARMCANZ, 1998 & 2000) and further associated these with the common symbols shown in Figure 2 for each EV.

INSIGHTS INTO THE UPTAKE AND IMPLEMENTATION OF THE NWQMS

Awareness and confusion with other NRM programs

The NWQMS originated in the early 1990s and there has been a steady roll out of documents since then. This was accompanied by initial Australian government publicity campaigns during the release of the guideline documents but not a great deal of follow-up after the release.

At a State/Territory level, the detail of the NWQMS is well known to key people in relevant agencies. However outside of this group, while people may know that the NWQMS and its key guideline documents exist, they generally do not have a detailed knowledge of it. Similarly, while key elements of the NWQMS have been incorporated into environmental legislation in most jurisdictions, the application of these elements has been patchy. For example, in Queensland, while there have been a few limited previous applications, a concerted roll out of the process of establishing EVs and WQ objectives only started in 2004. Similarly, application in WA focused on developing a State level strategy and, in the NT, focused on declared beneficial uses in their *Water Act*. In the ACT, many of the steps in the NWQMS were actually written into the *Environmental Protection Act* but the practical uptake of this work appears to have been limited and, as the project team discovered during the workshop, it is largely unrecognised by some current NRM practitioners.

The lack of ongoing publicity, combined with limited application of the NWQMS, has meant that detailed knowledge of the strategy has been confined to a few experts in the field. The advent of regional NRM bodies has seen the recruitment of a whole new generation of NRM practitioners who, given the context described above, are largely unaware of the NWQMS and therefore unlikely to implement it.

This situation has been significantly compounded by the NAP and NHT programs that, while attempting to achieve the same outcomes as the NWQMS with respect to WQ, have introduced superficially different management frameworks and a new set of terminology (see Table 1). The terminology developed in other programs has further contributed to this confusion. Some of this new thinking, for example the Monitoring and Evaluation framework, could be usefully incorporated into the NWQMS, but currently the programs are treated as quite separate entities. The confusion between programs was frequently commented upon in the workshops. This highlights the need for a strong champion of the NWQMS at the Australian Government level and for simple and consistent frameworks and terminology across strategies and programs.

Table 1. Comparison of NWQMS and NAP/NHT frameworks

	NWQMS framework	NAP & NHT program frameworks (i) Standards and Targets, and (ii) Monitoring and Evaluation
Objective of strategy / programs	Sustainable use of the nation's water resources	Achieve desired national natural resource outcomes
Purpose of frameworks	Show how the NWQMS guidelines can be applied	(i) establish the principles and requirements for NRM standards and targets, and guide investment through national NRM programs (ii) assess progress towards improved natural resource condition

What is it trying to protect?	‘Environmental values’ – that is social, economic and ecological values and uses of waters	‘Critical assets’ – e.g. ecosystem and habitat ‘matters for targets’ below
What does it call the ‘levels of quality’ of the water resource that it is aiming to achieve?	Water quality objectives (which includes ecosystem health objectives)	Resource condition targets for relevant matters for targets, including: - Inland aquatic ecosystems integrity - Estuarine, coastal and marine habitats integrity - Nutrients in aquatic environments - Turbidity / suspended particulate matter - Surface water salinity (freshwater)

Against this background, it is not surprising that awareness of the NWQMS and therefore the likelihood of its uptake has fallen to a low level. The pre-workshop evaluations showed that in most regions less than 30% of attendees had ever used the *Implementation Guidelines*. This situation was obviously recognised by the Australian Government-led NWQMS contact group and resulted in these workshops that have been a first step in attempting to reverse this trend. **It can be fairly stated that most people attending the workshops, once they started to understand the NWQMS, believe it to contain a logical and useful process, to have good supporting material and to be worthy of uptake.** The workshop evaluations indicated that participants were more likely to use the NWQMS documents in future.

Documentation, understanding and practical application of the NWQMS

The level of documentation of the different components of the NWQMS varies widely. Some areas are covered in great detail (e.g. the *Water Quality Guidelines* and the *Monitoring Guidelines*) while other parts of the process - e.g. involving the community, setting EVs and management goals, identifying high ecological value waterways and assessing the management options - are written at a fairly broad policy level. The very detailed documents are to some extent daunting to less specialised practitioners while the more broad policy type documents, although identifying a logical process, are lacking in the practical detail of how to make the process happen. In particular, involving the community and getting them to articulate EVs and management goals is a difficult process and there are many practical issues that are covered only in general terms. The project team invested significant time and effort in tailoring the broad process outline into a more detailed and practical process that could be understood and applied by workshop attendees. It was also found that using case studies of how this process was used elsewhere was a much more effective way of getting the message across than simply explaining the concepts of the process. Thus, the six small-group workshop activities at each workshop, using local catchments as practical examples, were a good way of ensuring that the concepts were thoroughly understood.

It was concluded from the above that it is perhaps unrealistic to expect people who are not expert in WQ management to pick up the process from existing documents and that some form of training is almost a necessity. Otherwise, any group trying to apply the strategy has to go through a significant and time-consuming process in understanding the NWQMS and developing the missing detail for themselves.

A common response to these difficulties has been that the initial steps of the NWQMS WQ management framework are short-circuited. People head straight for the guidelines, take numbers

from relevant sections and set these as WQ objectives, as seems to be the case with the ACT *Environment Protection Act*. While this may (or may not) provide numbers that are scientifically sound, failure to undertake the initial steps of community involvement and goal setting means that the objectives often fail to have broad acceptance or uptake and can sit in unused documents.

Another issue with documentation is that, while all the NWQMS documents fit in a logical framework, the documents themselves are not always written in such a way as to emphasise the links between the different components in the process. For example, the *Monitoring Guidelines* provide an excellent model for designing monitoring programs but do not go to the next step of explaining the various ways in which monitoring can be applied in the NWQMS.

Similarly, the selection of indicators is a key step in both deriving WQ objectives (or targets) and designing a monitoring program. The same process is the basis of both cases - i.e. development of current system understanding through shared conceptual models - but the linkages have not been adequately shown. Indeed, the derivation of indicators is given very little consideration in the *WQ Guidelines*.

The use of conceptual ('pictorial') models has been demonstrated to be a powerful method of combining stakeholders' and traditional scientists' knowledge into a common system understanding of their catchment. This was confirmed by workshop attendees' evaluation surveys that showed they gained great value from the session where they developed conceptual models for their catchments.

In order to address these issues - the daunting nature of some documents, the lack of detail in others and the lack of linkages between the steps - production of an integrated whole-of-process document along the lines of 'NWQMS for Dummies' might be useful. However, even this would probably need to be supplemented by some level of training.

NWQMS future directions – Integrated waterway management

The NWQMS was originally focused on a process to deal with traditional in-stream water quality issues i.e. physical-chemical pollutants. The protection of all EVs except the aquatic ecosystem EV (i.e. 'human' uses) is still largely focused on these types of pollutants (though with the addition of water borne pathogenic micro-organisms). However, the concept of protecting aquatic ecosystems has broadened considerably. WQ managers now consider not only in-stream pollutant concentrations but also loads of pollutant delivered to systems. They also consider a range of pressures other than physical-chemical pollutants, including alterations to habitat, physical form and flow. In addition to considering this broader range of pressures, it is now seen as critical to assess not only the pressures but also to directly assess the biological health of the systems they are trying to protect.

The broadening out of the concept of aquatic ecosystem protection has led to some scope or 'boundary issues' becoming apparent. In particular, flow or quantity issues in many jurisdictions have been dealt with under separate processes and often under different legislation. As well, flow issues are quite complex and need focused attention. Thus, some groups feel uncomfortable about including flow issues into the NWQMS even though they logically fit there.

Similarly, managing riparian and in-stream habitat and pollutant loads starts to overlap with 'catchment management' activities and questions were raised in the workshops about how the NWQMS fits in with integrated catchment/NRM strategies. While the objectives are similar (see

Table 1) and links between the two may be clear to experts, they may not be clear to more general practitioners. Another example of this is aquatic weeds, which might be considered either under a NRM weed strategy or the NWQMS. The view of the project team is that protection of an aquatic ecosystem should include consideration of all pressures and therefore future iterations of the NWQMS need to consider the policy and process linkages with pressures other than physical-chemical water quality in much more detail.

One mechanism for improving uptake of the NWQMS would be to articulate more clearly how the NWQMS fits in with broader NRM strategies and the key linkages between them. **Ideally, there would be one integrated water resource / waterway management strategy for a catchment**, with appropriate links to other relevant strategies and plans. The challenge of this integration hinges on developing and getting agreement of all ‘partners’ in waterway management to their roles and responsibilities for planning and management, as well as having a mechanism for synthesising the latest, supporting scientific and stakeholder knowledge. Using the categories of management based on Figure 3, Table 2 gives an example of typical roles of the various ‘partners’ usually involved in waterway management. Stakeholders for particular catchments need to form their own partnership and agree on roles and responsibilities that fit within their institutional arrangements.

Table 2. Typical roles and responsibilities for managing impacts on Australian waterways

		Categories for Management (based on Figure 3)				
		Point source management	Urban stormwater management	Rural land use & land management	Flow management	Riparian and in-stream management
‘Partners’ in Waterway Management	State/Territory Environmental Protection Agency	✓ ✓	✓			
	State/Territory NRM Agency			✓	✓ ✓	✓ ✓
	State/Territory Primary Industries Agency			✓		✓
	State/Territory Planning Agency		✓	✓		✓
	Regional NRM Body			✓ ✓		✓
	Local Governments	✓	✓ ✓			✓
	Rural Industry Bodies			✓ ✓		✓
	Other relevant partners?					

Note: ✓✓ is used to indicate the ‘lead agency’ for each management category

CONCLUDING REMARKS

The project team has reported to its Australian Government project managers and made recommendations for future capacity building workshops, as well as for improved uptake of the NWQMS and improved water planning and management (Mackenzie et al., 2005).

In general, workshop attendees found the NWQMS WQ management framework to be a logical and useful process that could easily be applied to other NRM matters. They also found the supporting material useful once they understood the terminology and how to use the documents.

Possible future directions for the NWQMS include updating the NWQMS and embarking on campaigns of awareness and education. The view of the authors is that the NWQMS is worthy of support and that processes such as these workshops are worth pursuing and can make a difference. Other approaches may also be successful.

Based on the experience gained from the workshops, there are a number of amendments and updates that could be made to the NWQMS. Such changes would obviously involve time and cost but would allow significant improvements to the Strategy. These include:

- broadening the focus of the NWQMS into an Integrated Water Resource / Waterway Management Strategy – identifying more explicitly how the scope of the NWQMS would include more than just physical-chemical water quality;
- incorporating the latest science to update the current guidelines and, where possible, broaden the documents by adding guidelines for other components of aquatic ecosystems;
- integrating the NWQMS with NAP, NHT and other NRM programs;
- improving the useability of the documents, perhaps including a whole-of-process summary document; and
- adding new information on topics such as the selection of indicators, use of conceptual models and evaluating high ecological value waterways.

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REFERENCES

ANZECC/ARMCANZ (1998) *Implementation Guidelines*. Document 3 of the National Water Quality Management Strategy.

ANZECC/ARMCANZ (2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*. Document 4 of the National Water Quality Management Strategy.

ANZECC/ARMCANZ (2000) *Australian Guidelines for Water Quality Monitoring and Reporting*. Document 7 of the National Water Quality Management Strategy.

Bennett, J., Moss, A., Mackenzie, R. and Tilden, J. (2005) *Water quality management workbook (Tully)*. Workshop commissioned by The Australian Government Department of Agricultural, Forestry and Fisheries under the National Landcare Program and conducted by the Cooperative Research Centre for Coastal Zone, Estuary and Waterway Management. June 2005.

Mackenzie, R., Bennett, J., Moss, A. and Tilden, J. (2005) *National Water Quality Management Strategy Regional Workshops - Final Report to Department of Agriculture, Fisheries and Forestry*. Report on Workshops commissioned by The Australian Government Department of Agricultural, Forestry and Fisheries under the National Landcare Program and conducted by the Cooperative Research Centre for Coastal Zone, Estuary and Waterway Management. August 2005.

Martin, M., Mackenzie, R. and Bennett, J. (2005) *Water Resource Management and Assessment in Regional Australia - National Water Quality Management Strategy Regional Workshops*. Waterwatch Conference. Melbourne. February 2005.