

# **Integrating the Reef Water Quality Protection Plan into regional NRM planning**



# **Integrating the Reef Water Quality Protection Plan into regional NRM planning and implementation**

## **Purpose of module**

This is a supporting document to *Guidelines for Regional Natural Resource Management (NRM) Planning in Queensland*. Its purpose is to assist regional NRM bodies to work with the Australian and Queensland Governments and other stakeholders to:

- develop regional NRM plans that contribute effectively to meeting the objectives of the Reef Water Quality Protection Plan (Reef Plan)
- provide direction on practical approaches for incorporating the best available information and advice on terrestrial impacts on the Great Barrier Reef lagoon into planning processes and implementation actions
- provide a reference point for priorities relating the Reef Plan and direct regional NRM bodies to sources of pertinent information
- provide guidance when setting resource condition targets to achieve water quality outcomes for the Reef
- ensure that regional NRM plans adequately address accreditation criteria for the Reef Plan.

## **Reef catchments**

There are 35 coastal river basins that have some level of impact on the Great Barrier Reef (the Reef) lagoon. The main regional NRM bodies addressing these catchments and having a responsibility for reef water quality issues are:

- Cape York Steering Committee
- Wet Tropics – FNQ NRM Ltd
- Burdekin Dry Tropics Board
- Mackay-Whitsunday Regional Strategy Group
- Fitzroy Basin Association
- Burnett Mary Regional Group for NRM Inc.

## **Reef Water Quality Protection Plan (Reef Plan)<sup>1</sup>**

In consultation with the community, the Australian and Queensland Governments have developed a Reef Plan to protect the Reef from land-based sources of diffuse pollution.

Decline in water quality is a significant threat to the natural, economic and social values of the Reef and the Reef Plan recognises that land-use activities in the adjacent catchments are a major source of pollutants entering the Reef lagoon. It proposes that a key mechanism to address the decline in water quality is appropriately targeting integrated catchment management.

It is intended that implementation of many of the strategies and actions in the Reef Plan will be carried out under the auspices of the National Action Plan for Salinity and Water Quality (NAPSWQ) and the Natural Heritage Trust Program (the Trust).

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<sup>1</sup> The full text of the Reef Plan is available at [www.thepremier.qld.gov.au/reefwater](http://www.thepremier.qld.gov.au/reefwater)

The Reef Plan is a framework for government, industry, community groups and landholders to guide the development of regional NRM plans, to support existing and new policies, and to monitor progress.

A long-term commitment is necessary in order to meet the two primary objectives of the Reef Plan which are to:

- reduce the load of pollutants from entering the Reef
- rehabilitate and conserve areas of the Reef catchment that have a role in removing water borne pollutants.

The Reef Plan aims to:

- provide policy direction for the integration of planning systems by reinforcing the need for regional NRM plans to deliver on water quality objectives
- influence planning for new development in the catchments adjacent to the Reef to improve delivery of water quality objectives
- identify the major source areas of pollutants, the major areas at risk and recommended priority responses
- promote property-level planning for agriculture that delivers improved natural resource management and environmental protection outcomes at farm and landscape levels and supports Reef water quality objectives.

The Reef Plan identifies nine key strategic areas and outlines the actions required to implement these strategies (see pages 11 to 28).

### **Assessing threats to the Reef from terrestrial inputs**

A 'risk management approach' has been used to target priority catchments which have large (potential) impacts on water quality in the Reef lagoon, and/or substantial issues in managing those (potential) impacts.

The criteria against which catchments were assessed and ranked and the catchment risk profiles are shown in Appendix 3 of the Reef Plan. The risk assessment is based on the current information available and will be refined as more information on sediment and nutrient export is collected, particularly at the sub-catchment level. It should be noted that the Reef Plan deals with diffuse, rather than point-based source pollutants.

In formulating measures to deliver Reef Plan outcomes and in ordering priorities, regional NRM bodies should take account of the relative level of risk posed by the catchments within its area of responsibility, as well as the nature of those risks.

Known threats include:

- changes in vegetation cover
- degradation or destruction of wetlands<sup>2</sup>
- loss or degradation of riparian vegetation
- decline in ecosystem integrity
- direct sediment, nitrate and phosphorus inputs from agricultural (intensive and extensive) and grazing land uses
- significant pesticide and fertiliser inputs

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<sup>2</sup> within the Great Barrier Reef catchment, approximately eighty per cent of pre-settlement wetlands have been lost (*source*: GBRMPA and State of the Environment Report 2001)

- changes in floodplain water flows through drainage and stormwater management practices
- coastal and upstream development that does not employ best management practice
- infiltration of polluted groundwater into the Reef lagoon.

### **Identifying Reef targets in NRM plans**

It is likely that a significant proportion of the land-based actions emerging from the planning process and designed to meet a range of NRM targets will also generate a positive benefit for Reef water quality. Many of the actions calculated to meet catchment or sub-catchment water quality targets, for example, will necessarily have a cumulative flow-on effect to end-of-catchment targets.

In the same way that improved vegetation management can also yield improved habitat and wider biodiversity outcomes, targets, actions and monitoring evaluation activities are likely to confer multiple benefits that include those associated with Reef water quality.

In considering investment allocations, the NRM Joint Steering Committee will take into account regional prioritisations that incorporate Reef Plan risk assessments for catchments/sub-catchments. Government investment is more likely to be attracted to regions or parts of regions where it can be demonstrated that proposed actions will contribute to meeting Reef Plan objectives together with other catchment targets.

It is therefore desirable that regional NRM bodies clearly identify or 'tag' targets, monitoring activities and actions that will contribute to achieving Reef plan objectives in

- regional NRM plans
- regional investment strategies
- all relevant reporting formats.

This will assist in smoothing accreditation processes and avoiding duplication of reporting as much as possible.

### **Partnerships**

Development of a coherent package of measures intended to deliver an overall positive trend for Reef water quality is likely to be approached differently within regions and will reflect regional-specific issues including:

- other NRM imperatives and priorities
- analysis and targeting of risks
- historical and socio-economic factors
- considerations of cost-effectiveness.

Despite regional variation, it is expected that all regional NRM plans will contain common strategic elements and a clear enunciation of measures designed to deliver on Reef Plan goals over the life of the NRM plan.

Effective community involvement will be pivotal to the success of any long-term strategy to improve Reef water quality. For this reason, it would be prudent for regional NRM bodies to contemplate capacity building and meaningful stakeholder

engagement activities in collaboration with institutions such as the Great Barrier Reef Marine Park Authority (GBRMPA) and the Queensland Environment Protection Agency (EPA), Department of Primary Industries and Fisheries (DPI&F) and Department of Natural Resources, Mines and Water (NRMW), as well as industry bodies, as an early investment priority.

There is a wide range of potential mechanisms by which regional NRM bodies can work in partnership with government and other Reef Plan partners to contribute to the achievement of Reef Plan outcomes. These include, but are not restricted to:

- working with government and industry groups on the uptake of sustainable best practice and appropriate property management planning
- incentive-based property level improvements in management practice targeted at reducing erosion, riparian degradation and inappropriate removal of vegetation and at protecting wetlands
- incentive-based property level improvements in management practice targeted at reducing pesticide and fertiliser inputs and/or re-use of tailwater
- improved uptake of self-assessment packages designed to improve environmental awareness and promote best management practice (BMP) (e.g. COMPASS)
- Implementation of an eco-efficiency agreement with fertiliser and intensive agriculture sectors and identification of nutrient sensitive zones
- fencing and off-stream watering of stock in strategic catchment zones
- rehabilitation of severely eroded stream segments
- development of water quality improvement plans which are integrated into regional NRM plans and regional investment strategies
- collaborating with government agencies to identify priority wetlands and riparian areas and rehabilitating those in poor but retrievable condition
- development and use of water quality decision support systems such as SedNet and EMSS
- partnering with local government to enhance planning scheme assessment codes, overlaps and other measures
- creating partnerships with Traditional Owners and landholders to manage country sustainably and restore degraded areas
- incorporating water quality maintenance in property management planning and formally recognising this in land management agreements
- improving water use efficiency.

These and other measures aimed at achieving on-ground outcomes should be identified and investigated as the regional NRM plan and regional investment strategy are developed.

Many implementation measures fall within the ambit of governments, which have a full suite of regulatory, planning and other mechanisms at their disposal. Others lend themselves to collaborative approaches between regional NRM bodies, government and other institutions to achieve beneficial complementarities of effort and outcome. Some measures fall squarely within the responsibility of the regional NRM bodies.

There will be instances where a collaborative approach between two or more of the Reef catchment NRM regions, or the establishment of partnered arrangements between regions and key agencies, research organisations, industry bodies and others will lead to greater efficiencies, more focused outcomes, improved consistency in approach or the ability to leverage significant additional investment.

Cooperation between regions in working towards the common goal of improved Reef water quality outcomes is therefore strongly encouraged. It is anticipated that regional NRM plans should take account of adjacent planning regions' proposed activities and targets to build complementarity and explore synergies that might arise from joint projects.

### **Addressing Reef Plan outcomes in regional NRM plans**

An accreditation requirement for regional NRM plans is that they demonstrate *consistency with other planning processes and legislative requirements*.

The nationally agreed accreditation criteria for regional NRM plans reflect the expectation that actions proposed in regional NRM plans will not be inconsistent with other planning processes and strategies that have been collectively agreed by relevant jurisdictions. The Reef Plan clearly falls within the intent of this criterion. The aim is to enable existing plans and strategies to be taken forward and implemented at the regional level.

Trust investment in coastal activities will assist in the implementation of the Reef Plan and will contribute to stabilising and reversing the decline in water quality entering the Reef lagoon. Reef Plan outcomes should be supported by regional NRM planning by:

- identifying information gaps (e.g. baseline information on water quality attributes at the sub-catchment level) and addressing these for those areas where information is critical and/or is most lacking
- identifying and documenting the key threats to the Reef lagoon from within the region, having regard to patterns of land-use and other biophysical risk factors, using the comparative catchment risk assessment set out in RWQMP and including identification of key sources of pollutants
- articulating clear regional water quality targets at appropriate scales
- addressing the collective and cumulative effects of threatening processes and land use in contributing to end-of-catchment impacts
- identifying management or other actions that are likely to have an indirect or long-term positive impact on Reef water quality (e.g. progressive adoption of BMP in agriculture and protection of wetlands)
- identifying management or other actions that are likely to have an indirect or direct, cumulative or more immediate impact on Reef water quality
- identifying and taking into account national, state and local planning and policy frameworks of relevance to regulation, management and direction)
- setting out a process for the establishment, or the enhancement of existing community water quality monitoring programs
- describing how water quality will be monitored and reported throughout the region in the short, medium and longer term.

### **Responsibility**

The Reef Plan nominates the principal organisations having responsibility for delivering on actions arising from each of its strategies and their components. Attachments 1 and 2 summarise those actions for which regional NRM bodies have some measure of responsibility.

Regional NRM plans will need to outline how each of these strategy components and actions will be implemented within a region (or note where any are, for whatever

reason, not applicable in a given region or more effectively delivered by another institution or body).

In order to deal effectively with the substantial workload outlined in the Reef Plan, regional NRM bodies will need to establish or build on partnerships with government and industry associations, thus utilising existing government agency data and drawing on experience with past and current activities, particularly in the areas of sustainable practices (Strategy A4), quality assurance schemes (Strategy A5), extension (Strategy B1) and research coordination (Strategy B2).

Regional NRM bodies will need to become acquainted with a number of concurrent state-wide processes, particularly those involving the development of water quality standards, modelling and monitoring (e.g. Water Quality SIP, EPA draft water quality guidelines)

## **Targets**

NRM targets may be formulated at three levels (aspirational, resource condition, and management). Targets form the centrepiece of all regional NRM plans. Their scope and development is dealt with in detail in *Module 5 – Guidelines for Target Setting in Regional NRM planning*.

In order to achieve plan accreditation, regional NRM bodies must address the *Minimum Set of Regional Targets*<sup>3</sup>. It is important to note that regional NRM bodies will not need to identify separate targets in relation to meeting Reef Plan objectives. Rather, a number of the biophysical matters for targets which are already expected to appear in regional NRM plans (i.e. resource condition level targets, particularly those relating to water quality and habitat protection), can stand either directly or as surrogates, representing effective benchmarks against which Reef Plan progress can be measured.

In addition, the aspirational level targets for the region would be expected to incorporate Reef Plan goals.

## **Requirement to set targets by 2005**

In order to deliver on the Reef Plan's objectives, and report in a meaningful way on that achievement, setting of regional water quality targets is essential. The Reef Plan has a goal to achieve a reversal in the decline of water quality entering the Reef within 10 years.

The JSC expects Reef regional NRM bodies to continue to progress management action targets, involving the development of reef water quality resource condition targets (RCTs) in accordance with the timeframes detailed in the respective accredited regional NRM plans.

Reef Plan Strategy H1 states that water quality targets will be developed by July 2005. Regional NRM plans will need to include these targets or a process for achieving these targets by July 2005. Regional NRM plans must also be aimed at reducing diffuse sources of pollution loads in Reef catchments as well as protecting wetlands, riparian areas and other vegetation important to water quality.

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<sup>3</sup> endorsed by the NRM Ministerial Council in October 2002

The Queensland and Australian Governments did not set targets for the Reef catchments in the Reef Plan in recognition of the role of the regional NRM plans in setting resource condition targets. Regional NRM plans should achieve this in a way that integrates other water quality values and NRM issues in the region, and which would take into account social and economic impacts and trade-offs required.

Regional NRM plans for the reef catchments recognise an adaptive management approach for setting quantitative targets for water quality. This will be achieved with the assistance of new information from integrated monitoring networks, catchment scale predictive tools, risk assessment of catchment and land use scenarios and knowledge from measurements.

Regional NRM plans need to include information on what is realistically and progressively achievable in their catchments within specified time frames. To this end, and based on the available scientific information, **targets must be progressively developed for:**

- nutrient (nitrogen and phosphorus) loads or concentrations
- sediment (turbidity or suspended solids) loads or concentrations at river mouths and sub-catchments identifies as having a high biophysical risk as per the Reef Plan and SedNet ANNEX modelling (see Brodie et al. 2003) <sup>4</sup>
- pesticide load or concentrations where identifies as a particular local or sub-catchment issue <sup>5</sup>.

### **Additional targets**

The Reef Plan notes the importance of enhancing and monitoring general riverine health and of improving the condition of riparian and wetland areas as contributing to the Reef water quality outcomes. Under the Reef Plan, Queensland agencies (EPA and NRMW) are seen as key partners with regional NRM bodies in rehabilitation of riparian and wetland areas.

Regional NRM bodies should therefore work in close collaboration with these agencies to progressively develop a **process to set targets** for:

- river condition, including riparian vegetation extent, distribution and condition
- inland, estuarine, coastal and marine wetland extent, distribution and condition.

It should be noted that the state-level requirements for matters for targets for resource condition targets include inland aquatic ecosystem integrity (wetlands and riparian zones) and specifically

- nutrients
- turbidity/suspended solids
- contaminants.

These matters for targets are consistent with Reef Plan requirements.

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<sup>4</sup> Brodie, J., McKergow, L.A., Prosser, I.P., Furnas, M., Hughes, A.O. and Hunter, H. 2003. *Sources of sediment and nutrient exports to the Great Barrier Reef World Heritage Area*. ACTFR Report No. 03/11, Australian Centre for Tropical Freshwater Research, James Cook University, Townsville, 191p.

<sup>5</sup> *Pesticide load or levels* targets are considered optional for some river mouths as it is acknowledged that current State and Commonwealth monitoring for pesticide levels is minimal in some regions, and that the setting of meaningful targets would therefore be problematic. Such targets may be relevant for particular management action targets relating to pesticides in specific problem areas or sub-catchments.

## How to set targets

Regional NRM bodies will be expected to make use of the best existing biophysical and socio-economic data to set targets. This process should be consistent with the principles of adaptive management to refine targets and their associated strategies and management actions over time as more information and modelling results become available.

Consistent with an adaptive management framework, the Queensland and Australian Governments have taken steps to develop a more strategic framework for the collection and provision of broad-scale information to support the implementation of actions under the Reef Plan. This is occurring through the GBRMPA Marine Monitoring Program and establishment of a Stream and Estuaries Assessment Program by Queensland Government. With time, these monitoring programs will support more informed decision making.

The Queensland Government has a preferred methodology to establish environmental values and water quality objectives under the *Environmental Protection Act 1994*. This methodology is complementary to the adaptive approaches for defining water quality targets, and has been established by the EPA to support consistency between water quality target setting, the National Water Quality Management Strategy and the Environmental Protection Policy for Water.

Regional NRM bodies are strongly encouraged to use this methodology in developing reef water quality RCTs. The EPA can provide advice and guidance on using the preferred methodology for setting targets and will be contacting regional NRM bodies to discuss this directly.

Existing data collection and modelling systems will need to be improved to adequately support the setting of catchment-scale resource condition targets. However, until these systems are fully operational and generating reliable information, the emphasis should be on continued learning based on existing knowledge from multiple lines of evidence (e.g. emerging monitoring information, preliminary model outputs, community engagement and research into the impact of management actions). This approach should also be complemented through improving, implementing and monitoring management action targets as short-term proxies for resource condition targets.

While there are significant technical challenges to setting catchment-scale water quality targets, it is possible in the short term to use existing information (available data and modelled outputs) to set resource condition and management action targets that relate conceptually to water quality outcomes at the broad-scale. These may not necessarily be water quality measures, but rather surrogate measures that represent intermediate resource condition outcomes, such as riparian condition, ground cover, groundwater levels etc.

A suggested approach to setting Reef water quality load targets is given in Attachment 3. The step wise approach is intended as a guide for regional NRM bodies so that the process is consistent and uses the best available information for the catchment. An application of this approach using examples for the dry and wet tropics is provided to demonstrate way in which the framework can be used by regional NRM bodies.

The approach in Attachment 3 acknowledges the technical constraints with setting and monitoring end-of-catchment resource condition targets for water quality. Currently (July 2005), the project *Short-term GBR catchment modelling to assist regional target-setting in reef catchments* is establishing a benchmark based on existing knowledge. This benchmark would be considered as the point of knowledge used to reference further progress in the development and implementation of management action targets.

These steps support the further development and application of broad-scale data collection and interpretation systems to inform the longer-term development and monitoring of resource condition targets, and provide a basis for the local measurement of the impact of management actions targets implemented. It also recognises that further monitoring, modelling and target setting needs to be carried out within an adaptive management framework involving Queensland and Australian Government agencies, research institutions and regional NRM bodies.

The framework also supports the continued development and implementation of accredited management actions to address the generation of sediments, nutrients and other pollutants based on a conceptual model of catchment processes and in a manner and scale appropriate to regional circumstances.

In addition to the framework outlined in Attachment 3, regional NRM bodies should consult *Module 5 – Guidelines for Target Setting in regional NRM planning*. This document suggests the use of environmental values for developing appropriate targets for water bodies. An updated version of the environmental values and water quality objectives is available through the EPA (see the *EPA Environmental Values* [http://www.epa.qld.gov.au/environmental\\_management/water/environmental\\_values\\_water\\_regulatory\\_impact\\_statement](http://www.epa.qld.gov.au/environmental_management/water/environmental_values_water_regulatory_impact_statement))

## **Monitoring and Evaluation**

The existing national and state monitoring and evaluation frameworks will be used to identify trends in water quality outcomes during the life of the Reef Plan. The Queensland and Australian Governments have the primary responsibility for appropriate monitoring programs to assess the effectiveness of actions under the Reef Plan. The Reef Plan acknowledges this by its commitment to strategies for water quality monitoring programs (Strategies I4 and I5).

Responsibility for the collection of data will be shared by the Queensland Government, regional NRM bodies, scientific institutions (on contract) and, where quality assurance issues have been addressed, community groups such as Waterwatch.

Early benchmarking, to establish current baseline levels of pollutant, nutrient and turbidity in river and stream segments within regions, will be of critical importance in order for trends to be detected in the medium to long term over the ambient and event driven variation in flow regimes.

Monitoring might also take account of indirect targets such as the rates of uptake of BMP and other positive land management changes as indicators of enhanced community awareness, participation and capacity building.

Where existing information is poor or discontinuous, it is anticipated that regional NRM bodies will identify the establishment of additional monitoring stations at critical sites within the region as among the high priorities for early investment.

Research into models which permit different management scenarios to be tested – in order to identify optimal combinations of actions to deliver on catchment water quality improvements – should be investigated to guide future planning decisions (work being undertaken on modelling sediment and nutrient discharges as part of the Reef Plan risk assessment and on DSS as part of the Water Quality SIP is relevant in this regard).

### **Progress of the Reef Plan**

Formal evaluation reports on the progress of the Reef Plan are to be completed by the Reef Plan Steering Committee in July 2005 and again in July 2010. Regional NRM bodies will be expected to provide information to the Reef Plan Steering Committee Secretariat to permit meaningful reports on regional activity and biophysical trends to be made at these intervals to Australian and Queensland Governments.

### **Useful information and where to get it**

Reference should be made to the following modules for related guidance information:

- *Module 5 – Target Setting*
- *Module 11 – Integrating Coastal and Marine Park Management into regional NRM plans*
- *Module 21 – Integrating Environmental Values for Water into Regional NRM Plans*
- *Module 26 – Integrating Wetlands Management into regional NRM plans.*

In order to address all relevant issues, regional NRM plans will need to incorporate information about

- the national and state **policies and agreements** which provide impetus and direction for positive change
- the **legislation** that provides mechanisms for regulation and enforcement
- the **planning** instruments at all levels that underpin NRM management
- resource condition **data**, assessments (including identification and quantification of pollutant sources at a sub-catchment level) and monitoring techniques
- **modelling** tools which can:
  - a) quantify the relative contribution made by catchments, sub catchments and current land-uses to pollutant and sediment loads
  - b) predict the likely impacts of different management or activity scenarios on overall water quality outcomes.

#### **1. Policies and agreements**

- [Reef Water Quality Protection Plan for catchments adjacent to the Great Barrier Reef World Heritage Area \(2003\)](#)
- *Memorandum of Understanding between the Commonwealth Government and the Government of the State of Queensland on cooperation to protect the Great Barrier Reef from land-sourced pollutants (2002);* (full text at <http://www.deh.gov.au/coasts/pollution/reef/mou/index.html>)

- [The National Water Quality Management Strategy](#) (NWQMS)
- [Australian Government Coastal Catchments Initiative](#) (CCI)
- [The Framework for Marine and Estuarine Water Quality Protection](#)
- [National Strategy for the Management of Coastal Acid Sulfate Soils](#)
- *An Agreement between the Commonwealth of Australia and the State of Queensland for the implementation of the Intergovernmental Agreement on a National Action Plan for the Salinity and Water Quality (1 March 2002)*

## 2. Legislation

- *Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)*
- *Great Barrier Reef Marine Park Act 1975 (Commonwealth)* (including the GBRWHA 25 year Strategic Plan)
- *Environmental Protection Act 1994 (Qld)*
- *Nature Conservation Act 1992 (Qld)* (including conservation areas)
- *Water Act 2000 (Qld)*
- *Land Act 1994 (Qld)* (including leasehold land conditions and pest management plans and plans for the allocation of State land)
- *Coastal Protection and Management Act 1995 (Qld)*
- *Vegetation Management Act 1999 (Qld)* including regional vegetation management codes
- Environmental Protection (Water) Policy 1997(Qld).

## 3. National, state, regional and local plans

- State and regional coastal management plans under the [Coastal Protection and Management Act 1995 – Qld](#)
- Regional vegetation management codes under the [Vegetation Management Act 1999 – Qld](#)
- Water use plans under the [Water Act 2000 – Qld](#)
- Lease conditions under the [Land Act 1994 – Qld](#)
- Zoning and Plans of Management gazetted under the *Great Barrier Reef Marine Park Act 1975*
- Local government planning schemes under the [Integrated Planning Act 1997 - Qld](#) and supporting by-laws (see also specific local government web sites)
- Regional framework for growth management
- Water quality improvement plans (such as being developed in Douglas Shire and Moreton Bay through the Australian Government's [Coastal Catchments Initiative Program](#))

## 4. Data sources

- Environmental Protection Agency Directory of Products and Services for regional NRM, planning and implementation (EPA publications <http://www.epa.qld.gov.au/publications?id=735>)
- Water quality guidelines for Queensland waters ([http://www.epa.qld.gov.au/environmental\\_management/water/water\\_quality\\_guidelines/](http://www.epa.qld.gov.au/environmental_management/water/water_quality_guidelines/))
- Department of Natural Resources, Mines and Water [digital groundwater and surface water technical data](#)
- Water quality data sets maintained by GBRMPA (email [gis@gbrmpa.gov.au](mailto:gis@gbrmpa.gov.au)), Australian Institute of Marine Science or the Reef CRC

- Queensland statistical data (ABS and QRSIS through the Queensland Government Data Hub <http://datahub.govnet.qld.gov.au/>)
- Outputs from the Queensland Water Quality state-wide investment program (SIP) (<http://www.wqonline.info/>)
- Strategic Data Capture Plan (Resource Planning Guideline E3) – (<http://www.nrm.qld.gov.au/land/planning/guidelines.html>)
- Webb Report – Natural Resource Foundation Data Capture to support the Reef Plan (hard copies of the Webb Report are available from the Land and Regional Planning section of NRMW by contacting Dot Hall [dot.hall@nrm.qld.gov.au](mailto:dot.hall@nrm.qld.gov.au))
- Integrated Reef Catchments Water Quality Monitoring Framework project - review and discussion documents endorsed by the Water Quality Coordination Group ([www.eberhardconsulting.com.au/Reef\\_reports.html](http://www.eberhardconsulting.com.au/Reef_reports.html)).

## 5. Modelling tools

- [Water Quality Targets OnLine](#)
- Short-Term Catchment Modelling to Assist Regional Target-Setting In Reef Catchments ([www.regionalnrm.qld.gov.au](http://www.regionalnrm.qld.gov.au))
- CSIRO's sediment and nutrient modelling programs (SedNet, EMSS); see also Greiner et al, ((Greiner, R., Herr, A., Brodie, J., Haynes, D., 2005. A multi-criteria approach to Great Barrier Reef catchment (Queensland, Australia) risk assessment. *Marine Pollution Bulletin*, 51 (1-4): 128-137.)
- Protocols being developed under Water Quality SIP
- DPI&F seagrass monitoring data.

## Contacts

In addition, the contact officers listed below can assist regional NRM bodies with queries.

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***Non-government organisations***

Non-government organisations, particularly research bodies (e.g. CRC Reef, CRC for Coastal Zone, Estuary and Waterway Management, Australian Institute of Marine Science, CSIRO and the Australian Centre for Tropical Freshwater Research) can provide technical assistance to regions in relation to aspects of catchment strategies designed to reduce land-based pollution into the Reef lagoon. Examples of other organisations also having a strong interest in implementation of the Reef Plan include Sunfish, Local Marine Advisory Committees, Australian Marine Tourism Organisation, Recfish, World Wildlife Fund, North Queensland Conservation Council and the Queensland Conservation Council.

## ATTACHMENT 1: Actions for which regional NRM bodies have sole or shared primary responsibility

	Strategy	Actions to implement the strategy	Responsibility	Milestones
D11	Strategy D: Planning for NRM and land use	Negotiate ILUAs in areas of particular significance to Indigenous peoples that recognise the linkages between land, waterways and the marine environment and implement strategies for maintaining water quality and ecosystem integrity. Provide mechanisms for Indigenous people to be involved in the management of areas under ILUAs.	<b>Indigenous bodies, EPA, NRMW, regional NRM bodies</b>	Report to Ministers on progress 1 July 2005
F3	Strategy F: Research and information sharing	Investigate the ability to coordinate future resource condition monitoring to meet the needs of a wide range of stakeholders including regional NRM bodies, local and state governments, industry, landholders and the community.	<b>NRMW, regional NRM bodies, DPI&amp;F, EPA, DAFF, DEH, research bodies, NLWRA</b>	1 July 2004
F4	Strategy F	Undertake coordinated research and development programs that will assist in delivering Reef Plan objectives.	<b>DPI, NRMW, EPA, DAFF, research bodies, regional NRM bodies, peak industry bodies</b>	Report on research undertaken 1 July 2005
F8	Strategy F	Facilitate exchange of information and experience between catchments where water quality improvement plans have been developed and other areas.	<b>DEH, regional NRM bodies, local governments</b>	Report to Ministers 1 July 2005
G1	Strategy G: Partnerships	Work in partnership with regional NRM bodies to determine water quality environmental values and objectives, and to develop aspirational and short term resource condition and management action targets that reflect the goal of the Reef Plan.	<b>JSC, regional NRM bodies, NRMW, DAFF, EPA, DEH, DPI&amp;F, GBRMPA</b>	Completed by 1 July 2005
G4	Strategy G	Work in partnership with research organisations to develop innovative sustainable production systems aimed at encouraging improvements in water quality entering the Reef.	<b>NRMW, Regional NRM bodies, DAFF, DEH, DPI, Research bodies</b>	Report on outcomes 1 July 2005
G7	Strategy G	Encourage regional NRM bodies and river improvement trusts to develop closer links to ensure compatible and coordinated planning, actions and work programs	<b>NRMW, regional NRM bodies, river improvement trusts</b>	Report on progress 1 July 2005
H1	Strategy H: Priorities and targets	Develop water quality targets for Reef catchment waterways with a major focus on: <ul style="list-style-type: none"> <li>improving water quality</li> <li>investing in remedial action that ensures adequate protection and rehabilitation of wetlands, riparian and other vegetation important to water quality</li> </ul>	<b>Regional NRM bodies, NRMW, DAFF, DEH, GBRMPA, EPA, research bodies, WTMA</b>	Completed 1 July 2005
H2	Strategy H	Incorporate the water quality targets established by the regional NRM bodies into the evaluation process of the Reef Plan.	<b>Regional NRM bodies, DPI&amp;F, NRMW, EPA, DAFF, DEH, GBRMPA, research bodies, WTMA</b>	Completed 1 July 2005
I6	Strategy I: Monitoring and evaluation	As part of the coordinated water quality monitoring program support and improve community and industry based water quality information collection programs in high-risk Reef catchments. Actions would include expanding the Waterwatch network to cover high-risk sub-catchments	<b>Regional NRM bodies, NRMW, DAFF, DEH, DPI&amp;F, EPA, Waterwatch groups, research bodies, peak industry, Indigenous bodies</b>	High risk catchments programs in place 1 July 2004

## ATTACHMENT 2: All actions for which Regional NRM bodies have supporting responsibilities

	Strategy	Actions to implement the strategy	Responsibility	Milestones
A4	Strategy A: Self-management approaches	Promote adoption of sustainable land management and best practices in high risk Reef catchments through programs such as: <ul style="list-style-type: none"> <li>• best management practice</li> <li>• property resource management planning</li> <li>• environmental management systems in agriculture.</li> </ul>	<b>Peak industry bodies, DPI&amp;F, NRMW,</b> regional NRM bodies, landholders, EPA, GBRMPA	Success in high risk catchments reviewed 1 July 2005 1 July 2010
A5	Strategy A	Facilitate industry-supported quality assurance schemes for AgVet chemicals that promote risk reduction processes for off-farm movement of pesticides/chemicals. Expand involvement with community groups looking to find local solutions through projects such as MAGIC (Managing Agricultural Chemicals in Communities)	<b>DPI&amp;F,</b> peak industry bodies, regional NRM bodies	Report on program achievements 1 July 2005
B1	Strategy B: Education and extension	In collaboration with regional NRM bodies and peak agricultural industry bodies, develop and implement education and extension programs and undertake the trialling of practices to increase the voluntary uptake by producers of sustainable agricultural practices, tailored to particular land uses, locations and pollutants	<b>DPI&amp;F,</b> NRMW, EPA, DAFF, DEH, peak industry bodies, regional NRM bodies, landholders, research bodies, Indigenous bodies	Completed 1 July 2005  Trial programs in place by July 2004
B2	Strategy B	Improve the integration and coordination of research information systems and relevant extension services to support regional NRM catchment and property resource management planning in the Reef catchment	<b>JSC,</b> NRMW, DPI&F, EPA, DAFF, DEH, peak industry bodies, conservation groups, research bodies, regional NRM bodies, Indigenous bodies	Report on improvements 1 July 2005
B3	Strategy B	Facilitate exchange of information between Indigenous groups, government agencies, industry and landholders on natural resource management approaches with positive Reef water quality outcomes	EPA, NRMW, DAFF, DEH, Indigenous bodies, DPI&F, regional NRM bodies, research bodies	Report on progress by 1 July 2005
B4	Strategy B	Develop and implement a community awareness raising campaign such as the Healthy Waterways model to achieve wide recognition and acceptance of the importance of Reef water quality and the need to protect and rehabilitate wetlands and riparian habitats within the Reef catchment.	<b>EPA,</b> NRMW, regional NRM bodies, research bodies, peak industry bodies.	Completed 1 July 2005
B5	Strategy B	Promote the benefits of management plans, conservation agreements and covenants for the protection of riparian areas and wetlands and management of vegetation cover over the land to landholders	<b>NRMW,</b> DPI&F, EPA, peak industry bodies, DAFF, DEH, regional NRM bodies, research bodies, local governments	Success in high risk catchments reviewed 1 July 2005 1 July 2010
C1	Strategy C: Economic Incentives	Promote the adoption of existing incentive schemes that have the potential to encourage landholders to implement sustainable management practices and property level planning.	<b>DPI&amp;F,</b> NRMW, EPA, DEH, DAFF, peak industry bodies, regional NRM bodies	Report on uptake of schemes 1 July 2005
C5	Strategy C	Investigate the potential for planning systems to be linked to preferential access to: <ul style="list-style-type: none"> <li>• government financial support programs</li> <li>• enhanced leasehold arrangements</li> </ul>	<b>NRMW,</b> DPI&F, EPA, DAFF, DEH, regional NRM bodies	Report completed 1 July 2005

	<b>Strategy</b>	<b>Actions to implement the strategy</b>	<b>Responsibility</b>	<b>Milestones</b>
		<ul style="list-style-type: none"> <li>• funding from regional NRM bodies</li> <li>• water allocation</li> <li>• other identified incentive options</li> </ul>		
C6	Strategy C	Implement programs to establish conservation agreements and covenants to ensure protection and management of remnant bushland, riparian vegetation and wetlands that can produce water quality improvement outcomes for the Reef	<b>EPA, DEH, DAFF, NRMW, regional NRM bodies, local governments, WTMA</b>	Report on uptake of agreements 1 July 2005
C8	Strategy C	Implement a pilot auction program that targets the conservation of wetland, riparian and other remnant vegetation that has a direct relationship with water quality improvements in high risk Reef catchments	<b>EPA, industry, NRMW, DAFF, DEH, regional NRM bodies</b>	Completed 1 July 2005
C9	Strategy C	Seek philanthropic investment as a source of finance for the protection and rehabilitation of important wetlands, riparian and other remnant vegetation that has a direct relationship with water quality improvements in high risk Reef catchments	<b>EPA, DAFF, DEH, NRMW, regional NRM bodies</b>	Report on progress by 1 July 2005
D4	Strategy D: Planning for NRM and land use	Promote development of local water quality improvement plans to local governments and regional NRM bodies in high-risk, high-priority catchments and give priority to their development and implementation where catchment communities have an interest and capacity to develop plans of a suitable standard.	<b>DEH, DPI&amp;F, NRMW, EPA, DAFF, regional NRM bodies, local governments</b>	Report on progress 1 July 2005
D8	Strategy D	Identify & establish nutrient sensitive zones within which extension services, property resource management planning and NRM funding will be focused to minimise impact of nutrients on the Reef. Investigate further land use planning, regulatory, market and voluntary mechanisms that could be applied in these zones	<b>DEH, DPI&amp;F, NRMW, GBRMPA, EPA, regional NRM bodies, industry bodies</b>	Completed 1 July 2004
E2	Strategy E: Regulatory frameworks	Identify potential areas within high-risk areas of the Reef catchment where declarations under the <i>Vegetation Management Act 1999</i> might be made to secure protection of vegetation as a measure against land degradation.	<b>NRMW, regional NRM bodies, DAFF, DEH</b>	Completed 1 July 2004
F8	Strategy E	Facilitate exchange of information and experience between catchments where water quality improvement plans have been developed and other areas	<b>DEH, regional NRM bodies, local governments</b>	Report to Ministers 1 July 2005
G2	Strategy G: Partnerships	Ensure Indigenous people are involved in ongoing consultation and support Indigenous peoples' desire to be involved in the protection and healing of country and culture for future generations	<b>GBRMPA, EPA, DEH, DPI&amp;F, NRMW, DAFF, regional NRM bodies, Indigenous bodies</b>	Ongoing
G3	Strategy G	Create a research and development program in partnership with research institutions and regional NRM bodies, to develop effective modelling tools to support regional target setting processes through the NAPSWQ state-wide water quality work plan	<b>NRMW, EPA, DEH, DPI&amp;F, DAFF, regional NRM bodies, research bodies, WTMA</b>	Completed by 1 July 2005
H3	Strategy H: Priorities and targets	Identify waterways, riparian areas and wetlands that are in good condition and should be preserved to protect water quality.	<b>NRMW, EPA, regional NRM bodies, DPI&amp;F, DEH, DAFF, GBRMPA, WTMA</b>	Completed 1 July 2005
H4	Strategy H	In partnership with regional NRM bodies identify sub-catchment hotspots responsible for delivering disproportionate quantities of sediment, nutrient and	<b>NRMW, EPA, DAFF, GBRMPA, DPI&amp;F, DEH, regional NRM bodies, WTMA</b>	Completed 1 July 2005

	<b>Strategy</b>	<b>Actions to implement the strategy</b>	<b>Responsibility</b>	<b>Milestones</b>
		pesticides to the Reef		
13	Strategy I: Monitoring and evaluation	Incorporate the goal of the Reef Plan into the state and Commonwealth governments' evaluation process for regional NRM planning	<b>NRMW, DAFF</b> , local governments, DPI&F, EPA, DEH, GBRMPA, peak industry bodies, regional NRM bodies	Completed 1 January 2004
15	Strategy I	Implement a coordinated water quality monitoring program in high-risk catchments to track long-term trends in water quality entering the GBR lagoon. Funding to be settled as part of future budget considerations	<b>NRMW</b> , local governments, EPA, GBRMPA, peak industry bodies, regional NRM bodies	To be advised
18	Strategy I	Ensure the monitoring and implementing of local water quality improvement plans and environmental flow objectives are reviewed and addressed in other planning processes.	<b>DEH, EPA, DLGP</b> , GBRMPA, NRMW, regional NRM bodies	Report to Ministers on implementation 1 July 2005

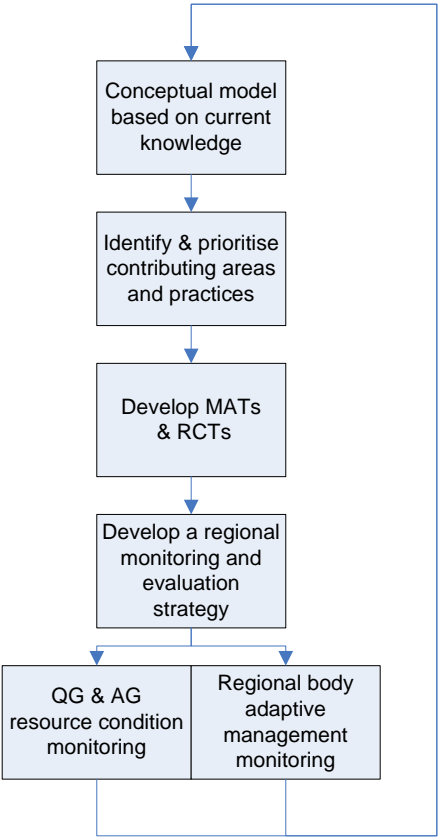
### **ATTACHMENT 3: Suggested approach to water quality load target-setting in Reef catchments**

To assist regional NRM bodies meet accreditation and Reef Plan requirements, the following process is recommended.

The steps provide an approach to setting resource condition targets to achieve water quality outcomes for the Great Barrier Reef lagoon.

1. Use existing information and knowledge to develop a conceptual model and a common understanding of catchment behaviour and management impacts that influence sediment, nutrient and pesticide export to the GBR lagoon. Such conceptual models would provide a benchmark of knowledge based on current data and information.
2. Use this information and an understanding of other regional NRM issues to identify priority sub-regional areas and/or specific land uses or management practices to focus investment activities on. This step should use existing Reef SedNet/Annex model outputs of scenarios (if available) and other data sources to identify the sources (hotspots) of sediments, nutrients and pesticides delivered to waterways draining into the Reef lagoon, and the contributing processes for these sources.
3. Develop and continuously improve management action targets (and resource condition targets where possible) through consultation and negotiation at the sub-regional level, using scientific and other expertise, considering the trade-offs and risks. There should be a strong conceptual linkage between the management actions targets, resource condition targets, monitoring strategies and impacts on end-of-catchment water quality.
4. Develop a monitoring and evaluation strategy at appropriate scales and negotiate implementation arrangements with potential partners. Regional NRM bodies should focus their monitoring on achievement of management actions, and local and direct impacts on resource condition for action learning. The Queensland and Australian Governments' water quality and ecosystem condition monitoring programs will target and measure broader scale resource condition and trend across the Reef catchments and will be coordinated with regional NRM monitoring needs. Monitoring results will be used to improve and re-calibrate catchment scale models.
5. Critical gaps in existing information should be resolved through negotiation with Queensland and Australian governments. Common interests in data collection and assessment may also involve landholders, industry, local government, research institutions and other stakeholders. The activities of the catchment to Reef CRC and WQ SIP programs will contribute to regional monitoring programs through the development of new monitoring tools for use at a range of scales
6. This process should be implemented in a staged adaptive approach. As new information and improved modelling and decision support tools become available (using both improved software and new data), they can be used to develop targets directly related to resource condition, and allow the updating and refining of new MATs.

These steps can be summarised in the following flow diagram.



Examples of how such an approach may be applied in the dry and wet tropics are given below.

## Two examples of the approach for setting interim water quality targets in the dry and wet tropics<sup>1</sup>

Region	Dry tropics	Wet tropics
<p><b>Conceptual model of impacts on reef water quality</b></p>	<ul style="list-style-type: none"> <li>• Dry tropic catchments contribute the highest sediment and nutrient concentrations and loads to the GBR</li> <li>• Rainfall and runoff highly irregular</li> <li>• Grazing lands dominant land use</li> <li>• Management of cover through grazing land management practices key strategy</li> </ul>	<ul style="list-style-type: none"> <li>• Wet tropic catchments have higher rates of sediment and nutrient loss due to (generally) steeper slopes and higher rainfall</li> <li>• Wet tropic rivers typically flood regularly each year, Near shore reefs bordering the wet tropics are therefore at the greatest risk from catchment runoff</li> <li>• Diverse land uses, intensive lowland floodplain development</li> <li>• Adoption and improvement of best management practices key strategy</li> </ul>
<p><b>Priorities identified</b></p>	<ul style="list-style-type: none"> <li>• Water contaminants (sediments, nutrients) identified as one of the highest priority issues for the region.</li> </ul>	<ul style="list-style-type: none"> <li>• Water quality decline identified as a high priority issue regionally.</li> </ul>
<p><b>Resource condition and management action targets</b></p>	<ul style="list-style-type: none"> <li>• Management action targets to enable the setting of targets for nutrients and sediments were developed and have been given the highest priority.</li> <li>• Actions include the establishment of monitoring networks, development of better understanding of process dynamics and the engagement of community in high risk catchments.</li> <li>• Relevant resource condition targets include ground cover management in the grazing lands (R2, R13-19, R26), property management planning (M1) and education and extension (R46, R47)</li> </ul>	<ul style="list-style-type: none"> <li>• Relevant resource condition targets include adoption and improvement of land management practices that benefit water quality (W3.7, W3.9), riparian and wetland restoration programs (W3.8), developing priorities further through the modelling of alternate strategies, investment in paddock-scale research, monitoring and evaluation to improve understanding of these relationships (W3.7) and establishing long-term water quality monitoring arrangements (W3.3).</li> <li>• The development of Water Quality Improvement Plans for each of the Wet Tropics catchment (W3.4) will contribute to the delivery of these actions.</li> </ul>
<p><b>Monitoring and evaluation strategy</b></p>	<ul style="list-style-type: none"> <li>• Development of a shared regional water quality and flow monitoring and reporting system (A225).</li> <li>• Development of a methodology for broad-scale monitoring of groundcover to evaluated actions</li> <li>• Monitoring of outcomes at the neighbourhood</li> </ul>	<ul style="list-style-type: none"> <li>• Monitoring and assessment activities include the establishment of in-stream water quality targets for the wet tropics (W3.2) and the development of an integrated long-term water quality monitoring regime for each catchment and adjacent marine waters</li> </ul>

<b>Region</b>	<b>Dry tropics</b>	<b>Wet tropics</b>
	<p>catchment scale will provide critical information for the further development of locally-relevant modelled scenarios, as well as informing program implementation directly.</p> <ul style="list-style-type: none"> <li>In the longer term, improvements in modelling capacity, broad-scale resource condition monitoring and information from local program implementation will provide the capacity to develop meaningful broad-scale water quality targets.</li> </ul>	<ul style="list-style-type: none"> <li>Monitoring adoption rates of best management practices and local-scale monitoring of the effectiveness of best management practices will be necessary to support the evaluation of the Wet Tropics' implementation strategy.</li> </ul>
<b>Review process</b>	<ul style="list-style-type: none"> <li>The evaluation framework in CQSS2 establishes an annual review of targets and milestones, with a major review of underlying data and assumptions and appropriateness of targets at 3 yearly intervals.</li> </ul>	<ul style="list-style-type: none"> <li>The evaluation framework in the Wet Tropic's plan includes plan monitoring, outcomes monitoring, adaptive management evaluation and accountability evaluation. Annual reporting of resource condition and management actions targets will trigger review as required.</li> </ul>

1. Examples provided by Eberhard Consulting and endorsed by the Water Quality Coordination Group.