Catchment pollutant loads monitoring methods



Great Barrier Reef
Report Card 2016

Reef Water Quality Protection Plan

Australian Government

Queensland Government

Catchment pollutant loads – monitoring methods

This report summarises the methods used for monitoring catchment pollutant loads reported in the Great Barrier Reef Report Card 2016.

The targets for catchment pollutant loads are as follows:

- At least a 50 percent reduction in anthropogenic end-of-catchment dissolved inorganic nitrogen loads in priority areas by 2018.
- At least a 20 percent reduction in anthropogenic end-of-catchment loads of sediment and particulate nutrients in priority areas by 2018.
- At least a 60 percent reduction in end-of-catchment pesticide loads in priority areas by 2018.

Monitoring sites

The end-of-system monitoring sites are located at the lowest point in a river or creek, mainly where gauging stations have been established and are being maintained by the Queensland Government Department of Natural Resources and Mines. These sites provide data on the catchment upstream of the site. Sub-catchment sites are located at the lowest point in a sub-catchment (tributary), mainly at existing gauging stations. They provide data on the sub-catchment upstream of the site. Both site types provide field data that is used to calibrate and validate catchment models.

Rainfall data

Rainfall totals and rainfall decile data were obtained from the Bureau of Meteorology National Climate Centre. These data were synthesised using geographic information system tools to display total annual rainfall and annual rainfall deciles for Queensland during the period from 1 July 2015 to 30 June 2016.

River discharge data

River discharge data (the volume of water moving past a point per unit of time in $m^3 s^{-1}$) for monitoring sites were extracted from Hydstra, the surface water database of the Department of Natural Resources and Mines. River discharge data for some monitoring sites were adjusted using timing and flow factors based on the nearest upstream gauging station; or a combination of modelled flow and flow measured by a horizontal acoustic doppler current profiler.

Sampling water quality

Water samples were collected, stored, transported and quality assured and quality controlled in accordance with the *Environmental Protection (Water) Policy Monitoring and Sampling Manual 2009* (www.ehp.qld.gov.au/water/pdf/monitoring-man-2009-v2.pdf). Water quality samples were collected using two methods: manual grab sampling, and automatic grab sampling using refrigerated pump samplers. Intensive sampling (daily or every few hours) was conducted during high flow events and monthly sampling was conducted during low or base-flow (ambient) conditions.

Analysing water quality

The Science Division Chemistry Centre (Dutton Park, Queensland) analysed water samples for total suspended solids and nutrients. The Queensland Health Forensic and Scientific Services Organics Laboratory (Coopers Plains, Queensland) analysed water samples for pesticides. Both laboratories are accredited by the National Association of Testing Authorities for the analyses conducted.

Calculating pollutant loads

The suitability of the generated water quality monitoring data for use in load calculations was assessed using a sample representivity rating. The most appropriate load calculation method—either the average load (linear interpolation of concentration) or the Beale ratio—was determined by assessing sample coverage and the representivity rating.

Annual loads were calculated for total suspended solids, nutrients (total nitrogen, particulate nitrogen, dissolved organic nitrogen, oxidised nitrogen, ammonium nitrogen, total phosphorus, particulate phosphorus, dissolved organic phosphorus, and dissolved inorganic phosphorus) and pesticides (ametryn, total atrazine, total diuron, hexazinone and tebuthiuron).

Loads were calculated using the Loads Tool component of the software Water Quality Analyser version 2.1.1.6.

Calculating toxic loads

A pesticide toxic-equivalent load (toxic load) is the calculated load of a pesticide multiplied by the relative toxicity of the pesticide compared to that of diuron (Smith et al., 2017a, b) and is expressed as an equivalent mass of diuron, i.e. diuron-equivalent kilograms. The total toxic load is calculated by summing the toxic loads of all pesticides that have the same toxic mode of action.

References

Smith RA, Warne MStJ, Mengersen K & Turner RDR 2017a, 'An improved method for calculating toxicity-based pollutant loads: Part 1. Method development', *Integrated Environmental Assessment and Management*, vol. 13, pp. 746–53.

Smith RA, Warne MStJ, Mengersen K & Turner RDR 2017b, 'An improved method for calculating toxicity-based pollutant loads: Part 2. Application to contaminants discharged to the Great Barrier Reef, Queensland, Australia', *Integrated Environmental Assessment and Management*, vol.13, pp. 754–64.