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## Sensitivity and Uncertainty Analysis of the eWater Source Catchment Model – A water quality case study of the Great Barrier Reef, Australia

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**Abstract:** To improve water quality entering the Great Barrier Reef lagoon, the Reef Water Quality Protection Plan (a joint Queensland and Australian government initiative), outlines a clear set of water quality targets to be achieved through improved agricultural management practices. The eWater Source Catchment modelling framework was one line of evidence used to report on progress towards the targets. The framework consists of sub catchment streamflow modelling, generation of contaminants at Functional Unit scales and transport through a node-link system. Parameter sensitivity and uncertainty analysis are important for any modelling program when estimating concentrations of constituents, and associated loads. Here we wish to find and quantify the critical uncertainties in the model, with a view to reformulating the model in places where there is little sensitivity, and identifying new information that would reduce uncertainties. Two initial approaches were used for the analysis. The first, to examine sensitivities and uncertainties of generic processes, predominantly through algebraic differentiation, in order to find the important processes and locations. The second approach, to undertake a simple one-at-a-time sensitivity analysis to appreciate how sensitivities cascade through the model. These will ultimately feed into an uncertainty analysis of the entire model. The preliminary findings indicate differences in sensitivity in grazing dominant versus sugarcane/cropping dominant areas. We also detect some differences in parameter sensitivity when looking at mean sediment loads vs 90<sup>th</sup> percentile sediment loads, with the latter generally corresponding to larger export events. This approach offers an informed alternative to assessing uncertainty in large-scale catchment models.

**Keywords:** Water quality modelling, parameter sensitivity, eWater Source