

Introduction to MUSIC

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MUSIC is the Model for Urban Stormwater Improvement Conceptualisation, first developed by the MUSIC Development Team of the CRC for Catchment Hydrology, and now enhanced by the eWater Cooperative Research Centre.

MUSIC provides the ability to simulate both quantity and quality of runoff from catchments ranging from a single house block up to many square kilometres, and the effect of a wide range of treatment facilities on the quantity and quality of runoff downstream.

MUSIC is also being adapted to other environments and regions, including the UK, France, Germany, Singapore, Malaysia and others and local partners are assisting eWater with this. To adapt it to these regions, local climatic and hydrologic data is being obtained, calibration and parameterisation activities undertaken and adaptation of particular elements of the software are improved to better apply it in the local context.

Background

Many organisations, from governments to catchment management groups, have introduced initiatives to protect the aquatic environment of urban areas. Often these initiatives have focussed on point sources of pollution, such as sewage discharge and industrial effluent. Building on the success of these initiatives, organisations are now turning their attention to diffuse sources of pollution, such as urban stormwater. Indeed, stormwater runoff is recognised as a major carrier of urban pollutants.

It is difficult to prevent stormwater from damaging and polluting creeks because runoff can be contaminated almost anywhere rain falls, and excessive flows will occur wherever there are impervious surfaces directly connected to watercourses. Consequently, successful initiatives to manage stormwater must adopt a catchment-wide approach, with a particular focus on tackling the sources of stormwater runoff at or near their source. The diffuse sources of stormwater pollution also demand a multi-disciplinary approach. Successful initiatives may need to integrate a range of urban planning and design disciplines, including urban hydrology, land-use planning, landscape design and asset life-cycle economics.

The Cooperative Research Centre for Catchment Hydrology (CRC) addressed these deficiencies through its Urban Stormwater Quality Research Program. The program's research culminated in MUSIC (the Model for Urban Stormwater Improvement Conceptualisation). As an aid to decision-making, MUSIC predicts the performance of stormwater management systems. It is intended to help organisations plan and design (at a conceptual level) appropriate urban stormwater management systems for their catchments. This latest version of MUSIC contains numerous improvements through further analysis of the science, and learnings gathered while applying MUSIC into new environments.

A pilot version of MUSIC was released in March 2001 for beta testing by Melbourne Water, Brisbane City Council and associated consultants. Following the eight-month testing period, MUSIC Version 1 was released to the stormwater industry at large. MUSIC Version 2 (December 2003) extended the capabilities of the original program through additional calculation and presentation features, greater ability to export data for external analysis, and substantially smaller saved files. MUSIC Version 3 introduced the Life Cycle Costing module, provided two additional treatment nodes (rainwater tanks and infiltration basins), and offered further options to import and export model data. MUSIC Version 4 significantly improved the bioretention node based on the outcomes of research from the Facility for Advancing Water Biofiltration and added further functionality improvements to the model.

The model's algorithms are based on the known performance characteristics of common stormwater improvement measures. These data, derived from research undertaken by the former CRCCH, the eWater CRC, affiliated research agencies and other organisations, represent the most reliable information currently available in our industry. Nonetheless, knowledge gaps remain. MUSIC will evolve as researchers, and the stormwater industry generally, conducts further research into:

- the catchment factors influencing the generation of stormwater pollutants and the characteristics of these pollutants;
- the hydrologic impacts of implementing sustainable stormwater systems;
- various physical, chemical and biological processes influencing the performance of stormwater improvement facilities; and
- how aquatic ecosystems respond to the intermittent and stochastic loading of stormwater-based pollutants.