



Assessing the Impact of Urban Development and On-Site Stormwater Detention on Regional Hydrology

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Biography:

Rodney is a Principal Engineer at Michael Bale & Associates on the Gold Coast. He specialises in stormwater infrastructure design and the management of water resources, working with a diverse range of public and private clients in the development and construction industry. Rodney was awarded a PhD by Griffith University for his research into stormwater infrastructure and its impact on regional catchment hydrology.

Abstract:

Urban development is a contributor to increased peak runoff and adverse hydrologic effects in regional catchments. On-Site Stormwater Detention (OSD) is a common way to mitigate these problems, however it is well known that OSD can have the opposite effect when it is installed at inappropriate locations. Parameter uncertainty and the need for a probabilistic approach to hydrograph generation are also factors that add to concerns regarding our reliance on OSD for the protection of regional hydrology. This study contributes to awareness of these issues and a practical solution to the problem. A hydrologic model for Monte Carlo simulation of regional catchment hydrographs has been developed using interrelated modules based on previous studies. A sample of ten regional catchments has been modelled with three simulation scenarios: i) status quo, ii) a land parcel of varying sizes is urbanised at varying locations within the regional catchment, and iii) the urbanised land parcel includes OSD. The focus on the results has been the identification and analysis of two key parameters that influence the regional catchments' peak runoff, being the size and location of the urbanised land parcel. A regression analysis of the model results has revealed recurring patterns that have been used to develop new equations for predicting the mean impact of urbanisation and OSD on regional catchment peak runoff. The study highlights the significance of rainfall pattern uncertainty and the importance of considering land parcel location in considering the need for OSD as part of urban land development projects.