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ARR2016 vs ARR1987 Design Flow Estimation: Correlation with Anecdotal Evidence and Implications for Mitigation Measures

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Biography:
Netsanet is a Senior Flood Engineer in the Expert Services team at BMT in Brisbane and has over 12 years of professional experience in hydrology and hydraulics in South Africa and Australia. Netsanet has completed a wide array of projects ranging from master planned community developments to detailed relief drainage and flood mitigation assessments. Netsanet is a CPEng and RPEQ.

Abstract:
The latest edition of the Australian Rainfall and Runoff 2016 (ARR2016) design guideline has been recently released, outlining the revised procedures for design flow estimation in Australia, and thus replacing the previous ARR1987 version. The new guidelines were developed based on, among other things, quantitatively and qualitatively enhanced rainfall data collated since its last edition, together with improved rainfall loss rates which have been discretised temporally per storm duration and probability of the event.

The principal distinguishing design philosophy behind ARR2016 is the incorporation of ensemble rainfall temporal patterns per duration storm, as opposed to the single-temporal pattern technique employed previously, to better quantify the influence of temporal patterns on the hydrologic response of a catchment and consequently on the magnitude and shape of the runoff hydrograph.

Based on the limited initial findings, the ARR2016 methodology has been found to result in a significant reduction in design flow estimates in various parts of the country including South East Queensland, compared to that of the ARR1987 method. There are therefore concerns among practitioners and regulatory bodies with adopting the ARR2016 method to derive design flow estimates, as the resultant design flood levels may be significantly lower than those achieved using the ARR1987 method. Conversely, the limited findings could also suggest that the ARR1987 approach is overly conservative for designing of stormwater management controls, especially for the predominantly urbanised small catchments for which the ARR1987 method was known to overestimate design flow estimates based on our previous investigations. Given the significant differences between the two methods, the use of ARR2016, particularly for development assessments, could be considered limited.

The paper examines the application of the two methods for designing mitigation measures based on a case study in a small urbanised catchment in Ipswich which is augmented with anecdotal evidence from a long-term resident. The study found that the ARR1987 method resulted in more conservative estimates of design flows and flood levels which were subsequently adopted for the final design. The ARR2016 methodology was found to correlate better with observed flooding behaviour based on the experience of the long-term resident. If the ARR2016 method were to be adopted, a 64 percent reduction in the stormwater detention volume used to mitigate the impacts of development could be achieved.

The results presented in the paper will help designers and decision-makers to better understand the practical implications of adopting either method for development assessments.