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Implication of urban baseflow on stormwater management

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Biography:
Dylan is a Registered Professional Engineer of Queensland with extensive experience in the areas of Urban and Environmental Civil Engineering. Positive outcomes are important to Dylan, and he has provided an outstanding level of service to a wide range of clients from masterplan phase through to detailed design and project supervision. He has achieved successful outcomes on many projects including sites with severe flooding constraints and environmentally sensitive land.
He has a particularly strong base of technical design ability, to integrate innovative Water Sensitive Urban Design within Standardised Civil Engineering Documentation. Dylan is also very interested in emerging trends and technology and is a keen participant in the CRC for Water Sensitive Cities.

Abstract:
A common characteristic of urban catchments within highly seasonal climatic regions, is the presence of a constant base flow within stormwater pipes and open drains. There can be multiple sources of this dry season flow however, natural groundwater seepage and excess irrigation within the catchment are key contributors.
While this flow is highly variable across catchments and is linked to community behaviour, which may alter over time, this feature of developed catchments is something widely observed across a range of new and established catchments. As such it is important to consider dry season base flow in the design of stormwater quality treatment systems.
Our observations across Darwin and Townsville suggest that urban base flow is a significant risk which can lead to the failure of vegetated systems (in particular bioretention basins) due to over-saturation of soils and surface ponding.
This project involved measurement of the dry weather base flow rates at pipe outlets across a range of developed catchments within the Darwin and Palmerston Regions. Timing of this study at the end of Darwin's dry season also reduces natural stormwater influence to emphasise the role which potable water contributes to this base flow.
To investigate the role urban base flow can have on the design of stormwater treatment systems, MUSIC was used to model a pond with and without base flow. Annual maximum water level drawdown is a key factor which should be assessed during the design process. This parameter is important for the health of fringing vegetation such as submerged and emergent macrophytes which assist in the stormwater treatment function of ponds. Drawdown within the range of 300-400 mm is considered acceptable for many stormwater treatment ponds. The purpose of modelling this base flow is to more accurately represent water level variation and the contribution of base flow in sustaining water levels throughout the dry season.
Results of the investigation suggest that even very low rates of dry weather base flow provide sufficient top up to limit maximum annual drawdown within acceptable limits.
The goal of this investigation is to broaden our understanding of urban catchments in seasonal climates by deeply exploring what we observe and using this information to inform stormwater management responses.