Cost-effective BMP Design for Stormwater Capture and Use

BMPs are designed for stormwater quality treatment, not capture and use

Stormwater pollution is a chronic environmental impact. The general approach to providing runoff water quality treatment is to capture and treat "the majority" of annual runoff to reduce long-term pollutant loading through the use of best management practices (BMPs). The term BMP represents a suite of engineered technologies designed to capture and treat urban runoff[1]. The use of BMPs to manage stormwater quality is a component of nearly every watershed management plan, NPDES MS4 permit, or TMDL mitigation strategy in California.

The size or footprint of a BMP directly depends on the amount of runoff to be treated from the contributing catchment, which in turn depends on the amount (depth) of rainfall that occurs. Guo and Urbonas (1996) established a widely adopted rationale for determining the storm depth to calculate the size of BMPs that balances the proportion of annual runoff captured/treated with the cost of the BMP. In classic economic terms, the research established a "point of diminishing returns" whereby increasing the size of a BMP (so that it can capture additional runoff) would not result in a proportionate increase in the annual proportion of rainfall or runoff treated, implying that the cost of additional water quality treatment would not be justified. In many jurisdictions across the USA, this approach results in the design of a water quality BMP to be calculated from the amount of runoff generated from the 85th percentile storm depth. In southern California, the 85th percentile storm depth is approximately 0.6-0.75 inches of rainfall.

There is a statewide interest in promoting and enabling stormwater capture and use

Stormwater capture and use (a.k.a. rainwater harvesting) is receiving increasing focus as a future water supply in California. The State Water Resources Control Board is actively investigating strategies and opportunities for stormwater capture and use in response to a mandate from the Governor. SCCWRP recently published a technical report documenting approaches to quantifying the potential for stormwater capture using BMPs.

There are no guidelines for sizing of BMPs for optimal rainwater harvesting, nor information on whether design for coupled water quality-harvesting systems is compatible.

How should BMPs be designed for cost-effective stormwater capture and use?

The research would develop a sizing methodology for BMPs that balances cost of design and construction with the benefit of providing water supply. Financial and technical trade-offs between design for water quality treatment and design for stormwater capture would be investigated. The outcomes of the research would be adopted into jurisdictional design manuals, and inform watershed management and water supply planning.

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[1] The implicit focus here is on structural BMPs, which are constructed, physical structures to manage runoff. Structural BMPs often occupy valuable land within the urban environment. In contrast, non-structural BMPs are programmatic actions, plans, or incentives to reduce runoff and/or pollution sources. Non-structural BMPs are not considered herein.