Optimal Design of Storm Water Networks Using Simulation-Optimization Technique

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Abstract : Rapid urbanization coupled with changes in land use pattern results in increasing peak discharge and shortening of catchment time of concentration. The consequence is floods, which often inundate roads and inhabited areas of cities and towns. Management of storm water resulting from rainfall has, therefore, become an important issue for the municipal bodies. Proper management of storm water obviously includes adequate design of storm water drainage networks. The design of storm water network is a costly exercise. Least cost design of storm water networks assumes significance, particularly when the fund available is limited. Optimal design of a storm water system is a difficult task as it involves the design of various components, like, open or closed conduits, storage units, pumps etc. In this paper, a methodology for least cost design of storm water drainage systems is proposed. The methodology proposed in this study consists of coupling a storm water simulator with an optimization method. The simulator used in this study is EPA's storm water management model (SWMM), which is linked with Genetic Algorithm (GA) optimization method. The model proposed here is a mixed integer nonlinear optimization formulation, which takes care of minimizing the sectional areas of the open conduits of storm water networks, while satisfactorily conveying the runoff resulting from rainfall to the network outlet. Performance evaluations of the developed model show that the proposed method can be used for cost effective design of open conduit based storm water networks.
Keywords : genetic algorithm (GA), optimal design, simulation-optimization, storm water network, SWMM

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