Testing of an optimization model for optimal sewer system layout and wastewater treatment locations

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ABSTRACT

Wastewater systems are one of the most crucial systems for urban infrastructure, especially in regions with large population densities. Determining the optimal (minimum cost) sewer pipe layout and the location of wastewater treatment plants (WWTPs) must take into considerations of economic, environmental, and hydraulics of pipe flows. This paper presents an optimization model for minimum cost design of sewer system layout and wastewater treatment plant locations of the combined systems. The model can be used to minimize the total costs associated with a sewer network and WWTPs by determining an optimal layout of sewer pipes and the locations of WWTPs that meet connectivity, continuity, and capacity requirements. The model is formulated as a 0–1 Integer nonlinear programming (INLP) problem solved using in the general algebraic modeling system (GAMS). The application of the model is illustrated using a simple example to demonstrate that the method allows for significant cost savings.

Keywords: Water resources; Sewer layout; Optimization models; Wastewater planning

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