Public Abstract

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Title:Conservation and Allocation of Slope in Gravity Sanitary Sewer Design

Gravity sanitary sewers are traditionally designed in a relatively direct route from source to destination after considering property boundary/easement constraints and topographic features. Direct routing often squanders or fails to take full advantage of the potential energy reserves represented by the terrain elevation along the route. A methodology is presented in this research for considering potential energy (as measured by elevation and slope) as a resource to be conserved and deliberately allocated in gravity sanitary sewer routing. A graphical tool was first developed for identifying acceptable design flow limits for a gravity sanitary sewer based on hydraulic and practical constraints. A GIS map that incorporates a DEM can be used to obtain elevation information for a selected study area. Baseline and alternative slope-conserving sewer routes can then be selected by considering the pixel-to-pixel elevation change of the DEM and the acceptable design flow illustrated in the graphical tool. The baseline and alternative slope-conserving routes can be compared by calculating the total trenched volume required to maintain gravity flow within design constraints throughout each route. The methodology was tested in an undeveloped area near Ashland, Missouri to simulate a new development. Two pairs of baseline and slope-conserving routes were evaluated, and the slope-conserving routes were found to require less trenched volume than the baseline routes despite being longer. The developed methodology can be applied to route sanitary sewers more efficiently.