A probabilistic sewer sedimentation model

Philipp Staufer[1,2]

[1] Swiss Federal Institute of Aquatic Science and Technology, Ueberlandstrasse 133, CH-8600 Duebendorf, Switzerland
[2] RWTH Aachen University, Institute of Environmental Engineering, Mies-van-der-Rohe Strasse 1, 52074 Aachen, Germany

ABSTRACT

During dry-weather periods and storm water events deposit build up in certain reaches of a combined sewer system. The information on the whereabouts of sediments can be assessed by inspection or mathematical modelling. Inspection will significantly concur costs if the entire sewer network has to be monitored with special regards to rain characteristics. Subsequently, modelling is a cost-effective approach locating deposit in sewers. However, deterministic sediment transport models for combined sewers need large data sets for calibration and verification. If large datasets are needed, cost wise there is not much gained compared to inspection. Furthermore, high uncertainties militate against the application of deterministic sediment transport models for combined sewer systems. To utilize modelling for the assessment of areas with risk of sedimentation semi-stochastic modelling are feasible. Semi-stochastic models combine hydrologic flow routing with a sediment transport model whose parameters are varied stochastically. Thus omitting calibration which identifies just one of the many optimal parameter sets, the model computes probabilities of sedimentation by running large number simulations. The aim of the paper is to present a conceptual framework that is able to determine the total length of sewers with risk of sedimentation. The new model shows good agreement with real data. The total calculated length of areas with risk of sedimentation was 2.998 m while inspection determined 3.121 m of sewers with observed sediments.

KEYWORDS

adjacent systems, localization, mineral sediments, organic deposit, stochastic modelling,