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Validating Quantitative Stormwater Simulations in Edmonton Using MIKE URBAN

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Abstract : Many municipalities within Canada and abroad use chloramination to disinfect drinking water so as to avert the production of the disinfection by-products (DBPs) that result from conventional chlorination processes and their consequential public health risks. However, the long-lasting monochloramine disinfectant (NH2Cl) can pose a significant risk to the environment. As, it can be introduced into stormwater sewers, from different water uses, and thus freshwater sources. Little research has been undertaken to monitor and characterize the decay of NH2Cl and to study the parameters affecting its decomposition in stormwater networks. Therefore, the current study was intended to investigate this decay starting by building a stormwater model and validating its hydraulic and hydrologic computations, and then modelling water quality in the storm sewers and examining the effects of different parameters on chloramine decay. The presented work here is only the first stage of this study. The 30th Avenue basin in Southern Edmonton was chosen as a case study, because the well-developed basin has various land-use types including commercial, industrial, residential, parks and recreational. The City of Edmonton has already built a MIKE-URBAN stormwater model for modelling floods. Nevertheless, this model was built to the trunk level which means that only the main drainage features were presented. Additionally, this model was not calibrated and known to consistently compute pipe flows higher than the observed values; not to the benefit of studying water quality. So the first goal was to complete modelling and updating all stormwater network components. Then, available GIS Data was used to calculate different catchment properties such as slope, length and imperviousness. In order to calibrate and validate this model, data of two temporary pipe flow monitoring stations, collected during last summer, was used along with records of two other permanent stations available for eight consecutive summer seasons. The effect of various hydrological parameters on model results was investigated. It was found that model results were affected by the ratio of impervious areas. The catchment length was tested, however calculated, because it is approximate representation of the catchment shape. Surface roughness coefficients were calibrated using. Consequently, computed flows at the two temporary locations had correlation coefficients of values 0.846 and 0.815, where the lower value pertained to the larger attached catchment area. Other statistical measures, such as peak error of 0.65%, volume error of 5.6%, maximum positive and negative differences of 2.17 and -1.63 respectively, were all found in acceptable ranges.

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