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Evaluation of Backwater Rising due to Group of Bridge Piers in Urban Rivers

KWONKYU YU[1], BYUNGMAN YOON[1], SEOKHYUN KOH[2], CHUHWANG KIM[1]

[1]*Myongji University*

[2]*EPS solution*

Some urban rivers in Korea have covered reach with concreted road ways. These covered road is supported with a group of bridge piers. In flood season, these multiple bridge piers may bring large amount of backwater, and cause flood damage to neighboring areas. The present study aims to figure out the backwater effect due to accumulation of bridge piers and interference of eddies around them. Extensive hydraulic model experiments and a series of numerical model simulations were performed. The Foude number of the flow, longitudinal pier spacing, and the transversal pier spacing were selected as govering factors of the backwater rising. The experiments were performed to evaluate the performance of the numerical model when the model was applied to simulate the water surface variation due to bridge piers. The model results were compared with the experiment result. The comparison showed that the numerical model could simulate the backwater effect fairly well except only in the wake region close to piers. The maximum error between the experiments and the simulation reached around 5%. The numerical results for multiple piers showed that the maximum water surface rising occurred when the alignment angle was around 45 degree deviated from the main flow direction. As the longitudinal spacing increases from 1 diameter spacing, the backwater effect was increased. This tendency was kept until the spacing reached around 6∼8 diameter of the piers. After that the effect showed a stable state.