

Abstract

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Scour Around Bridge Piers Applying Stream Power Approach

The current research aims introducing the problem of scour around bridge piers from a new point of view. The classical approach for tackling this problem usually depends on applying empirical equations developed from the analysis of experimental results with the use of dimensional analysis. Thus, in the current research an intensive study for evaluating the existing scour predictor was performed. The comparison processes through comparing the results of some laboratory experiments performed for scour around bridge piers with the predicted scour depth from some available predictor equations. About 156 experiments were carried out to perform the current study in accordance with 15 predictor equations. The results show that the scour predictors have a low reliability for following a specific trend giving accurate results. Thus, it has been considered that it is of great importance to study the scour problem around bridge piers through a new approach. Stream power approach has been used for achieving this objective. A one dimensional numerical model for open channel hydraulic was used to stimulate the problem of flow around bridge piers. Stream power variation is studied versus several parameters such as scour depth, sediment type, flow conditions. Several laboratory experimental studies were tested; stream power values in these different cases were analyzed. Results show that there is a significant relationship between scour depth escalations and stream power value. The relationship between stream power and scour depth was found to have a specific trend through which a new predictor could be developed. The new predictor was applied on some experiments; the estimated scour depth was compared to the experimental results. It was found that there was a good agreement between the experimental results and the scour calculated using the stream power approach. Finally, it can be concluded that the new approach is considered more reliable than the classical methods for estimating the scour depth at bridge piers. However more studies are needed to perform an inclusive idea about the application of stream power approach for pier and abutment scour problem.