Flow and edge scour in current adjacent to stone covers

This paper presents the results of an experimental investigation on edge scour adjacent to a stone cover laid on a sandy bed. The three-dimensional flow over the edge of the stone layer has been investigated by the use of particle image velocimetry. The flow measurements show a significant amount of turbulence in the primary flow near the junction between the stone layer and the sand bed and the formation of complex secondary-flow structures. The results show that the flow and the edge scour process in a steady current are governed by the size of the roughness elements and to some extent the side slope of the berm. The edge scour is caused by the combined action of the primary flow and the secondary flow. The primary flow stirs up the sediment and puts it into suspension, and the secondary flow carries it away from the junction between the stone layer and the sand bed, resulting in a scour hole forming adjacent to the toe of the stone layer. The measured scour depth attained a constant level of approximately one times the stone size in the live-bed regime; further, the scour depth showed a slight decrease when the side slope of the berm was increased. Design diagrams are presented for the scour depth and the time scale of the scour process.

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