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DEVELOPMENT OF PIER SCOUR EQUATIONS USING FIELD DATA

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ABSTRACT

Various equations have been developed to predict local scour depth at bridge piers. Majority of them were based on experimental data. However, very few equations were founded on field data. In this paper, two new equations were proposed based on investigation of available field data.

INTRODUCTION

The presence of bridge piers causes an abrupt change in the direction of the approach flow resulting in the removal of bed material hence local scour at piers. Sediment movement in the approach flow determines whether the local scour is clear water (no sediment transport) or live bed (with sediment transport).

Extensive experimental studies (Simons and Senturk 1992) have been conducted on the subject resulting in many empirical equations. In general, the equations were derived for live bed scour in cohesionless sand bed rivers with steady flow. Kafi and Alam (1995) found out that the accuracy of the laboratory-based equations were improved if the coefficients and exponents of these equations were derived using field data.

In this paper, field data were analysed and dimensional analysis was used to develop new equations. Multiple linear regression analysis was used to obtain the best-fit equations having a high value of adjusted coefficient of determination (adj. r^2) and a low value of standard deviation (s).

PRELIMINARY ANALYSIS

Local scour at piers is a function of many variables such as flow characteristics, geometry of the piers, bed material size, and fluid properties. Field data found in the literature (Kafi and Alam 1995, Kothyari et al 1992) were used to establish the effects of these factors on scour depth. Table 1 summarises ranges of field data available