SYNTHETIC UNIT HYDROGRAPH FOR SELANGOR BASINS AND THE ENHANCEMENT OF DEFLOOD SOFTWARE

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Abstract

Design flood estimation is fundamental to ensure that economic engineering design of a hydraulic structure with adequate standards of safety can be achieved. The research studied the feasibility of two established and widely used synthetic unit hydrograph methods for Malaysian design flood estimation, therefore the better method could be recommended for ungauged Malaysian catchments. The SCS (now known as NRCS) and Snyder's procedures were developed based on studies of catchments ranging in size and geographic locations in the United States. In this research, five catchments in Selangor were selected and observed storm hyetographs and their corresponding total runoff hydrographs were studied in detail to derive unit hydrographs. In the record period of 3 years (1999-2001), 28 single storms were found to be suitable for unit hydrograph derivation. Applying the two methods, synthetic unit hydrographs were derived using the geomorphologic characteristics of the catchments and comparisons were made between the synthetic unit hydrographs and the observed unit hydrographs. The study found that both methods calculate the peak discharges well, but Snyder's method calculates the time to peak better than the SCS. It can be inferred from the time to peak results that if one uses SCS method to perform flood estimation, the time taken for the flood to rise could be slower than the actual time. The base time is better calculated by the Snyder's method with a further improvement recommended by the study; that is changing the factor of 5 to 3 in the base time equation. The proposed reduce factor which has been verified is suggested based on the fact that Malaysia is a tropical country which is naturally warmer than the United States, hence storm water would possibly attenuates faster. The second part of the report discusses the enhancement of Deflood with a knowledge-based system to assist users with design flood estimations. An interactive, flexible and adaptable system that guides the users in decision making for design flood estimation was developed as a result of the study.

CHAPTER 1

1. INTRODUCTION

Reliable estimates of the magnitude and frequency of floods are essential for the economical planning and safe design of any water related structure such as bridges, culverts and drainage systems. Highway and railroad stream crossings designs, delineation of flood plains and flood-prone areas and management of water-control structures are all activities that require reliable estimates of the magnitude and frequency distribution of floods. If a water control structure is under designed, the results could be a disaster; the culverts may be overflowed, the dam may break, the highway may flood or the bridge may collapse. On the other hand, if the structure is over designed and hence very safe, the cost involved could be unreasonably expensive. Therefore, estimation of the magnitude of a flood of a certain recurrence interval to be adopted for the design of a water control structure (design flood) is fundamental to ensure that economic engineering design with adequate standards of safety can be achieved.

The design flood can be estimated using several methods like Regional Flood Frequency Analysis, Rational method and Unit Hydrograph method. While the Regional Flood