CHAPTER 4

STATISTICAL ESTIMATES

A statistical estimation method is used for deriving probable maximum precipitation (PMP) approximately for small areas. While the method is basically a frequency analysis method, it is different from traditional frequency analysis methods in two important respects. First, it focuses on a wide region, rather than a single station or single watershed, in order to seek a storm that approximates the physical upper limit of precipitation (the maximum observed rainfall). Second, frequency analysis methods are used to determine the statistics of extremes and this method involves the application of the process of enveloping. These two points are highlighted in Figure 4.1, which shows smooth enveloping of data from around 2 700 stations (90 per cent of which are located in the United States of America).

The essence of the method is storm transposition, but instead of transposing the specific rainfall amount of one storm, an abstracted statistic K_m is transposed. (The transposition is achieved by looking up the value of K_m in Figure 4.1 using a corrected average $\overline{X}_n$ for the design station.) The transposition correction is estimated using the average $\overline{X}_n$ and the coefficient of variability C_v (see Equation 4.3).

The method identifies the enveloping value of K_m from the observed data in a wide region (mainly in the United States) as the probable maximum value corresponding to PMP. It assumes that the PMP has been observed at the station that provided the K_m value.

4.1 USE OF STATISTICAL PROCEDURE

Statistical procedures for estimating PMP may be used wherever sufficient precipitation data are available, and are particularly useful for making quick estimates, or where other meteorological data, such as dewpoint and wind records, are lacking. The procedure described below is not the only one, but it is the process that has received the widest acceptance. It is used mostly for making quick estimates for basins of no more than around 1 000 km^2, but has been used for much larger areas. It is convenient because it requires considerably less time to apply than the meteorological, or traditional, approach, and one does not have to be a meteorologist to use it. A major shortcoming of the procedure is that it

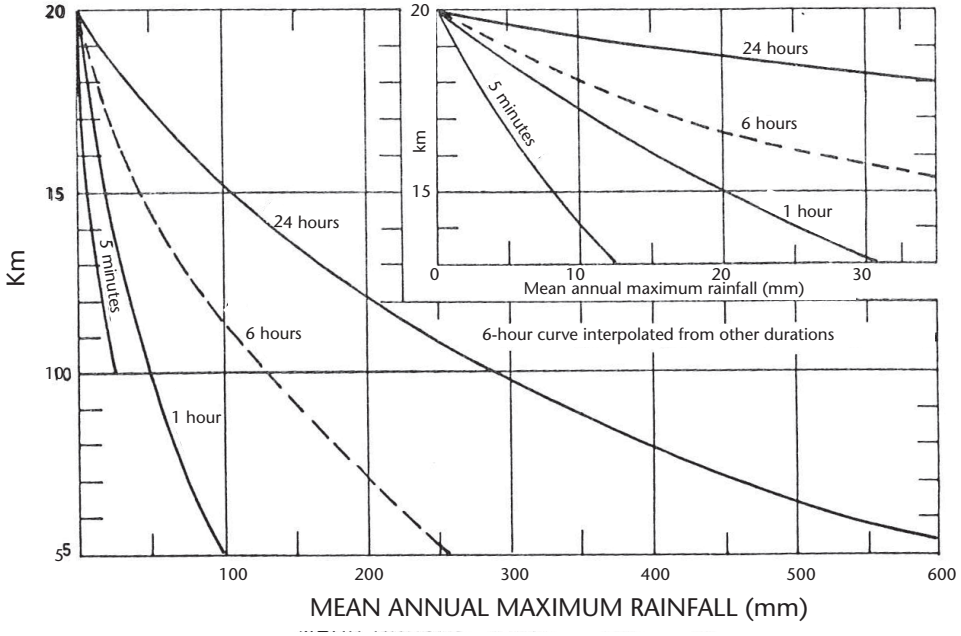

Figure 4.1. K_m as a function of rainfall duration and mean of annual series (Hershfield, 1965)