an approximation of the actual loss because of the rapid change i velocity from section 1 to section 3. Therefore, satisfactory results ar attainable only if the term "hf" is small relative to the difference i head, Ah.

FLOW OVER DAMS AND WEIRS

The term "dams," as used here, also includes highway and railwa embankments that act as broad-crested dams during floods. The pea discharge over a dam or weir can be determined on the basis of a fiel survey of high-water marks and the geometry of the particular struc ture. (The terms "dam" and "weir" are used interchangeably.)

The basic e uation for flow over a dam is

where

Q = discharge,

C = a coefficient of discharge having the dimensions of the square root of the acceleration of gravity, *b* = width of the dam normal to the How, excluding the width of piers, if any, and

H = total energy head (h + V,,112g) referred to the crest of the dam, where h = static head, and V, = mean velocity at the approach section to the dam.

It is apparent from equation 50 that the reliability of a computation of flow over a dam is dependent primarily on using the correct dam coefficient, C. Values of C vary with the geometry of the dam and with the degree of submergence of the dam crest by tailwater. One of the manuals referred to on page 273 (Hulsing, 1967) treats in detail the coefficients associated with sharp-crested (thin-plate) weirs, broadcrested weirs, round-crested weirs, and weirs of unusual shape. Because the technical details in that manual cannot be readily summarized here, the reader is referred to the Hulsing report.

FLOW THROUGH CULVERTS

The peak discharge through culverts can be determined from high-water marks that define the headwater and tailwater elevations. This indirect method is used extensively to measure flood discharges from small drainage areas.

The placement of a roadway fill and culvert in a stream channel causes an abrupt change in the character of flow. This channel transition results in rapidly varied flow in which acceleration, rather than boundary friction, plays the primary role. The flow in the approach channel to the culvert is usually tranquil and fairly uniform. However, within the culvert the flow may be tranquil, critical, or rapid if the culvert is partially filled, or the culvert may flow full under pressure.