

Hydrology for Dam Safety Evaluations – It's All Subjective!

Erman Caudill, Stantec

There are numerous studies and technical guidance documents out there related to how to do spillway hydraulic evaluations. Spillways hydraulic considerations are important, but more often than not a dam's ability to meet its hydraulic design criteria is driven by the assumptions made in the hydrologic analyses. It does not matter if the spillway discharge coefficient is 3.6 or 3.9 if the antecedent conditions in the watershed vary the SCS runoff curve numbers from 65 to 85 throughout the course of any given year or if the storm does not occur uniformly over a large watershed or over time. This presentation will provide a brief overview of the process of evaluating the hydrologic and hydraulic capacity of a dam, while giving some much-needed attention to some of the more influential hydrologic aspects of these evaluations.

The author will provide a short run-through of the typical approach used to do a hydrologic evaluation for a dam while touching on special topics and assumptions that can greatly affect the results. Practical, common sense terms and visual aids will be used to illuminate a number of topics including: site-specific and regional estimates of the Probable Maximum Precipitation (PMP) depths, spatial variability of the storms, temporal variation, application of grid-based model simulations, use of 2-D rain on grid type simulations, antecedent conditions, how to use gage-calibration to get whatever answer you want, model input assumptions, abstraction, storage & losses, hydrograph routing and attenuation, and a host of other aspects of the hydrologic study.

A hypothetical case study will be used to demonstrate how a number of different modeling approaches and assumptions can be made (each of which are individually valid and technically acceptable) to yield a vastly different array of estimates of the inflow and outflow discharge hydrographs for a dam safety hydrologic and hydraulic evaluation.