

Lessons learned from the bluestone dam inflow design flood update

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Abstract. Bluestone Dam is a large concrete gravity dam designed during the late 1930's and constructed in the 1940's. Like many dams of the era, the inflow design flood (IDF) was based on the transposition of the largest observed storm of the region. The Bluestone Dam original IDF had a peak inflow of 430,000-ft³/s. During the 1980's, the National Weather Service (NWS) published improved estimates of Probable Maximum Precipitation (PMP). Subsequently, many existing projects were re-evaluated for hydrologic adequacy given this new understanding of the maximum precipitation over a given drainage area. The inflow design flood for Bluestone Dam was re-evaluated in 1982, including a site-specific PMP performed by the NWS, and the peak inflow resulting from the updated probable maximum precipitation was estimated at 1,086,000-ft³/s; more than double the original inflow design flood peak. A more recent analysis of the Bluestone Basin PMP performed in 2014 resulted in a 10-percent reduction of precipitation depth compared to prior estimates. Although the rainfall estimates were reduced, refinements to the rainfall-runoff modeling resulted in a peak inflow estimate at the dam site in the order of 1,444,000- ft³/s to 1,661,000- ft³/s, a 33- to 53-percent increase as compared to the 1982 study. The limitations of the 1982 study that resulted in a lower peak inflow compared to the 2014 study include; the intensity and time-step of unit hydrographs derived from 6-hour precipitation data, the computational time-step of the numeric analysis and the use of a linear reach routing method. The results of this study indicate that the improvements in data and computational analysis, compared to 1980's and previous era IDFs, could significantly change the IDF for other large dams as well.

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