

Annual Exceedance Probability of the PMP Values

AWA has conducted probability assessments of PMP for several watersheds utilizing L-moment statistics, regional precipitation-frequency methods, and stochastic storm transposition (SST) methods to estimate the annual exceedance probability (AEP) and uncertainty of PMP. Using deterministic PMP results that were calculated following the storm-based approach, AWA developed the AEP of the basin PMP and basin precipitation amounts up to PMP. Discussions regarding uncertainty of the frequency estimates at return periods are provided, uncertainty analysis provide a measure of reasonableness of the PMP values and provide information for risk informed decision making. AWA utilizes the Hosking and Wallis (1997) methodology of a regional L-moment approach and the SST methodology to estimate AEP and uncertainty of PMP for the basins.

Regional precipitation-frequency analyses are conducted by storm type to avoid mixed population contamination. L-moment statistics are used for computing sample statistics for data at individual sites; for testing for homogeneity/heterogeneity of proposed groupings of sites (regions); for conducting goodness-of-fit tests for identifying a suitable probability distribution(s); and for solving for distribution parameters for the selected probability distribution. Monte Carlo methods will be used to derive the frequency curve and uncertainty bounds based on the simulated quantiles to the true quantiles (Hosking and Wallis, 1997; Hosking, 2015).

For the SST methodology, the concept of storm transposition used for PMP development is extended to incorporate the probability of occurrence. SST assumes that a meteorologically homogeneous region exists such that a significant storm of a given magnitude occurring somewhere in such a region has the same probability of occurring anywhere else in the region, subject to adjustment of the magnitude or other storm characteristics. By using data from extreme storm events AWA has analyzed that have occurred in a meteorologically homogeneous region, it is possible to extend the storm database used to estimate storm exceedance probabilities for the basin (Fontaine and Potter, 1989). The SST methodology estimates the annual exceedance probability based on joint probabilities: i) probability of precipitation occurrence, ii) probability of watershed size from storm transposition region, and iii) probability of PMP events from sample period of record.

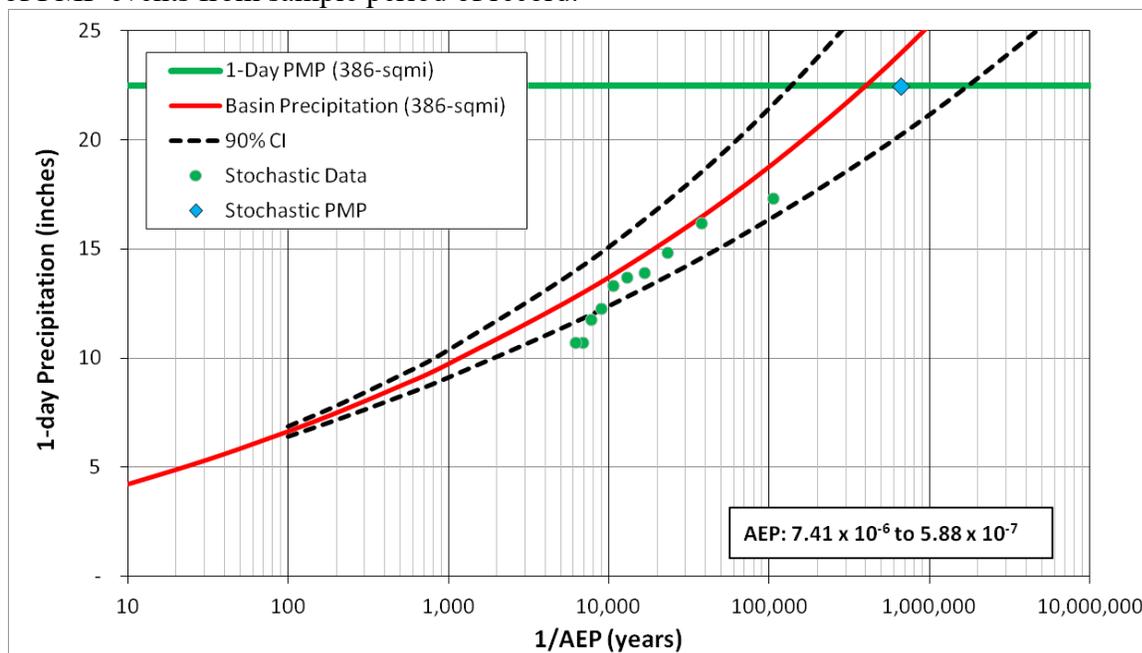


Figure 1. Sample 386-sqmi basin regional L-moment frequency curve, uncertainty bounds and the Stochastic Storm Transpositioned storms AEPs.