



Relating design rainfall estimates to probable maximum precipitation – a study of reservoir flood risk in the UK

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Rainfall frequency estimation provides vital information for use in the assessment of reservoir safety in the UK. Reservoirs are classified into four categories depending on the potential risk to communities downstream in the event of a dam failure. The design flood in each case is obtained through a rainfall-runoff analysis, with the return period of the design rainfall input ranging from about 200 years to 10,000 years. For the highest category of dam, the probable maximum flood (PMF) is the design standard and is derived by routing the probable maximum precipitation (PMP) through the rainfall-runoff model.

This study forms part of a wider analysis of rainfall frequency estimation for reservoir safety. Rainfall frequency estimates at more than 60 raingauge sites have been derived from a number of different methods and detailed comparisons have been made. The results of applying the generalised techniques given in the Flood Studies Report (NERC, 1975) and the more recent Flood Estimation Handbook (Institute of Hydrology, 1999) have been compared with statistical distribution fitting at each location. Also the PMP has been abstracted from pre-existing digital maps and compared to rainfall estimates of long return period.

The sites were chosen by their proximity to dams categorised as posing the highest risk to human life, and also on the basis that they could provide at least 25 annual maximum rainfall depths for the 1-day duration. A number of raingauges have records that are considerably longer than 25 years. Of particular concern is whether the number of recorded occurrences of rainfall depths of specified return periods corresponds to

that predicted by the generalised estimation methods, as well as whether any of the frequency estimates appear to exceed the currently-used PMP values. The paper concludes by discussing the implications of the results for the improvement of spatially generalised estimation techniques in the UK.