Reliability and Utility of "Fit for Purpose" Flood Investigations and Hazard Products

The **aim** is for users to understand the inherent uncertainties and have confidence, for their particular purpose, in the range of flood hazard products being promoted and developed in Queensland. This is a similar aim for the UK Environment Agency.

The **issue** is potential liability associated with the use of hazard products given the cumulative uncertainty arising from the data and the methodology used. Hydrology data of varying standards is used in conjunction with spatial information (principally Digital Elevation Models (DEM)) of various standards, in processes (GIS mapping with DEM to Hydrodynamic models) that range from being unvalidated (at best based on anecdotal information), validated (checked against known flood extents) and fully calibrated. Key features of these products are:-

- A Flood Frequency Analysis (FFA) to estimate the AEP of targeted events and to estimate the level of a range of AEPs, and
- The extent and depth and when required, velocity of flood waters.

The **drivers** for uncertainty include

- The **availability of continuous flow** data to enable a FFA. Gauging stations may be located at the subject town or some distance upstream or downstream with other contributing inflows influencing the analysis. In some cases there may be no continuous flow data and no rainfall stations in the subject catchment. The result is that multiple methods using records spanning timeframes will have different inherent uncertainties. Monte Carlo 90% quantile probability limits provide uncertainty limits.
- The **location and observational uncertainty of recorded flood levels** to identify flood levels at the town. This could be a gauge in town, GPS locations of various peak flood heights captured during or after the event, interpreted floodlines or anecdotal information.
- The **accuracy of the DEM**. This depends on the method of capture and could range from field survey to multiple points per square metre LiDAR. The current LiDAR (and high resolution aerial photography) program in Queensland results in a DEM specification of +/- 0.15m (V) and 0.5m (H), contours can be developed to 0.25m +/- 0.15m. At the catchment scale 30m grid data with 10m (+/- 5m) contours is available. Bathymetry information is required to improve the accuracy of DEMs.
- The **methodology** and need for datum consistency for developing the hazard products range from using GIS software to map the extent and depth of an historic event which may be validated against the known extent of the event (or the result may be un-validated if there are no records to check against), to using 1D or 2D computer models (eg TUFLOW, MIKEFLOOD, Hec-RAS) which are validated against the known extend of a recorded peak event, and to the more comprehensive fully calibrated computer model.
- **User needs** range from property level to catchment scale, and combinations of extent, depth, and velocity. In some cases duration of inundation is required.

The **task** then is to collaboratively develop (for both the Qld and UK contexts)

- a methodology to assign levels of confidence for hazard products aligned to user needs,
- and, a way of communicating the resultant metrics and levels of confidence.

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