Camp Pendleton Watershed Modeling—Developing a Working Tool

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WEST Consultants, Inc. developed a set of working hydrologic and hydraulic analytical tools for the Las Flores, Aliso, and Horno watersheds for Marine Corps Base, Camp Pendleton, California. The three watersheds vary in size between 3 and 27 square miles and are located along the coast in northern San Diego County. WEST performed hydrologic analyses of the Las Flores, Aliso, and Horno watersheds with two main goals in mind: (1) Develop working hydrologic models for each watershed, and (2) Determine frequency discharge relationships for key locations.

Observed storm precipitation amounts from six rainfall events occurring during the months of March 1995 and February 1998 were used to test the overall accuracy of the preliminary model. Computed hydrographs from HEC-HMS were compared to observed (measured) hydrographs to judge the accuracy of the model. Flow data were obtained from U.S. Geological Survey (USGS) stream gages for verifying the hydrologic model results.

The format of precipitation data in the HEC-HMS model consisted of total precipitation for each subbasin and a temporal pattern to distribute the precipitation over the storm duration. The following procedure was used to compute the total precipitation for each subbasin. First, total precipitation at each gage was computed for the event time span. A key step in this process was excluding several gages from the analysis due to inconsistent trends with other nearby gages. Second, precipitation contours (isohyets, or lines of equal precipitation depth) were developed for each storm using the spline function in ArcView GIS. Third, the precipitation contours were averaged over each subbasin to compute the precipitation for the particular event. A temporal gage was selected for each subbasin to compute the temporal distribution of the precipitation over the storm period for a subbasin. The temporal gage was chosen based on proximity to the centroid of the subbasin and a data collection frequency of one hour or smaller.

Three approaches were used to evaluate frequency flows for this study—flow-frequency analysis using HEC-FFA software, USGS regression equations, and hypothetical precipitation modeling. Prior to selecting a methodology for estimating frequency flows, some research was conducted regarding 100-year discharges for similarly-sized watersheds in San Diego County. The hypothetical precipitation modeling method was ultimately selected to define the magnitude of the 2-, 5-, 10-, 25-, 50-, and 100-year discharges. In summary, the Base now has a working tool that can be used to evaluate the impact of hydrologic changes to the watersheds on the magnitude of frequency flows.