

## **Recommendation for: Using Baseflow Parameters with HEC-HMS in Harris County (Revised 02/13/2002)**

**Goal:** To determine the necessity of baseflow computations as utilized in the original Flood Hazard Study and the currently effective HEC-1 models for Harris County.

**Recommended Procedure:** It is recommended that the baseflow option (as originally used) be eliminated from use in HEC-HMS modeling of Harris County watersheds.

**Assumptions:** Based on the Flood Hazard Study appendices, it appears that the baseflow parameters were developed for each watershed in Harris County based on calibration to various storm events. The baseflow parameters as implemented in the Flood Hazard Study define the rate of recession on the falling limb of the hydrograph only, and not necessarily any true baseflow contributed by groundwater or WWTP effluent.

The problem with calculated hydrographs not matching observed hydrographs may be attributable to insufficient definition of spatial rainfall variability. For the storm events used in calibration for the Flood Hazard Study, there were only a few rainfall gages upstream of the stream flow calibration point. It is, therefore, likely that if a single storm pattern is applied to then entire watershed upstream of a stream gage with losses adjusted to calibrate the peak of the hydrograph, the volume will be deficient on the falling limb of the hydrograph.

**Testing Procedure:** In order to demonstrate the problems associated with using the baseflow as currently implemented in the effective HEC-1 models and to demonstrate the impacts of removing the baseflow option, three scenarios were examined. A description of these scenarios follows.

*Scenario #1:* Little Cypress Creek at Cypress-Rose Hill for the October 1998 flood event using the baseflow parameters from the Cypress Creek HEC-1 model. This is compared to the same conditions with the baseflow option omitted. Rainfall based on radar calibrated to rain gage data.

*Scenario #2:* The E100A subarea of White Oak Bayou for the September 1998 flood event using the baseflow parameters from the White Oak Bayou HEC-1 model. This is compared to the same conditions with the baseflow option omitted. Rainfall based on radar calibrated to rain gage data.

*Scenario #3:* White Oak Bayou at Heights for the September 1998 flood event using the baseflow parameters from the Cypress Creek HEC-1 model. This is compared to the same conditions with the baseflow option omitted and to the observed hydrograph at Heights. Rainfall based on radar calibrated to rain gage data.

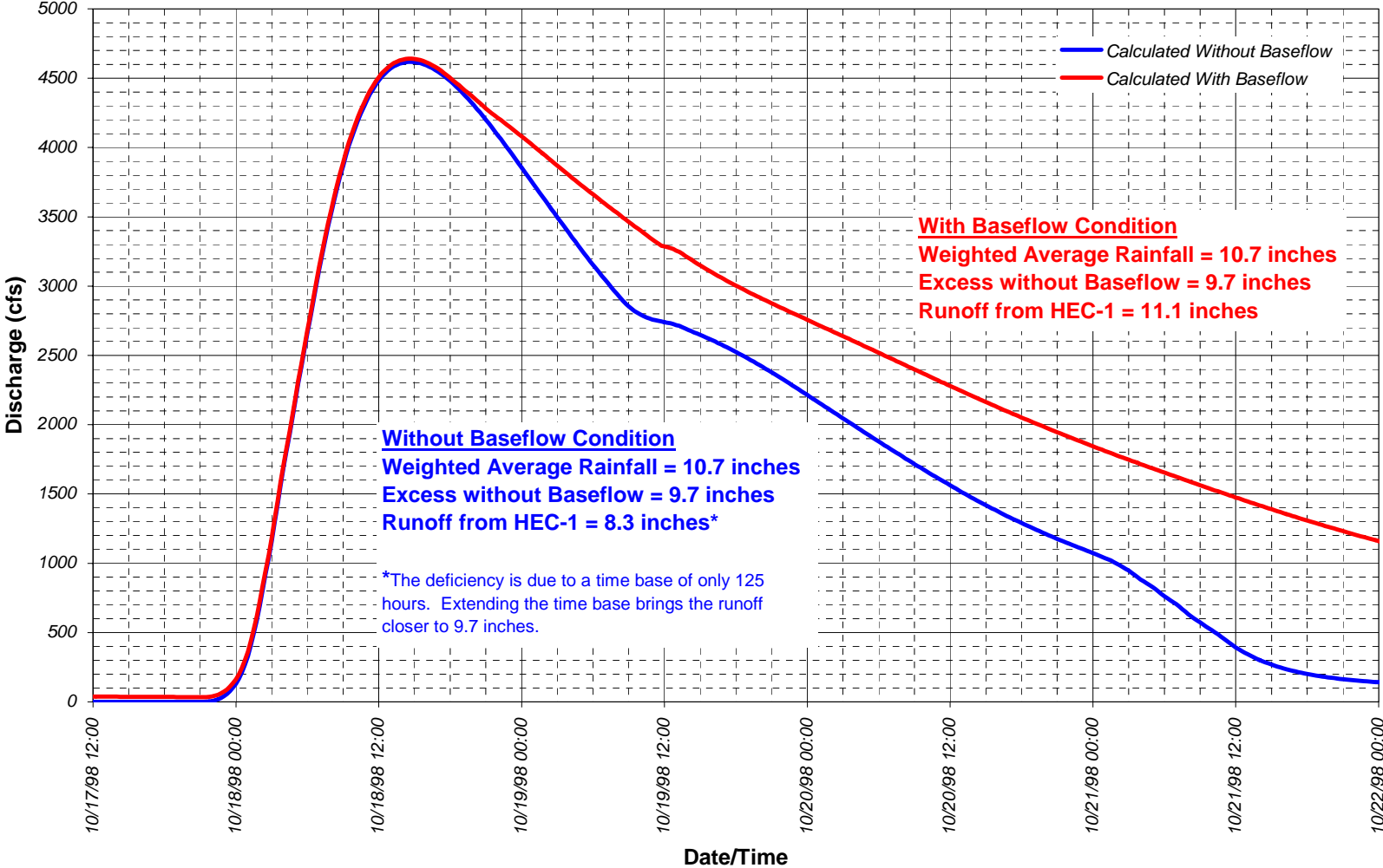
**Test Results:** The attached graphs illustrate the results of the tests. Scenario #1 shows the potential problems associated with the use of the baseflow option at a location upstream from the original calibration point in the Flood Hazard Study. In this case, the original calibration point was located at Cypress Creek and I-45. However, using the baseflow parameters defined by that calibration produces a scenario in which the runoff (when the baseflow is included) is greater than the rainfall. Scenario #2 demonstrates that the removal of the baseflow option will have negligible effect on individual subareas within a watershed. Finally, Scenario #3 illustrates that an adequate replication of historic data can be accomplished for a major with or without the baseflow option being implemented watershed as long as the spatial variability of rainfall can be adequately defined.

**Final Notes:** It would appear that this was done to create a hydrograph tail which more closely approximates observed hydrograph data. It is anticipated that better definition of spatial variability of rainfall from radar data will produce more consistent hydrograph shapes when compared to observed data without the use of the baseflow option.

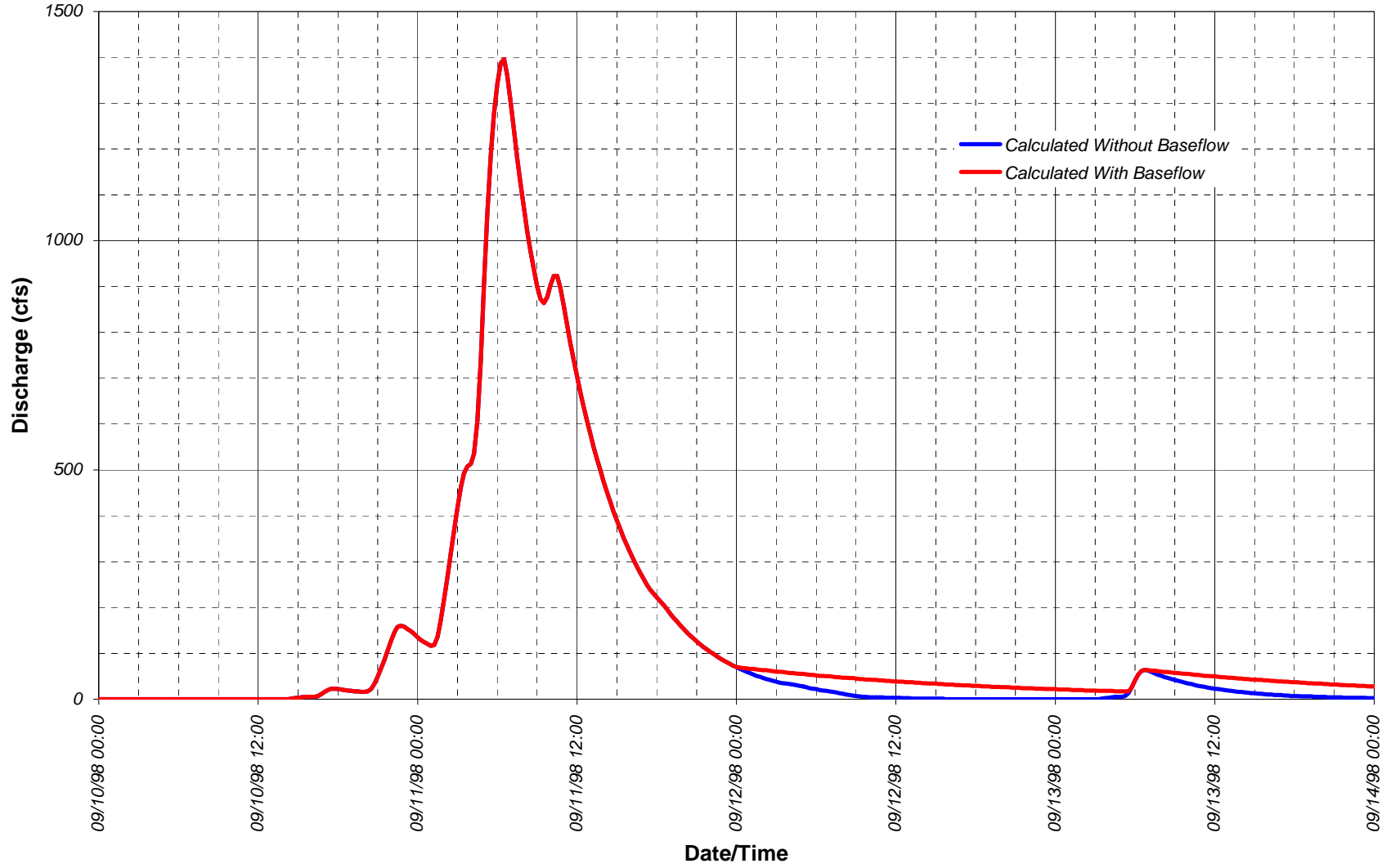
**Committee Resolution:** Eliminate the use of baseflow.



**Scenario #1: October 18, 1998 Flood**  
**Little Cypress Creek @ Cypress-Rose Hill**



**Scenario #2: September 11, 1998 Flood**  
**White Oak Bayou @ E100A**



**Scenario #3: September 11, 1998 Flood**  
**White Oak Bayou @ Heights Boulevard**

