

**Texas A & M University and U.S. Bureau of Reclamation
Hydrologic Modeling Inventory
Model Description Form**

JUNE, 1999

Name of Model: Hydrologic Modeling System (HEC-HMS)

Model Type: The program is a precipitation-runoff model with hydrologic channel routing methods. A snowmelt preprocessor is under development.

Model Objective(s) : The program is designed to be applicable in a wide range of geographic areas for solving the widest possible range of rainfall-runoff problems including water availability, urban drainage, flow forecasting, future urbanization impact, reservoir spillway design, flood damage reduction, floodplain regulation, and systems operation.

Agency and Office: U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, CA 95616
Tel: (530) 756-1104
Fax: (530) 756-8250
Web: <http://www.hec.usace.army.mil>

Technical Contact and Address: William Scharffenberg, Research Division
Hydrologic Engineering Center

Model Structure or Mathematical Basis:

Precipitation	Infiltration	Evapotranspiration
Methods include user-specified hyetograph, user-specified gage weights, inverse distance gage weights, gridded precipitation, frequency hypothetical storm, and standard project storm	Methods include Green & Ampt, SCS curve no., initial /constant rate, deficit / constant rate, gridded SCS curve no., and linear storage reservoir as part of SMA*	Method is monthly average as part of SMA*

Interception	Detention Storage	Overland Flow
Method is linear storage reservoir as part of SMA*	Method is linear storage reservoir as part of SMA*	Methods include Clark, Snyder, SCS, and user-specified unit hydrographs, kinematic wave, and modClark (semi-distributed linear unit hydrograph)

Channel Flow	Groundwater Flow	Snowmelt
Methods include lag, Muskingum, Muskingum-Cunge prismatic channel, Muskingum-Cunge 8-point channel, kinematic wave, and modified Puls	Methods include recession, constant monthly, and linear storage reservoirs as part of SMA	A separate preprocessor currently under development uses the temperature index method from the SSARR model on a gridded-basis

* SMA refers to Soil Moisture Accounting and is a feature of the upcoming Version 2.0

Model Parameters: Required and optional parameters are dependent on the selected computation method.

Spatial Scale Employed in the Model: The watershed is represented as a dendritic network of subbasins, channels, reservoirs, diversions, sources, junctions, and sinks. Each subbasin is homogeneous unless the modClark semi-distributed linear unit hydrograph transform is used.

Temporal Scale Employed in the Model: The length of a simulation is limited only by computer resources and can operate at time steps from 1 minute to 24 hours. Version 1.1 is primarily event-based with a simple continuous simulation capability. Version 2.0 will provide a complete continuous simulation capability.

Input Data Requirements: The minimum required input is precipitation data and parameters required by the selected computation methods. Optionally, observed flow data and stage-flow curves may be included.

Computer Requirements: Windows 98/95/NT on Intel compatible architecture with 16Mb memory and 10 Mb disk space; Sun Solaris 2.5 or higher with 64Mb memory and 10Mb disk space

Model Output: The program produces time-series of flow and writes them to a database for all nodes in the drainage network.. All time-series of precipitation, infiltration, overland flow, and baseflow necessary to compute total flow are also written to the database. The program produces summary tables and graphs at any node as requested by the user.

Parameter Estimation / Model Calibration: The program includes a versatile optimization facility that may be employed when observed flow data are available. Goodness-of-fit is estimated by either percent error in peak flow, sum of absolute residuals, sum of squared residuals, or peak-weighted root mean square error. The search algorithm is either a uni-variant or downhill simplex method.

Model Testing and Verification: The HEC-HMS computational engine is based on the HEC-1 engine which is backed by 30 years of research, field testing, and maintenance. Formal documentation of the verification process for HEC-HMS is under development.

Model Sensitivity: Sensitivity is dependent on the selected computation method.

Model Reliability: The Federal Emergency Management Agency (FEMA) has accepted the program for use in floodplain management studies. Reliability for an individual project is dependent on the quality of available data and the skill of the user.

Model Application / Case Studies: The program has been applied to civil works projects involving real-time flood forecasting, flood damage reduction, urban and rural drainage, and channel routing.

Documentation: Hydrologic Modeling System HEC-HMS User's Manual
Hydrologic Modeling System HEC-HMS Technical Reference Manual
(due soon)
Various Technical Papers, Project Reports, and Training Documents

Other Comments: Version 1.1 is currently available from many third-party vendors who can provide the program, documentation, training, and other related services. The program and documentation are also available from the HEC website. Version 2.0 is expected before the end of the current year and will be similarly available.