Project Overview: Transition from FLDWAV to HEC-RAS

Last Update: 10/24/2011

Prior to the development of the Community Hydrologic Prediction System (CHPS), the "Flood Wave Dynamic Model" FLDWAV and the "Dynamic Wave Operation" DWOPER were the two main operational hydraulic models supported by the Office of Hydrologic Development (OHD) as part of the National Weather Service River Forecast System (NWSRFS). The report on "Evaluation of Hydraulic Models in Support of NWS Operations" (Hydraulic Model Evaluation Team, 2007) includes the following recommendation:

> "*It is the consensus of the evaluation team that HEC-RAS be considered for inclusion into the suite of NWS hydraulic models.*"

HEC-RAS is the Hydrologic Engineering Center-River Analysis System (HEC-RAS) developed by the United States Army Corps of Engineers (USACE). HEC-RAS has some advantages over both FLDWAV and DWOPER including more functionality, a better user interface, better documentation, and easier troubleshooting. Because it was not be cost effective to continue supporting two very similar hydraulic models (FLDWAV and HEC-RAS) in operations, OHD has supported River Forecast Centers (RFCs) in replacing FLDWAV and DWOPER with HEC-RAS in CHPS. In order to accomplish this, (1) OHD has worked with HEC, Deltares, and Resource Management Associates (RMA) to integrate HEC-RAS software into CHPS, and (2) the OHD Hydraulics Group has documented procedures to efficiently replace existing FLDWAV and DWOPER models with HEC-RAS models without losing accuracy or functionality.

Although FLDWAV and HEC-RAS solve the same basic hydraulic equations, the solution algorithms, representations of cross-section geometry and structures, and methods for calculating conveyance are not identical. One obvious difference is that HEC-RAS implementations most often use more explicit cross-section geometries and different methods to specify boundary roughness. During transition, we evaluated the viability of three model conversion approaches: (1) convert existing DWOPER and FLDWAV models to HEC-RAS, including closely approximating the FLDWAV roughness parameterizations, (2) obtain existing HEC-RAS models for the same rivers of interest (e.g. developed for FEMA studies) and modify them to meet RFC needs, or (3) a combination of the first two approaches. All approaches proved viable. The first approach was least costly and used for several rivers primarily to meet software transition deadlines. For some rivers, the second approach was more desirable when HEC-RAS models were available for the entire model domain. Improvements in simulation accuracy were seen in some rivers, but not others, when using more refined cross-section data from HEC-RAS. In cases where the desired model domain for operational forecasting exceeded the domain of available HEC-RAS models, the third approach was proved effective.

OHD worked closely with RFCs to transition models for approximately 12,000 km of river. The figure below shows the approximate model domains.

Extent of HEC-RAS Operational Forecast Models
Implemented or in Progress
(Approximate 10/25/2011)