Hydrologic Engineering Center

Training course on

CWMS Modeling for Real-Time Water Management

Davis, California

The Corps Water Management System (CWMS) is a software and hardware system to improve the Corps' water control operations decision-making process. This class provides water managers the training necessary to effectively use hydrologic, hydraulic, reservoir, and flood impact modeling software in CWMS for real-time operations. Students will learn the advanced features of modeling with CWMS, including real-time calibration and execution of model programs in support of the decisions made in the course of Corps project operations. This class does not address the installation of CWMS or the development of models.

Monday

8:00 – 8:45 a.m.   **INTRODUCTION AND PRE-TEST**

Class and Staff Introductions, Admin details, Pre-test.

8:45 – 9:30 a.m.   1.1 Lecture: **OVERVIEW OF THE CORPS WATER MANAGEMENT SYSTEM (CWMS)**

General concepts, history and the background of CWMS. Major components of CWMS, including data acquisition, database, modeling. Client-server architecture, workstations, file system organization. Oracle and HEC-DSS relationships.

9:30 – 9:45 a.m.   BREAK

9:45 – 11:30 p.m.   1.2 Lecture: **CAVI OVERVIEW AND DEMONSTRATION**

Overview of the CWMS Control and Visualization Interface (CAVI) and its basic functionality. Common CAVI elements: menus, maps, tool bars, control panel, layers, icons, plots, tables, and time windows. CAVI components, including the Data Acquisition, Observed Data Visualization and Model Interface modules. Day-to-day operations with CWMS. CAVI demonstration.

11:30 – 12:30 p.m.   ICE BREAKER LUNCH

12:30 – 1:30 p.m.   1.3 Lecture: **HMS REAL-TIME HYDROLOGIC MODELING**

Specialized hydrologic capabilities in HMS for CWMS, including gridded precipitation, Mod-Clark, bounded recession, and deficit-constant algorithms. Real-time calibration of hydrologic parameters. Evaluation and analysis of modeling results.

1:30 – 2:30 p.m.   1.4 Workshop: **HMS REAL-TIME HYDROLOGIC MODELING**

Executing HMS with algorithms used in CWMS. Adjusting hydrologic parameters, viewing and evaluating model results.

2:30 – 2:45 p.m.   BREAK

2:45 – 3:00 p.m.   Review :   1.4 WORKSHOP

3:00 – 4:30 p.m.   1.5 Lecture: **CWMS MODEL INTEGRATION AND SETUP**

Creating a watershed. Installing modeling files into a CWMS watershed. Watershed file structure. HEC-DSS pathname conventions used in the modeling process.   CWMS run nomenclature. Creating modeling and forecast alternatives. Selecting forecast times and time windows.

<u>Tuesday</u>

8:00 – 9:00 a.m.   2.1 Lecture: **CWMS REAL-TIME MODELING**

Creating and executing simulation forecasts. Creating and configuring time series icons for modeling purposes. Reviewing and evaluating modeling results.

9:00 – 9:15 a.m.   BREAK

9:15 – 10:35 a.m.   2.2 Workshop: **CWMS MODEL INTEGRATION AND MODELING**

Create a CWMS watershed, add maps and time-series icons. Installing modeling files into a watershed. Creating modeling and forecast alternatives. Selecting forecast times and time windows. Creating and executing simulation forecasts. Reviewing and evaluating modeling results.

10:35 – 10:55 a.m.   Review :   2.2 WORKSHOP

10:55 – 11:55 a.m.   2.3 Lecture: **MFP AND HMS IN CWMS**

Purpose and use of MFP and HMS. Creating precipitation scenarios with MFP, and hydrologic forecast alternatives with HMS. Adjusting hydrologic parameters in CWMS through HMS. Execution of a forecast through HMS. Evaluating HMS results in the CAVI.

11:55 – 1:00 p.m.   CLASS PHOTO / LUNCH

1:00 – 2:10 p.m.   2.4 Workshop: **USE OF MFP AND HMS FOR REAL-TIME HYDROLOGIC FORECASTING**

Create precipitation and hydrologic model alternatives using MFP and HMS. Create and execute a modeling forecast through HMS. Evaluating HMS results in the CAVI.

2:10 – 2:30 p.m.   Review :   2.4 WORKSHOP

2:30 – 2:40 a.m.   BREAK

2:40 – 3:40 p.m.   2.5 Lecture: **INTRODUCTION TO HEC-RESSIM**

Overview of HEC-ResSim. Capabilities and limitations of ResSim. ResSim in the modeling sequence. Importing ResSim into a CWMS watershed. Linking ResSim to HMS. Adding ResSim lookback data to the Extract List. Computing and Evaluating ResSim results.

3:40 – 4:40 p.m.   2.6 Workshop: **INTEGRATING AN HEC-RESSIM MODEL INTO CWMS**

Import a ResSim watershed into an existing CWMS watershed, create a CWMS forecast run, establish the modeling linking for ResSim to HMS, update the extract list information, compute and evaluate results.

4:40 – 5:00 p.m.   Review :   2.6 WORKSHOP

Wednesday

8:00 – 8:15 a.m.   Review / Questions

8:15 – 9:15 a.m.   3.1 Lecture: **HEC-RESSIM IN REAL-TIME OPERATIONS**

Concepts and use of release overrides and reservoir operations in CWMS.
Output options for accessing simulation results.

9:15 – 9:30 a.m.   BREAK

9:30 – 11:00 a.m.   3.2 Workshop: **HEC-RESSIM IN REAL-TIME OPERATIONS**

Setting ResSim release overrides. Modifying and adding reservoir operation
rules. Viewing and evaluating results.

11:00 – 11:15 a.m.   Review :   3.2 WORKSHOP

11:15 – 12:15 p.m.   3.3 Lecture: **REAL-TIME HYDRAULIC MODELING WITH HEC-RAS**

Overview of HEC-RAS and its use in CWMS. Adjusting RAS parameters
through CWMS. Computation of inundation maps using RAS. Creating RAS
model alternatives. Viewing and evaluating results.

12:15 – 1:15 p.m.   LUNCH

1:15 – 2:15 p.m.   3.4 Workshop: **REAL-TIME HYDRAULIC MODELING WITH HEC-RAS**

Create RAS model alternatives. Connect to HMS and ResSim computed
hydrographs. Create and execute a modeling forecast through RAS. Adjust RAS
parameters. Evaluating RAS results.

2:15 – 2:30 p.m.   Review: 3.4 WORKSHOP

2:30 – 2:45 p.m.   BREAK

2:45 – 3:45 p.m.   3.5 Lecture: **FLOOD IMPACT ANALYSIS (HEC-FIA) IN CWMS**

Overview of HEC-FIA and its use in CWMS.   Available FIA reports.
Connecting FIA to computed flow and stage hydrographs. Viewing and
evaluating FIA computations. Creating FIA model alternatives.

3:45 – 4:45 p.m.   3.6 Workshop: **FLOOD IMPACT ANALYSIS (HEC-FIA) IN CWMS**

Evaluate and modify existing FIA model alternatives. Connect to RAS computed
hydrographs at cross sections and storage areas. Execute a modeling forecast
through FIA. Viewing and evaluating FIA reports.

4:45– 5:00 p.m.   Review: 3.6 WORKSHOP

Thursday

8:00 – 9:30 a.m.	4.1 Workshop: **DAILY MODELING WITH CWMS**

Typical daily operations with CWMS. Evaluating and validating observed data. Typical daily model executions and precipitation scenarios, including base flow and loss rate parameter adjustments, and reservoir release overrides. Evaluation of results.

9:30 – 9:45 a.m.	BREAK

9:45 – 10:00 a.m.	Review: 4.1 WORKSHOP

10:00 – 10:45 a.m.	4.2 Lecture: **CWMS GRAPHICS CAPABILITIES**

Overview of the graphics plots available in CWMS. User interfaces for setting plot characteristics. Saving and retrieving plot characteristics using "templates". Applicability of templates to other data sets. Setting and using "default line styles" to set plot characteristics based on data parameter types.

10:45 – 11:45 a.m.	4.3 Workshop: **CWMS GRAPHICS CAPABILITIES**

Creating complex graphs. Saving and retrieving graphs characteristics in templates. Setting and using default line styles.

11:45 – 12:45 p.m.	LUNCH

12:45 – 1:00 p.m.	Review : 4.3 WORKSHOP

1:00 – 2:30 p.m.	4.4 Workshop: **OPERATIONAL DECISIONS USING CWMS**

Comparing and analyzing forecasted results. Updating forecasts as an event progresses. Troubleshooting issues.

2:30 – 2:45 p.m.	Review : 4.4 WORKSHOP

2:45 – 4:30 p.m.	4.5 Workshop: **EVENT SCENARIOS AND MODELING WITH CWMS**

Use of CWMS during a significant event. Real-time model calibration. Adding and evaluating precipitation event scenarios. ResSim reservoir operation adjustment during real-time simulations and consequences analysisusing FIA.

4:30 – 5:00 p.m.	Review : 4.5 WORKSHOP

Friday

8:00 – 8:30 a.m.	5.1 Demonstration:	**METVUE OVERVIEW**

8:30 – 9:30 a.m.   5.2 Lecture: **SCRIPTING IN CWMS**

Overview and use of scripting in the CAVI. Use of the script editor and browser. Examples of scripts including those for customized graphics. Script scheduler and automatic modeling executions.

9:30 – 9:45 a.m.   BREAK

9:45 – 10:45 a.m.   5.3 Workshop: **SCRIPTING IN CWMS**

Modifying and adding customized graphics scripts. Scheduling automatic modeling executions.

10:45 – 11:00 a.m.   Review: 5.3 WORKSHOP

11:00 – 11:30 a.m.   Critique and Post-test.