

Chapter 1

Introduction

A package of computer programs have been assembled to compute water-surface profiles and display the results on a personal computer (PC). The package is based on the HEC-2 Water Surface Profile computer program. The User's Manual provides detailed information for the HEC-2 program. This document provides installation information and presents a description of each component of the PC package.

1.1 Program Development

The HEC-2 computer program was originally developed at the Hydrologic Engineering Center (HEC) by Bill S. Eichert. The present version is the product of development involving several HEC engineers. The basic computational capabilities for calculating water surface profiles remain essentially unchanged; however, numerous supplemental capabilities have been added over the years.

In response to a high demand from both the Corps and private engineering sectors, HEC implemented HEC-2 for MS-DOS compatible microcomputers (PC) in 1984. The edit program for HEC-2 data (EDIT2) was also converted at that time. The PC program distribution started in the fall of that year. The programs were modified in 1986 to meet FORTRAN77 standards. The 1984 PC versions maintained all the capabilities of the original mainframe version of the program, except for internal trace and comment information.

In 1986 a package of programs was provided that brought together all the necessary tools to accomplish a complete computation and display of water surface profiles on a personal computer. This Training Document was developed in support of that package of programs.

The 1988 version of HEC-2 was created with a number of added features, with an emphasis on hydraulic design applications. The 1990 Version 4.6 includes error corrections 01-04 to the 1988 version, plus culvert hydraulics. Additionally, some improvements have been made to each program in the PC package.

1.2 Overview of the HEC-2 Package

Once the cross section and field information has been gathered, the basic steps for computing water surface profiles include: (1) develop a data file that represents the physical reach under study, (2) check the data file for proper format and data errors, (3) compute water surface profiles, (4) review and evaluate computed results, and (5) produce required displays of computed results. The computational process is illustrated in Figure 1. The programs provided with the HEC-2 package provide the necessary tools to accomplish all the basic steps on a PC.

Figure 1
HEC-2 Computational Process

A menu program, MENU2, has been developed to provide program users convenient access to the HEC-2 package of programs and related files, when operating a PC with hard disk storage. The menu, described in Chapter 3, eliminates repeated typing of program and filenames in order to use the programs in the package.

Text editors can be used to create and modify an input data file for the HEC-2 program. The Corps' editor, COED, has been developed with some features specifically designed around the HEC format for computer program input. COED will place the input data in the format expected for HEC-2 as the data file is created. It also has help file information on HEC-2 variables. Chapter 4 provides information on creating and editing HEC-2 input files.

Checking an HEC-2 data input file is facilitated with the EDIT2 computer program. The program provides tests for proper input sequence, format, and data ranges. Running the input data file with EDIT2 is recommended to assist in locating input errors. Chapter 5 describes the EDIT2 program, the types of error messages, and the typical corrections required.

The HEC-2 program operates with the input data file to compute the water surface profiles. The optional capabilities, provided in the program, can also be used to solve many floodplain hydraulic problems. Chapter 6 provides information on running HEC-2 on a PC.

Once the HEC-2 program has been executed, the job of reviewing the results begins. Chapter 7 describes the HEC-2 output and gives some guidelines for output review. The use of computer program SUMPO to create summary tables of results is presented in Chapter 8, and the use of computer program PLOT2 for graphical displays is presented in Chapter 9. PLOT2 duplicates most of the capabilities of the Hydraulics Graphics Package, which produces HEC-2 cross section and profile plots in interactive or batch modes on the Corps' mainframe computers.

1.3 Acknowledgments

Vern Bonner, Chief, Training Division, is the author of this document. Dan Hoggan provided document revisions for the updated 1988 versions of the programs. Some of the concepts presented were derived from training materials on HEC-2, developed over the past decade. John Peters, Richard Hayes, and Alfredo Montalvo were major contributors to those training materials.

The HEC-2 computer program was developed by Bill S. Eichert, a past Director of HEC. The program is the product of development, primarily involving those HEC engineers mentioned above. The PC version of the program was created in 1984 by Alfredo Montalvo. The 1988 version was developed by Randy Hills. The 1990 version includes culvert hydraulics added by Dodson & Associates, Houston, TX.

The SUMPO program was developed, from the HEC-2 output routines, by Al Onodera. The program was converted for the PC by Alfredo Montalvo. The menus for the current PC version of the program were developed by Keith B. Knight.

The PLOT2 program was developed by Bob Barkau. Keith B. Knight added new menus, scaling options, rating curve routines and restructured the program. PLOT2 uses plot subroutines developed by Microcompatibles, Inc.

The menu program, MENU2, was developed by Keith B. Knight. It provides convenient access to the HEC-2 package and the utilities LIST, PROUT and COED.

The PC version of COED, with full-screen edit capability, was developed at HEC by Art Pabst and Bill Charley from the command-line editor in use on the HARRIS computers in the Corps of Engineers since 1980.

The LIST program is a public domain utility written by Vernon D. Bueg, AAI Systems, Inc. The program is presently distributed as shareware with a request for a gift to support development.

1.4 Program Documentation

The primary documentation for the HEC-2 program is the User's Manual. The manual provides a complete description of the HEC-2 program capabilities, theoretical basis for computations, program input and program output. A careful review of the User's Manual should be made before using the computer program. There are no user's manuals for the EDIT2, SUMPO, or PLOT2 computer programs. This material is the only documentation for those programs.

Supplemental information is available through the following HEC publications:

Training Document No. 5, Floodway Determination Using Computer Program HEC-2
(Presents FEMA based floodway procedures in HEC-2)

Training Document No. 18, Application of the HEC-2 Split Flow Option
(Present concepts and procedure for using option to compute overflow from water surface profiles).

Training Document No. 30, River Routing with HEC-1 and HEC-2.

Technical Paper No. 20, Computer Determination of Flow Through Bridges
(Description of HEC-2 bridge hydraulics)

Technical Paper No. 69, Critical Water Surface by Minimum Specific Energy Using the Parabolic Method
(Description of the HEC-2 critical depth computation procedure)

Research Document No. 26, Accuracy of Computed Water Surface Profiles.

The supplemental material, as well as other HEC publications, is listed in the Publication Catalog; along with prices and ordering information. This free catalog is available from:

**Hydrologic Engineering Center
609 Second Street
Davis, CA 95616-4687**

HEC provides training in HEC-2 in Basic and Advanced HEC-2 courses and in a Floodplain Hydrology Course. HEC also provides user assistance for Corps offices and other federal agencies. There are several university extension short courses on the use of the HEC-2 program. A one-week course provides a good overview of the basic program capabilities.

For those unable to attend a course, there are video tapes of most lectures given in HEC training courses on HEC-2. The tapes are distributed only in the USA by a contractor, which may vary from year to year. A Video Tape Catalog with ordering information is available from HEC at no charge.

1.5 Computer Equipment Requirements

The following equipment is required to run the HEC-2 package of programs on MS- DOS microcomputers.

DOS 2.0 (or later) Operating System
450K RAM Memory available
Two 5 1/4 inch floppy-disk drive (360 KB or 1.2 MB), or
One 5 1/4 inch floppy-disk drive and one 10 MB (or larger) hard-disk drive

(NOTE: a hard-disk is required for MENU2 use)

The graphic displays from PLOT2 can be sent to the screen or an HP 7475A pen plotter. Files can also be created for use by word processors. One of the following graphics cards (or their equivalent) is required:

Color Graphics Adapter (CGS), or
Enhanced Color Graphics Adapter (EGA), or
Video Graphics Array (VGA)

The programs will take advantage of a math coprocessor (8087, 80287, or 80387) if present in your computer. This coprocessor greatly speeds up program run time and is recommended, but it is not necessary for program accuracy.

1.6 Program Distribution

Corps of Engineers offices and other U.S. Federal agencies may receive copies from HEC at no charge. Other offices may obtain the program from NTIS or a number of private distributors. A list of these private distributors is available from HEC.

A free Computer Program Catalog is available from HEC. The catalog provides a description of all available computer programs and program support information. The catalog can be ordered at the HEC address shown above.