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HEC-1 AND HEC-2 APPLICATIONS ON THE MICROCOMPUTER

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ABSTRACT

The Hydrologic Engineering Center (HEC) has developed versions of the HEC-1 Flood Hydrograph Package and the HEC-2 Water Surface Profiles programs for MS/PC-DOS compatible microcomputers (PC). The increased speed, memory and storage capacity of the latest PCs make the use of these large FORTRAN programs highly practical in the PC environment.

Typical tasks that are required when using these batch oriented programs include creating, checking and editing input data; executing the program; and summarizing and displaying the results. The HEC has developed a menu driven user interface or shell program to integrate several application programs, an editor and other utility programs to assist the user in accomplishing these tasks. The interface takes advantage of the unique capabilities and user friendliness found in the PC environment. In addition to the HEC-1 and HEC-2 programs, the integrated package includes a program (SUMPO) for creating summary tables of HEC-2 results, a program (PLOT2) that plots cross sections and water surface profiles, and a PC version of the Corps of Engineers editor (COED), which features full screen editing and on-line help screens and documentation. The application of these programs is described and demonstrated using the menu driven interface.

INTRODUCTION

The Hydrologic Engineering Center (HEC) has converted several of their engineering application programs to the microcomputer (PC). In order to take advantage of the unique capabilities of the PC and to assist the user in working with these programs, the HEC has developed menu driven, user interfaces for several of their PC application programs. This paper describes the use and features of the menu driven interfaces developed for the Flood Hydrograph Package (HEC-1) and the Water Surface Profiles (HEC-2) programs.

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HEC-1 APPLICATIONS WITH MENU1

The HEC-1 program menu interface (MENU1) allows the user to define input and output file names, create and edit input data files, run the HEC-1 program and display program output to the printer or console. The opening menu screen for MENU1, listing these choices, is shown on Figure 1.

HEC1 Package Menu	
1. Define Input/Output files	
2. Create/Edit Input file	
3. Run HEC1	
4. Display Output to console	
5. Exit to DOS	
INPUT: (specify)	OUTPUT: CON
Press number of desired option or ↑ ↓ with <ENTER>	

Figure 1. MENU1 Opening Screen

Menu options shown are selected either by using the cursor keys or by simply entering the number of the selection desired. The first choice on the menu allows the user to define input and output file names. If this choice is selected a window appears on the screen so that the user can type in the names of the input and output files. An alternative to typing in the names is to enter a question mark (?) and a directory of file names in the current directory will appear in a window on the screen. The user can then select from this directory of file names by using the cursor keys. The second choice on the menu allows the user to create a new or edit an existing input data file using the Corps of Engineers editor (COED). COED has been modified by HEC so that it will perform not only as a powerful line editor but a full screen editor as well. COED also includes extensive, easy to use on-line documentation. Additional enhancements have also been added to allow right justified data entry in 10-8 column fields and program specific variable identification and description. This latter capability will be discussed in a subsequent section. The third choice on the menu is to run the HEC-1 program. If the input and output file names have been selected, the program will begin execution using these file names. If the file names have not been specified, the program will ask for these names prior to execution. Once

the HEC-1 program has finished execution, the user is returned to the menu. The fourth choice on the menu allows the user to display the HEC-1 program output file on the screen or send the output to the printer. This choice is made by pressing the space bar to toggle between the console and the printer. A utility program is used to display the output (or any file specified) to the screen and allows scrolling up and down, right and left, searching and many other features. A program called PROUT is used to send output to the printer with carriage control recognition. The last choice on the menu returns the user to DOS.

DATA ENTRY AND EDITING USING COED

A special feature has been added to the COED program that assists the user in preparing input data for specific HEC application programs. This feature includes variable name and field location prompting, automatic tab stops and right justification of input for each variable field, checking for inappropriate (non-numeric) data entry where applicable, and cursor position sensitive input variable definitions. These features are invoked while in the full screen mode by entering the Help Program command and the name of the program for which the input data applies. When the cursor is placed on a line having a two character record ID in the first two columns, the name of the variables for that record are shown in their appropriate position at the bottom of the screen. When the cursor is on a variable position and the Help Variable command is issued, the definition of that variable appears in a window on the screen. Figure 2 illustrates this feature for the variable ITIME in field three of the IT record for the HEC-1 program.

```

*****
* IT.03 -- ITIME
*
* +      - Integer number for hour and minute of the
*         beginning of the first time interval (e.g.,
*         1645 is input for 4:45 pm).
*
*
* ---<< Press the SPACE bar to continue >>---
ID  U
ID  M
ID  25-26 NOV 1950 EVENT
IT  60 25NOV50  0600  50
IO  1  2
OU  12  34
PG  SOCAN
IN  60 25NOV50  0200
PI  0.00  0.03  0.04  0.02  0.06  0.09  0.14  0.19  0.11  0.10
PI  0.15  0.24  0.21  0.22  0.14  0.16  0.42  0.00  0.00  0.00
KKHAWLEY  MIDDLE CREEK NEAR HAWLEY GAGE
BA  78 4
BF  30  -0.1  1.01
PT  SOCAN

IT NMIN  IDATE  ITIME  NQ  NDDATE  NDTIME
Help=F1 Insert Line      Data Justify      Caps-Lk Col=24 Line=11

```

Figure 2. COED Help Program and Help Variable Feature

HEC-2 APPLICATIONS USING MENU2

MENU2 is the menu driven user interface that assists the user when making HEC-2 program applications. MENU2 is similar to the MENU1 interface described previously. It allows the user to define input and output files, create and edit input data files, and display the results. The MENU2 package also uses COED and its associated Help Program and Help Variable capabilities specifically designed for the HEC-2 program. In addition, MENU2 interfaces three supplementary programs, called EDIT2, SUMPO, and PLOT2 that can be used with the HEC-2 program to check input data, create summary tables from HEC-2 results, and plot cross sections and water surface profiles, respectively. The space bar is used from menu item three to toggle the selection of the HEC-2 program or any of these three supplemental programs. Each of these additional features are described in the following paragraphs.

CHECKING HEC-2 INPUT DATA USING EDIT2

The EDIT2 program allows the user to check HEC-2 program input data for errors prior to execution. The program uses the HEC-2 input data file as its input and checks the entire file for fatal errors, as well as possible errors and inconsistencies. The optional ED record can be specified as the first record in the input to set EDIT2 program options for listing input, output format, and change the range of elevation differences that the program checks for in the cross-sectional data. An input listing, if not suppressed, and error messages are written to the specified output file. After the results of the EDIT2 run are reviewed, COED can be used to correct the HEC-2 input data prior to execution.

CREATING SUMMARY TABLES OF HEC-2 RESULTS USING SUMPO

The SUMPO program is used to create convenient summary tables using the computed results from HEC-2 multiple water surface profile runs. The user first runs the HEC-2 program, which creates a binary file of results. This binary file becomes the input file for the SUMPO program. The SUMPO program menus, which are similar to those described for MENU2, can be used to select standard, predefined summary tables or to create user defined summary tables by selecting the variables to be displayed. User selected summary table variable lists can be stored for later use. The screen including a window for selecting standard summary tables, which appears after selecting choice 2 from the opening SUMPO menu, is shown on Figure 3.

1. Define files & printer width																				
2. Select pre-defined summary tables																				
<table border="1"> <tr> <td>Cross-section output at bridges</td> <td>100</td> </tr> <tr> <td>Four cross-section output at bridges</td> <td>105</td> </tr> <tr> <td>Encroachment data</td> <td>110</td> </tr> <tr> <td>Channel improvement</td> <td>120</td> </tr> <tr> <td>Standard summary</td> <td>150</td> </tr> <tr> <td>Floodway data</td> <td>200</td> </tr> <tr> <td>Floodway insurance zone data</td> <td>201</td> </tr> <tr> <td>Recall saved variable table</td> <td>(specify)</td> </tr> <tr> <td colspan="2">Return to previous menu</td> </tr> </table>			Cross-section output at bridges	100	Four cross-section output at bridges	105	Encroachment data	110	Channel improvement	120	Standard summary	150	Floodway data	200	Floodway insurance zone data	201	Recall saved variable table	(specify)	Return to previous menu	
Cross-section output at bridges	100																			
Four cross-section output at bridges	105																			
Encroachment data	110																			
Channel improvement	120																			
Standard summary	150																			
Floodway data	200																			
Floodway insurance zone data	201																			
Recall saved variable table	(specify)																			
Return to previous menu																				
INPUT: (specify)	OUTPUT: CON	PRINTER WIDTH: 132																		
<ENTER> to select summary table ↑ ↓ moves cursor																				

Figure 3. SUMPO Standard Summary Table Selection Menu

PLOTTING CROSS SECTIONS AND PROFILES USING PLOT2

Graphical interpretations of cross-sectional data and water surface profile computations are an effective way of reviewing HEC-2 program input and results. The PLOT2 program provides the capability of creating plots of cross sections from the HEC-2 program input and profiles of water surface elevation or any of the other variables available from HEC-2 program results written to the binary file. The plots are created by using a series of menus similar to those described for MENU2 and SUMPO. The opening menu for PLOT2 present a choice of plotting profiles, plotting cross sections or exiting the program. If plot profiles is selected, a second menu appears giving the user the choice of defining profile options, defining plotting options, plotting the profile or returning to the main menu. This Plot Profiles Menu also allows the user to specify the names of the HEC-2 program input and binary files. If define profile options is selected, an additional menu is displayed. This menu allows the user to select the variable to be plotted, whether the invert profile is to be plotted, and the starting and ending cross-section for the profile to be plotted. If the user selects the define plotting options choice from the Plot Profiles Menu, a menu is displayed that allows the definition of labels and legends, and specification of the plotting device to be used. Device choices are the color graphics adapter, the enhanced graphics adapter, or the HP 7475 pen plotter. Once the desired profile and plotting options have been selected, the user can select the begin plotting option from the Plot Profiles Menu to plot the defined profile.

The procedure for plotting cross sections is similar to that described for plotting profiles. Choice 2, plot cross-sections is selected from the PLOT2 opening menu. A second menu appears for defining cross-section and plotting options and specifying file names. The cross section options consist of whether to plot water surface, bridge geometry, n-values, encroachments or channel improvements on the cross section. The plotting option selection is for defining plot labels, grid and plotting device. An example cross-section plot is shown on Figure 4.

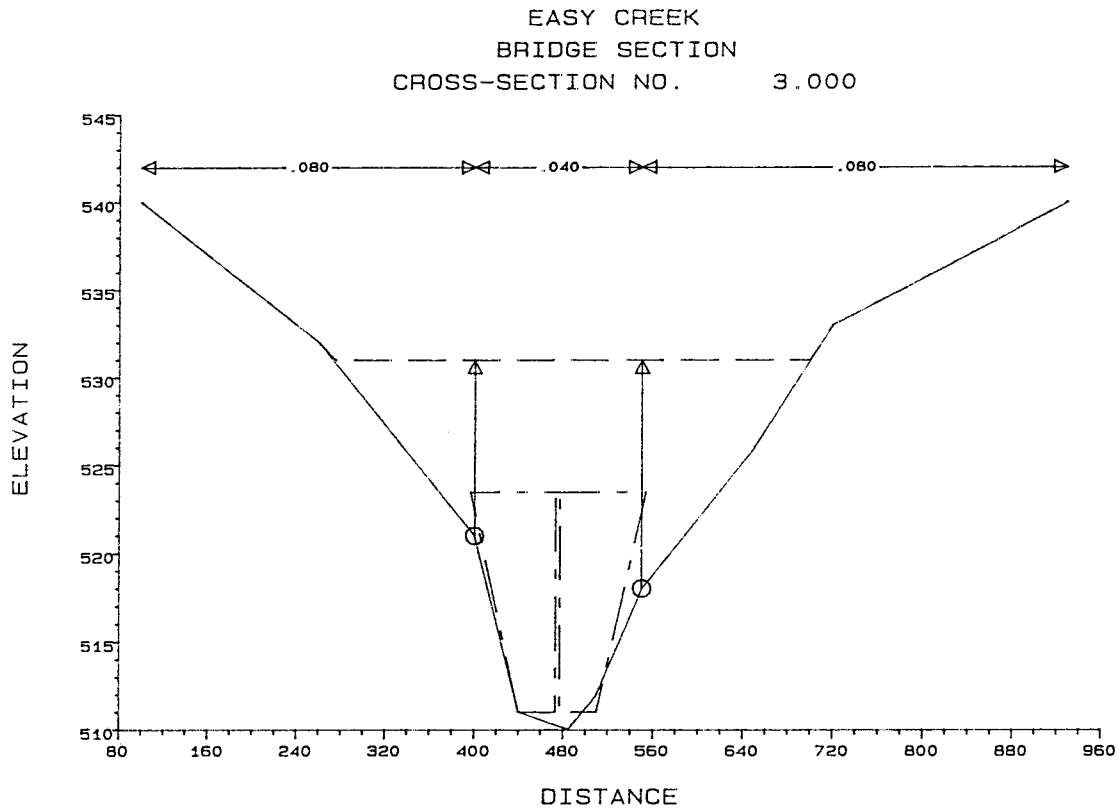


Figure 4. Example Cross-Section Plot Using PLOT2

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