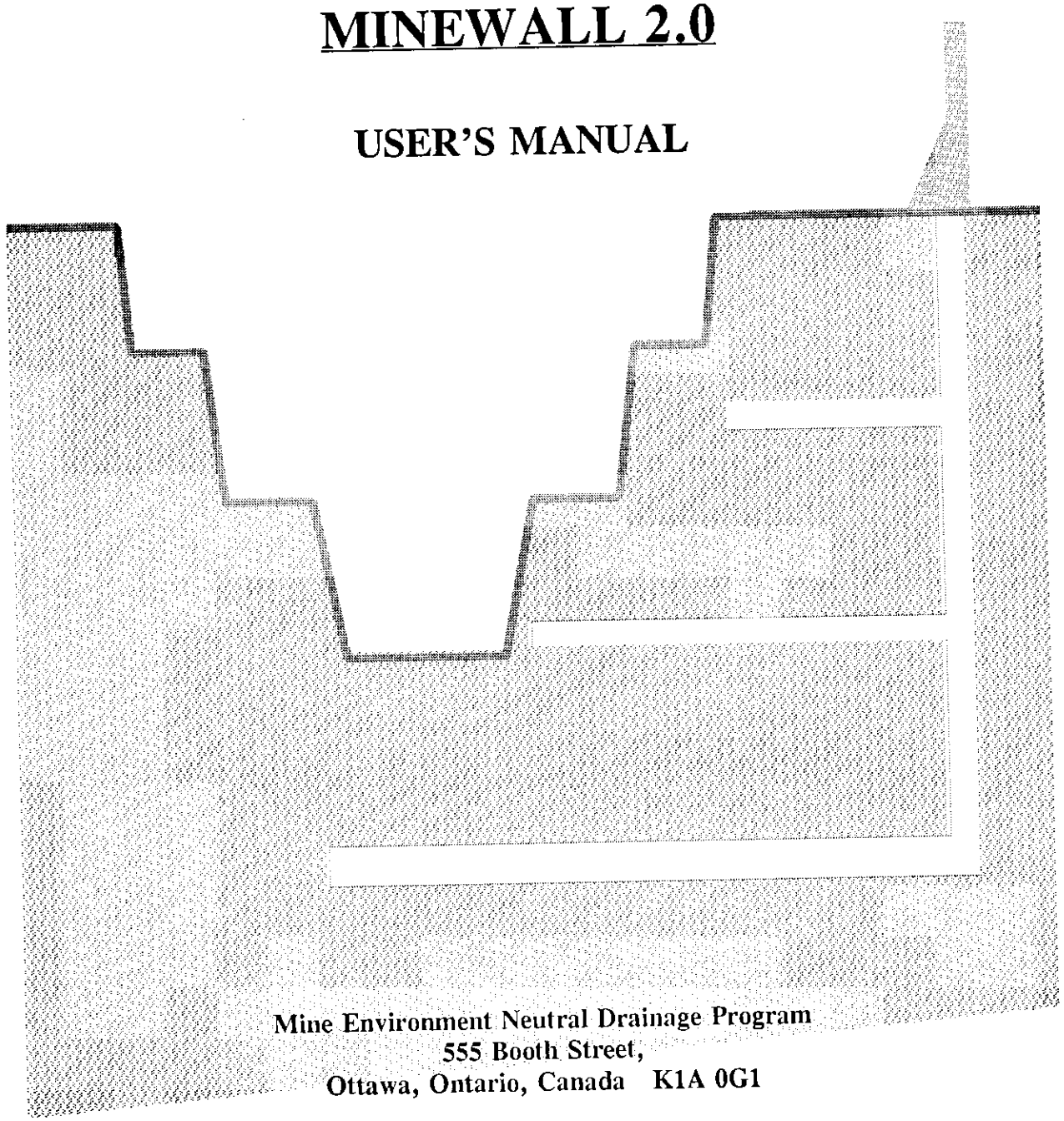
MINEWALL 2.0

USER'S MANUAL



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Latest Revision: September 11, 1995

This project was funded by the Canada/British Columbia Mineral Development Agreement through the MEND Program and the British Columbia AMD Task Force.

Additional funding was provided by BHP Minerals' Island Copper Mine and Noranda Minerals' Bell Mine.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1. INTRODUCTION

Welcome to MINEWALL 2.0! This program assists you in simulating open-pit mines or underground workings, during operation and/or closure. The fundamental objective of MINEWALL 2.0 is to provide you with a flexible tool for forecasting geochemical conditions in a mine.

In addition to this User's Manual, there are three other, related reports. The first is a literature review and discussion of the conceptual models on which MINEWALL is based. Because of all the previous work examined, MINEWALL offers you an up-to-date, organized approach for predicting water chemistry in a mine, even if you do not actually use the computer program. This underlying MINEWALL approach and its conceptual models offer guidance on which physical, geochemical, and biological data should be collected before, during, and after mining. In other words, the current value of MINEWALL to a mining company might not lie in running the computer program itself, but in designing a monitoring program to collect the data that would be needed to run it.

A second related report is the application of MINEWALL 2.0 to three mines in British Columbia. The Main Zone Pit at Equity Silver Mines was simulated with MINEWALL 1.0 and is re-simulated for comparison. BHP Canada's Island Copper Mine will be closing shortly and has completed a detailed closure plan. Noranda Minerals' Bell Mine has already closed and the pit is currently filling with water. MINEWALL has been used for refining closure options at Island Copper and for estimating future water chemistry in all three pits. This related report should be consulted if you wish to see detailed applications of MINEWALL 2.0.

A third related report is the Programmer's Notes and Source Code. This report discusses some of the more technical aspects of MINEWALL's programming and contains a listing of MINEWALL's roughly 24,000 lines of code.

Based on the aforementioned descriptions of MINEWALL's literature review, conceptual models, application, and size, it should be apparent that MINEWALL requires a great deal of data to properly simulate a mine. In reality, you can simulate a mine with very little data. For example, you can run MINEWALL at monthly, rather than weekly frequency, using one water analysis of water and published rates of geochemical reactions. The important point to remember is: if you enter data not representative of your mine into MINEWALL, do not expect MINEWALL to magically provide representative estimates. The old computer acronym is GIGO: Garbage In, then Garbage Out. MINEWALL will use whatever numbers you give it: you must decide if those numbers are appropriate.

A note about "bugs", or problems in the code, is appropriate here. The number of bugs in a program, and the frequency that they appear, depends on how often the program is run. For example, some bugs might only appear on average once every tenth run; others once every thousandth run. Some bugs may only appear when a user enters an unexpected series of input data. In any case, MINEWALL will in theory never be free of bugs, but we have eliminated the most frequently appearing ones. If you are unfortunate enough to encounter a bug, please tell us about it and send any input data you saved. The address and phone number are listed in Chapter 6. Please keep in mind that MINEWALL 2.0 has been overdesigned for most existing PC's (some simulations can require over 50 Mb of extended memory!) and an apparent bug may actually be a limitation in a particular PC. MINEWALL warns you of some potential problems when you start it.

We can offer no warranty on MINEWALL code or its results, but we can ensure you we are committed to providing a high-quality tool for the prediction of minewater chemistry. We will have accomplished our primary objective if MINEWALL 2.0 guides you and saves your time in obtaining a minewater prediction.

2. INSTALLING MINEWALL ON A PC COMPUTER

For MINEWALL 2.0 to run, a PC must contain the following hardware and software:

✓ *an 80386 or higher processor,*

✓ *extended memory with at least 1 Mb free,*

✓ *a hard disk with at least 10 Mb free, and*

✓ *DOS 3.3 or higher.*

If you are not sure your PC meets these requirements, MINEWALL will inform you when you try to run it. If you have an *80286 processor*, please contact Mr. Carl Weatherell (see Chapter 6) to get an 80286 compatible copy of MINEWALL.

In addition to the previous requirements, MINEWALL is easier and faster to run if you have the following optional equipment:

✓ *a numeric coprocessor (80387 or higher),*

✓ *a color monitor, and*

✓ *a mouse.*

MINEWALL 2.0 is not a Windows-based program and does not require Windows to run. It can run in a DOS windows under the Windows operating system; however, this is not recommended since Windows uses some lower memory that MINEWALL needs for optimum performance.

MINEWALL 2.0 is supplied on one high-density 3.5" floppy disk. To install MINEWALL, just use the Install Program:

❶ *Place the MINEWALL floppy disk into the disk drive (Drive A: or B:, assume A:)*

❷ *Type* A: *and then press the <ENTER> key*

❸ *Follow the instructions provided by the Install Program, installing all files to a subdirectory on the hard drive.*

The Install Program copies several files to your hard drive:

❶ *the MINEWALL executable file (MW20.EXE),*

❷ *the MINEWALL on-line help file (MW20.HLP),*

❸ *the MINEWALL stand-alone help program (MW20HELP.EXE), and*

❹ *sample input-data files with the extension MW2.*

3. AN INTRODUCTORY RUN OF MINEWALL

After installing MINEWALL (Section 2), an initial run of MINEWALL is informative and satisfies initial curiosity about the program. The Install Program should have left you in the MINEWALL subdirectory, MW20. If not, type CD\MW20 and then press <ENTER>. If you did not use the default subdirectory name of MW20, then replace MW20 with your choice in the CD command.

Type MW20 and press <ENTER>. MINEWALL first notifies you that it is searching for a mouse and whether it finds one. If MINEWALL fails to operate at this point or at a later time, the most likely cause is insufficient amount of lower RAM memory. If you are attempting to run MINEWALL under Windows, leave Windows and run MINEWALL directly from DOS. If this still does not work, the most likely problem is TSR (terminate-and-stay-resident) programs, such as network and disk-compression software, which can deny MINEWALL the lower memory it needs and prevent MINEWALL from even running. In this situation, you will have to temporarily remove the TSR programs while you are running MINEWALL. Removal of TSR programs may require adjustments to your AUTOEXEC.BAT and CONFIG.SYS files and the assistance of a knowledgeable computer user.

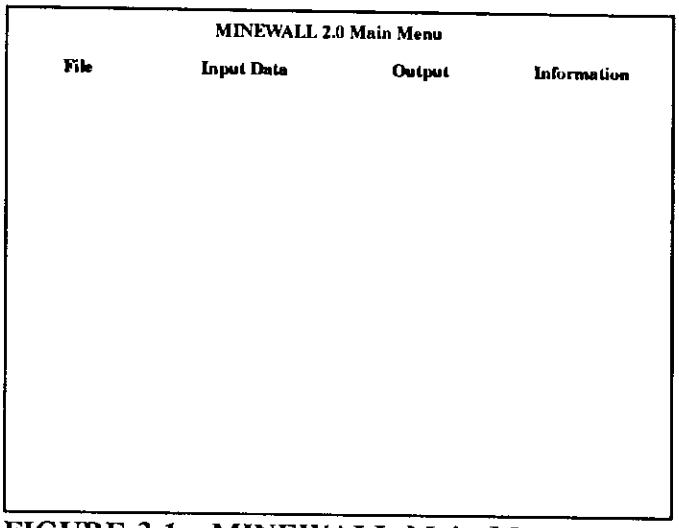

FIGURE 3-1. MINEWALL Main Menu.

If MINEWALL loads properly and determines whether a mouse is present, then a welcome/information message is displayed. To move on, position the mouse pointer over the OK button and press the left mouse button, or just press the <ENTER> key on the keyboard. The next message reports on the amount of free extended (XMS) memory and indicates the type of simulations you may be able to do with that amount of free XMS. MINEWALL requires at

least 1 Mb of free XMS. Again, click the OK button with the mouse or press the <ENTER> key. The next message reports on the amount of free storage on the default hard disk. MINEWALL requires at least 10 Mb of free disk space, and significantly more if you are planning on a long simulation at a weekly frequency. Clicking once more on the OK button or pressing <ENTER> will finally reveal MINEWALL's Main Menu (Figure 3-1).

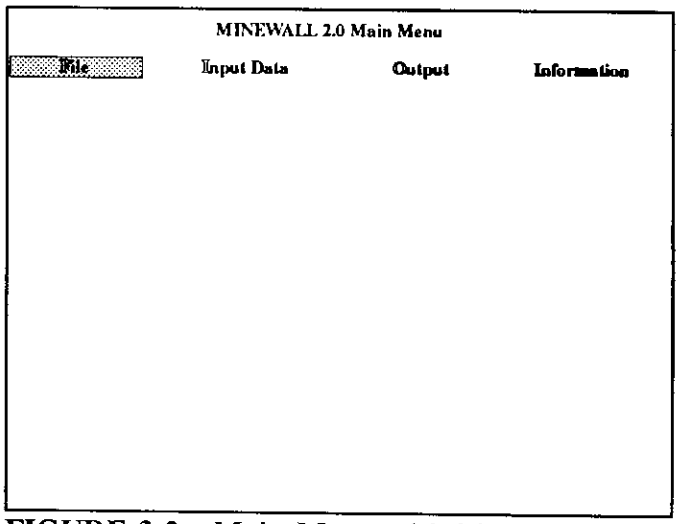

FIGURE 3-2. Main Menu with highlighted short-cut letters after the <ALT> key is pressed.

The Main Menu is the central hub of MINEWALL from which all input data, simulations, and output are controlled. The Main Menu has four choices along the top: File, Input Data, Output, and Information. Vertical submenus will appear under each of these if you select one by either (1) moving the mouse pointer over it and clicking the left mouse button or (2) pressing and releasing the <ALT> key and then pressing the letter that is highlighted (such as F for File, Figure 3-2) or (3) pressing and releasing the <ALT> key and then using the left and right arrow keys to highlight your choice and then pressing the <ENTER> key. For this introductory run, choose File.

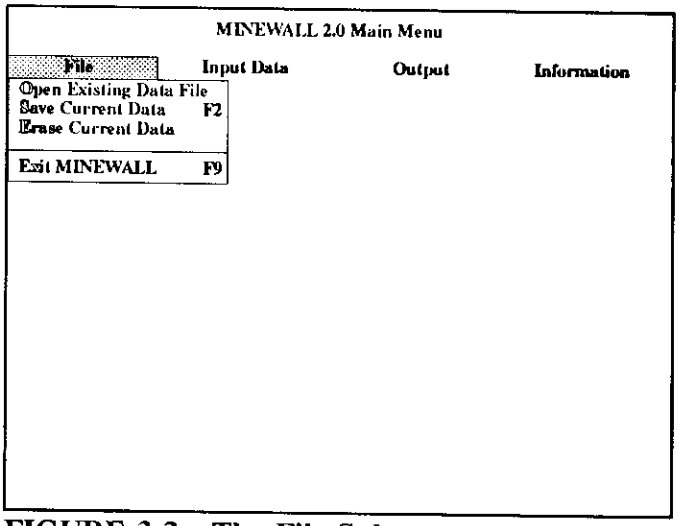

FIGURE 3-3. The File Submenu.

The File submenu appears (Figure 3-3) and contains the choices of Open Existing Data File, Save Current Data, Erase Current Data, and Exit MINEWALL. Select Exit MINEWALL

by clicking on it with the mouse, moving the down arrow key until it is highlighted and then pressing <ENTER>, or by simply pressing the X key. If the submenu is not showing, Exit can also be chosen by pressing the F9 key as indicated on the right side of Exit MINEWALL.

After selecting Exit, a screen appears and asks if you are sure you want to Exit. Select No by clicking on it with the mouse, holding down the <ALT> key and pressing N, or by pressing the <TAB> key once and then pressing <ENTER>. This returns you to the Main Menu.

Now select Information from the Main Menu and examine one or more of the choices from this submenu (Figure 3-4). When you are done, select Input Data (Figure 3-5). Notice that all except one choice is disabled (grayed or "washed out" in appearance). Only Title, which allows the entry of a title one or more lines long and asks whether a pit or underground mine will be simulated, is enabled. Select Title by clicking on it with the mouse, pressing <ENTER>, or

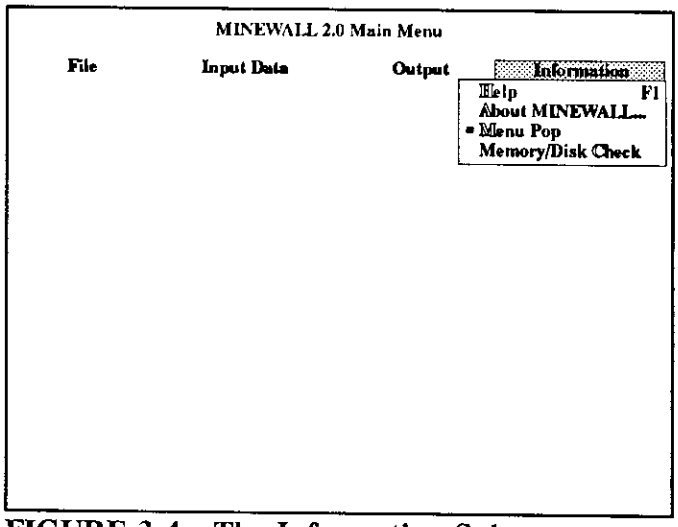

FIGURE 3-4. The Information Submenu.

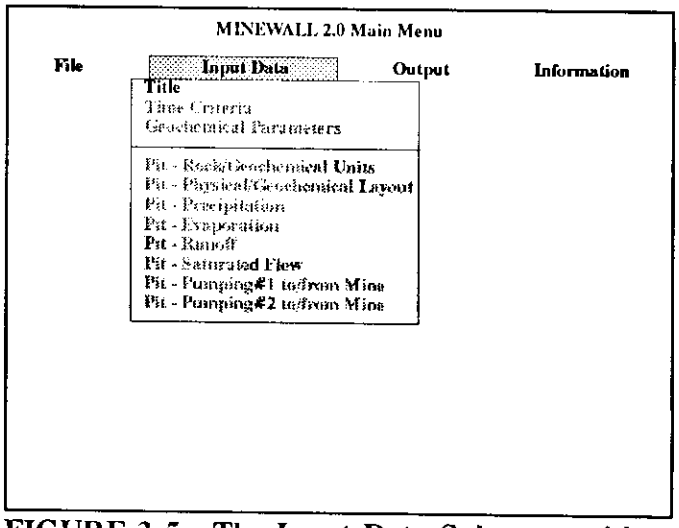

FIGURE 3-5. The Input Data Submenu with the Title selection enabled.

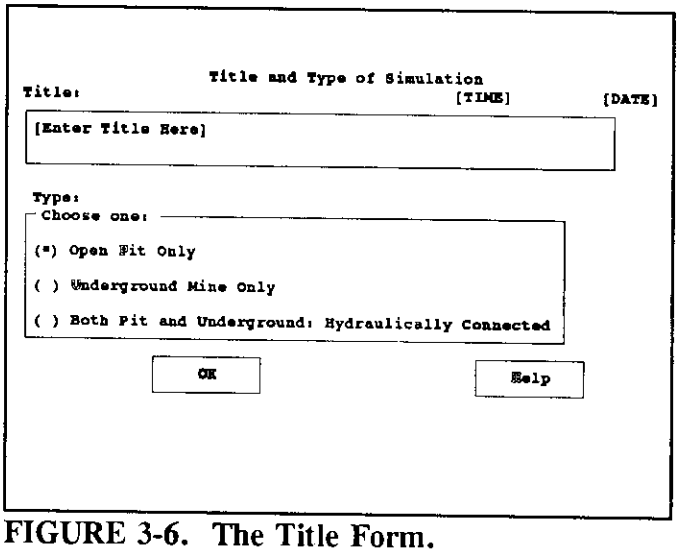

FIGURE 3-6. The Title Form.

pressing T. The Title Form will appear (Figure 3-6).

The cursor will lie within the text box called "Title" (in Figure 3-6, it contains the words: Enter Title Here). This means you can type a sample title for a simulation. If you want more than one line in the title, just press <ENTER> at the end of each line. When you are finished, click on the OK button, or press and release the <ALT> key and then press O, or press the <TAB> key until the OK button is highlighted and then press <ENTER>.

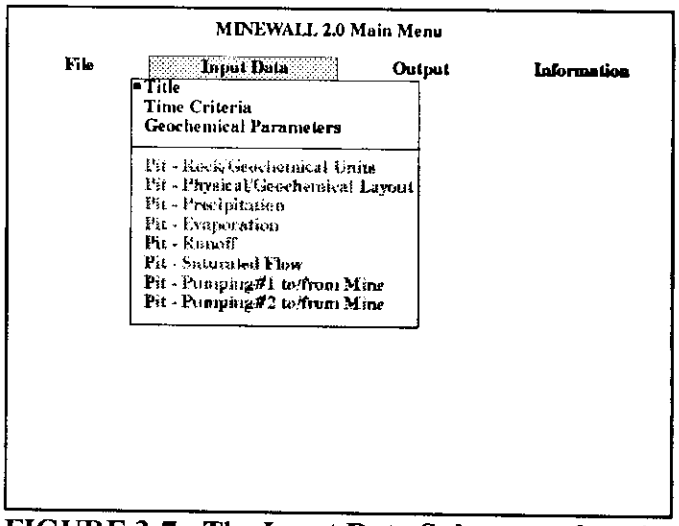

FIGURE 3-7. The Input Data Submenu after the Title Form has been completed.

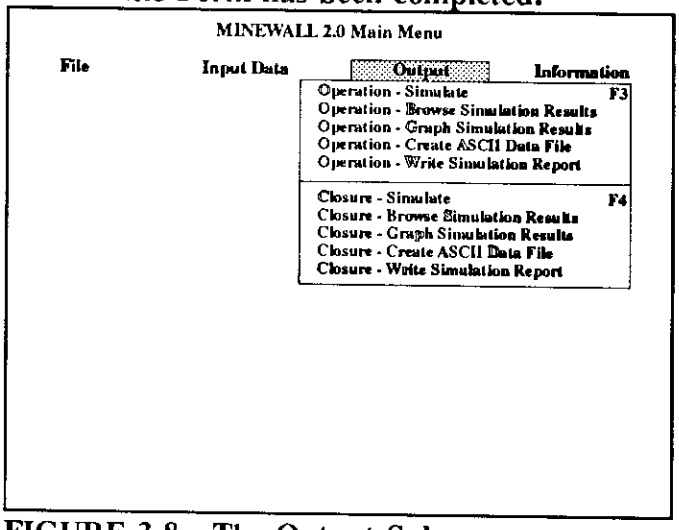

FIGURE 3-8. The Output Submenu.

Once you do this, the Input Data submenu reappears, but now two more choices have been enabled and can now be selected (Figure 3-7). Notice also that the Title choices has been "checked" with a small mark on the left side, indicating you have already completed the requirements under Title. Also, if you selected Underground Mine in the Title Form, other selections will begin with "U/G" rather than "Pit".

In this way, MINEWALL guides data entry in the proper order and reminds you which choices have been completed. If you were to complete the two newly enabled selections (Time Criteria and Geochemical Parameters), more choices would be enabled until all choices required for a simulation were enabled. Once you have completed all enabled choices and "check" marks appear to the left of them, you could perform a simulation under Output at the top of the Main

Menu (Figure 3-8).

Instead of proceeding with data entry, select File from the top of the Main Menu (Figure 3-3). (You may have to press the <ESCAPE> key to first hide any submenus that are showing.) Then select Load Existing Data File. A screen will appear listing all data files in the default directory with the extension "MW2" (Figure 3-9). You can examine other directories and disks from this form by selecting them from the form, and you can obtain a list of other files in the default directory by changing the default File Name (such as to *.*). The vertical scroll bars will assist you in browsing through lists of files and subdirectories. Also, the downward pointing arrow on the right side of "[C:]↓" indicates a "combo box" which will display a list of available choices.

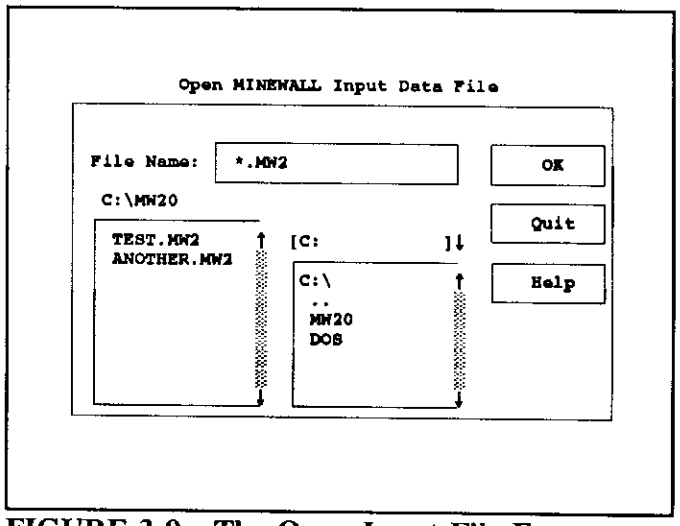

FIGURE 3-9. The Open Input File Form.

For this introductory run, select TEST.MW2 from the list of files by (1) double-clicking on it, (2) clicking once on it then clicking on OK, (3) pressing the <ALT> key and then O, or (4) by pressing the <TAB> key until OK is highlighted and then pressing <ENTER>. This will cause MINEWALL to load the data file into memory. Now select Input Data from the top of the Main Menu: you will see all choices for a pit have been enabled and "checked" (Figure 3-10). This means data entry is complete and a simulation can be run. However, this is the end of

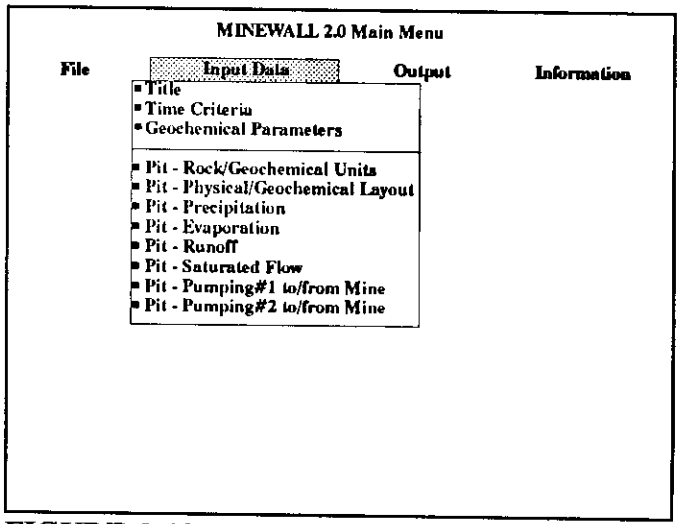

FIGURE 3-10. The Input Data Submenu with all selections completed for a pit simulation.

the introductory run, so select Exit MINEWALL from the File submenu and terminate the program.

Before continuing with MINEWALL, you should be familiar with some technical and software terminology in order to understand the detailed instructions in Chapter 5. Chapter 4 explains this terminology and provides detailed instructions on using MINEWALL. You should review Chapter 4.

4. IMPORTANT POINTS TO KNOW BEFORE USING MINEWALL

MINEWALL is a computer-based tool to assist you in predicting water chemistry in pits and underground workings during and after operation. To use MINEWALL correctly, you therefore must understand the terminology behind both the software and the scientific approach. If you do not understand the terminology, you may enter faulty information into MINEWALL, which in turn will produce faulty forecasts of water chemistry. You should work through Chapter 3, if you have not already done so, before continuing here.

4.1 Important Software Terminology and Controlling MINEWALL Operation

MINEWALL 2.0 is a product of *object-oriented programming*. This essentially means that a user controls the direction and rate of program execution through *objects*. For the purpose of this manual, the important objects are: (1) *forms* and their *controls* and (2) *spreadsheets* and their *controls*. As a user of MINEWALL, you will more often encounter forms than spreadsheets.

A form is a general term to describe any sort of text-based box that is displayed on a computer monitor. All ten diagrams reproduced in Chapter 3 are forms in MINEWALL. Each form has one or more controls that allow you to make a selection or enter information. For example, the Title Form (Figure 3-6) contains several controls: a *text box* in which a multi-line title can be entered, a set of *option buttons* from which you can only select one (pit or underground), and *command buttons* (OK and Help). If you were to immediately select the OK command button after entering the Title Form, the form would disappear and the Main Menu would reappear. Of course, you could again select Title from the Input Data Submenu, and edit what had been previously entered.

There are several different controls used in MINEWALL (Table 4-1). You should have a basic understanding of them before using the program.

Table 4-1
Important Controls to Operate MINEWALL Forms

Check boxes	A series of check boxes allow a user to select one or more items from the list; for example, see the Geochemical Parameters Form in Section 5.3.3. A choice is selected by clicking on it with a mouse, highlighting it with the <TAB> key and pressing <ENTER>, or holding down the <ALT> key and pressing the highlighted short-cut letter (if present). Unlike check boxes, a list of option buttons (see below) will only allow one selection.
Combo boxes	A combo box appears as "[ ]↓" on a form, sometimes with text between the brackets; for example, see the Save/Open File Form (Figure 3-9). A list of choices is provided by clicking on the down arrow or by selecting the brackets with the <TAB> key and holding the down arrow key. For MINEWALL, all combo boxes are of the type known as "drop-down list boxes", which means that only choices provided in the dropdown list can be selected.
Command buttons	A command button in MINEWALL causes some action external to the current form to occur. MINEWALL buttons are usually labelled "OK", which causes the form to disappear while saving information entered on the form, "Quit", which causes the form to disappear without saving information, and "Help", which displays on-line help. MINEWALL buttons are usually located along the bottom or right margin of a form; for example, see the Title Form (Figure 3-6). An "OK" command button is selected by clicking on it with a mouse, or by using the <TAB> key to highlight it and then pressing <ENTER>, or by holding down the <ALT> key and pressing O.
Menus	A menu provides a graphical list of choices. The only menu in MINEWALL is the Main Menu with the accompanying pulldown submenus. The Main Menu is discussed and shown in Chapter 3, including several methods for selecting a menu item.
Option buttons	A series of option buttons allows a user to select only one item; for example, the pit/underground buttons on the Title Form (Figure 3-6). One button in a list can be selected by clicking a mouse on it, pressing the <TAB> key until one button is highlighted and then using the arrow and <ENTER> keys to choose one, or by holding down the <ALT> key and pressing the highlighted short-cut letter (if present). Unlike a list of option buttons, a list of check boxes permits multiple choices.

Table 4-1 (continued)

Scroll bars	These bars, oriented vertically and/or horizontally, allow you to move rapidly through a list or table of information; for example see the Save/Open File Form (Figure 3-9). The bars are activated by clicking on the adjacent arrows to scroll one row/column at a time or by moving the highlighted box along the bar to scroll several rows/columns at a time.
Text boxes	An open box which allows the entry of any type of text (characters and numbers) in MINEWALL is a text box; for example, the text box for the Title (Figure 3-6). Most text boxes in MINEWALL are relatively small and are designed for entering numbers. An adjacent label will always describe the information to be entered into a text box. (If alphabetic characters are entered into a text box expecting numbers, a default value of zero will be assigned.)

In addition to forms, data are entered into MINEWALL through a spreadsheet (Figure 4-1). The MINEWALL spreadsheet is a Lotus 123 look-alike, although values for a cell cannot be calculated from other cells or formulae. Nevertheless, the spreadsheet is more convenient than a text form for entering columns and tables of data.

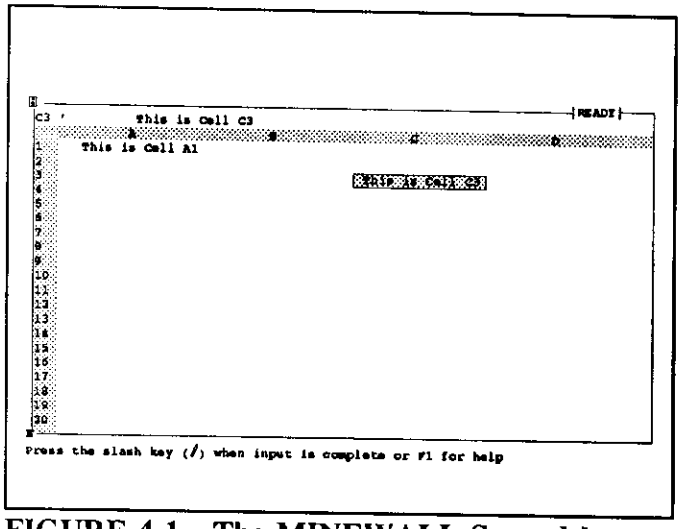

FIGURE 4-1. The MINEWALL Spreadsheet.

To enter information into a spreadsheet cell, the "cell highlighter" must be positioned over the cell. Movement of the cell highlighter around the spreadsheet can be controlled by either a mouse or keyboard (Table 4-2). Keyboard control includes a few function keys such as F1 for help, F2 to edit the contents of a cell instead of retyping all characters, and F5 to jump immediately to ("go to") a particular cell. Figure 4-2 shows an example of the Precipitation Spreadsheet (Section 5.3.6) with one cell filled in with 0.1 m of precipitation for the month of April in 1970.

The spreadsheet usually asks for numbers, although there are a few times when text is requested, such as typing in "Bottom of Mine" under Physical/ Geochemical Layout (Section 5.3.5). The spreadsheet indicates what information it wants by listing column and row headers in Column A (the leftmost column) and Rows 1 and 2 (the two uppermost rows). You should enter data in the cell at the intersection of each labelled column and row. If an alphabetic character is entered where a number is needed, MINEWALL will use a default value of zero after the spreadsheet is terminated with the / key.

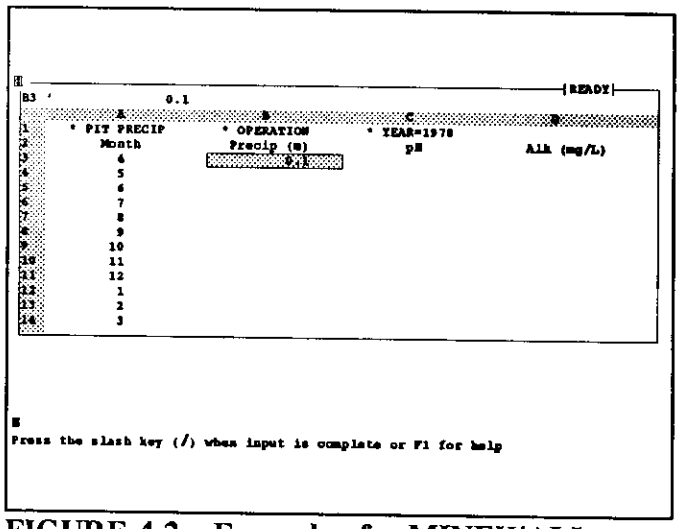

FIGURE 4-2. Example of a MINEWALL Spreadsheet with one cell filled.

Table 4-2
Important Controls to Operate the MINEWALL Spreadsheet

Keyboard Controls	
<ENTER> key	This indicates all information for the highlighted cell has been entered on the input line above the column names ("A", "B", etc.), and the information is visually placed into the highlighted cell. You can then move the cell highlighter to another cell or press F2 to edit the information you just entered.
/ key	The "/" key indicates you have completed the spreadsheet and are ready to continue program operation. If you inadvertently press this key before you are done, return to the spreadsheet by selecting the appropriate choice from the Main Menu, and then choose to edit the partial data or begin with a cleared spreadsheet.
Arrow keys (left, right, up, down)	The arrow keys move the cell highlighter to the adjacent cell in the desired direction. (For the effect of holding down the <CTRL> key while pressing the left or right arrow keys, see TAB key below.)

Page-Up and Page-Down keys	These page keys move the cell highlighter vertically up or down one page at a time.
TAB and <SHIFT> TAB (or <CTRL> Left arrow and <CTRL> Right arrow)	These keys move the cell highlighter laterally left and right one page at a time.
Home key	This sends the cell highlighter to the top left corner (Cell A1) of the spreadsheet.
F1 key	This activates the on-line help screens.
F2 key	This permits active editing of the highlighted cell on the line above the column names ("A", "B", etc.)
F5 key	This will allow the entry of a cell address (e.g., C4) to which the cell highlighter immediately jumps after pressing <ENTER>
Mouse Controls	
Any cell	The cell highlighter will jump to any cell on which the mouse pointer is placed after the left mouse button is clicked.
H and E "hot spots"	These two "hot spots" are located in the upper left and lower left of the page and are highlighted in red on color monitors. By moving the mouse pointer over the "H" hot spot and clicking the left mouse button, you will move the cell highlighter as described above for the Home key. Clicking on the "E" hot spot will move the highlighter to the bottom page of the spreadsheet (not available from the keyboard).
/ "hot spot"	This hot spot terminates the spreadsheet and is equivalent to pressing the "/" key as described above.
Upper and lower double-lined borders of a page	Clicking the mouse on these double-lined borders will move the highlighter vertically up or down one page, equivalent to the Page-Up and Page-Down keys described above. Additionally, the highlighter is moved laterally to the column above/below where the mouse was clicked.
Left and right double-lined borders of a page	Clicking the mouse on these double-lined borders will move the highlighter laterally to the left and right one page, equivalent to the TAB and <SHIFT> TAB keys described above. Additionally, the highlighter is moved vertically up/down to where the mouse was clicked.

4.2 Important MINEWALL Terminology

In addition to the software terminology, there are important technical terms which you should understand. These terms have specific meanings in MINEWALL. They have already been defined and discussed in the Literature Review under the MINEWALL conceptual models, and are only briefly reviewed here.

In MINEWALL 2.0, *Operation* and *Closure* are simple, functional terms with no economic or regulatory implications. Operation begins at the time when a pit or underground working attains a relatively static size and configuration for an extended period of time. Operation ends when active dewatering ceases. All, or only a portion, of Operation can be simulated, or Operation can be ignored completely. However, the simulation of the portion of Operation for which there are already monitoring data at an operating mine is valuable in calibrating MINEWALL to the site. This is discussed further in the MINEWALL report on the application of the program to three minesites and the literature review.

Closure begins immediately at the end of Operation and extends indefinitely into the future. MINEWALL 2.0 can simulate Closure as far as the Year 2460, or Closure can be ignored entirely.

A *Geochemical Parameter* is one of the 37 elements, ions, titration-based measurements, and gases included in MINEWALL 2.0. These 37 parameters are listed on the Geochemical-Parameter Form (Figure 4-3) and discussed further in Section 5.3.3.

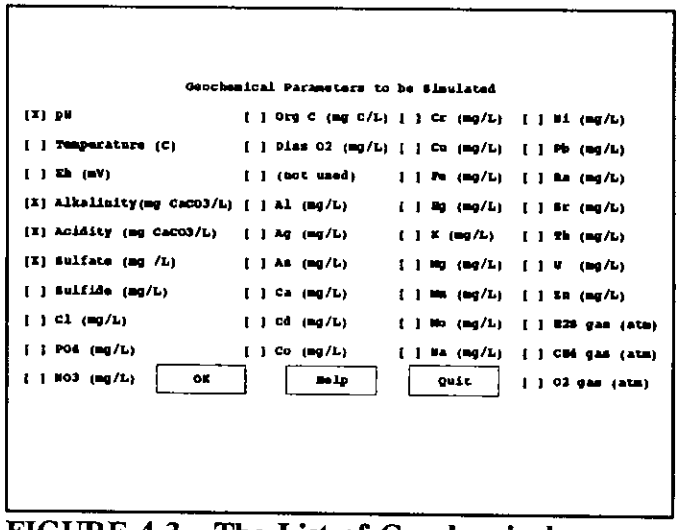

FIGURE 4-3. The List of Geochemical Parameters in MINEWALL 2.0.

A *Geochemical Unit* is a geochemically homogeneous zone of rock exposed on the walls of, or piled in, a pit

or underground working. From a geologic perspective, a Geochemical Unit can be thought of as a Rock Type, but in reality a Geochemical Unit can also be a portion of a Rock Type or a set of Rock Types. MINEWALL 2.0 allows up to 10 Geochemical Units in a simulation.

During Closure, a *Layer* is a user-defined horizontal portion of ponded water in a pit or underground working with distinct geochemical reactions and controls. For example, a filling pit may have a basal Layer whose chemistry is regulated by Sulfate-Reducing Bacteria and whose volume is controlled by inflow of deep groundwater, while the uppermost Layer is designated to receive all chemically-dilute precipitation and runoff. Due to lower-RAM memory constraints, MINEWALL 2.0 allows only one layer. During Operation, the mine Bottom with its sump(s) is considered Layer 0. During Closure, the flooded portion of the mine is Layer 1.

Armed with this terminology, you are ready to conduct a simulation with MINEWALL 2.0. The following Chapter explains the procedures for entering data, conducting a simulation, and examining the output results.

5. DETAILED INSTRUCTIONS FOR MINEWALL

Like most programs for simulating environmental systems, MINEWALL has three basic steps: the entry of input data, the simulation, and the examination and manipulation of output results. Chapter 3 of this Manual provides a basic explanation of MINEWALL's handling of these three steps, and you should carefully review Chapter 3 while running MINEWALL before continuing here. Chapter 4 provides a detailed discussion of important terminology and the manner in which a user moves through MINEWALL, and you should again carefully review Chapter 4 before continuing here.

The aforementioned three steps can be depicted in a "flowchart" graphically showing each step divided into subtasks for simulations of open pits and underground workings (Figure 5-1). Each of the subtasks corresponds to a selection from the Main Menu, which was discussed in Chapter 3. The remainder of this Chapter contains detailed descriptions and helpful hints for each of the subtasks/selections.

5.1 On-line and Stand-alone Help Facilities

When any form or spreadsheet is showing, you can obtain on-line help by pressing the Help command button if one is showing or by pressing F1 if a Help button is not showing. Help can also be accessed from the Main Menu under the Information Submenu (Figure 3-4). Help displays a form through which you can browse with the mouse or keyboard as explained in Chapter 4.

MINEWALL's on-line help is "hypertext", which means that you can jump from one topic to another by selecting the "links" surrounded by triangles, such as ◂Exit MINEWALL▸. Consequently, you should locate such links by browsing through a help screen and selecting one if you are interested in it. However, MINEWALL is memory constrained (see the Programmer's Notes and Source Code for more details) and there is little memory available to show several help topics. This is a concession made during the programming to optimize the execution of MINEWALL. Therefore, you should pick no more than three topics at any one

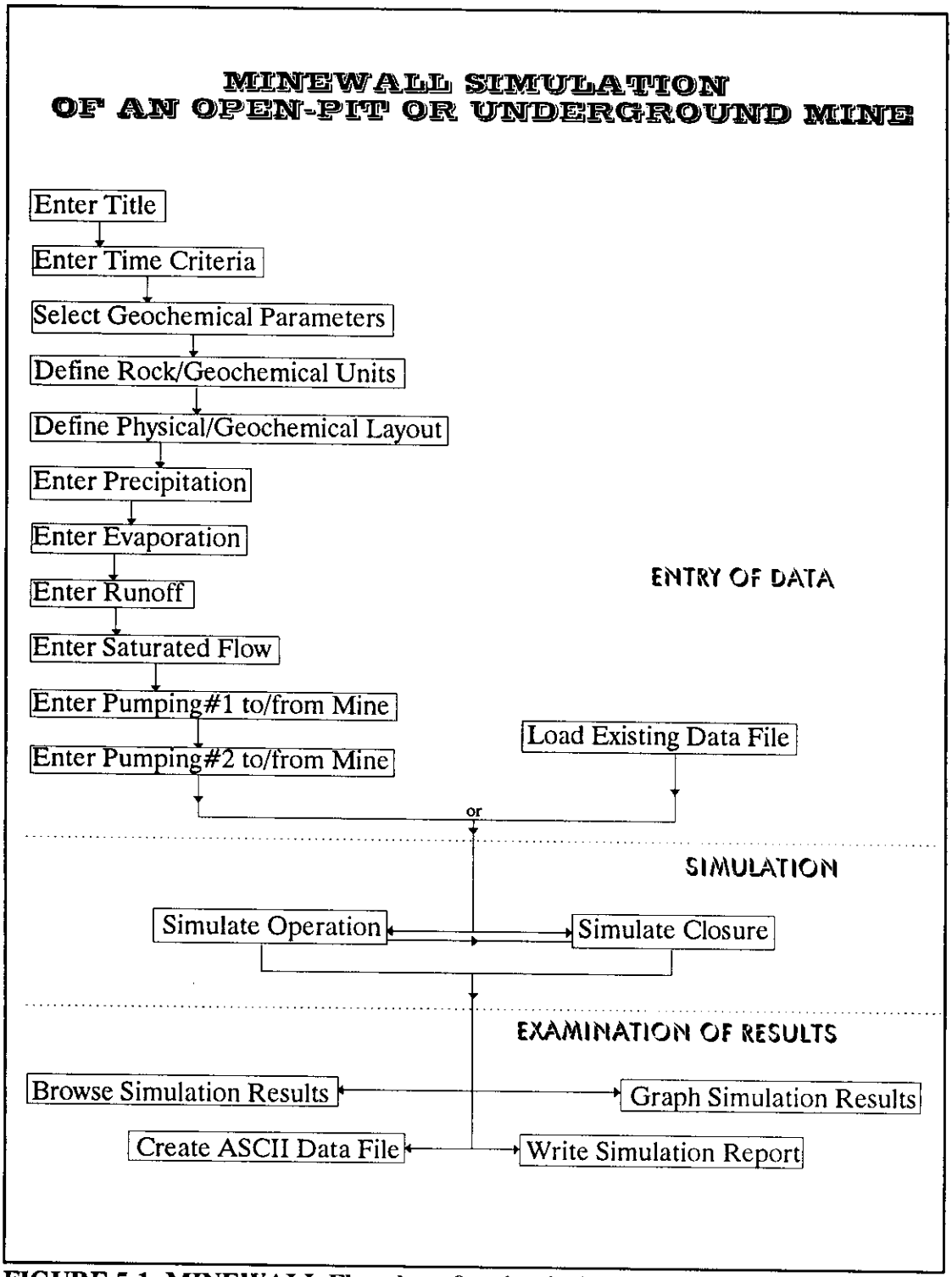

FIGURE 5-1. MINEWALL Flowchart for simulating an open-pit or underground mine.

time without quitting on-line help; you can then immediately re-enter help to view additional topics. Otherwise you may encounter an "Out of Memory" error, MINEWALL will terminate, and the DOS prompt will be displayed.

☞WARNING: Because of potential "Out of Memory" problems, save your input data often, as you enter it.

There are three ways to terminate on-line help. You can click on the Quit command button with a mouse, press the <ESCAPE> key, or hold down the <CTRL> key and press F4.

If you want to casually browse through the many MINEWALL help screens, exit MINEWALL (Section 5.2.4) and use the enhanced, stand-alone help program called MW20HELP which is installed with MINEWALL 2.0 (Chapter 2). At the DOS prompt, type MW20HELP and press <ENTER> to start the stand-alone program. There are no memory limitations with MW20HELP, so you can browse from topic to topic as much as you like.

Stand-alone MW20HELP provides four command buttons to enhance your browsing of help. The buttons and their functions are:

Search - opens a dialog box that lists all available Help topics. Select a topic from the list box and press ENTER.

Back - jumps to the last Help topic viewed.

History - lists the last 20 Help topics viewed. Jump to a topic by selecting from the list box and pressing ENTER.

Copy - Copies the contents of the current Help topic into an edit area. Select the text you want copied to the Clipboard and choose Copy. Choosing Copy without selecting any text in the edit area copies the entire Help topic to the Clipboard.

5.2 The File Submenu

As explained in Chapter 3, this submenu (Figure 3-3) of the Main Menu (Figures 3-1 and 3-2) contains four choices: Load Existing Data File, Save Current Data, Erase Current Data, and Exit MINEWALL. Chapter 3 describes the various ways to choose one of these selections with a mouse or various keyboard options.

5.2.1 Open Existing Data File

This selection from the File Submenu (Figure 3-3) allows a user to retrieve previously saved MINEWALL input data (Section 5.2.2). Upon selecting this choice, a form (Figure 5-2) with various command buttons labelled OK, Quit, and Help, text/list boxes containing lists of subdirectories and files with vertical scroll bars, a text box for a file name to load, and a combo box with a hidden list of available hard and floppy drives. If you are not familiar with command buttons and text boxes, review Chapter 4 before proceeding.

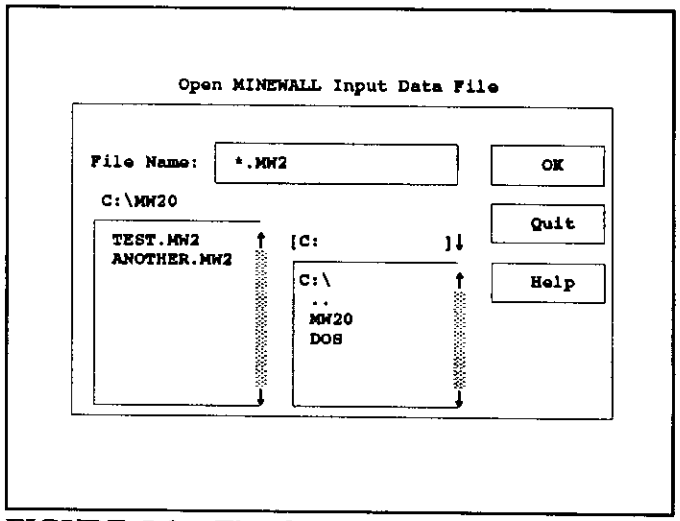

FIGURE 5-2. The Open Input Data File Form.

The default file extension for MINEWALL input data files is "MW2" and thus the form initially searches for any file(s) with this extension in the default subdirectory on the default drive. However, you can use any extension (or even not use one) to save the data file (Section 5.2.2) if you wish, as long as you remember it.

To search for files with other extensions, move to the text box containing the file name (initially "*.MW2") and then change "MW2" to the extension of interest. To search for a particular file, you can also change the wildcard ("*") to the actual name of the file. To check all file names, change the file name to "*.*". To search another subdirectory, choose one from the box containing their names. Depending on where you are in the subdirectory structure, you

may have to choose ".." to return to a higher level. To search another drive, activate the combo-box list stating your current drive.

When you have selected the file to open, press the OK command button. Alternatively, you can double-click the mouse on the file name if it appears in the file list. If you decide not to open a file, select the Quit button.

5.2.2 Save Current Data

Like Open Existing Data File (Section 5.2.1), this selection displays a form (Figure 5-3) with various command buttons labelled OK, Quit, and Help, text/list boxes containing lists of subdirectories and files with vertical scroll bars, a text box for a file name to save, and a combo box with a hidden list of available hard and floppy drives. If you are not familiar with command buttons and text boxes, review Chapter 4 before proceeding.

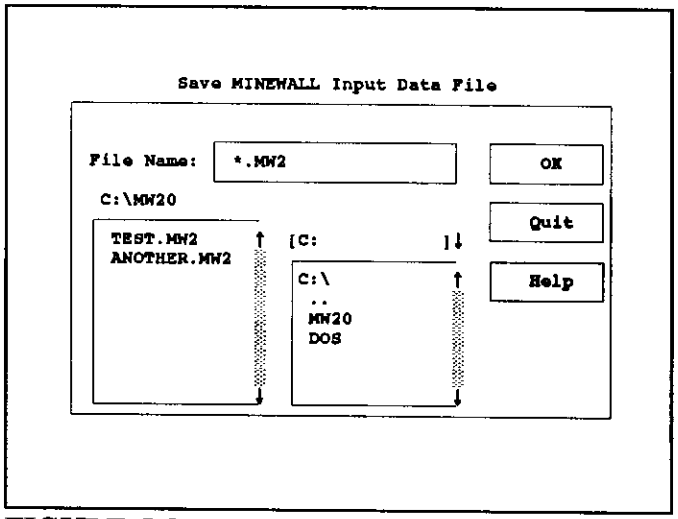

FIGURE 5-3. The Save Current Data Form.

The default file extension for MINEWALL input data files is "MW2" and thus the form initially searches for any file(s) with this extension in the default subdirectory on the default drive. However, you can use any extension (or even not use one) to save the data file if you wish, as long as you remember it so you can open it later (Section 5.2.1).

If the file name you have selected does not exist in the displayed file list, move to the text box and type in the file name. If you wish to save the data under an existing file name, type the name in the box or choose it from the file list. To search for an existing file name in another subdirectory, choose one from the box containing their names. Depending on where you are in the subdirectory structure, you may have to choose ".." to return to a higher level. To

search another drive, activate the combo-box list stating your current drive.

When you have selected the file to save, press the OK command button. Alternatively, you can double-click the mouse on the file name if it appears in the file list. If you decide not to save a file, select the Quit button.

☞WARNING: If your PC does not have sufficient RAM memory or if you are entering lots of input data, you may encounter "Out of Memory" errors, causing MINEWALL to terminate while returning you to the DOS prompt. Any input data not saved will be lost. To be safe and remain sane and unflustered, Save Your Data Often As You Enter It!!! Then you can retrieve the partial data later and continue data entry where you left off.

5.2.3 Erase Current Data

This selection from the File Submenu (Figure 3-3) clears all data, and re-initializes, MINEWALL. This is automatically done when MINEWALL is first started, whenever Open Existing Data File (Section 5.2.1) is selected, or when Time Criteria (Section 5.3.2) are changed after initial values are entered. This selection allows you to do the same any time you are unhappy with the data you have entered. However, because of the amount of data entered into MINEWALL, it is faster to save the current data (Section 5.2.2) and edit/change specific portions of it, rather than starting from the beginning. If you make this selection, a message box will appear to check if you are sure you want to erase the current data.

☞WARNING: If you answer yes to the message box asking if you are sure you want to erase the current data, the data are permanently and unretrievably lost unless previously saved to a disk file (Section 5.2.2)!!!

5.2.4 Exit MINEWALL

This selection from the File Submenu (Figure 3-3) is the only proper and advisable way to terminate MINEWALL and return to DOS. Because MINEWALL manipulates forms, graphics, and disk files "behind the scenes", any other termination of MINEWALL may produce

strange results afterwards and will fail to clear un-needed disk space. Your choices are then to: reboot the PC or re-start MINEWALL and then exit properly.

You can choose Exit MINEWALL in various ways with the mouse or keyboard (Chapter 3). Once making the choice, a message box will appear asking you to confirm your choice with "Yes". If you choose "No" or "Cancel" (they are identical here), you will return to the Main Menu.

5.3 The Input Data Submenu

As explained in Chapter 3, this submenu (Figures 3-5, 3-7, and 3-10) of the Main Menu (Figures 3-1 and 3-2) contains numerous choices for simulating an open-pit mine or underground workings. Chapter 3 describes the various ways to choose one of these selections with a mouse or various keyboard options.

Initially, most selections are disabled and appear "grayed" (Figure 3-5) so that they cannot be selected and activated. However, as you complete the enabled selections and they are "checked" on the Submenu (Figures 3-7), other selections will become enabled. You should continue entering data under all enabled selections are completed and checked (even if you only enter zeros). Only then can a simulation be run (Section 5.4.1). If you attempt to run a simulation before all selections are checked, MINEWALL will notify you that all required data have not been entered.

If you have previously saved some or all input data (Section 5.2.2), then loading that data file (Section 5.2.1) will automatically enable and check the Submenu selections that had been completed (e.g., Figure 3-10).

MINEWALL 2.0 includes an optional "Menu Pop" (Section 5.5.3) which causes the Input Data and Output submenus to automatically reappear after a selection is completed. This saves time and effort in re-displaying the Submenus after each completion. However, it prevents the use of the function keys (e.g., F9 to Exit MINEWALL) which do not operate when

submenus are showing. You can disable Menu Pop if you prefer by following the instructions in Section 5.5.3.

5.3.1 Title

This is the first selection from the Input Data Submenu (Figure 3-5). After initially starting MINEWALL, opening an existing input-data file (Section 5.2.1), or erasing current data (Section 5.3.3), this will be the only available ("enabled") choice under this Submenu. After completing this form, it will be "checked" to show you have completed it and additional selections will become enabled (Figure 3-7). You should continue this process until all enabled selections have been checked (Figure 3-10), and only then can a simulation (Section 5.5.1) be run.

Upon selecting Title, the Title form appears (Figure 5-4) requesting a title for the simulation and whether you are simulating an open-pit mine or underground working. The option of co-simulating both with a hydraulic connection is not currently available due to memory limitations (discussed further in the Programmer's Notes and Source Code).

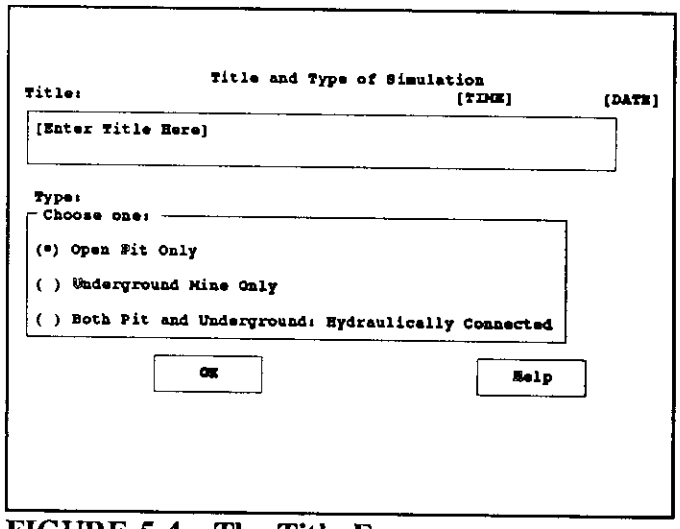

FIGURE 5-4. The Title Form.

On the Title Form, you should enter a Title for the simulation in the text box. The title can be several lines long and you can start a new line by simply pressing <ENTER> at the end of the current line. The choice of pit or underground is made from the set of option buttons. When you are finished with the form and wish to return to the Main Menu, select the OK command button (or Quit if you do not want the information retained). If you are not familiar with text boxes, option buttons, and command buttons, you should review Chapters 3 and 4 before continuing.

5.3.2 Time Criteria

This selection from the Input Data Submenu (Figures 3-5 and 3-7) can be chosen after Title (Section 5.3.1) is completed. This causes the Time Criteria Form to appear (Figure 5-5) after a message box explains the required forethought (see the Warning below). The two sets of option buttons along the left side of the form set (1) the frequency of the simulation (every day, every week, or every month) and (2) whether Operation, Closure, or both will be simulated. Daily simulations are not currently available due to memory limitations.

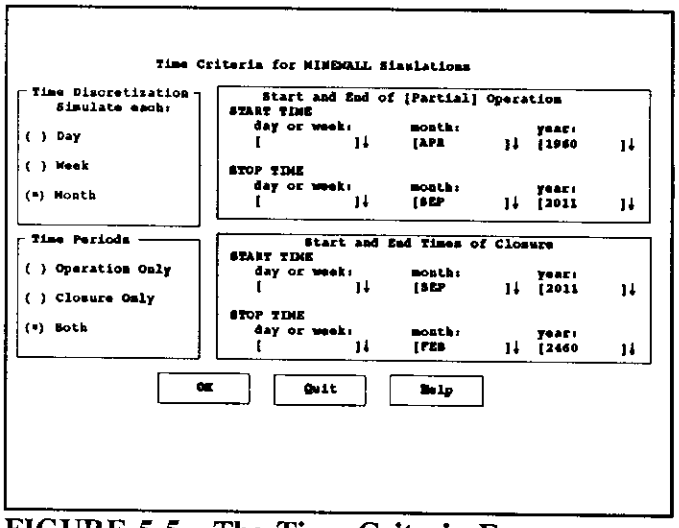

FIGURE 5-5. The Time Criteria Form.

By changing the choice of Operation and Closure, the two Start/Stop boxes on the right side will appear and disappear. By changing the choice of frequency, the individual combo boxes in the two Start/Stop boxes will be enabled and disabled and/or re-labelled. In this way, MINEWALL will indicate the information needed for a particular type of simulation. When you started MINEWALL, it gave a general indication of the greatest frequency you could use with your PC, depending on the number of Geochemical Parameters (Section 5.3.3) you select. You can use Memory/Disk Check under the Information Submenu (Section 5.5.4) to monitor free memory and disk space.

All values that can be entered into the time boxes are held in the pulldown combo boxes. If you do not know how to access combo boxes, you should read Chapters 3 and 4.

You do not have to simulate the entire actual times of Operation and Closure. The words, Operation and Closure, have specific non-regulatory meanings in MINEWALL which are explained in Section 4.2.

☞TIP: If you are simulating both Operation and Closure, MINEWALL will automatically set the Start Time of Closure to the next time period after the Stop of Operation.

☞WARNING: If you later return to Time Criteria to change the values, all data except Title (Section 5.3.1) and Geochemical Parameters (Section 5.3.3) will be erased (see Erase Current Data in Section 5.2.3 for more details).

5.3.3 Geochemical Parameters

This selection from the Input Data Submenu (Figures 3-5 and 3-7) can be chosen after Title (Section 5.3.1) is completed. A form is displayed showing the 37 elements, ions, gases, and other parameters in MINEWALL 2.0 (Figure 5-6). The form is a large set of check boxes, so that you can choose one or more parameters (see Section 4.2 for MINEWALL's definition of Geochemical Parameter). However, pH, alkalinity, acidity, and sulfate are always selected (and MINEWALL will later select them even if you do not). The selected parameters are marked with an "X" (if you are not familiar with check boxes, read Chapter 4).

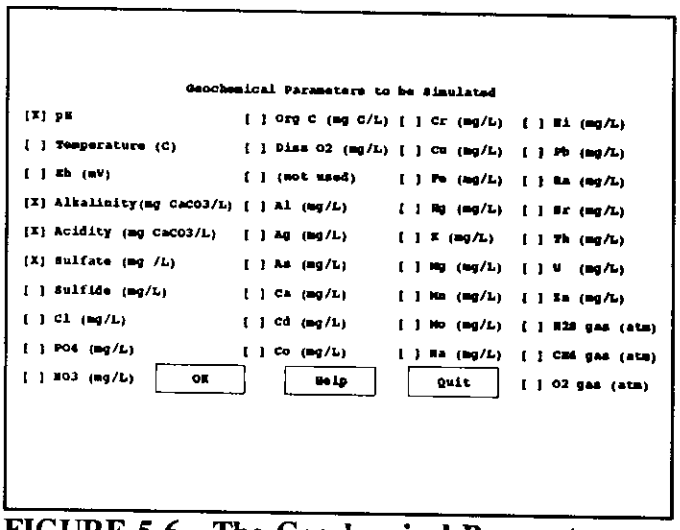

FIGURE 5-6. The Geochemical Parameters Form.

The parameters you select will later reappear in forms and spreadsheets for which you must enter data such as concentrations or rates. So be certain you have data for each Parameter before choosing it. Nevertheless, you can change the number of selected parameters at a later time.

The number of parameters you choose directly affects the size of data arrays and disk files. At the beginning, MINEWALL generally suggested the number of parameters you could

choose, depending on the Time Criteria (Section 5.3.2) you selected. You can use Memory/Disk Check under the Information Submenu (Section 5.5.4) to monitor free memory and disk space.

5.3.4 Rock/Geochemical Units

This selection from the Input Data will only be enabled after you have completed Title (Section 5.3.1), Time Criteria (Section 5.3.2), and Geochemical Parameters (Section 5.3.3). The selection will be preceded by "Pit -" if you have chosen Open Pit Only from the option boxes on the Title Form (Section 5.3.1) or by "U/G -" is you chose Underground Mine Only. MINEWALL's definition of a Geochemical Unit is presented in Section 4.2.

This selection causes several forms and spreadsheets to be displayed. The First Form simply asks for the number of units (not reproduced here). Up to 10 units can be simulated, and the number is chosen from the combo box. (A Unit does not have to be physically continuous; see Section 5.3.5). Then a second form is repeatedly displayed for each unit, asking for its name and the equation which controls the change in geochemical reactivity through time (Figure 5-7). You must enter a value for applicable Factor and Rate Acceleration Factor. The equations and Factors are discussed in detail in the MINEWALL report entitled

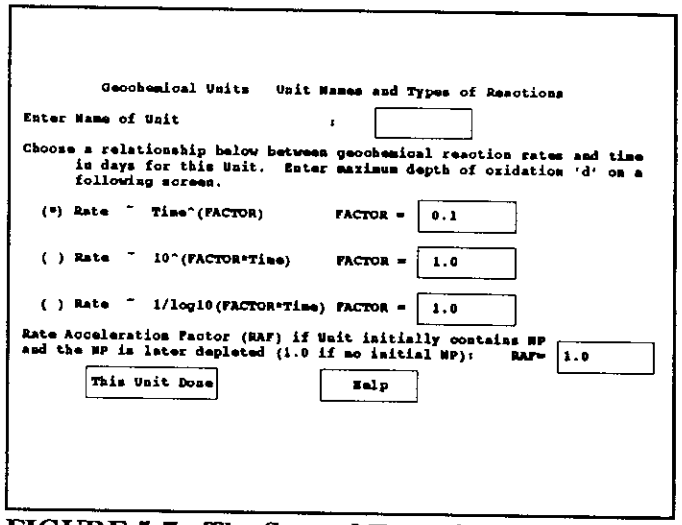

FIGURE 5-7. The Second Form for Geochemical Units.

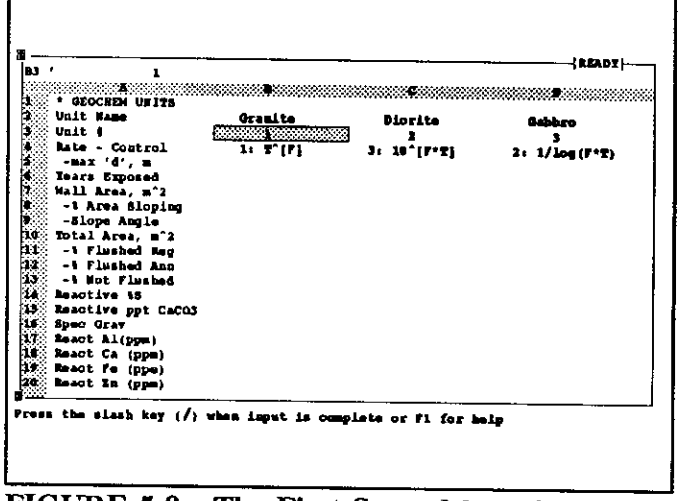

FIGURE 5-8. The First Spreadsheet for Geochemical Units.

Literature Review and Conceptual Models.

After the Second Form has been completed for each unit, the First Spreadsheet is displayed, seeking physical and geochemical information in a tabular manner (Figure 5-8). The required information is discussed in detail in the MINEWALL reports entitled Literature Review and Conceptual Models and Application of MINEWALL to Three Minesites.

The information you already entered on the First and Second Forms is summarized in the spreadsheet. However, any changes you make to the previously entered information at this point will be ignored; you will have to complete the Geochemical Units selection and then return to the earlier forms and change the data.

The Second Spreadsheet (Figure 5-9) is relatively simple, requesting the time periods when the annually repeated flushes of the periodic-flushed fracture surfaces occur. The time period(s) for an annually repeated flush is marked with the number "1" at the intersection of the specified time period and the unit number. For example, if the annually repeated flush of Unit 1 occurs only in the months of April and November (assuming a monthly simulation), a "1" is entered in the Unit 1 Column across from the Rows labelled "4" and "11" (Figure 5-9). If the annually repeated flushes of Unit 2 occur on Week 10 and 39 (assuming a weekly simulation), then a "1" should be entered in the Unit 2 Column across from the Rows labelled 10 and 39.

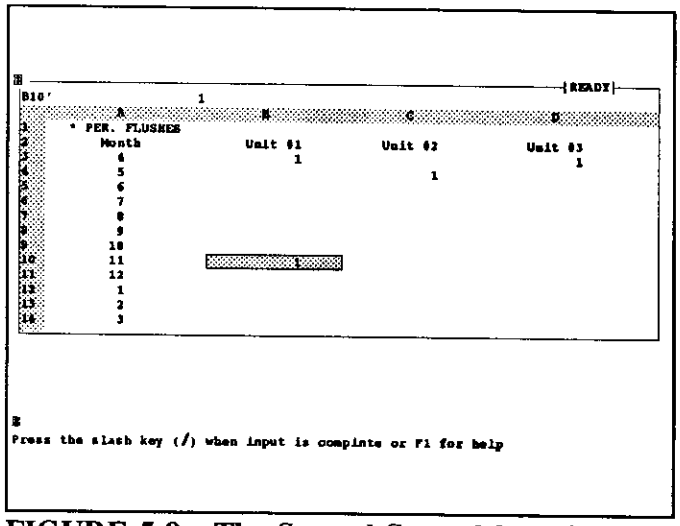

FIGURE 5-9. The Second Spreadsheet for Geochemical Units.

In order to set up the Third Spreadsheet, the Third Form first asks for three specific choices pertaining to geochemical topics (Figure 5-10). The topics on fresh vs. aged rates and

on control of submerged rates by dissolved oxygen will be taken into account during simulations. The remaining topic of input of Neutralization-Potential-consumption (NP) rates or NP/SO_4 ratios pertains to the following Third Spreadsheet.

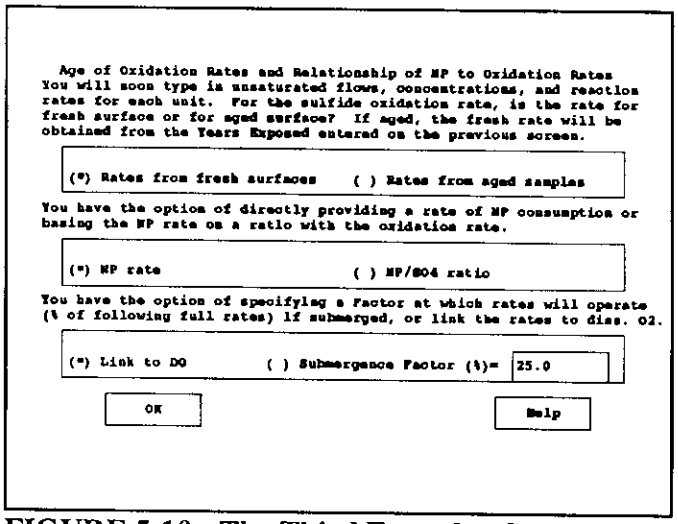

FIGURE 5-10. The Third Form for Geochemical Units.

The Third Spreadsheet is repeated for each unit. This spreadsheet is not reproduced here, but it appears similar to Figure 5-9 except the selected Geochemical Parameters (Section 5.3.3) are listed in the second row rather than Unit numbers. The spreadsheet asks for reaction rates as $mg/day/m^2$ of unit surface for each Geochemical Parameter at each time interval. There is also a column provided to enter any flow of water as m^3/day associated with a unit. If no flow is entered, then a loading with no accompanying volume of water is delivered to the mine sump(s) during Operation (Layer 0) and to Layer 1 during Closure. Reaction rates and related topics are discussed further in the Literature Review.

At this point, data entry for Rock/Geochemical Units is completed and you are returned to the Main Menu. If Menu Pop is active (Section 5.5.3), the Input Data Submenu will also reappear; otherwise, you will have to manually choose the Submenu in order to continue data entry with Physical Geochemical Layout (Section 5.3.5).

5.3.5 Physical/Geochemical Layout

At this point in a simulation, MINEWALL requires information such as volumes and lateral areas of a mine at distinct elevations and the cumulative percentage of each Unit exposed at the distinct elevations. This information is entered through one spreadsheet (Figures 5-11 and 5-12). Additional information is then requested on the aqueous Layer.

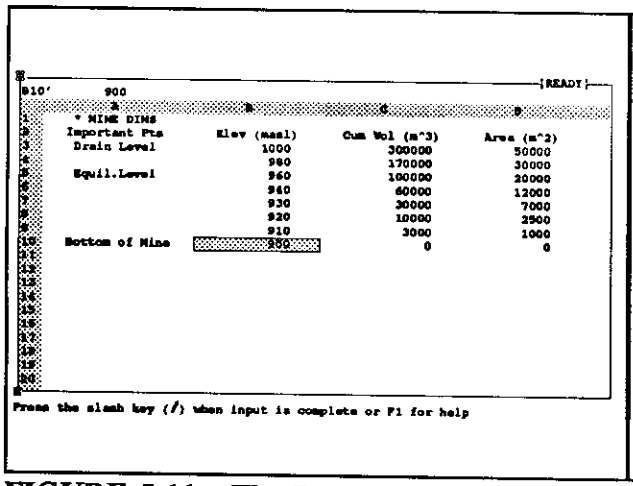

FIGURE 5-11. The Layout Spreadsheet - Columns A to D

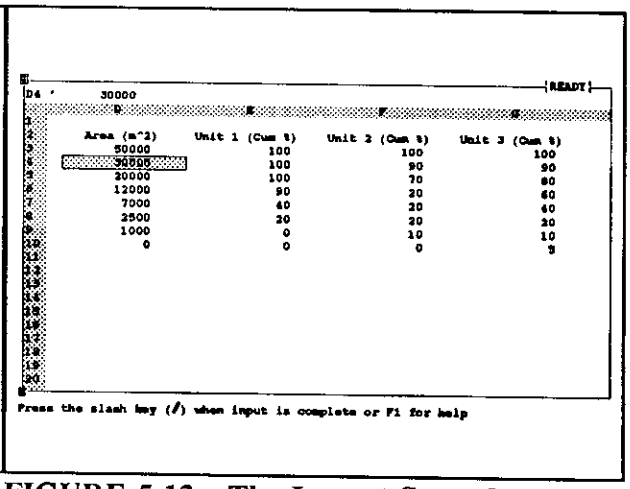

FIGURE 5-12. The Layout Spreadsheet - Columns D to G.

This spreadsheet is one of the few times in MINEWALL that you are required to enter/manipulate text. Column A contains the labels Drain Level, Equilibrium Level, and Bottom of Mine whose meanings are discussed in the MINEWALL report, Literature Review and Conceptual Models. The latter label (Bottom of Mine) is initially displayed in Cell A20 on the spreadsheet, but was manually moved upwards in Figure 5-12 because eight elevations were considered sufficient to characterize the layout. You must move these three labels to their correct position (elevation).

☞TIP: MINEWALL examines Column A of the Layout Spreadsheet for the first letter of each label. Consequently, you do not have to re-type each label, but just its first letter in lowercase or uppercase. For example, MINEWALL would identify b or B as Bottom of Mine.

Geochemical Units (Section 5.3.4) do not have to be physically continuous on the mine walls. For example, Figures 5-11 and 5-12 show that 20% of Unit 2's exposed surface area lies below 920 m elevation and 80% lies above 940 m elevation.

After this information on mine elevations and exposure of units is completed,

MINEWALL displays a series of forms and spreadsheets for information on the aqueous Layer during Operation and/or Closure.

During Operation, the mine has one Layer (see Section 4.2 for a definition of MINEWALL Layers): Layer 0, the Mine Bottom and its sump(s). If Closure is simulated, the mine will likely fill with water unless negative flows (out of the mine) exceed cumulative inflow (Sections 5.3.6 through 5.3.11). As a mine fills with water, the water column can remain homogeneous (one Layer) or stratified into two or more Layers (the MINEWALL report on the Literature Review and Conceptual Models discusses this in detail). Due to memory limitations, MINEWALL allows only one Layer to exist. First, a form (not shown here) is displayed indicating only one Layer is permitted.

Next, a form is displayed asking for the name of the layer in a text box. After that, a spreadsheet provides a reminder of information on Layer 0 (the Mine Bottom or Sump(s)) if Operation is simulated and another spreadsheet provides a reminder of information on Layer 1 (the flooding water) if Closure is simulated. The layer number appears as a column heading and the row headings remind that MINEWALL automatically assigns 100% of each flow, such as precipitation and saturated groundwater flow (Sections 5.3.6 to 5.3.11), to the single Layer. A reminder also indicates that subsequent forms will ask which geochemical process (mass balance, kinetics, etc.) regulate each Geochemical Parameter in the Layer.

☞NOTE: Pumping#1 and Pumping#2 (Sections 5.3.10 and 5.3.11) include special options to partition and control flows in various ways during simulations.

Finally, the Layer Chemistry Form (Figure 5-13) is repeatedly displayed, once for each Geochemical Parameter in each Layer. For most MINEWALL simulations, this form will likely

be displayed many times because of the typical number Parameters in Layer 0 and 1.

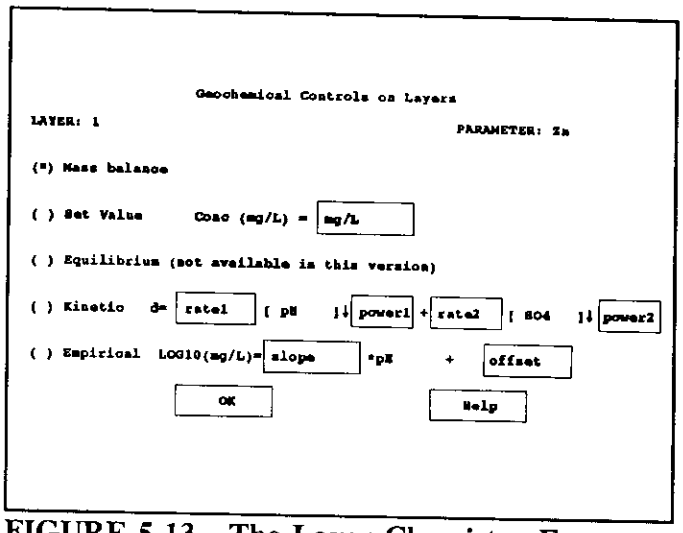

FIGURE 5-13. The Layer Chemistry Form.

The Layer Chemistry Form gives users great flexibility and control over concentrations of individual species during Operation and Closure. However, such flexibility can be misused, such as in creating unbalanced water chemistry with concentrations of anions greatly exceeding those of cations. Therefore, forethought and caution should be used with this form.

The Layer Chemistry Form (Figure 5-13) provides you with four geochemical processes for determining the concentration of a particular parameter in a particular layer (equilibrium is not available due to memory limitations). These four processes are discussed in detail in the MINEWALL report entitled, Literature Review and Conceptual Models, and are only summarized here. Firstly, mass balance simply involves the homogenized mixing of all flows and loadings in the inflows to the mine while subtracting those of all outflows. Secondly, a set value is literally one designated value, reflecting simple equilibrium, and the value is entered into the text box laterally adjacent to the option button. Thirdly, the kinetic equation calculates a concentration of one parameter from a rate constant and the concentration of another parameter. The rate constant is entered into the laterally adjacent text box and the parameter is chosen from a combo box. Fourthly, the empirical approach calculates a concentration from a slope, offset, and usually pH. For pH the empirical approach calculates pH from acidity. For proper calculations, MINEWALL actually calculates all concentrations "behind the scene" through mass balance before implementing any of the other four processes.

Figure 5-13 displays all the text boxes and combo boxes associated with the four processes. Actually, when MINEWALL is running, all boxes are hidden except for any

associated with your particular choice. The appropriate boxes will appear and disappear as you move through the set of option buttons. The text boxes require the entry of numbers whereas the combo boxes allow you to select one of the Geochemical Parameters.

After a geochemical process has been selected for each parameter in each layer, MINEWALL will display the Main Menu. If Menu Pop (Section 5.5.3) is active, the Input File Submenu will also be displayed. At this point, it is wise to save the current data (Section 5.2.2); it can be heartbreaking to re-enter all these Layout data.

5.3.6 Precipitation

This selection from the Input Data Submenu of the Main Menu invokes one spreadsheet (Figure 5-15), which may be repeatedly displayed. If both Operation and Closure are simulated, then the spreadsheet would appear at least twice if each of the yearly values are constantly repeated. The spreadsheet would appear as many times as the number of simulated years if each year has unique values. You must fill in all cells, even if the values are zero. The "seed" spreadsheet discussed below will help with this task.

In order to assist in filling out the Precipitation Spreadsheet, MINEWALL will initially show a "seed" spreadsheet (Figure 5-15). This allows you to enter default values, such as zero, that will apply to the entire column below that seed value. After pressing the / key, a form will appear (Figure 5-16) asking if you want MINEWALL to repeat the yearly data for each year of the simulation or whether each year will have unique values. After you make a choice, the Precipitation Spreadsheet (Figure 5-14) will appear with each column showing its default value. You can then enter the values which differ from the default.

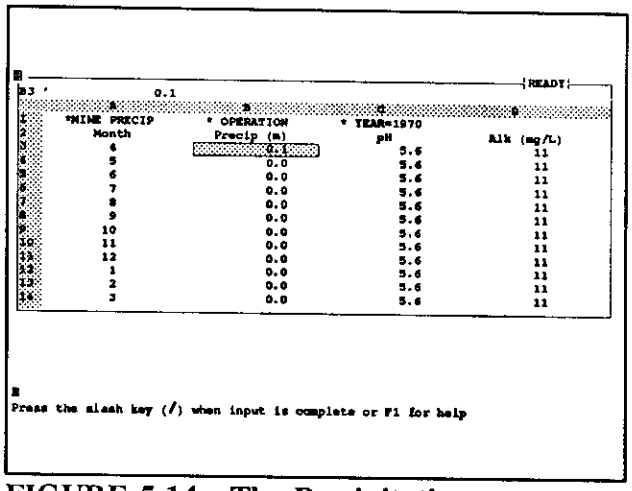

FIGURE 5-14. The Precipitation Spreadsheet.

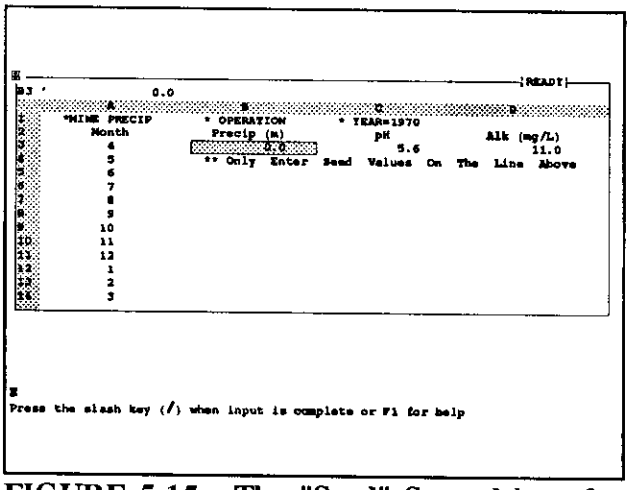

FIGURE 5-15. The "Seed" Spreadsheet for Precipitation.

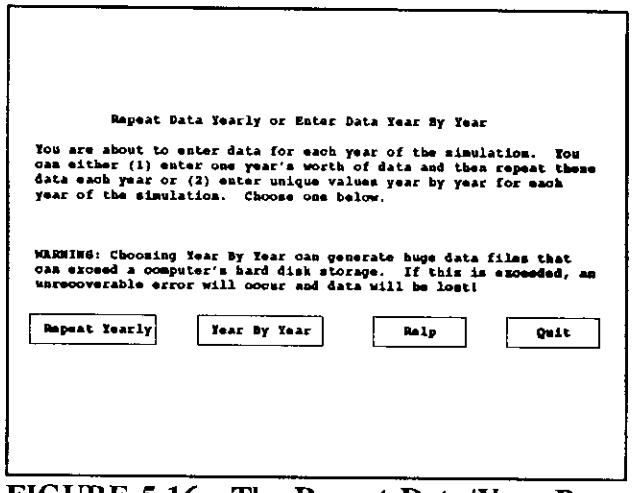

FIGURE 5-16. The Repeat Data/Year-By-Year Data Form.

If data have been previously entered for this selection, a message form will be displayed (Figure 5-17) asking whether you wish to edit the existing data or enter new data. If you choose to edit existing data, the seed spreadsheet will not appear.

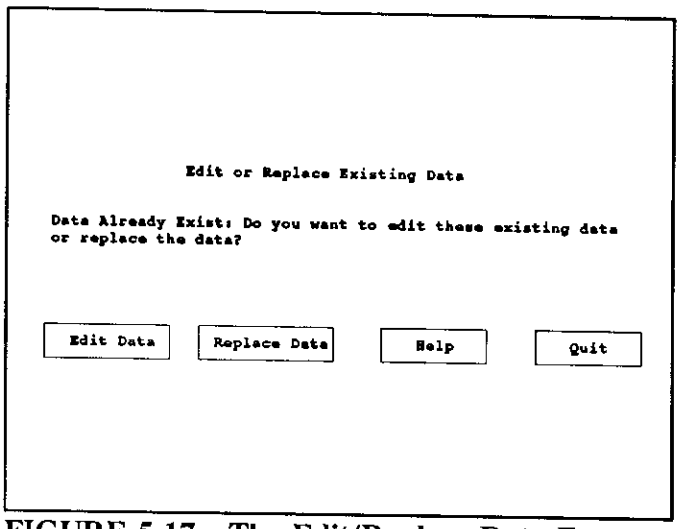

FIGURE 5-17. The Edit/Replace Data Form.

5.3.7 Evaporation

Like Precipitation (Section 5.3.6), this selection from the Input Data Submenu includes a "seed" spreadsheet (Figure 5-18) that assists in filling in the entire spreadsheet (Figure 5-19). The values entered into the top of each column in the seed spreadsheet will be copied into all cells of the column in the main spreadsheet. Individual cells in the main spreadsheet can then be changed. Before the main spreadsheet (Figure 5-19) is displayed, however, MINEWALL asks whether one cycle of yearly data will be repeated or whether each year will have unique values (Figure 5-17). If you choose to repeat the data, only one spreadsheet will be shown for Operation or Closure.

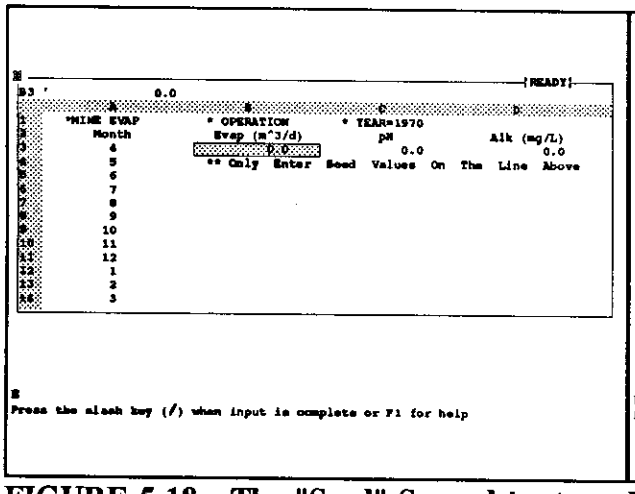

FIGURE 5-18. The "Seed" Spreadsheet for Evaporation.

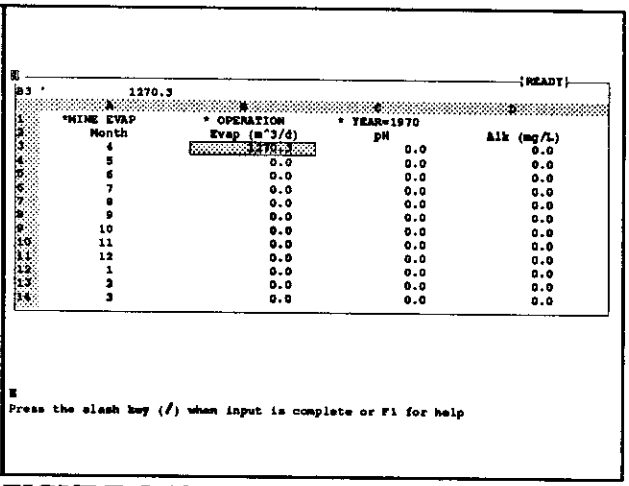

FIGURE 5-19. The Evaporation Spreadsheet.

If data have been previously entered for this selection, a message form will be displayed (Figure 5-17) asking whether you wish to edit the existing data or enter new data. If you choose to edit existing data, the seed spreadsheet will not appear.

5.3.8 Runoff

Like Evaporation (Section 5.3.7), a series of forms and spreadsheets similar to Figures 5-16 to 5-19 will be displayed, except Cell A1 will indicate Runoff rather than Evaporation. Consult Section 5.3.7 for details.

5.3.9 Saturated Flow

Like Evaporation (Section 5.3.7) and Runoff (Section 5.3.9), a series of forms and spreadsheets similar to Figures 5-16 to 5-19 will be displayed, except Cell A1 will indicate Saturated Flow rather than Evaporation. Consult Section 5.3.7 for details.

If you are simulating Closure, you can instruct MINEWALL to adjust the saturated-groundwater flow into the mine as the minewater level rises (Figure 5-20). This adjustment reflects the decrease in hydraulic gradient towards the mine as it fills. The options for adjusting the flow (Figure 5-20) allow MINEWALL to generally mimic the predictions of a detailed physical-hydrogeologic model. The MINEWALL report entitled Literature Review and Conceptual Models discusses this issue in more detail.

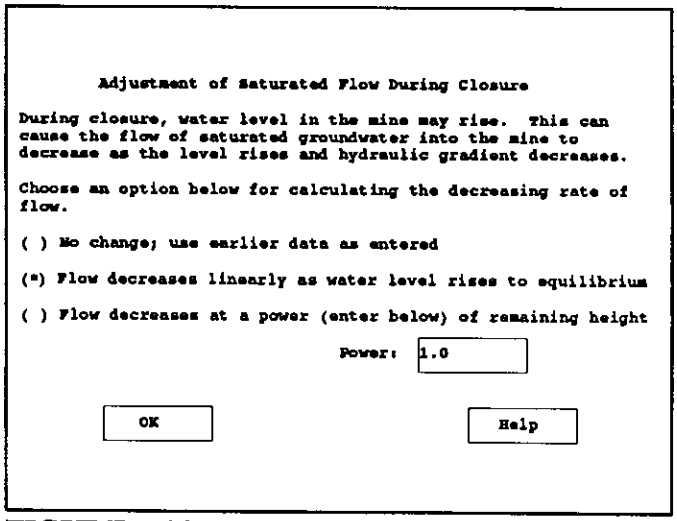

FIGURE 5-20. The Saturated-Flow Adjustment Form.

5.3.10 Pumping#1 to/from Mine

Like Evaporation (Section 5.3.7), a series of forms and spreadsheets similar to Figures 5-16 to 5-19 will be displayed, except Cell A1 will indicate Pump#1 rather than Evaporation. Consult Section 5.3.7 for details. Since pumping of water can be into or from the mine, the correct mathematical signs for flow are: positive (+) values of flow indicate pumping into the mine and negative (-) values indicating water removed from the mine.

There is a special option available under Pumping#1 if you are pumping water from the mine during Operation or Closure (negative values of flow). If you enter any concentrations, MINEWALL will remove only those concentrations and loadings from the appropriate Layer. During Operation, for example, this would correspond to intercepting a seep before it reaches the mine sump(s) and combines with other flows. If you leave all concentrations at zero, MINEWALL will remove the composite concentrations and loadings at the from the appropriate Layer. Otherwise, Pumping#1 produces the same basic effect on flows, concentrations, and loadings as Runoff (Section 5.3.8) and Saturated Flow (Section 5.3.9).

If you specify a pumping flow greater than that available from the mine sump(s) during Operation, only the maximum volume available in the sump(s) will be removed. If you specify a high pumping flow during Closure that dewaters the aqueous Layer, the volume of the Layer will be adjusted to zero.

5.3.11 Pumping#2 to/from Mine

Like Evaporation (Section 5.3.7), a series of forms and spreadsheets similar to Figures 5-16 to 5-19 will be displayed, except Cell A1 will indicate Pump#2 rather than Evaporation. Consult Section 5.3.7 for details. Since pumping of water can be into or from the mine, the correct mathematical signs for flow are: positive (+) values of flow indicate pumping into the mine and negative (-) values indicating water removed from the mine.

Pumping#2 contains special options that make it unique from other selections, including

Pumping#1 (Section 5.3.10). After choosing this selection and completing the spreadsheets, one or more message forms will appear, depending on whether you are simulating Operation and/or Closure. If you are simulating Operation, you can instruct MINEWALL to adjust Pumping#2 to maintain a dry mine. This is valuable if you do not have information on evaporation, for example, and are not sure all flows are balanced to maintain a dry mine. MINEWALL reports the required, balanced pumping flows for each time interval after Operation is simulated (Section 5.4.1) so that the flows can be inspected to determine if they are reasonable or if other flows should be adjusted. In this way, you can calibrate MINEWALL to the exact flows at your site. You can even calibrate MINEWALL further by partitioning Pumping#2 flows among the other flows, such as Runoff and Pumping#1, and re-simulate Operation until Pumping#2 reports no unbalanced flows.

If you are simulating Closure, you can instruct MINEWALL to maintain the minewater level below the natural Equilibrium Level. A message box appears asking if you want to implement this option and, if so, what elevation you want to maintain should the water level reach it. This would reflect, for example, the decision of a mining company to maintain the water level below that which would allow some escape of mine water into surrounding groundwater flow systems. If this option is not used, the mine will be allowed to fill up to, but no higher than, the Equilibrium Level specified under Physical/Geochemical Layout (Section 5.3.5) if inflow is sufficient.

If the pumping flow of Pumping#2 from the mine during Closure is relatively high (designated by the user or calculated by the option in the previous paragraph), water will be taken from the Layer until the Layer is dewatered.

5.4 Output Submenu (for both Operation and Closure)

If you have finally entered all of the required input data for a MINEWALL simulation (Section 5.3), congratulations - you are ready to run a simulation and examine the results! This is accomplished through this submenu (Figure 3-8) of the Main Menu (Figures 3-1 and 3-2). Due to the potentially large amount of information created by a simulation, Operation and Closure are simulated separately by MINEWALL. However, the procedures to simulate and to examine the results are essentially identical for Operation and Closure. Thus, the procedures described in the following subsections apply to both.

The selections for examining output results include graphics and text browsing. However, MINEWALL was not designed to replace commercially available wordprocessors and graphics software. Therefore, MINEWALL 2.0 offers various options that allow a user to export simulation results to a wide variety of other, commercial software packages.

5.4.1 Simulate

This selection from the Output Submenu (Figure 3-8) must be made before any results can be examined, because the results are created through this selection. After selecting Simulate, if you have not entered all required input data, MINEWALL will inform you of this problem and you can return to the Input Data Submenu (Section 5.3). Otherwise, MINEWALL displays a form which explains which tasks are being carried out and which have been completed. Additionally, to show it is still active, MINEWALL displays a "gas gauge" form graphically showing its progress year-by-year through a simulation.

If you chose to simulate both Operation and Closure, then Operation must be simulated first. The Closure simulation requires the results and mass balances generated by the Operation simulation.

A simulation can require less than one minute to more than a few hours, depending on the type of PC and the type of simulation (time frequency and number of Geochemical

Parameters). When a simulation is finished, the gas-gauge form will disappear and the remaining form will state the simulation is completed. Choose the OK button to return to the Main Menu. The Output Submenu will also automatically reappear if Menu Pop (Section 5.5.3) is active.

5.4.2 Browse Simulation Results

This selection in the Output Submenu (Figure 3-8) allows the visual examination of output results as text if Operation or Closure have been simulated (Section 5.4.1). If a simulation has been completed, this selection will first show a form (Figure 5-21) to obtain the type of results to display. The combo box on the form lists the Layer (0 for Operation and 1 for Closure). If you are not familiar with combo boxes or MINEWALL Layers, you should review Chapter 4 before proceeding.

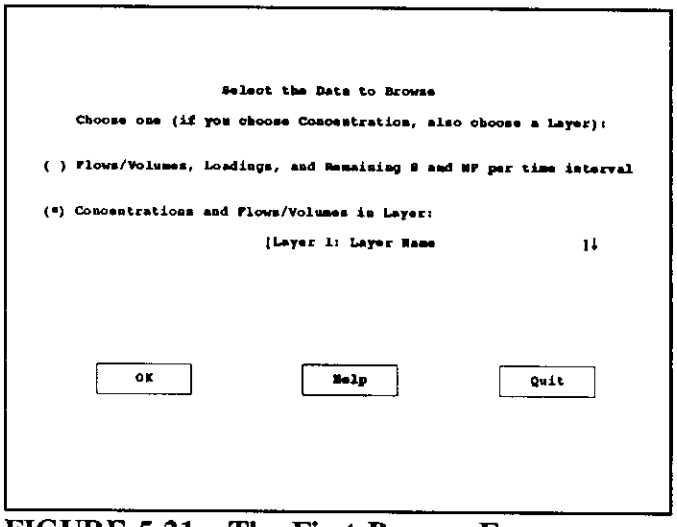

FIGURE 5-21. The First Browse Form.

Once the type of results has been chosen, another form with horizontal and vertical scroll bars is displayed (Figure 5-22). Because of memory limitations in MINEWALL, the form will display only about 20-50 lines of output in tabular format. You can then browse through this first "page" of results, then press the Next button to obtain the next page. By pressing the Next and Previous buttons, all output results of the designated type can be browsed. Pressing the Quit button terminates the browse routine and the Main Menu reappears. The Output

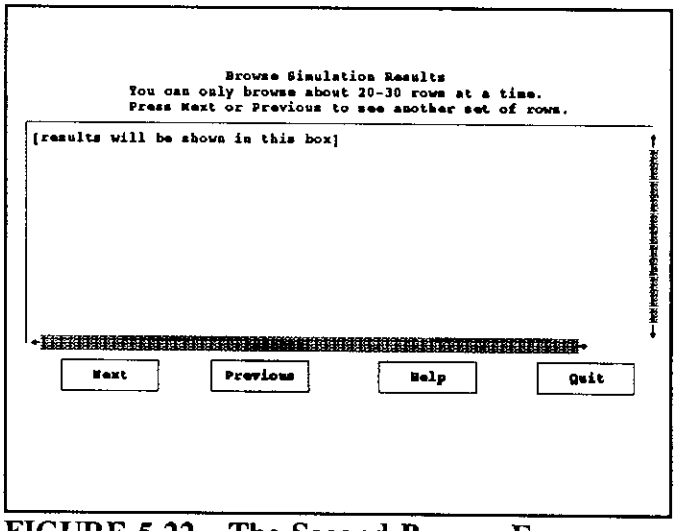

FIGURE 5-22. The Second Browse Form.

Submenu will also automatically reappear if Menu Pop (Section 5.5.3) is active.

5.4.3 Graph Simulation Results

This selection from the Output Submenu (Figure 3-8) allows the examination of output results as X-Y graphical plots after Operation or Closure have been simulated (Section 5.4.1). The Y axis is always time. If a simulation has been completed, this selection will show several forms to obtain information on the type of information to plot, the X and Y axes, and the type of printer if a printed copy of the graph is needed.

Initially, a message box asks if you may want to print a graph. If you answer Yes, a form asks for information on the graphics printer (Figure 5-23). (If you answer No and later wish to print a graph, you have to return to the Main Menu and select Graph Simulation Results again.) After you complete this form, or if you answer No to printing a graph, another form requests information on the variable(s) to plot (Figure 5-24) for Layer 0 (Operation) or 1 (Closure). Up to five choices can be plotted at one time, but for clarity any combination of choices should

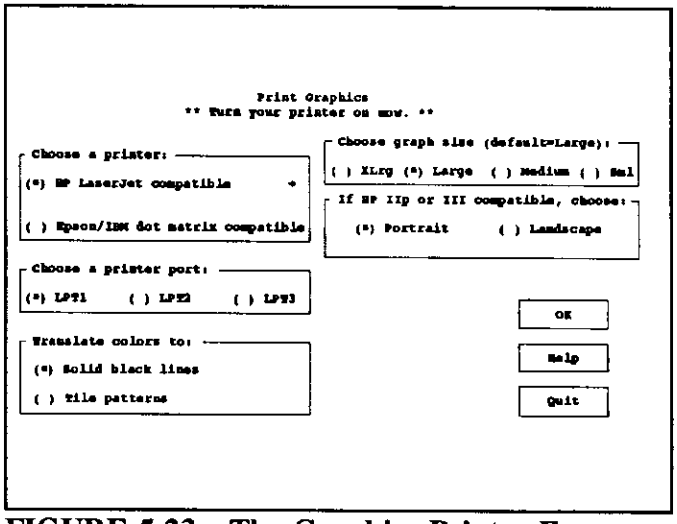

FIGURE 5-23. The Graphics Printer Form.

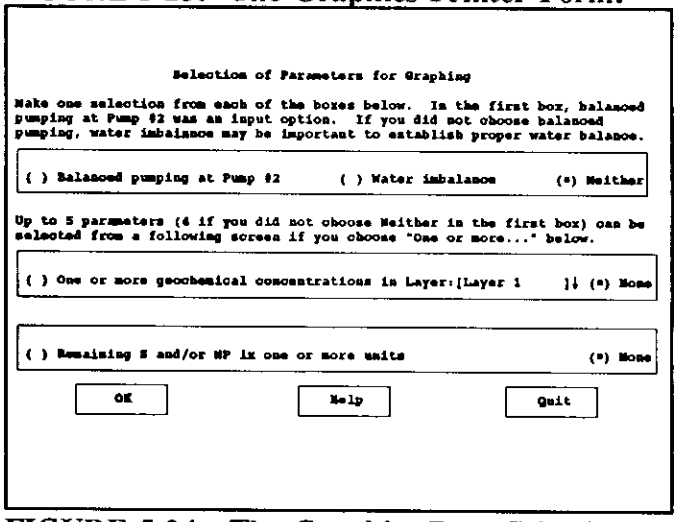

FIGURE 5-24. The Graphics Data-Selection Form.

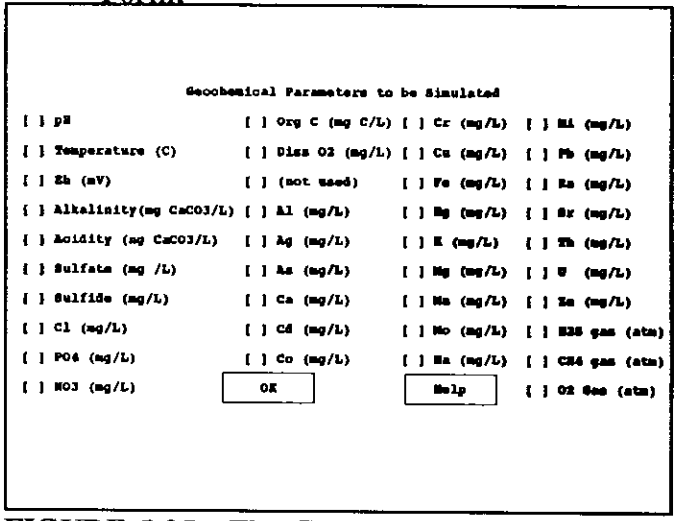

FIGURE 5-25. The Graphics Parameter Form.

share a similar range of values. Choose the OK button to proceed to the next form. If you are not familiar with combo boxes or MINEWALL Layers, you should review Chapter 4 before proceeding.

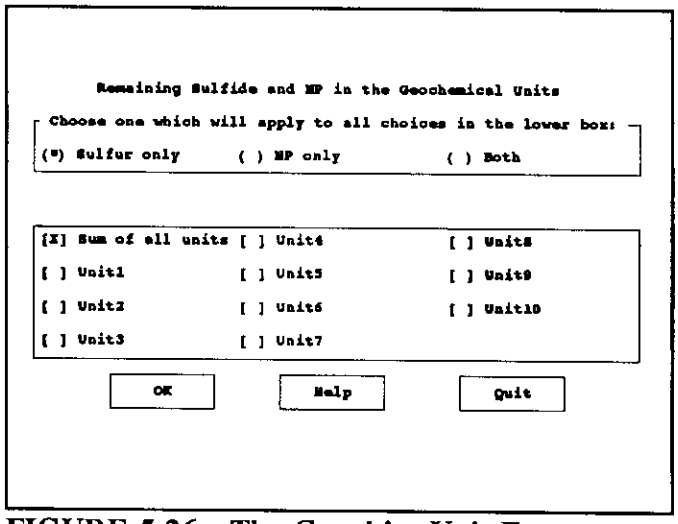

FIGURE 5-26. The Graphics Unit Form.

The form that appears next depends on the choices made on the previous screen (Figure 5-24). If you selected concentrations in one or more layers, a list of parameters appears (Figure 5-25). In this case, you can select the parameter(s) you wish to plot from the set of check boxes. If you selected remaining sulfur and/or neutralization potential from one or more units, a list of the units appears (Figure 5-26).

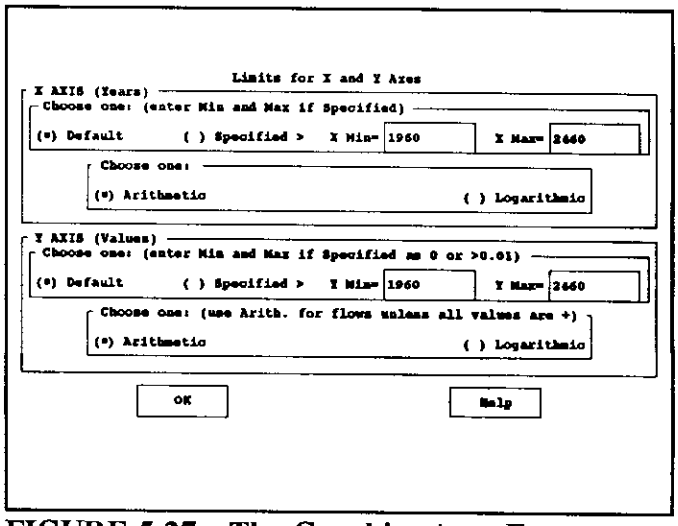

FIGURE 5-27. The Graphics Axes Form.

After all items to be plotted have been chosen, the last form to appear (Figure 5-27) asks for plotting information such as X and Y limits (MINEWALL can determine appropriate default values), and arithmetic/logarithmic axes. After you choose OK on this form, MINEWALL begins to gather and examine the requested data. A few seconds to more than a minute may elapse before the graphics plot appears, depending on the number of selected items and the number of data points for each item.

After the graph appears and you have examined it, (1) you can press any key to continue if you did not indicate earlier that you may want to print a graph (if you now want to print, you have to return to the Main Menu and start again) or (2) press F10 to print the graph or any other

key to continue if you indicated earlier you may want to print a graph. If you print the graph, the graph will be redisplayed after it is sent to the printer. After you have left the graph, a message box will ask if you want to make another plot or return to the Main Menu. If you choose to return to the Main Menu, the Output Submenu will also reappear if Menu Pop (Section 5.5.3) is active.

5.4.4 Create ASCII Data File

This selection from the Output Submenu (Figure 3-8) instructs MINEWALL to send the results of a simulation to a user-defined and user-named file so that the results can be imported into other software packages. This selection first shows a form similar to Figure 5-25 asking for the data you want to export. If you want to export results for a particular layer, choose the desired layer from the combo-box list. Choose the OK button to proceed to the next form. If you are not familiar with combo boxes or MINEWALL Layers, you should review Chapter 4 before proceeding.

The next form asks for the format or type of data file you want (Figure 5-28). The three choices are: (1) comma-delimited standard ASCII, which means that all numbers and labels are separated by commas and labels are surrounded by double quotes ("), (2) space-delimited standard ASCII, which means all number and labels are separated by spaces and labels are surrounded by double quotes ("), and (3) Lotus WKS format, which is a binary-type file.

The last form under this selection is similar to Figure 5-3 for entering the name of the data file. Section 5.2.2 explains how to use this form and its controls. The data file you wish to create can have any name and extension as long as you remember what they are.

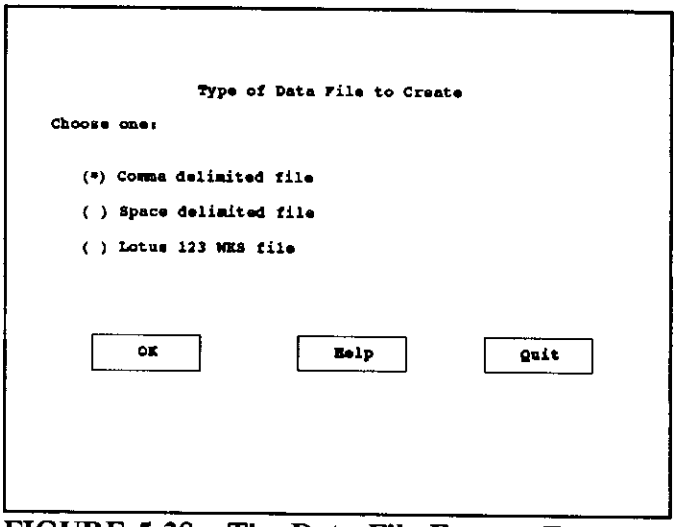

FIGURE 5-28. The Data File Format Form.

MINEWALL offers the default extension of "DAT".

MINEWALL informs you of its progress as it creates the requested data file. The Main Menu then reappears. The Output Submenu will also reappear if Menu Pop (Section 5.5.3) is active.

5.4.5 Write Simulation Report

This selection from the Output Submenu (Figure 3-8) creates a text-based ASCII file with explanatory headers containing the input data (Section 5.3) and/or the simulation results (Section 5.4.1). This report differs from the optional data files (Section 5.4.4) in that the report contains longer headers and optionally includes all input data. For input data, this report differs from the input-data file (Section 5.2.2) in that this report contains headers and labels for the data, whereas the input-data file is designed for MINEWALL use only and may appear cryptic when viewed.

☞NOTE: Write Simulation Report is essentially the only method through which input data used in a simulation can be obtained in a reasonably legible manner.

Under this selection, the first form that appears (Figure 5-29) asks whether input data and/or simulation results should be included in the report. Choose the OK button to proceed to the next form. If you are not familiar with forms and command buttons, you should review Chapter 4 before proceeding.

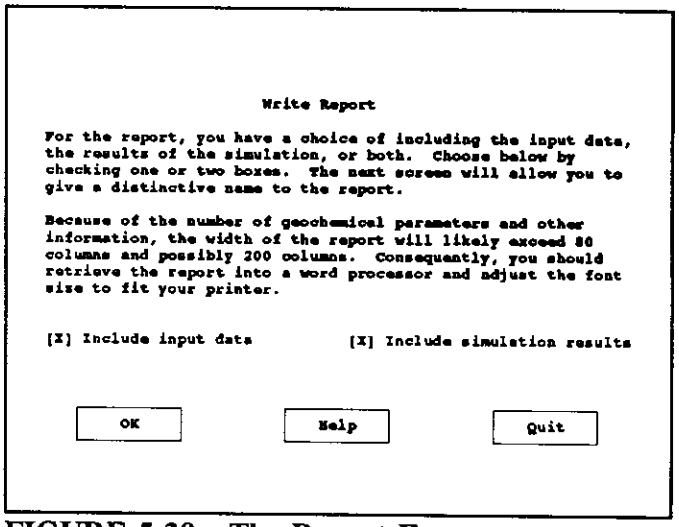

FIGURE 5-29. The Report Form.

The second and final form that appears is similar to Figure 5-3 in which the desired name for the report file can be entered. Section 5.2.2 explains how to

use this form and its controls. The report file you wish to create can have any name and extension as long as you remember what they are. MINEWALL offers the default extension of "OP" for Operation and "CL" for Closure.

5.5 Information Submenu

This choice from the Main Menu (Figures 3-1 and 3-2) offers four selections (Figures 3-4). These selections are not critical to MINEWALL's operation, but they make MINEWALL easier to use and monitor.

5.5.1 Help

MINEWALL 2.0 offers an on-line help service, although memory constraints preclude a casual browse through all help topics. For more extensive browsing of the help topics, a stand-alone program, MW20HELP, was installed with MINEWALL 2.0 (Chapter 2). All of these points are discussed in greater detail in Section 5.1

5.5.2 About MINEWALL ...

Like most software today, an "About..." selection is provided to generally remind you what MINEWALL is. This is beneficial in the event you find yourself dazedly running MINEWALL without knowing why.

5.5.3 Menu Pop

This is an option you can activate or disable. A "check" box mark appears on the left side of the words "Menu Pop" on the Submenu (Figure 3-4) when it is active. Menu Pop is automatically activated when MINEWALL starts.

Menu Pop causes the Input Data Submenu (Section 5.3) or Output Submenu (Section 5.4) to automatically reappear with the Main Menu after a selection under those submenus is completed. Menu Pop saves some time and effort because, otherwise, the submenu would have

to be reselected after completion of each submenu item. On the other hand, Menu Pop precludes the use of the function keys, such as F9 for Exit MINEWALL (Section 5.2.4), which are inoperative when a submenu is showing.

5.5.4 Memory/Disk Check

As mentioned in various portions of this User's Manual, MINEWALL is memory constrained, and the entry of large amounts of data can consume all available data and result in an error which will terminate MINEWALL. Additionally, MINEWALL can create large disk files. This selection from the Information submenu will show a message form which reveals the amount of free memory and disk space.

☞WARNING: Because of potential "Out of Memory" problems, save your input data often as you enter it. Do not depend on Memory/Disk Check to tell you when a problem is about to occur!

6. CONCLUSION

MINEWALL 2.0 is an computer-based, object-oriented tool for predicting water chemistry in open-pit mines and underground workings during operation and closure. MINEWALL was designed to offer the user a graphical interface through forms, Windows-like behaviour, and flexibility in using available data. However, it was not designed to run under the Windows operating system, and should instead be run from DOS outside of Windows.

MINEWALL simulates a mine with as little or as much data as you have. However, reasonable results can only be obtained from reasonable input data. This User's Manual along with the three other manuals comprising the MINEWALL 2.0 documentation, will show which and how much data are reasonable in light of current knowledge of pits and underground mines.

A periodic newsletter is planned for MINEWALL 2.0. If you are interested in the newsletter or would like to improve MINEWALL through your comments, questions, problems, or observations, please contact:

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